ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
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July 9, 2021
Revised: July 20, 2021

Classic Communities
2138 Flying Horse Club Drive
Colorado Springs, Colorado 80921

Attn: Adam Doyle

Re: Pavement Recommendations - Revised
Poco Road and Aspen Valley Road
Retreat at TimberRidge, Filing No.1
El Paso County, Colorado

Dear Mr. Doyle:

As requested, Entech Engineering, Inc. obtained samples of the pavement subgrade soils from the proposed roadways at the above referenced site. Laboratory testing was performed in order to determine the pavement support characteristics of the soil. This letter presents the results of the laboratory testing and pavement recommendations for the roadways.

Project Description

The project will consist of paving of the proposed Poco Road and a portion of Aspen Valley Road in the Retreat at TimberRidge, Filing No.1 subdivision in El Paso County, Colorado. A Subsurface Soil Investigation and laboratory testing were performed to determine the pavement support characteristics on the soils. The general layout of the site is presented in the Test Boring Location Map in Figures 1 and 2.

Subgrade Conditions

A total of four test borings were drilled along the roadways to depths of approximately 5 and 10 feet below the existing subgrade surface at the required sample frequency. At the time of our field investigation the subgrade was in good condition and adequate for vehicle traffic, including emergency vehicles.

The soils at the roadway subgrade depth consisted of silty to slightly silty sand (Soil Type 1) and very sandy claystone (Soil Type 2). The Test Boring Logs are presented in Appendix A. Sieve Analyses and Atterberg Limit testing were performed on subgrade soil samples obtained from the test borings for the purpose of classification. The percent passing the No. 200 sieve for the Type 1 soils ranged from approximately 11 to 23 percent soils.

The Type 1 soils classified as A-2-4 to A-1-b, which commonly exhibits good pavement support characteristics. The Type 2 soils classified as A-6 soils, which exhibit poor pavement support characteristics. Groundwater was not encountered in the test borings. Sulfate testing resulted in 0.00 to less than 0.01 percent soluble sulfate by weight, indicating a negligible potential for below grade concrete degradation due to sulfate attack.

Swell/Consolidation tests were not required on the Type 1 soils due to their classification. A Swell test on the Type 2 soils resulted in volume change of 5.5 percent, however the soil is

anticipated to be below the influence zone and mitigation for expansive soils is not required on this site. Type 2 Soil if encountered within the influence zone shall be removed and replaced with approved granular soils.

California Bearing Ratio (CBR) testing was performed on a representative subgrade sample of the Type 1 materials to determine the support characteristics of the subgrade soils for the roadway sections. The Type 2 soils were not analyzed as they are below the pavement influence zone. The results of the CBR testing, are presented in Appendix B and summarized as follows:

Soil Type 1 – Silty Sand
CBR 1
R @ 95% = 73.0
R @ 90% = 37.0
Use R = 50.0 for design

Classification Testing	
Liquid Limit	NV
Plasticity Index	NP
Percent Passing 200	15.3
AASHTO Classification	A-1-b
Group Index	0
Unified Soils Classification	SM

Pavement Design

CBR testing was used to determine pavement sections for the roadways. Pavement sections were determined utilizing El Paso County Engineering Criteria Manual. Poco Road classifies as an Urban Local Road, which used an 18K ESAL value of 292,000 for design purposes. Aspen Valley Road classifies as a Rural Local Road, which used an 18K ESAL value of 36,500 for design purposes. Pavement sections were determined for asphalt on cement stabilized subgrade.

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

Reliability	80%
Δpsi (Rural Local)	2.0
Δpsi (Urban Local)	2.0
"R" Value Subgrade (Soil Type 1)	50.0
Resilient Modulus (Soil Type 1)	9,497 psi
Hot Bituminous Pavement	0.44
Cement Stabilized Subgrade	0.12

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.

Pavement Sections – Rural Local
ESAL = 36,500 – Aspen Valley Road
Soil Type 1

Alternative	Asphalt (in)	Cement Stabilized Subgrade (in)
1. Asphalt Over Stabilized Subgrade	3.0*	8.0

Pavement Sections – Urban Local
ESAL = 292,000 – Poco Road
Soil Type 1

Alternative	Asphalt (in)	Cement Stabilized Subgrade (in)
1. Asphalt Over Stabilized Subgrade	4.0	8.0*

* Minimum sections required per El Paso County.
-The calculations have full-depth sections provided. Full depth sections are currently not allowed by El Paso County.

Roadway Construction – Cement Stabilized Subgrade

Prior to placement of the asphalt, the subgrade may be stabilized by addition of cement to a depth of at least 8 inches. The amount of cement applied shall be 2.0 percent (by weight) of the subgrade's maximum dry density as determined by the Modified Proctor Test (ASTM D-1557) and based on laboratory cement stabilization testing. The cement should be spread evenly on the subgrade surface and be thoroughly mixed into the subgrade over an 8-inch depth such that a uniform blend of soil and cement is achieved. Prior to application or mixing of the cement, the upper 8 inches of subgrade 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 Modified Proctor Test (ASTM D-1557). 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.

If significant grading is performed, the soils at subgrade may change. Modification to the pavement sections 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. The pavement sections provided are based on general site soil types. 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

Encl.

Entech Job No. 211574
AAprojects/2021/211574 pr-rev2

Reviewed by:

Joseph C. Goode, Jr., P.E.
President

TABLE

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

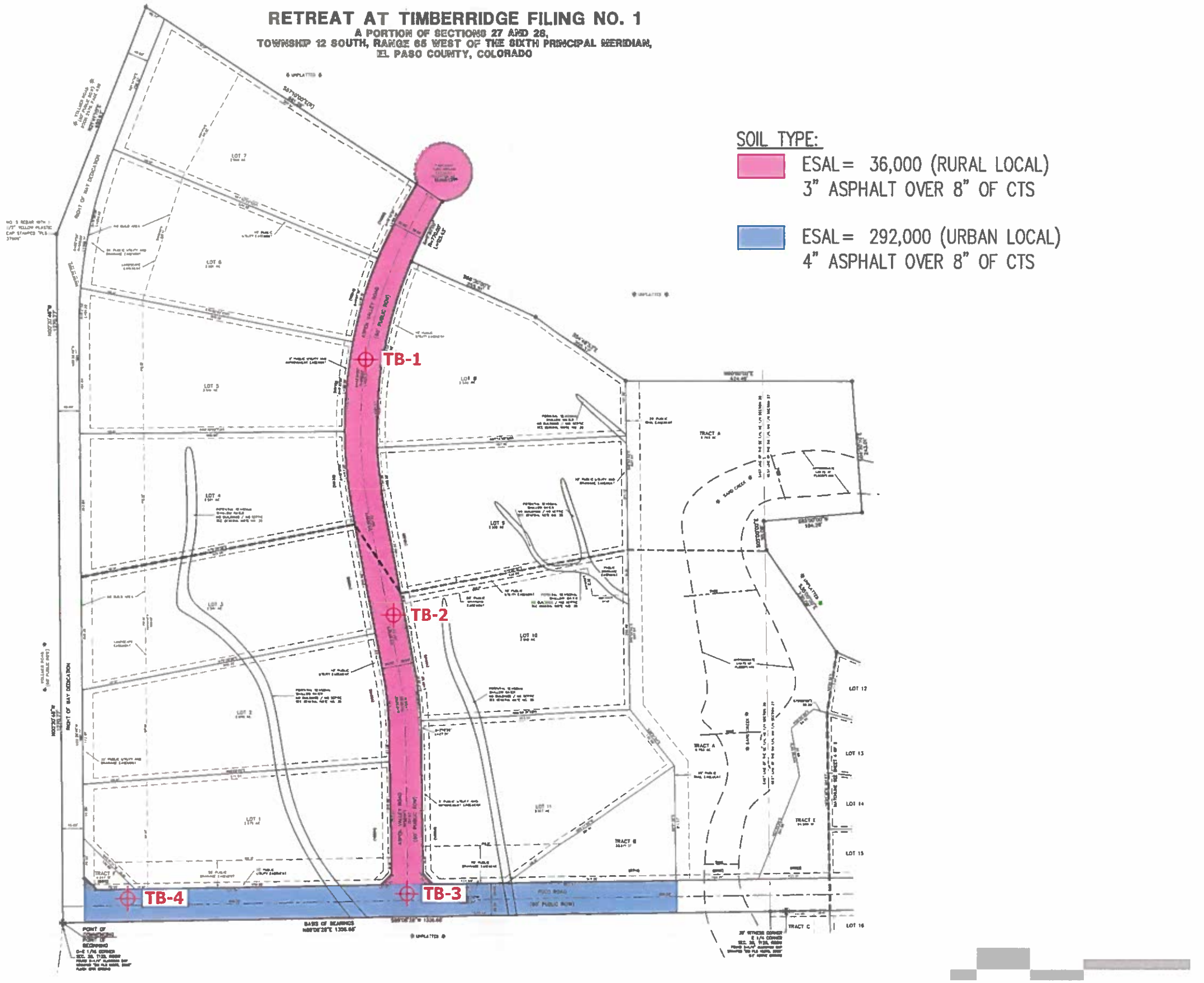
CLIENT CLASSIC COMMUNITIES
PROJECT RETREAT AT TIMBERRIDGE
JOB NO. 211574

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			15.3	NV	NP		A-1-b		SM	SAND, SILTY
1	1	1-2			16.1	NV	NP		A-1-b		SM	SAND, SILTY
1	2	1-2			11.0	NV	NP	<0.01	A-1-b		SM-SW	SAND, SLIGHTLY SILTY
1	3	1-2			16.7	NV	NP		A-1-b		CL	SAND, SILTY
1	4	1-2			23.3	NV	NP		A-2-4		SM	SAND, SILTY
2	1	5	14.3	119.4	54.0	40	21	0.00	A-6	5.5	CL	CLAYSTONE, VERY SANDY

FIGURES

RETREAT AT TIMBERRIDGE FILING NO. 1

A PORTION OF SECTIONS 27 AND 28,
TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
EL PASO COUNTY, COLORADO



SOIL TYPE:

ESAL = 36,000 (RURAL LOCAL)
3" ASPHALT OVER 8" OF CTS

ESAL = 292,000 (URBAN LOCAL)
4" ASPHALT OVER 8" OF CTS

50 0 100 200 400

1" = 200'

TB- APPROXIMATE TEST BORING LOCATIONS AND NUMBERS

REVISION	BY

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TEST BORING LOCATION MAP
RETREAT AT TIMBERRIDGE, F1
EL PASO COUNTY, CO
FOR: CLASSIC COMMUNITIES

DRAWN	RPJ
CHECKED	DPS
DATE	7/9/21
SCALE	1" = 200'
JOB NO.	211674
FIGURE No.	1

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 6/17/2021
Job # 211574

REMARKS

DRY TO 5', 6/17/21

SAND, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, DRY

CLAYSTONE, VERY SANDY, BROWN, VERY STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			50	2.0	1
5			42	13.0	2
10					
15					
20					

TEST BORING NO. 2
DATE DRILLED 6/17/2021
CLIENT CLASSIC COMMUNITIES
LOCATION RETREAT AT TIMBERRIDGE

REMARKS

DRY TO 5', 6/17/21

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, DENSE, DRY TO MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			39	1.9	1
5			31	8.4	1
10					
15					
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO.: 211574
FIG NO.: A- 1

TEST BORING NO. 3
DATE DRILLED 6/17/2021
Job # 211574

REMARKS

DRY TO 10', 6/17/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			20	2.4	1	SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST
5			26	10.4	1	
						SAND, CLAYEY, FINE TO COARSE GRAINED, BROWN, DENSE, MOIST
10			46	11.8	1	
15						
20						

TEST BORING NO. 4
DATE DRILLED 6/17/2021
CLIENT CLASSIC COMMUNITIES
LOCATION RETREAT AT TIMBERRIDGE

REMARKS

DRY TO 5', 6/17/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			50 / 10"	3.0	1	SAND, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE TO DENSE, MOIST
5			39	8.3	1	
10						
15						
20						

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TEST BORING LOG

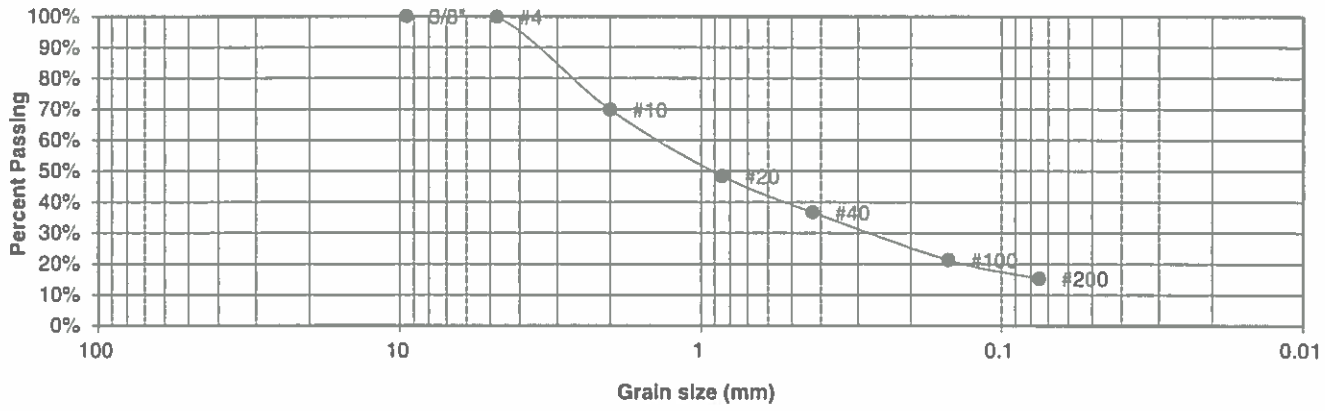
DRAWN:	DATE	CHECKED	DATE
			7/22/21

JOB NO.: 211574
FIG NO.: A- 2

APPENDIX B: Laboratory Testing Results

UNIFIED CLASSIFICATION	SM	CLIENT	CLASSIC COMMUNITIES
SOIL TYPE #	1, CBR	PROJECT	RETREAT AT TIMBERRIDGE
TEST BORING #	3	JOB NO.	211574
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.8%
10	69.8%
20	48.4%
40	36.7%
100	21.2%
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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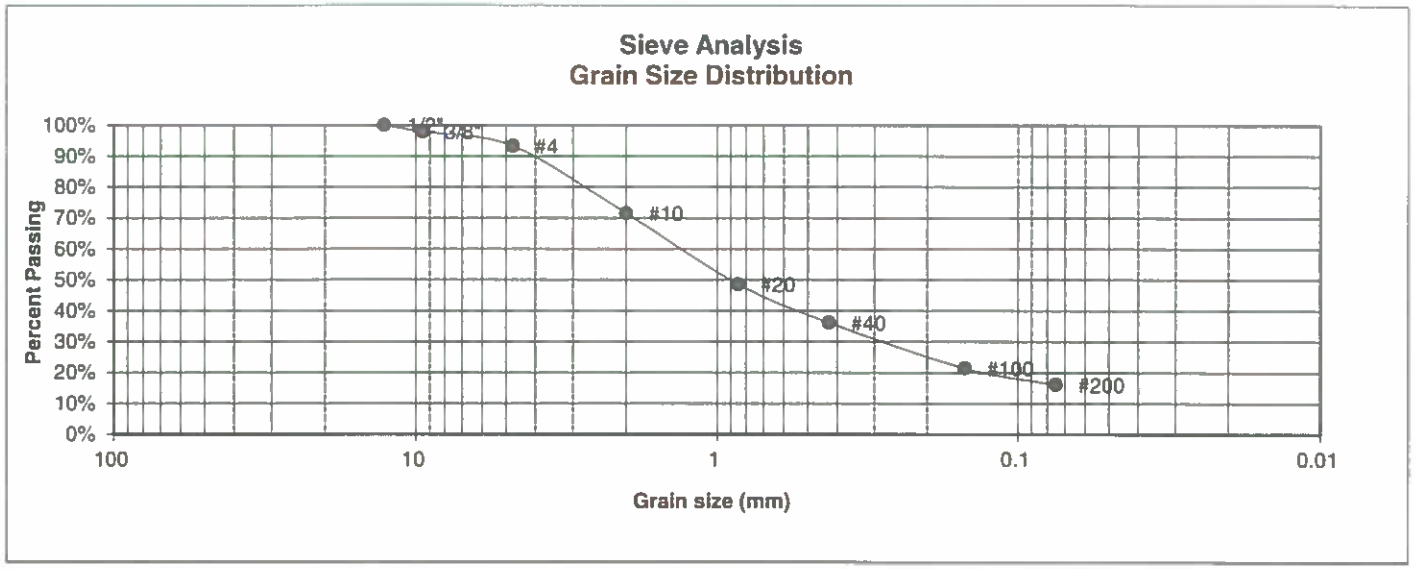
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO.: 211574
FIG NO.: B-1

UNIFIED CLASSIFICATION	SM	CLIENT	CLASSIC COMMUNITIES
SOIL TYPE #	1	PROJECT	RETREAT AT TIMBERRIDGE
TEST BORING #	1	JOB NO.	211574
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.9%
4	93.3%
10	71.5%
20	48.6%
40	36.1%
100	21.4%
200	16.1%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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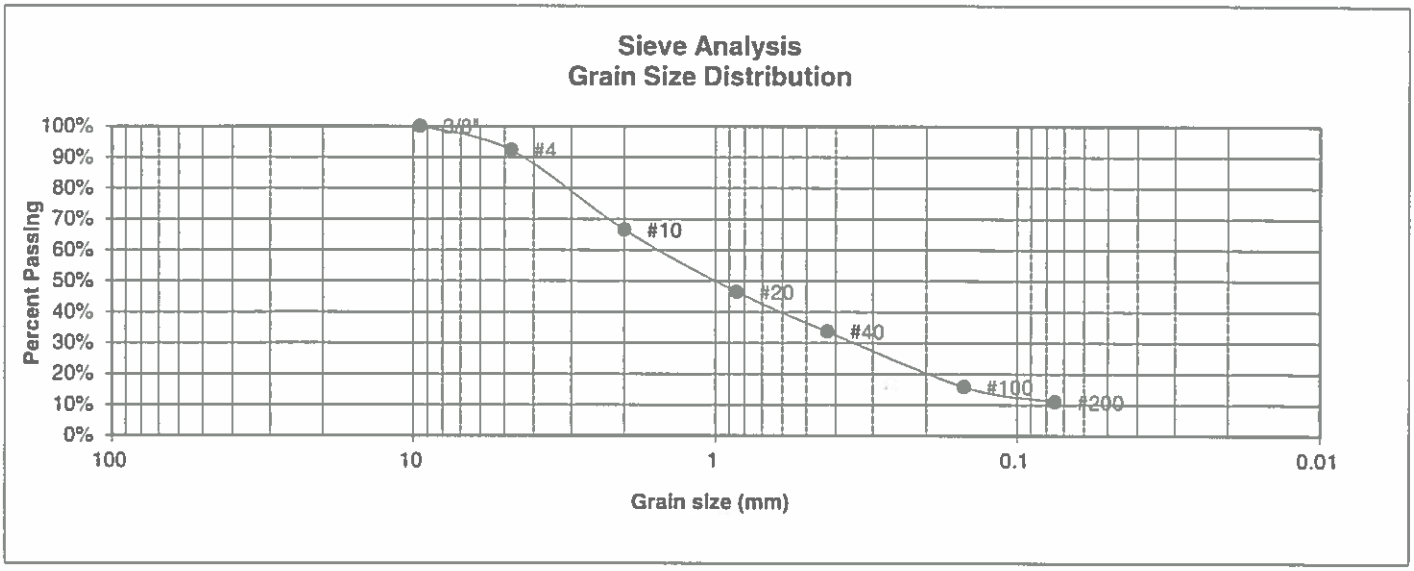
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO. 211574
FIG NO. B-2

UNIFIED CLASSIFICATION	SM-SW	CLIENT	CLASSIC COMMUNITIES
SOIL TYPE #	1	PROJECT	RETREAT AT TIMBERRIDGE
TEST BORING #	2	JOB NO.	211574
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.3%
10	66.6%
20	46.5%
40	33.7%
100	15.8%
200	11.0%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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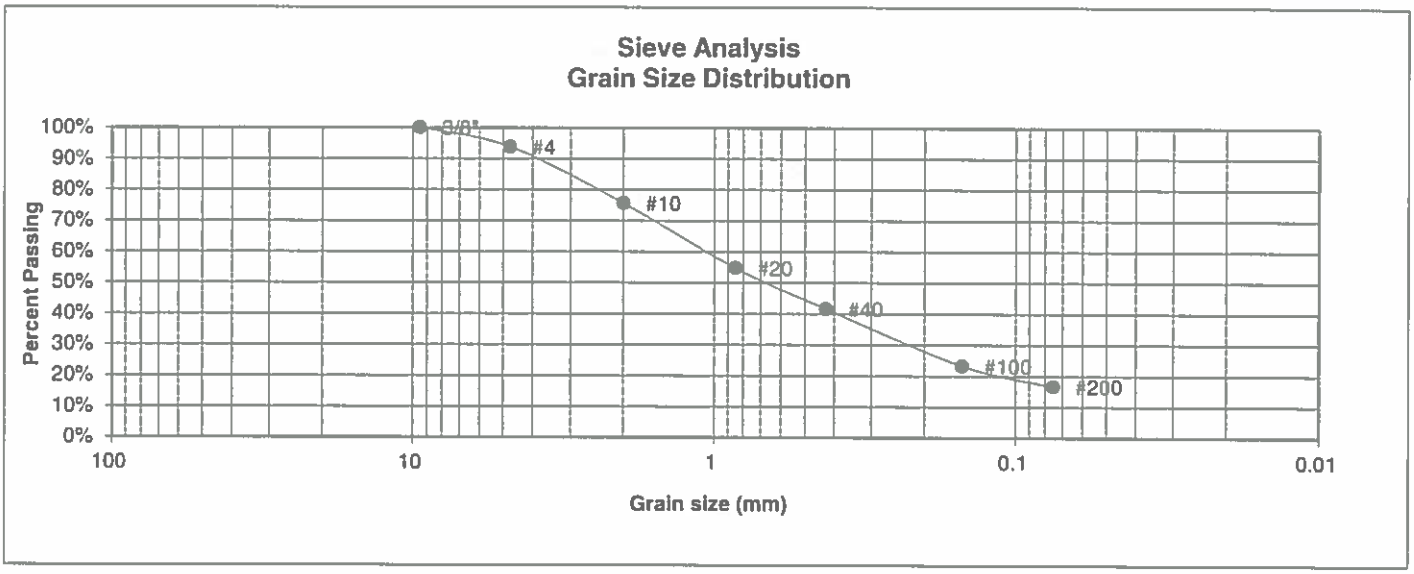
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE: 7/2/21

JOB NO. 211574
FIG NO. B-3

UNIFIED CLASSIFICATION	CL	CLIENT	CLASSIC COMMUNITIES
SOIL TYPE #	1	PROJECT	RETREAT AT TIMBERRIDGE
TEST BORING #	3	JOB NO.	211574
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.8%
10	75.6%
20	54.7%
40	41.6%
100	23.2%
200	16.7%

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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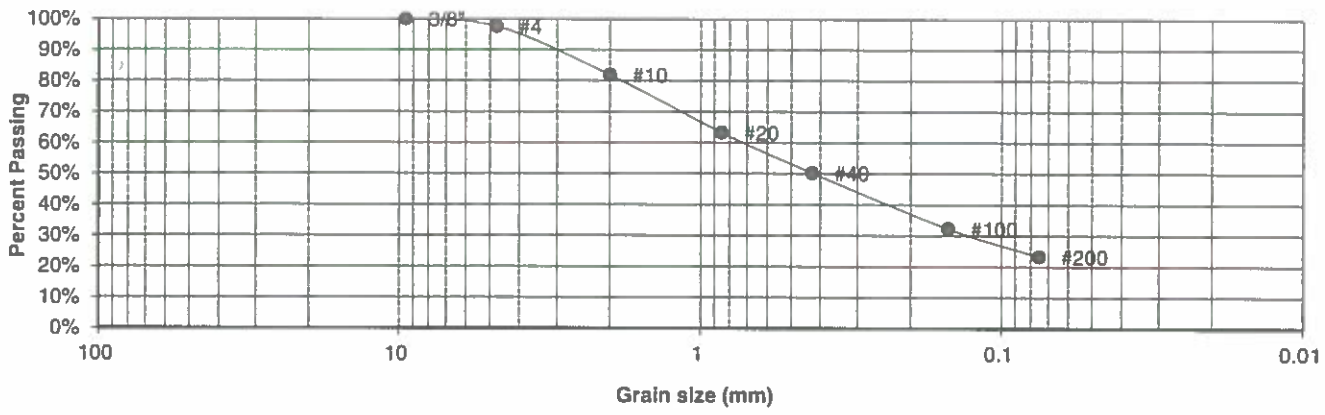
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO.: 211574
FIG NO.: B-4

UNIFIED CLASSIFICATION	SM	CLIENT	CLASSIC COMMUNITIES
SOIL TYPE #	1	PROJECT	RETREAT AT TIMBERRIDGE
TEST BORING #	4	JOB NO.	211574
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.5%
10	81.9%
20	63.2%
40	50.2%
100	32.2%
200	23.3%

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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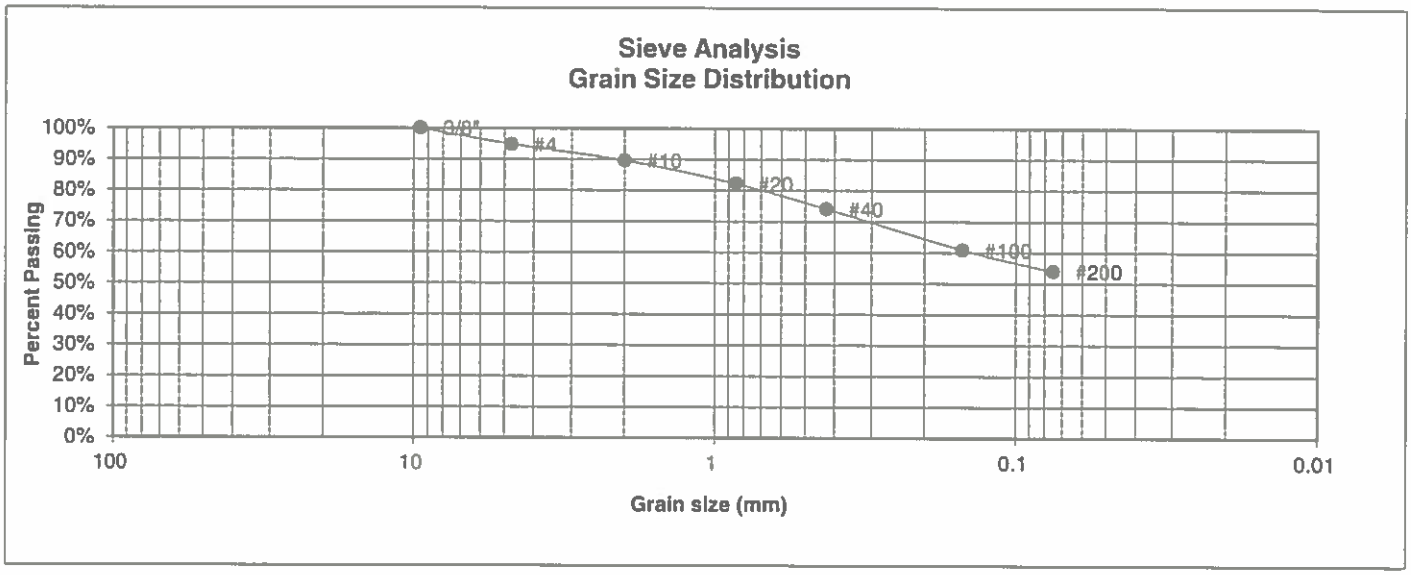
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			7/2/21

JOB NO. 211574
FIG NO. B-5

UNIFIED CLASSIFICATION	CL	CLIENT	CLASSIC COMMUNITIES
SOIL TYPE #	2	PROJECT	RETREAT AT TIMBERRIDGE
TEST BORING #	1	JOB NO.	211574
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	8



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.8%
10	89.6%
20	82.2%
40	74.1%
100	60.9%
200	54.0%

Atterberg Limits

Plastic Limit	19
Liquid Limit	40
Plastic Index	21

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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LABORATORY TEST RESULTS

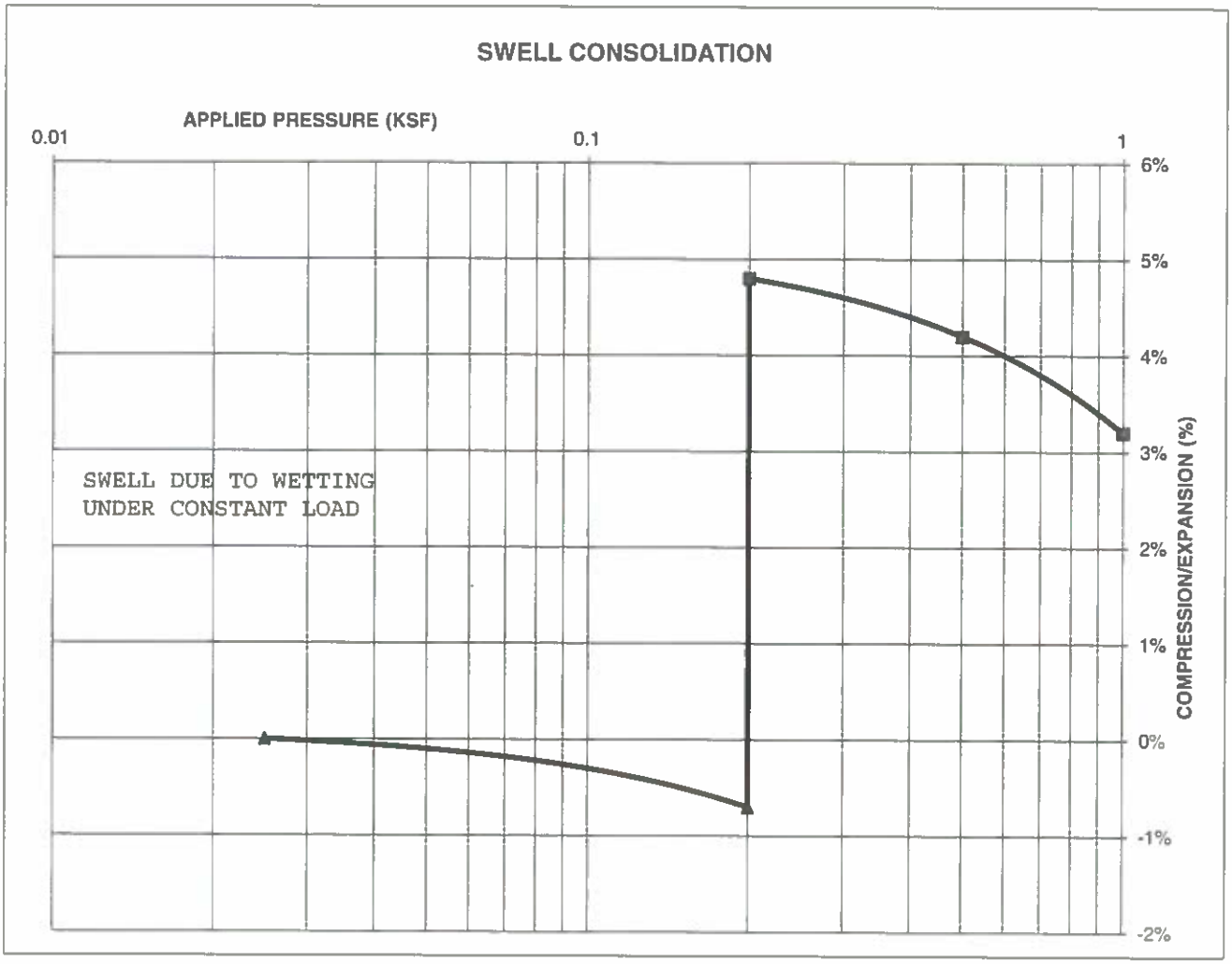
DRAWN:	DATE:	CHECKED:	DATE: 7/2/21

JOB NO.: 211574
FIG NO.: B-6

CONSOLIDATION TEST RESULTS

TEST BORING #	1	DEPTH(ft)	5
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			14.3%
SWELL/CONSOLIDATION (%)			5.5%

JOB NO. 211574
CLIENT CLASSIC COMMUNITIES
PROJECT RETREAT AT TIMBERRIDGE



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		h	7/12/21

JOB NO.: 211574
FIG NO.: B-7

CLIENT	CLASSIC COMMUNITIES	JOB NO.	211574
PROJECT	RETREAT AT TIMBERRIDGE	DATE	6/29/2021
LOCATION	RETREAT AT TIMBERRIDGE	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	5	2	CL	0.00
TB-2	1-2	1	SM-SW	<0.01

QC BLANK PASS

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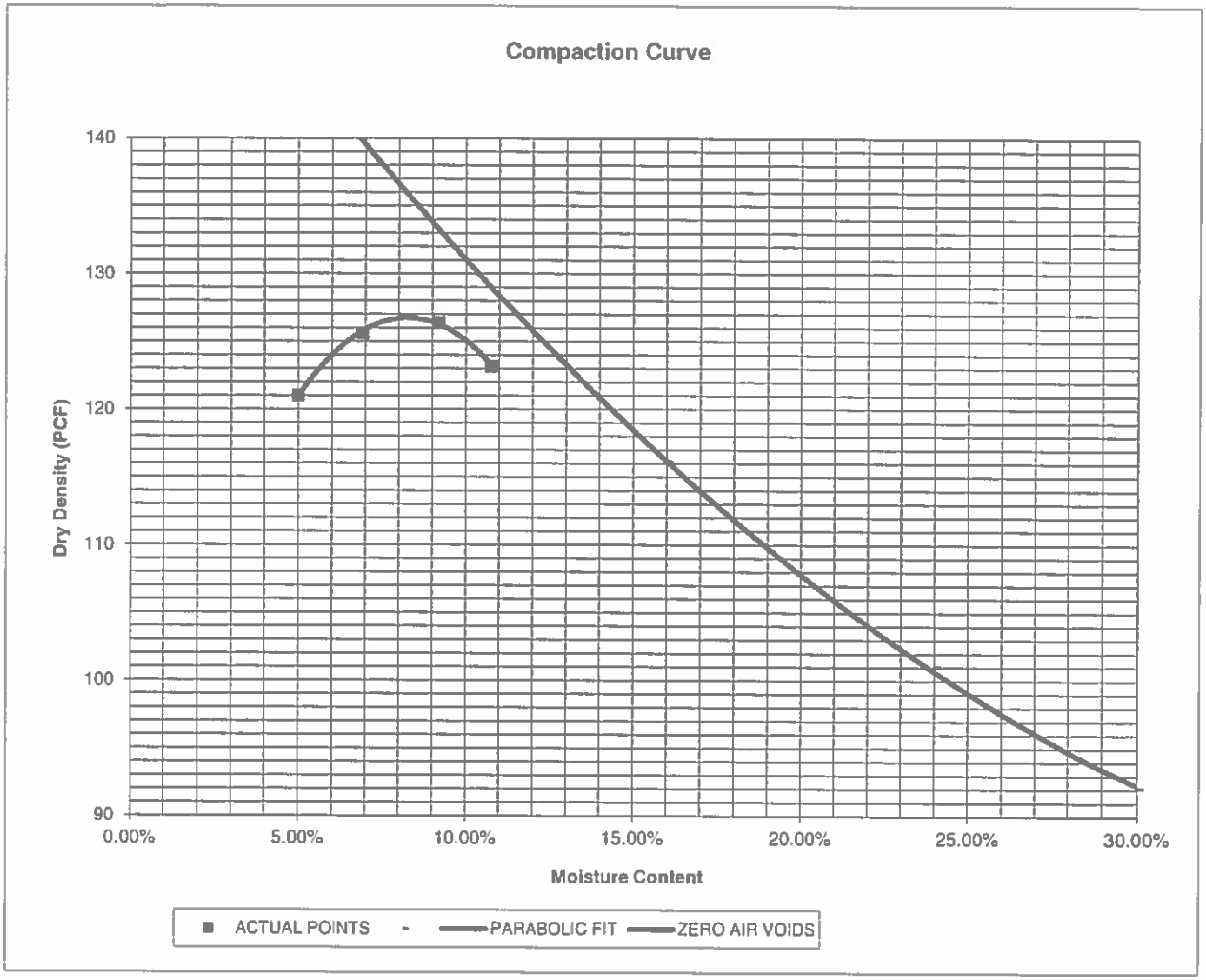
LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO.: 211574
FIG NO.: B-8

PROJECT	RETREAT AT TIMBERRIDGE	CLIENT	CLASSIC COMMUNITIES
SAMPLE LOCATION	TB-1 @ 0-3'	JOB NO.	211574
SOIL DESCRIPTION	SAND, SILTY, BROWN	DATE	06/29/21

IDENTIFICATION	SM	COMPACTION TEST #	1
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	126.9	OPTIMUM MOISTURE	8.2%



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MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO: 211574

FIG NO: B-9

CBR TEST LOAD DATA

JOB NO: 211574
CLIENT: CLASSIC COMMUNITIES
PROJECT: RETREAT AT TIMBERRIDGE
SOIL TYPE: 1

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	123	41.10	325	108.60	200	66.83
0.050	138	46.12	439	146.70	640	213.87
0.075	154	51.46	522	174.44	1124	375.60
0.100	178	59.48	614	205.18	1841	615.20
0.125	206	68.84	750	250.63	2553	853.13
0.150	238	79.53	880	294.07	3191	1066.33
0.175	271	90.56	1049	350.54	3640	1216.37
0.200	210	70.18	1190	397.66	4200	1403.50
0.300	477	159.40	1795	599.83	6000	2005.01
0.400	619	206.85	2341	782.29		
0.500	805	269.01	2937	981.45		

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	300	116	310
WT. CAN	6.7	9.29	6.88
WT. CAN+WET	249.94	218.32	236.08
WT. CAN+DRY	221.5	197.96	216.49
WT. H20	28.44	20.36	19.59
WT. DRY SOIL	214.8	188.67	209.61
MOISTURE CONTENT	13.24%	10.79%	9.35%

WET DENSITY (PCF)	119.4	128.9	136.4
DRY DENSITY (PCF)	110.4	119.1	126.1

BEARING RATIO	5.95	20.52	61.52

90% OF DRY DENSITY	114.2
95% OF DRY DENSITY	120.6

BEARING RATIO AT 90% OF MAX	12.37	~ R VALUE	37
BEARING RATIO AT 95% OF MAX	29.04	~ R VALUE	73

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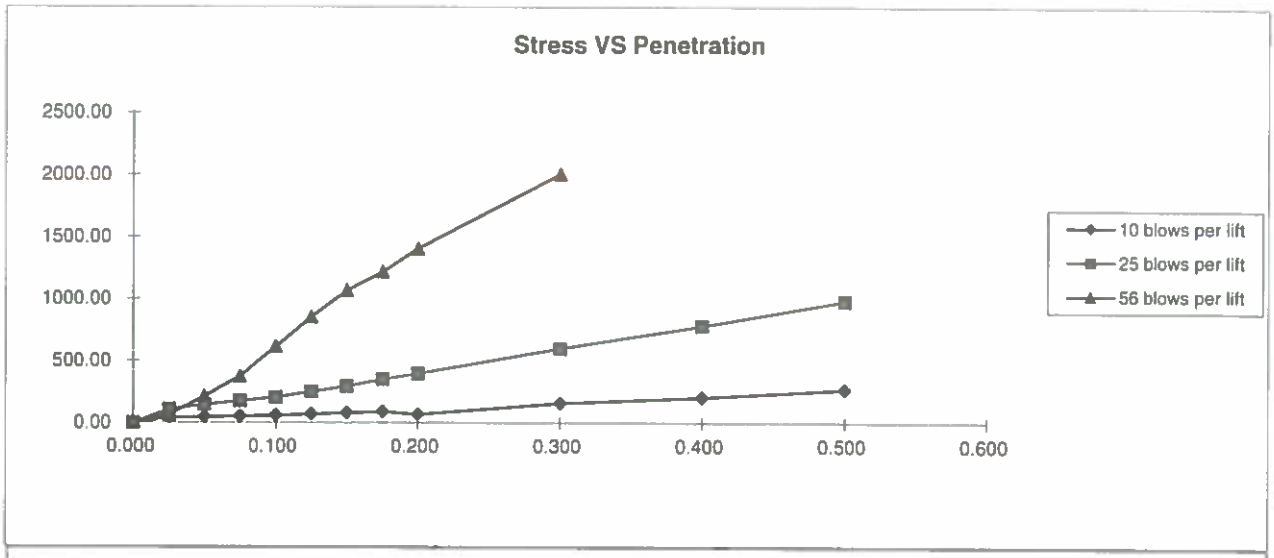
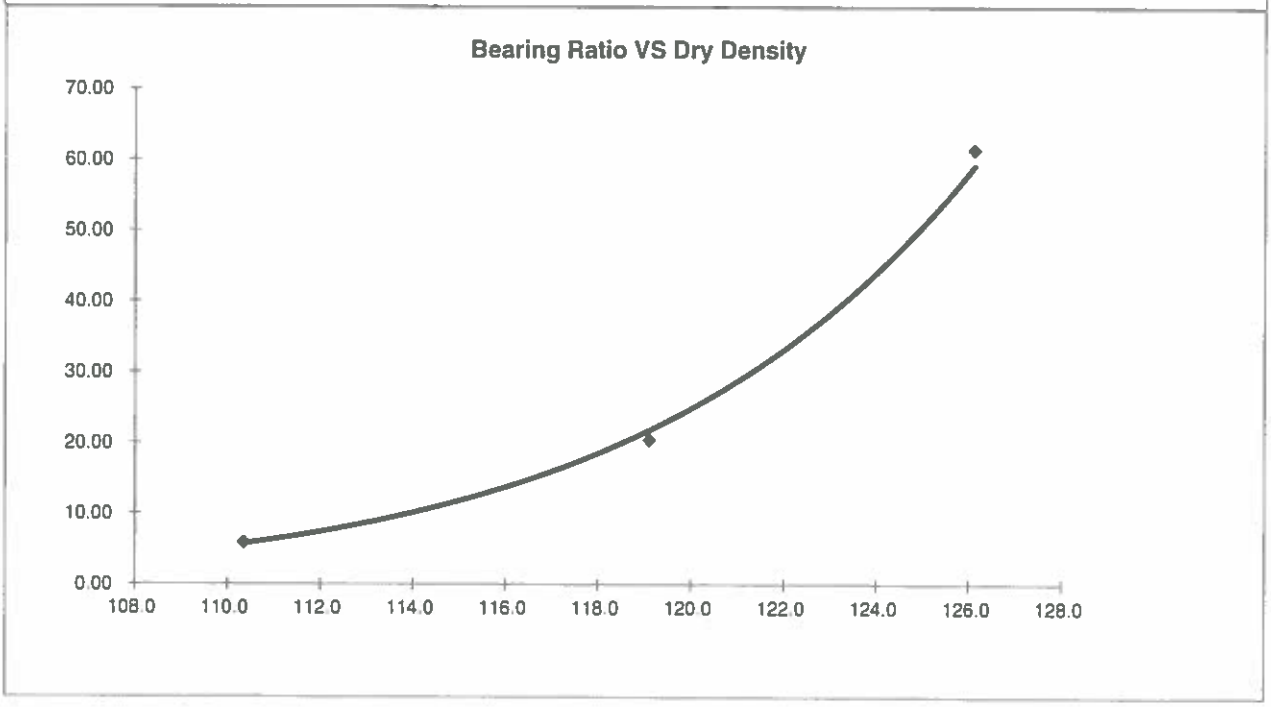
CBR TEST DATA

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO.: 211574
FIG NO.: B-10





BEARING RATIO AT 90% OF MAX	12.37 ~ R VALUE	37.00
BEARING RATIO AT 95% OF MAX	29.04 ~ R VALUE	73.00

JOB NO: 211574
SOIL TYPE: I

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

CALIFORNIA BEARING RATIO

DRAWN:	DATE:	CHECKED:	DATE:
			7/2/21

JOB NO. 211574
FIG NO. B-11

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA — Classic Communitites
Retreat at TimberRidge - Rural Local - Soil Type 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	50
Standard Deviation	S_o =	0.44
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.841
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)
50	0
60	-0.253
70	-0.524
75	-0.674
80	-0.841
90	-1.282
95	-1.65
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. 211574
Fig. No. C-1

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA Classic Communitites
Retreat at TimberRidge - Rural Local - Soil Type 1

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

$$WSN = C_1D_1 + C_2D_2$$

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

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

FOR FULL DEPTH ASPHALT SECTION(CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 3.3 inches of Full Depth Asphalt
Use 4.0 inches Full Depth

FOR ASPHALT + CEMENT STABILIZED SUBGRADE SECTION

Asphalt Thickness (t) = 3 inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 1.2 inches of Cement Stabilized Subgrade,
use 8.0 inches

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 8.0 inches of Cement Stabilized Subgrade, or
2. 4.0 inches of Full-Depth Asphalt

Job No. 211574
Fig. No. C-2

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA — Classic Communitites
Retreat at TimberRidge - Urban Local - Soil Type 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Hveem Stabilometer (R Value) Results:	R =	50
Standard Deviation	S_o =	0.44
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.841
Soil Resilient Modulus	M_R =	13168

Weighted Structural Number (WSN): → WSN = 2.09

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)
50	0
60	-0.253
70	-0.524
75	-0.674
80	-0.841
90	-1.282
95	-1.65
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. 211574
Fig. No. C-3

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA Classic Communitites
Retreat at TimberRidge - Urban Local - Soil Type 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	292,000
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	2.09

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 Stabilized Subgrade

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

FOR FULL DEPTH ASPHALT SECTION(CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 4.7 inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + CEMENT STABILIZED SUBGRADE SECTION

Asphalt Thickness (t) = [4] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 2.7 inches of Cement Stabilized Subgrade,
use 8.0 inches

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 8.0 inches of Cement Stabilized Subgrade, or
2. 5.0 inches of Full-Depth Asphalt

Job No. 211574
Fig. No. C-4