



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
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April 27, 2023

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



Attn: Raul Guzman

Re: Pavement Recommendations
The Sanctuary at Meridian Ranch - Filing No. 1, Phase No. 1
El Paso County, Colorado
Entech Job No. 230532

Dear Mr. Guzman:

As requested, Entech Engineering, Inc. has obtained samples of the subgrade soils from sections of the roadways in the Sanctuary at Meridian Ranch subdivision, Filing No. 1, in El Paso County, Colorado. Subsurface Soil Investigation and laboratory testing to determine the pavement support characteristics of the soils were performed. This letter presents the results of the laboratory testing and provides pavement recommendations for the roadways.

Project Description

The roadways in Filing No.1 consist of sections of Rex Road, along with Retreat Peak Drive, Manzanola Drive, Shelter Creek Drive, Rico Ridge Drive, Estes Ridge Drive, Nederland Drive, Arriba Drive, and the cul-de-sac named Cuchara Way. The site layout and the locations of the test borings drilled at appropriate spacings are shown on the Test Boring Location Map, Figure 1.

Subgrade Conditions

Eighteen exploratory test borings were drilled in the roadways to depths of approximately 5 to 10 feet bgs. 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. Four soil types and two bedrock types were encountered in the test borings. The soils encountered at subgrade depth consisted of five general soil types; Type 1; silty to clayey sand fill, Type 2; very clayey sand fill to sandy clay fill, Type 3; native silty sand, Type 4; native very clayey sand, and Type 5; silty to clayey sandstone bedrock. The Type 6 soils consisted of sandy claystone bedrock which was encountered at a depth which is beneath the subgrade influence zone. Soil Types 1, 3 and 5 were grouped into one soil category, (denoted as Soil Type 1/3/5), due to their similar characteristics. Due to the limited locations of Soil Types 2 and 4, the Type 1/3/5 soils were analyzed for this pavement design. The Type 2 and 4 soil types will be mitigated with suitable site soils. This report evaluates and presents recommendations for Type 1/3/5 soil for all roadway sections.

Sieve analyses performed on Type 1/3/5 soils indicated the percent passing the No. 200 sieve ranged from approximately 11 to 32 percent. Sieve analysis on the Type 2/4 soils ranged from approximately 35 to 83 percent passing. Atterberg Limit Tests performed on the Type 1/3/5 soils resulted in Liquid Limits ranging from no-value to 30 percent and Plastic Indexes of non-plastic to 15 percent. Atterberg Limit Tests performed on the Type 2/4 soils exhibited liquid limits of 27 to

33 percent and plastic indexes of 8 to 19 percent. The Type 1/3/5 subgrade soils classified as A-2-6, A-2-4, A-1-b and the Type 2 Soils classify as A-6 soils, based on the AASHTO classification system. The Type 1/3/5 soils have good pavement support characteristics. The Type 2/4 soils generally have poor pavement support characteristics, and will require mitigation. The Type 6 soils were encountered below the subgrade influence zone. Sulfate testing 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 subgrade soils, based on their Plastic Indexes. Volume changes of -0.2 to 1.2 percent indicate low expansion and consolidation potentials. Higher swells were encountered in the Type 6 claystone; however, the claystone was encountered below the subgrade influence zone. Based on the low volume changes of the subgrade soils, mitigation due to expansive soils is not required on this site. Laboratory test results are presented in Appendix B and are summarized on Table 1.

California Bearing Ratio (CBR) testing was performed on two samples of Soil Type 1/3/5 and Soil Type 2/4 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:

<u>Soil Type 1/3/5 – Clayey Sand Fill</u>		<u>Soil Type 2/4 – Very Clayey Sand Fill</u>	
<u>CBR #1</u>		<u>CBR #2</u>	
R @ 90% = 10.0		R @ 90% = 6.0	
R @ 95% = 30.0		R @ 95% = 14.0	
Use R = 30.0 for design		Use R = 14.0 for design	
<u>Classification Testing</u>		<u>Classification Testing</u>	
Liquid Limit	26	Liquid Limit	27
Plasticity Index	11	Plasticity Index	14*
Percent Passing 200	32.0	Percent Passing 200	46.3*
AASHTO Classification	A-2-6	AASHTO Classification	A-6
Group Index	0	Group Index	3
Unified Soils Classification	SC	Unified Soils Classification	SC

*Values in excess of the limits set forth per the El Paso County Pavement Design Criteria. Mitigation will be required. Mitigation specifics will follow

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". ESAL values were obtained from the Traffic Impact Study performed by LSC Transportation Consultants, LLC dated May 5, 2023, LSC Job No. S224190. The recommended street classifications are also shown in Figure No. 1. The cul-de-sac portions of Cuchara Way classified as an urban local (low-volume) roadways, which used an 18k ESAL value of 36,500 for design. Rex Road classifies as a minor arterial, which used an 18K ESAL value of 1,971,000 for design. The remaining roadways, Retreat Peak Drive, Manzanola Drive, Shelter Creek Drive, Rico Ridge Drive, Estes Ridge Drive, Nederland Drive and Arriba Drive all 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. Design parameters used in the pavement analysis are as follows:

Reliability,	
Urban Local Low Volume	80%
Urban Local	80%
Minor Arterial	85%
Serviceability Index	
Urban Local Low Volume	2.0
Urban Local	2.0
Minor Arterial	2.5
Resilient Modulus Soil Type 1/3/5	6,849 psi
Resilient Modulus Soil Type 2/4	4,060 psi*
"R" Value Subgrade Soil Type 1/3/5	30.0
"R" Value Subgrade Soil Type 2/4	14.0*
Structural Coefficients:	
Hot Bituminous Pavement	0.44
Aggregate Basecourse	0.11
Cement Stabilized Subgrade	0.11

*All areas with Soil Type 2/4 at subgrade depth will be replaced with Type 1 soils. Designs are based on Type 1/3/5 values only.

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

Pavement Sections – Soil Type 1/3/5

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

Cuchara Way

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Cement Stabilized Subgrade (in.)</u>
1. Asphalt Over Basecourse	3.0*	6.0	--
2. Asphalt Over Cement Subgrade	4.0	--	8.0

Urban Local – ESAL = 292,000

Retreat Peak Drive, Manzanola Drive, Shelter Creek Drive, Rico Ridge Drive, Estes Ridge Drive, Nederland Drive, Arriba Drive

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Cement Stabilized Subgrade (in.)</u>
1. Asphalt Over Basecourse	4.0	10.0	--
2. Asphalt Over Cement Subgrade	4.0	--	10.0

<u>Minor Arterial – ESAL = 1,971,000</u>			
<u>Rex Road</u>			
<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Cement Stabilized Subgrade (in.)</u>
1. Asphalt Over Basecourse	5.0*	12.5	--
2. Asphalt Over Cement Subgrade	5.0	--	12.5

* Minimum sections per the El Paso County Pavement Design Criteria – Full depth sections are not allowed.

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. Based on the swell testing, mitigation for expansive soils will not be required on this site.

The Type 2 soils do not meet the CTS Criteria for the Plasticity Index or for the sieve analysis. In the areas with Type 2 soils, it is recommended that 18 inches of the Type 2 soils be removed and replaced with Type 1 soils. The approximate extents of the Type 2 soils are shown in Figure No. 1. The approximate locations for mitigation will be field determined.

Roadway Construction - Full Depth Asphalt and Asphalt on Aggregate Basecourse Alternatives

Prior to placement of the asphalt, the subgrade should be proofrolled and compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture content or to 95% of its Maximum Standard Proctor Dry Density, ASTM D-698 at 0 to 4 percent over optimum moisture content. Any loose or soft areas should be removed and replaced with suitable materials. Basecourse materials should be compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture content. Special attention should be given to areas adjacent to manholes, inlet structures, and valves.

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 at least 8 to 12.5 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 Modified Proctor Test (ASTM D-1557) and Maximum 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 12.5-inch depth such that a uniform blend of soil and cement is achieved. Prior to application or mixing of the cement, the upper 8 to 12.5 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.
- 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 sections should be evaluated after site grading is completed.

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, cement, subgrade conditions, compaction of materials and roadway construction methods shall meet the El Paso County specifications.

Tech Contractors
Pavement Recommendations
The Sanctuary at Meridian Ranch - Filing No. 1, Phase No. 1
El Paso County, Colorado
Entech Job No. 230532
Page 6

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/lu

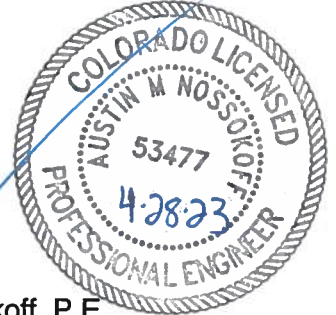
Encl.

AAprojects/2023/230532 pr-F1, Ph1

Reviewed by:



Austin M. Nossokoff, P.E.



TABLE

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

CLIENT TECH CONTRACTORS
PROJECT SANC. AT MERIDIAN RANCH, F-1
JOB NO. 230532

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 #1	6	0-3			32.0	26	11		A-2-6		SC	FILL, SAND, CLAYEY
1	1	1-2			13.3	NV	NP	<0.01	A-1-b		SM	FILL, SAND, SILTY
1	2	1-2			19.0	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	3	1-2			13.5	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	4	1-2			15.3	NV	NP	<0.01	A-1-b		SM	FILL, SAND, SILTY
1	5	1-2			19.0	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	7	1-2			29.0	27	10		A-2-4		SC	FILL, SAND, CLAYEY
1	8	1-2	8.6	115.0	27.8	27	12		A-2-6	-0.2	SC	FILL, SAND, CLAYEY
1	9	1-2	6.8	111.4	27.8	30	15		A-2-6	0.1	SC	FILL, SAND, CLAYEY
1	10	1-2			19.1	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	15	1-2			13.3	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	3	0-3			27.5						SM	FILL, SAND, SILTY
1	9	0-3			20.5						SM	FILL, SAND, SILTY
1	12	0-3			30.8						SM	FILL, SAND, SILTY
2, CBR #2	18	0-3			46.3	27	14		A-6		SC	FILL, SAND, VERY CLAYEY
2	6	1-2	11.5	114.6	45.2	34	18		A-6	1.2	SC	FILL, SAND, VERY CLAYEY
2	14	1-2			82.8	33	19		A-6		CL	FILL, CLAY, SANDY
2	15	0-3			45.5						SC	FILL, SAND, VERY CLAYEY
3	6	10			20.4	NV	NP	<0.01	A-2-4		SM	SAND, SILTY
3	17	1-2			14.9	NV	NP		A-1-b		SM	SAND, SILTY
3	18	1-2			11.0	NV	NP		A-1-b		SM-SW	SAND, SLIGHTLY SILTY,
4	3	5	13.7	119.3	35.4	29	15	<0.01	A-6	1.0	SC	SAND, VERY CLAYEY
5	11	1-2			14.2	NV	NP		A-1-b		SM	SANDSTONE, SILTY
5	12	1-2			15.0	NV	NP		A-1-b		SM	SANDSTONE, SILTY
5	13	1-2			16.4	NV	NP		A-1-b		SM	SANDSTONE, SILTY
5	16	1-2			16.1	NV	NP		A-2-4		SM	SANDSTONE, SILTY
5	3	10			29.7	21	8	<0.01	A-2-4		SC	SANDSTONE, CLAYEY
5	9	10			23.3	30	15		A-2-6		SC	SANDSTONE, CLAYEY
6	9	5	15.7	115.7	86.0	41	21	<0.01	A-7-6	4.3	CL	CLAYSTONE, SANDY

FIGURE

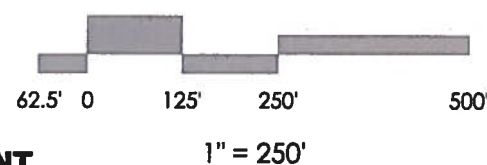
SOIL TYPES:

URBAN MINOR ARTERIAL
(ESAL 1,971,000)
5" ASPHALT ON 12.5" OF BASE
COURSE OR 5" ASPHALT ON 12.5" CTS.

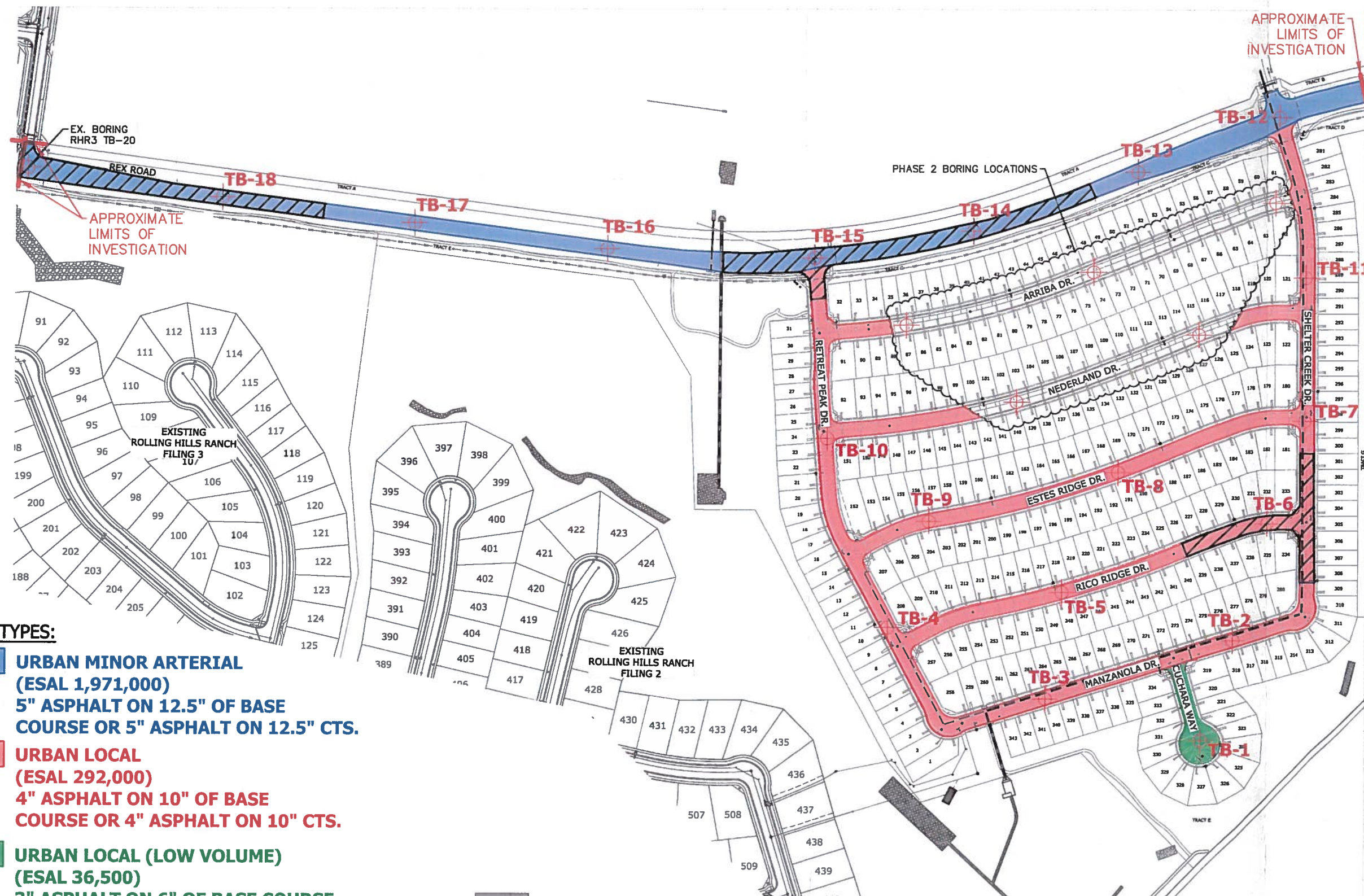
URBAN LOCAL
(ESAL 292,000)
4" ASPHALT ON 10" OF BASE
COURSE OR 4" ASPHALT ON 10" CTS.

URBAN LOCAL (LOW VOLUME)
(ESAL 36,500)
3" ASPHALT ON 6" OF BASE COURSE
OR 4" ASPHALT ON 8" OF CTS.

APPROXIMATE LIMITS OF SOIL TYPE 2
-MITIGATION OF 18 INCHES AND REPLACEMENT
WITH TYPE 1 SOILS MAY BE REQUIRED.
LOCATIONS SHOULD BE FIELD VERIFIED.



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER



NOTE:
EXTEND TO END
OF REX ROAD

REVISION	BY

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

TEST BORING LOCATION MAP
THE SANCTUARY AT MERIDIAN RANCH,
FILING 1, PHASE 1
EL PASO COUNTY, COLORADO
FOR: TECH CONTRACTORS

DATE	04/24/23
BY	JAC
CHECKED	DFB
DATE	04/24/23
SCALE	1"=250'
JOB NO.	230633
TEAM NO.	1

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 4/6/2023
Job # 230532

TEST BORING NO. 2
DATE DRILLED 4/6/2023
CLIENT TECH CONTRACTORS
LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 5', 4/6/23
FILL 0-5', SAND, SILTY, FINE TO
COARSE GRAINED, TAN, MEDIUM
DENSE, MOIST TO DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			20	9.1	1
5			24	2.6	1
10					
15					
20					

REMARKS

DRY TO 5', 4/6/23
FILL 0-5', SAND, SILTY, FINE TO
COARSE GRAINED, TAN, MEDIUM
DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			12	9.5	1
5			27	9.8	1
10					
15					
20					



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: SW

DATE:

4-24-23

JOB NO.:
230532

FIG NO.:
A- 1

TEST BORING NO. 3
 DATE DRILLED 4/6/2023
 Job # 230532

TEST BORING NO. 4
 DATE DRILLED 4/6/2023
 CLIENT TECH CONTRACTORS
 LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 10', 4/6/23

FILL 0-2', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE, MOIST
 SAND, VERY CLAYEY, FINE
 GRAINED, GRAY BROWN, LOOSE,
 MOIST

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			29	6.0	1
5			8	14.9	4
10			50 7"	8.4	5
15					
20					

REMARKS

DRY TO 5', 4/6/23

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			6	9.8	1
5			26	9.3	1
10					
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

4-24-23

JOB NO.:
 230532

FIG NO.:
 A- 2

TEST BORING NO. 5
 DATE DRILLED 4/6/2023
 Job # 230532

TEST BORING NO. 6
 DATE DRILLED 4/6/2023
 CLIENT TECH CONTRACTORS
 LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 5', 4/6/23

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			6	8.1	1
5			26	7.8	1
10					
15					
20					

REMARKS

DRY TO 5', 4/6/23

FILL 0-8', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE, MOIST

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			13	9.3	1
5			29	4.6	1
10			20	2.5	3
15					
20					



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 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: SW

DATE:

4-24-23

JOB NO.:
 230532

FIG NO.:
 A-3

TEST BORING NO. 7
DATE DRILLED 4/6/2023
Job # 230532

TEST BORING NO. 8
DATE DRILLED 4/6/2023
CLIENT TECH CONTRACTORS
LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 5', 4/6/23
FILL 0-5', SAND, SILTY, FINE TO
COARSE GRAINED, TAN, MEDIUM
DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			11	4.9	1
5			21	10.0	1
10					
15					
20					

REMARKS

DRY TO 5', 4/6/23
FILL 0-5', SAND, SILTY, FINE TO
COARSE GRAINED, TAN, LOOSE
TO DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			9	5.9	1
5			30	4.1	1
10					
15					
20					



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.:
230532

FIG NO.:
A- 4

TEST BORING NO. 9
 DATE DRILLED 4/6/2023
 Job # 230532

TEST BORING NO. 10
 DATE DRILLED 4/6/2023
 CLIENT TECH CONTRACTORS
 LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 10', 4/6/23
 FILL 0-4', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE, MOIST

 CLAYSTONE, SANDY, GRAY
 BROWN, HARD, MOIST

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			5	14.2	1
5			50 7"	12.2	6
10			50 3"	7.5	5
15					
20					

REMARKS

DRY TO 5', 4/6/23
 FILL 0-5', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, LOOSE
 TO VERY LOOSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			6	11.6	1
5			3	9.2	1
10					
15					
20					



ENTECH
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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE: *4-24-23*

JOB NO.:
 230532

FIG NO.:
 A- 5

TEST BORING NO. 11
 DATE DRILLED 4/6/2023
 Job # 230532

TEST BORING NO. 12
 DATE DRILLED 4/7/2023
 CLIENT TECH CONTRACTORS
 LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 5', 4/6/23

FILL 0-1', SAND, SILTY, TAN
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
1			50	6.5	1
5			10"		5
5			50	7.3	5
			8"		
10					
15					
20					

REMARKS

DRY TO 10', 4/7/23

FILL 0-1', SAND, SILTY, TAN
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
1			50	8.6	1
5			10"		5
5			50	10.0	5
			9"		
10			50	9.7	5
			6"		
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.
 230532

FIG NO.
 A- 6


TEST BORING NO. 13
 DATE DRILLED 4/7/2023
 Job # 230532

TEST BORING NO. 14
 DATE DRILLED 4/7/2023
 CLIENT TECH CONTRACTORS
 LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 5', 4/7/23

FILL 0-1', SAND, SILTY, TAN
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST


Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			50 10"	9.4	1
			50 8"	12.8	5
10					
15					
20					

REMARKS

DRY TO 5', 4/7/23

FILL 0-3', CLAY, SANDY, GRAY
 BROWN, STIFF, MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, GRAY BROWN,
 VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			25	12.5	2
			50 6"	10.8	5
10					
15					
20					



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.:
 230532

FIG NO.:
 A-7

TEST BORING NO. 15
 DATE DRILLED 4/7/2023
 Job # 230532

TEST BORING NO. 16
 DATE DRILLED 4/7/2023
 CLIENT TECH CONTRACTORS
 LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 10', 4/7/23

FILL 0-4', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE, MOIST

SAND, SILTY, FINE TO COARSE
 GRAINED, GRAY BROWN, MEDIUM
 DENSE, MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			20	7.2	1
5			27	16.2	3
10			50 7"	12.2	5
15					
20					

REMARKS

DRY TO 5', 4/7/23

FILL 0-1', SAND, SILTY, TAN
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			50 8"	10.5	5
5			50 9"	16.9	5
10					
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE: *4-24-23*

JOB NO.:
 230532

FIG NO.:
 A- 8

TEST BORING NO. 17
DATE DRILLED 4/6/2023
Job # 230532

TEST BORING NO. 18
DATE DRILLED 4/6/2023
CLIENT TECH CONTRACTORS
LOCATION SANC. AT MERIDIAN RANCH, F-1

REMARKS

DRY TO 5', 4/7/23

SAND, SILTY, FINE TO COARSE
GRAINED, GRAY BROWN TO
TAN, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			39	10.1	3
5			43	11.2	3
10					
15					
20					

REMARKS

DRY TO 10', 4/7/23

SAND, SLIGHTLY SILTY, FINE TO
COARSE GRAINED, TAN, DENSE,
MOIST
SANDSTONE, SILTY, FINE TO
COARSE GRAINED, GRAY BROWN,
VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			46	9.4	3
5			50 8"	9.4	5
10			50 5"	8.0	5
15					
20					



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505 ELKTON DRIVE
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TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE: *4-24-23*

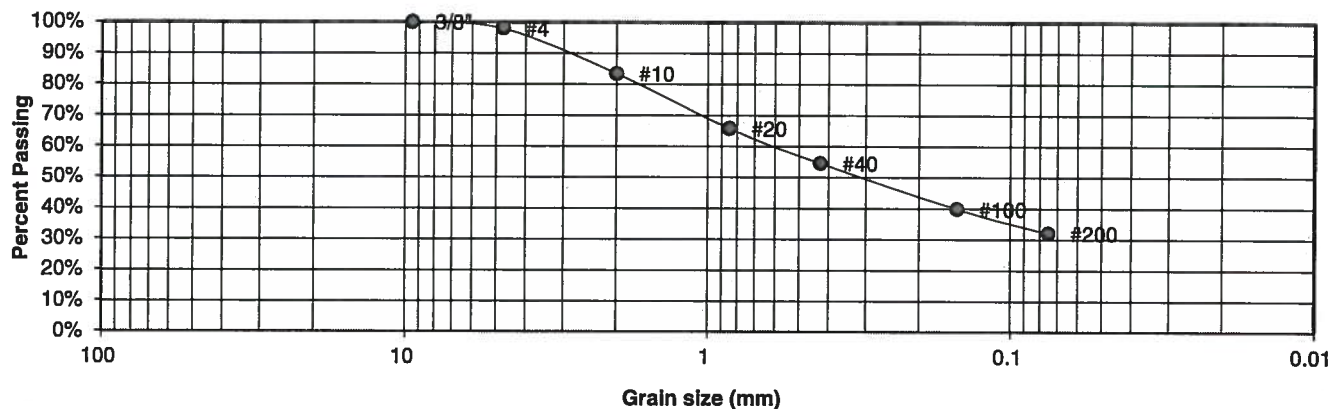
JOB NO.:
230532

FIG NO.:
A- 9

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1, CBR #1	PROJECT	SANC. AT MERIDIAN RANCH, F-1
TEST BORING #	6	JOB NO.	230532
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	98.0%
10	83.4%
20	65.8%
40	54.6%
100	39.8%
200	32.0%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	26
Plastic Index	11

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: *4-24-23*

JOB NO.:

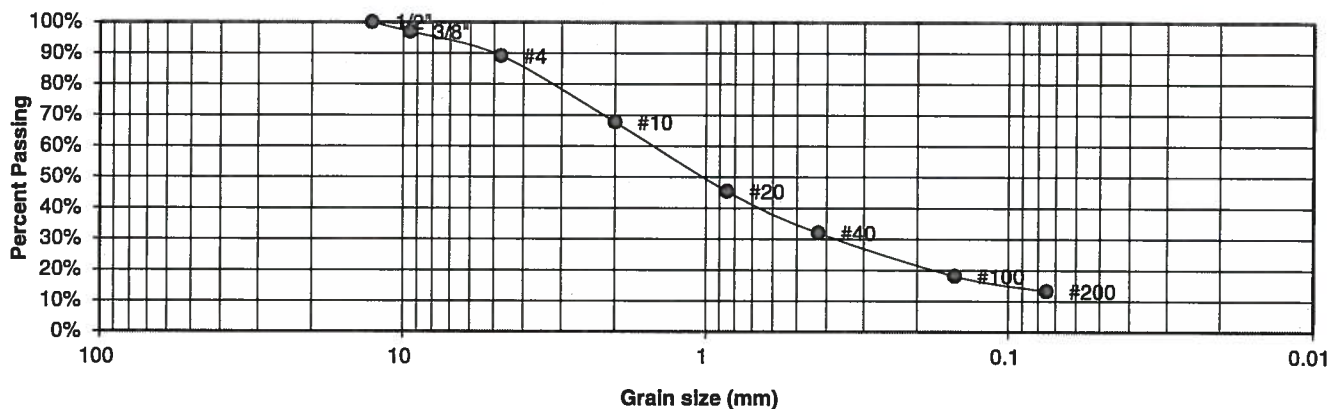
230532

FIG NO.:

B-1

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	SANC. AT MERIDIAN RANCH, F-1
TEST BORING #	1	JOB NO.	230532
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.9%
4	89.2%
10	67.7%
20	45.4%
40	32.0%
100	18.1%
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
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *7-24-23*

JOB NO.:

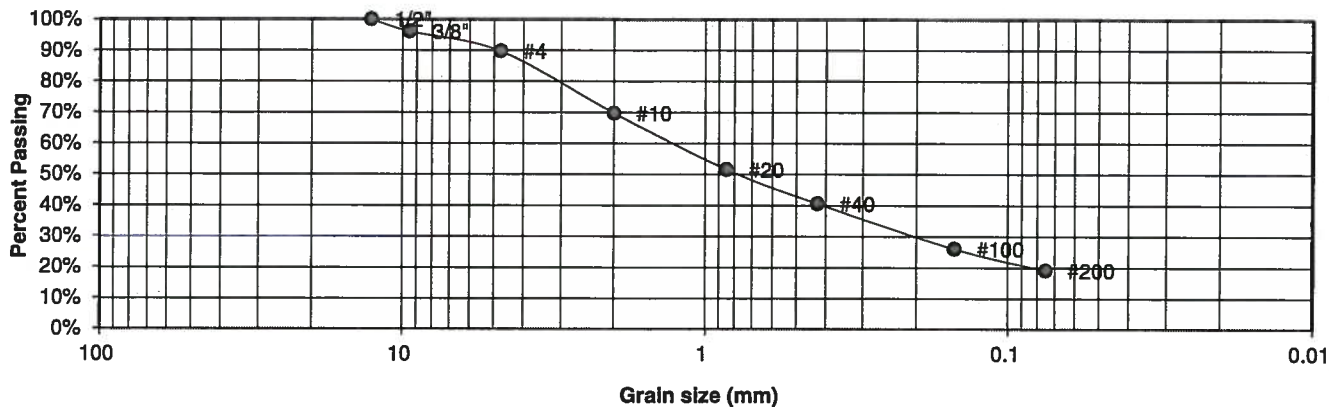
230532

FIG NO.:

B-2

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	2	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.0%
4	89.7%
10	69.7%
20	51.6%
40	40.6%
100	26.0%
200	19.0%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
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:

4-24-23

JOB NO.:

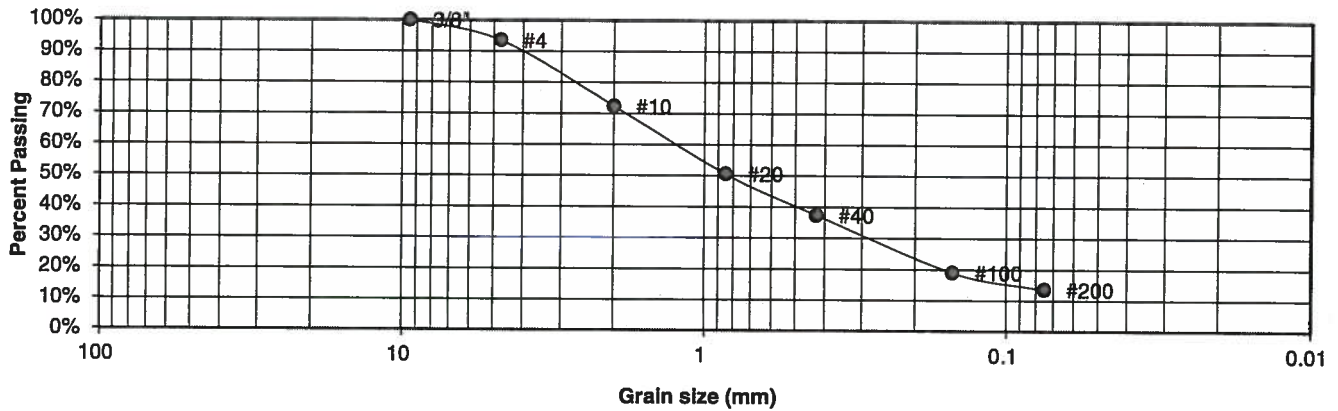
230532

FIG NO.:

B-3

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.5%
10	72.3%
20	50.6%
40	37.3%
100	19.0%
200	13.5%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
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: *4-24-23*

JOB NO.:

230532

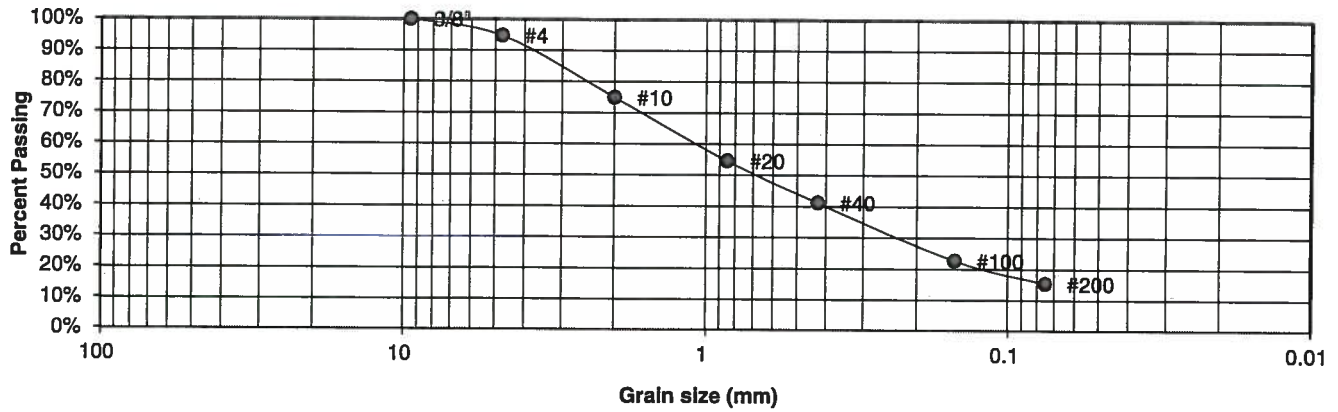
FIG NO.:

B-5

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

CLIENT TECH CONTRACTORS
PROJECT SANC. AT MERIDIAN RANCH, F-1
JOB NO. 230532
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	94.7%
10	74.9%
20	54.5%
40	41.1%
100	22.6%
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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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED: SW

DATE:

4-24-23

JOB NO.:

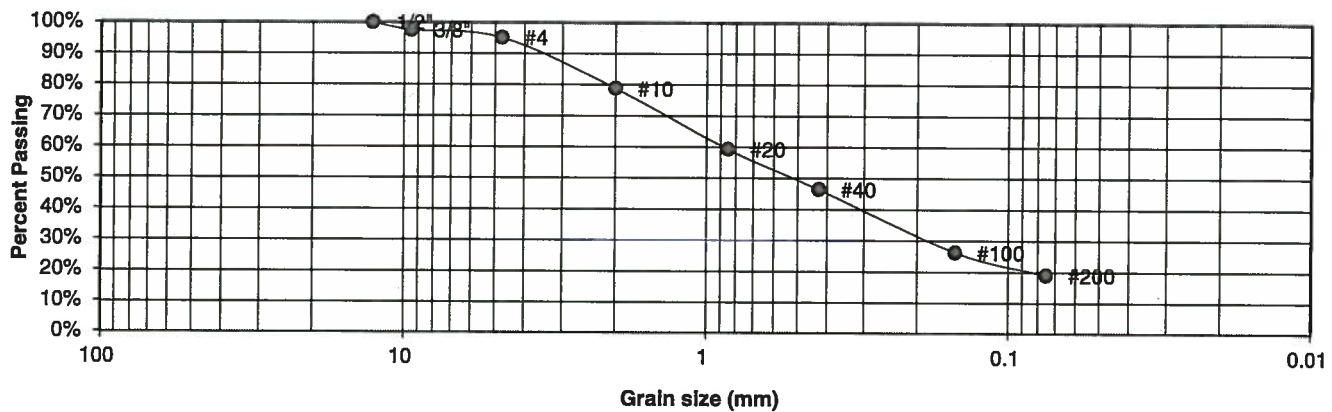
230532

FIG NO.:

B-6

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	5	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.5%
4	95.1%
10	78.8%
20	59.3%
40	46.5%
100	26.3%
200	19.0%

<u>Atterberg Limits</u>	
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:

4-24-23

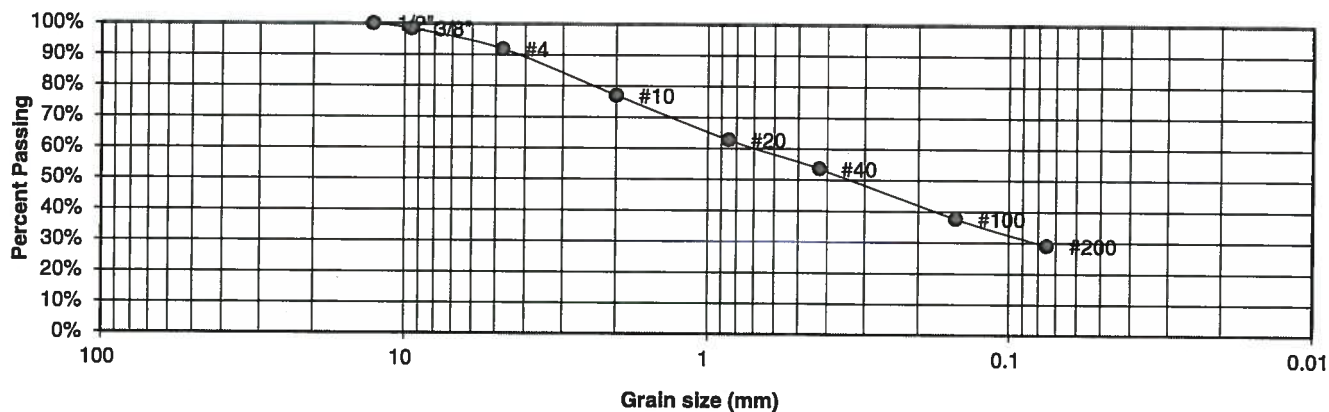
JOB NO.:

230532
FIG NO.:

B-7

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	7	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0

Sieve Analysis Grain Size Distribution



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.4%
4	91.9%
10	77.0%
20	62.7%
40	53.6%
100	37.6%
200	29.0%

<u>Atterberg Limits</u>	
Plastic Limit	17
Liquid Limit	27
Plastic Index	10

<u>Swell</u>	
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: *4-24-23*

JOB NO.:

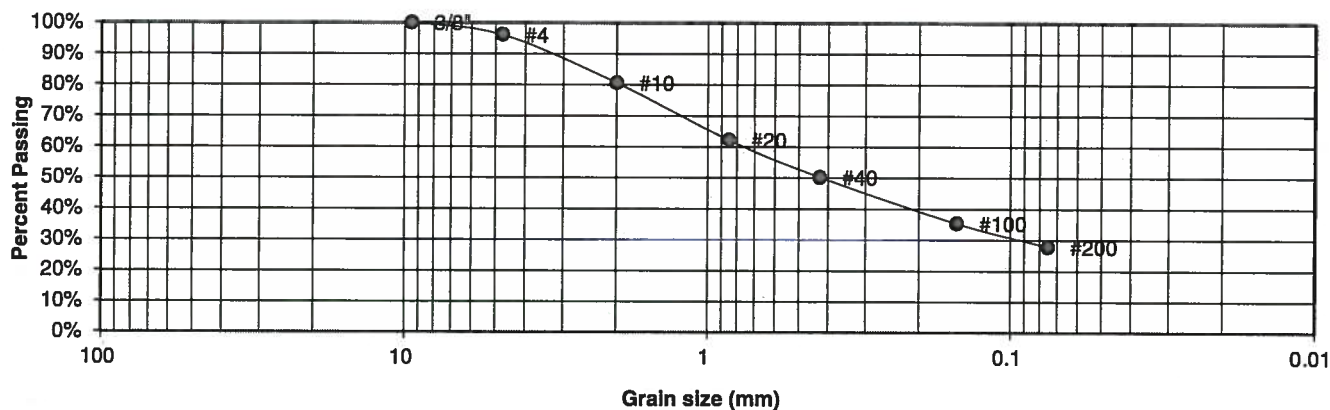
230532

FIG NO.:

B-8

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	8	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-6	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.1%
10	80.6%
20	62.2%
40	50.2%
100	35.4%
200	27.8%

<u>Atterberg Limits</u>	
Plastic Limit	15
Liquid Limit	27
Plastic Index	12

<u>Swell</u>	
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:

4-24-23

JOB NO.:

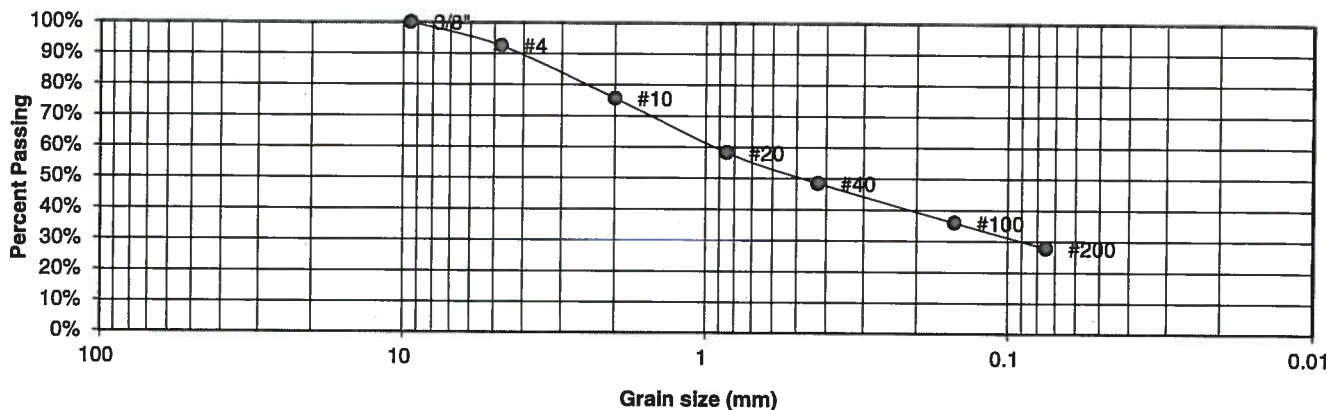
230532

FIG NO.:

B-9

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	9	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-6	<u>GROUP INDEX</u>	1

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.5%
10	75.6%
20	58.3%
40	48.5%
100	35.9%
200	27.8%

<u>Atterberg Limits</u>	
Plastic Limit	15
Liquid Limit	30
Plastic Index	15

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:

4-24-23

JOB NO.:

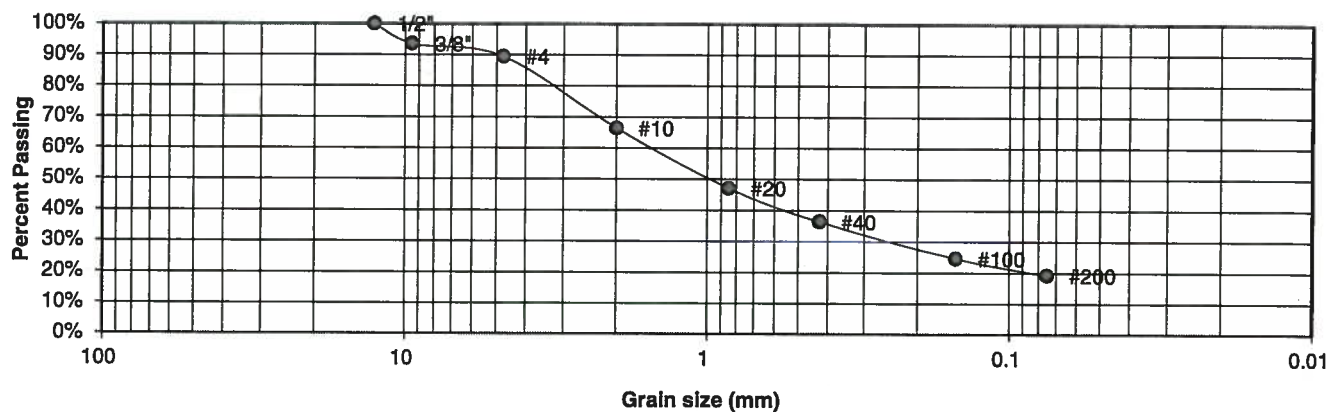
230532

FIG NO.:

8-10

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	10	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	93.5%
4	89.4%
10	66.4%
20	47.1%
40	36.4%
100	24.6%
200	19.1%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
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: *7-24-23*

JOB NO.:

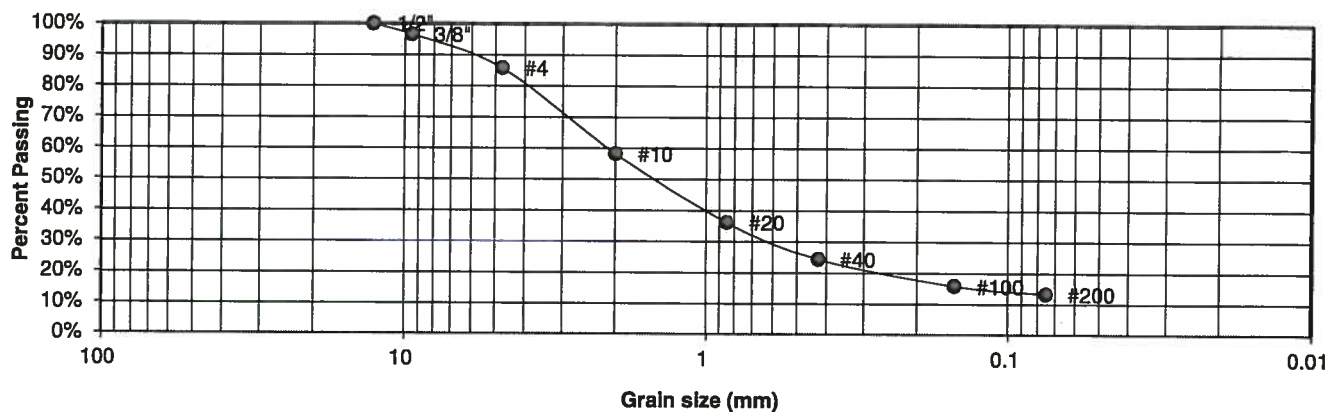
230532

FIG NO.:

B-11

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	15	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.6%
4	85.8%
10	58.2%
20	36.2%
40	24.4%
100	15.8%
200	13.3%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
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: *4-24-23*

JOB NO.:

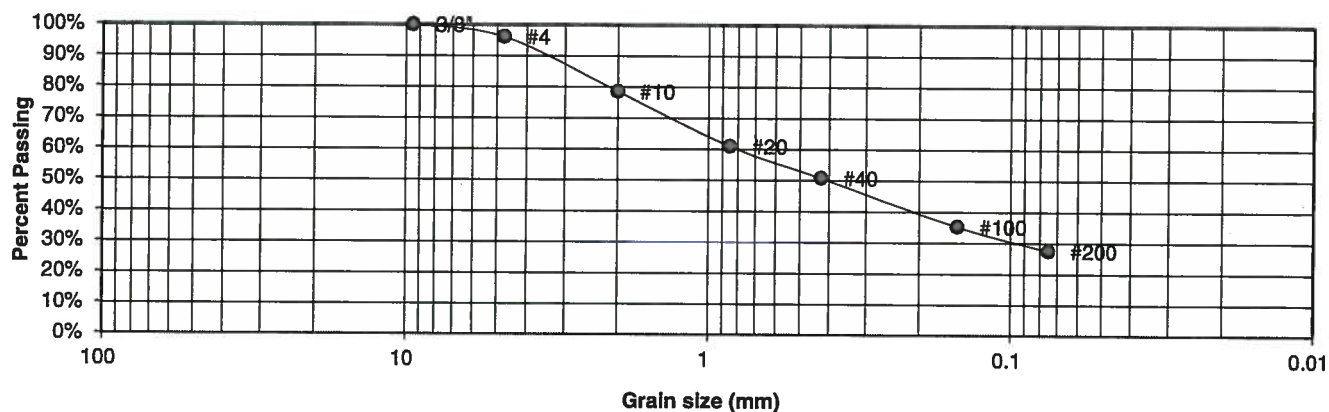
230532

FIG NO.:

B-12

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	0-3	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>		<u>GROUP INDEX</u>	

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.1%
10	78.6%
20	61.0%
40	50.8%
100	35.2%
200	27.5%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

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**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *4-24-23*

JOB NO.:

230532

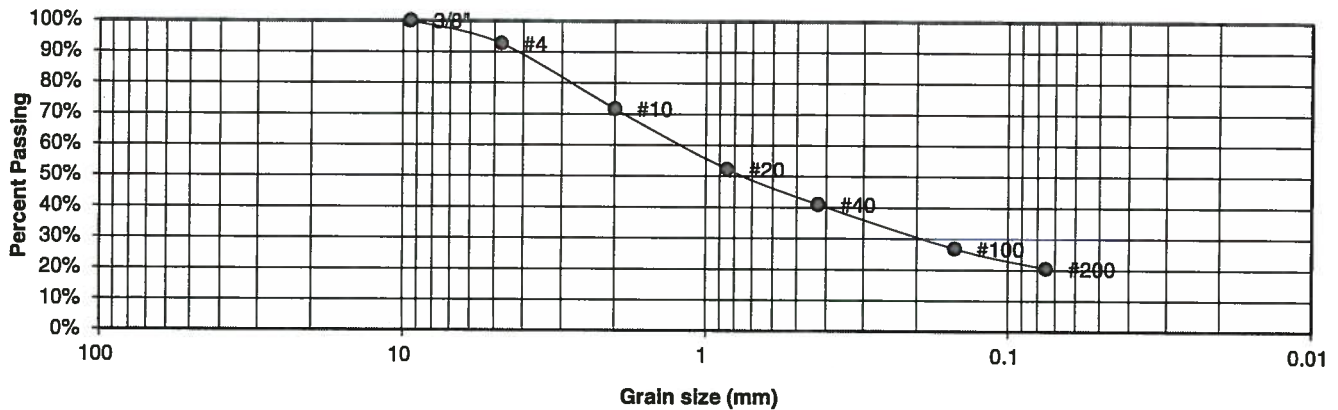
FIG NO.:

B-13

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 9
DEPTH (FT) 0-3
AASHTO CLASSIFICATION

CLIENT TECH CONTRACTORS
PROJECT SANC. AT MERIDIAN RANCH, F-1
JOB NO. 230532
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	92.7%
10	71.7%
20	52.3%
40	41.0%
100	26.8%
200	20.5%

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

DRAWN:

DATE:

CHECKED: SW

DATE: 4-24-23

JOB NO.:

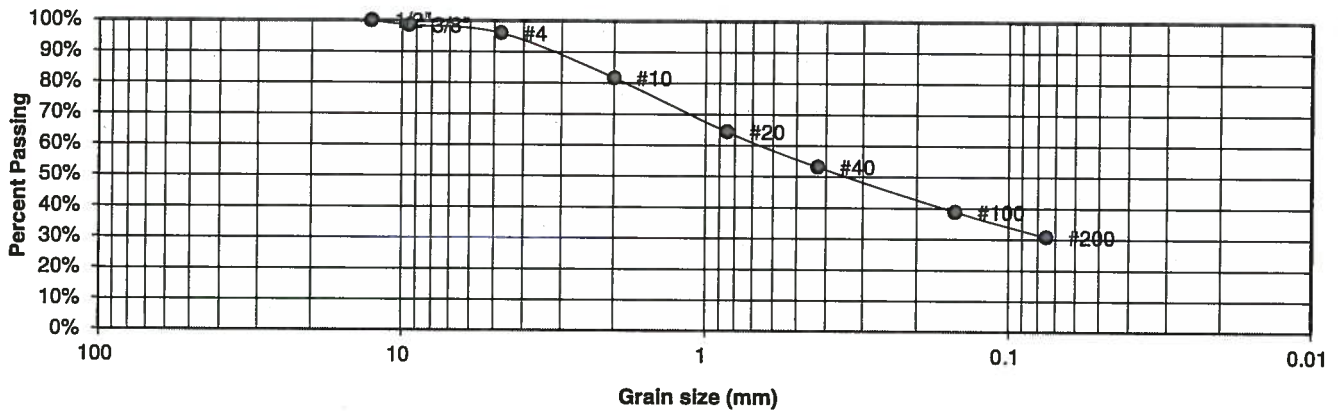
230532
 FIG NO.:

B-14

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 12
DEPTH (FT) 0-3
AASHTO CLASSIFICATION

CLIENT TECH CONTRACTORS
PROJECT SANC. AT MERIDIAN RANCH, F-1
JOB NO. 230532
TEST BY BL
GROUP INDEX

Sieve Analysis Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.5%
4	96.0%
10	81.7%
20	64.4%
40	53.2%
100	38.8%
200	30.8%

**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: 4-24-23

JOB NO.:

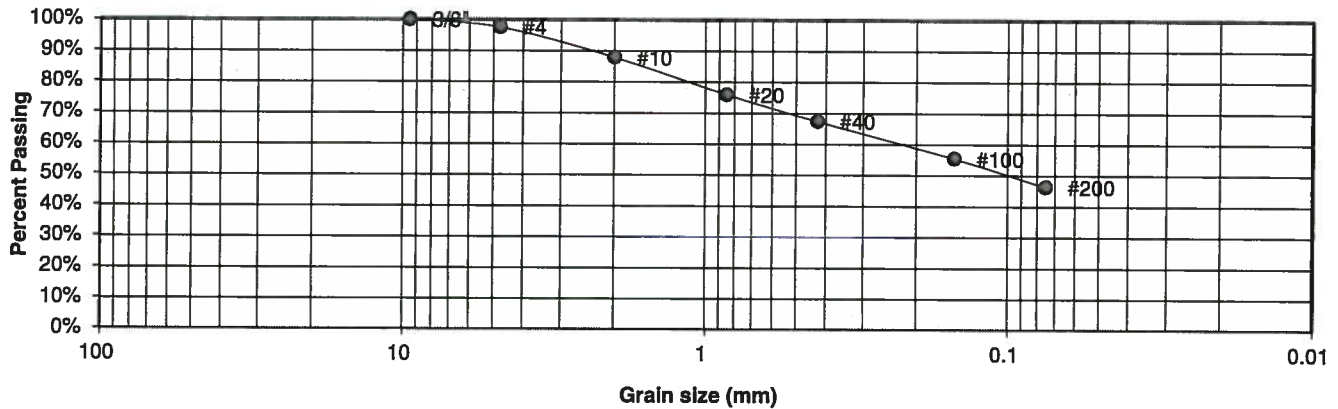
230532

FIG NO.:

B-15

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2, CBR #2	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	18	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	0-3	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-6	<u>GROUP INDEX</u>	3

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.6%
10	87.9%
20	76.0%
40	67.4%
100	55.4%
200	46.3%

<u>Atterberg Limits</u>	
Plastic Limit	13
Liquid Limit	27
Plastic Index	14

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:

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DATE:

4-24-23

JOB NO.:

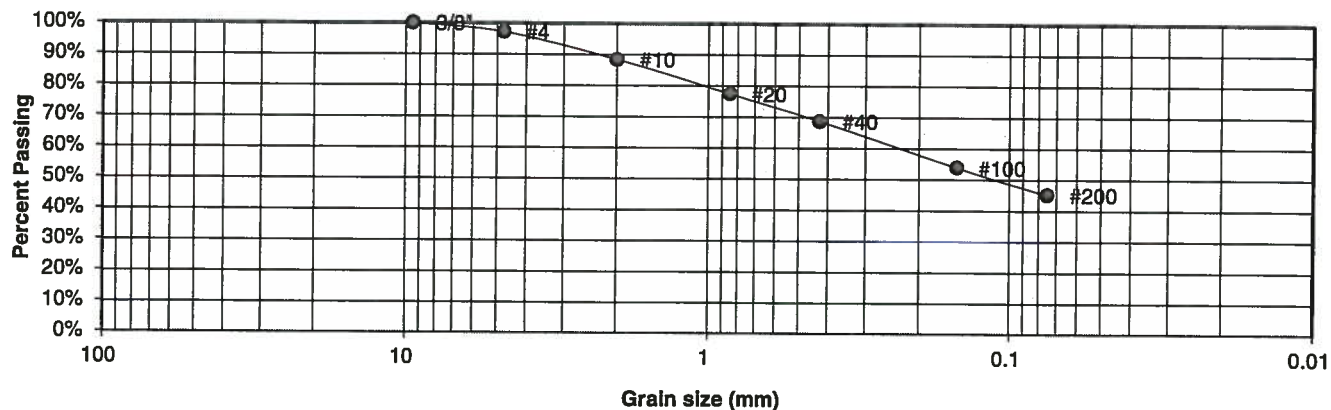
230532

FIG NO.:

B-16

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	6	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-6	<u>GROUP INDEX</u>	4

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	88.4%
20	77.4%
40	68.7%
100	53.9%
200	45.2%

<u>Atterberg Limits</u>	
Plastic Limit	16
Liquid Limit	34
Plastic Index	18

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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**LABORATORY TEST
RESULTS**

DRAWN:

DATE:

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DATE: *4-24-83*

JOB NO.:

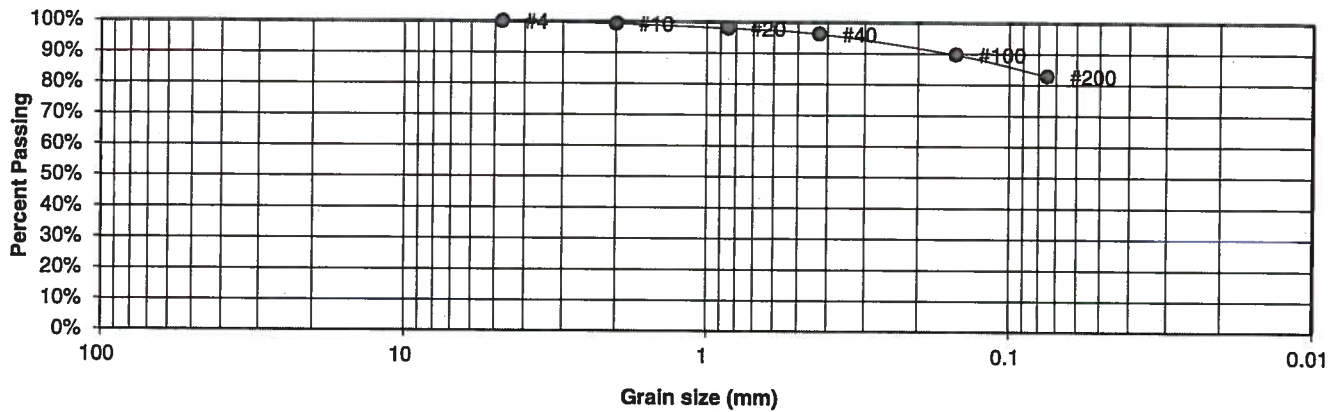
230532

FIG NO.:

B-17

<u>UNIFIED CLASSIFICATION</u>	CL	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	14	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-6	<u>GROUP INDEX</u>	14

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.3%
20	97.9%
40	96.2%
100	89.7%
200	82.8%

<u>Atterberg Limits</u>	
Plastic Limit	14
Liquid Limit	33
Plastic Index	19

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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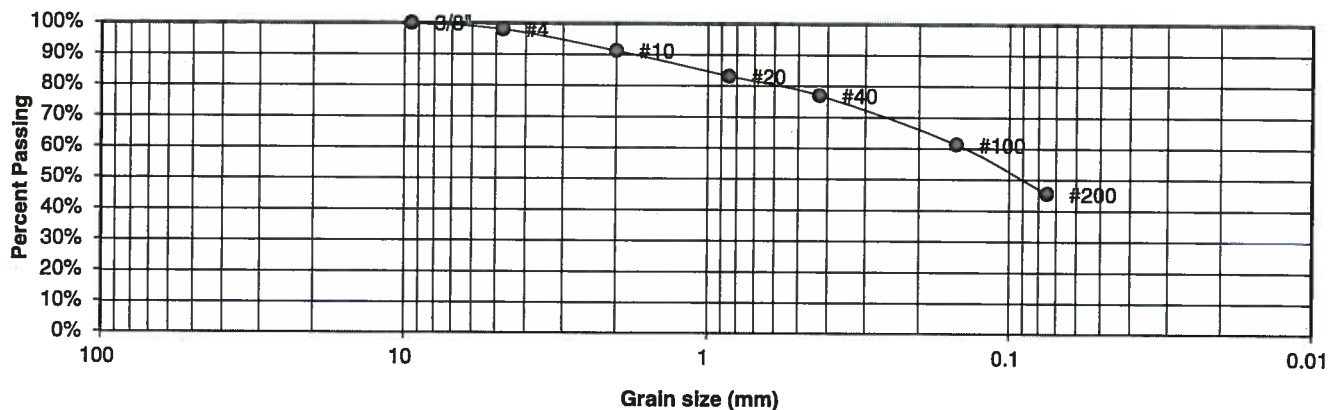
JOB NO.:

230532
FIG NO.:

B-18

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	15	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	0-3	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>		<u>GROUP INDEX</u>	

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.1%
10	91.3%
20	83.1%
40	77.0%
100	61.3%
200	45.5%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

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**

DRAWN:

DATE:

CHECKED: *SW*

DATE:

4-24-23

JOB NO.:

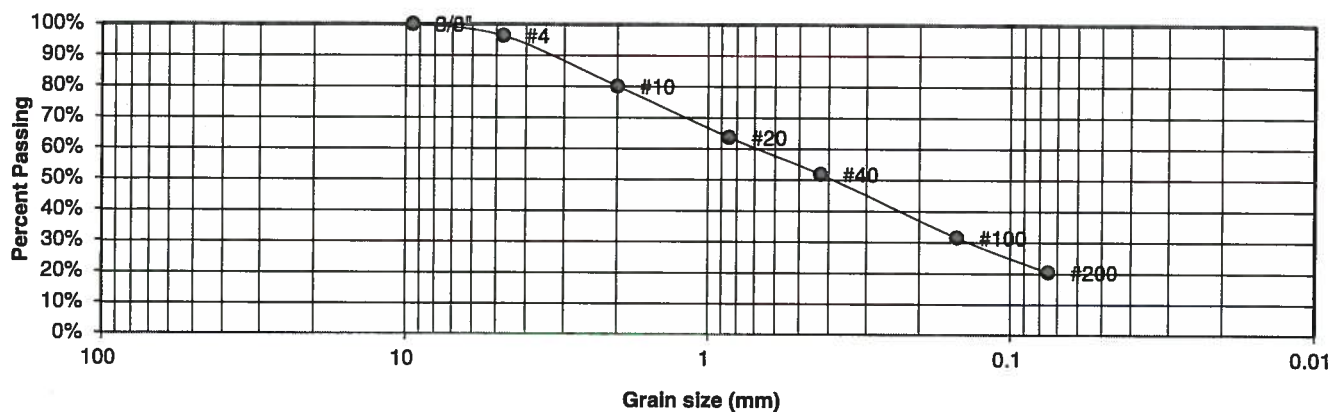
230532

FIG NO.:

B-19

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	6	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.4%
10	80.1%
20	63.7%
40	51.9%
100	31.5%
200	20.4%

<u>Atterberg Limits</u>	
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
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>4-24-23</i>
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JOB NO.:

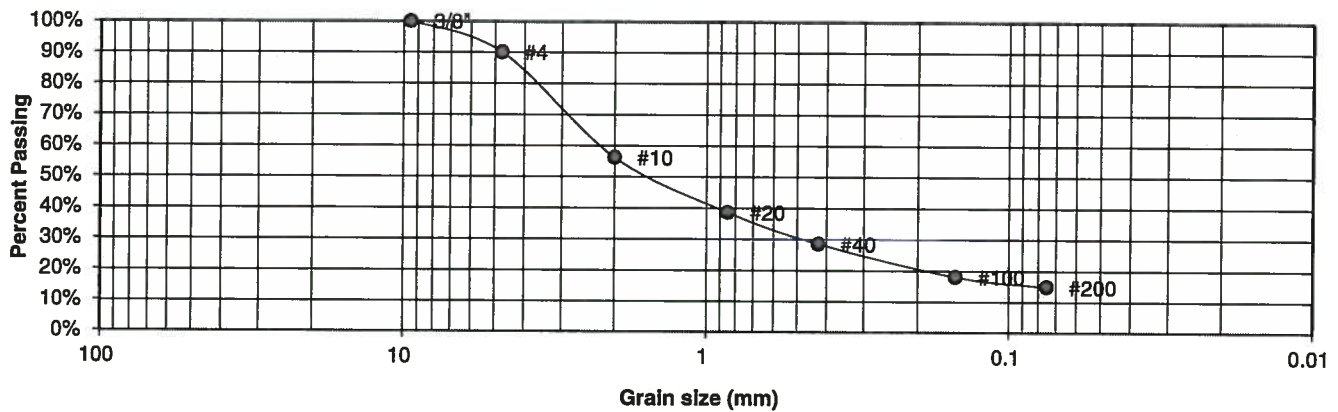
230532

FIG NO.:

B-20

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	17	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

Sieve Analysis Grain Size Distribution



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	90.1%
10	56.2%
20	38.6%
40	28.6%
100	18.0%
200	14.9%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
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:

4-24-23

JOB NO.:

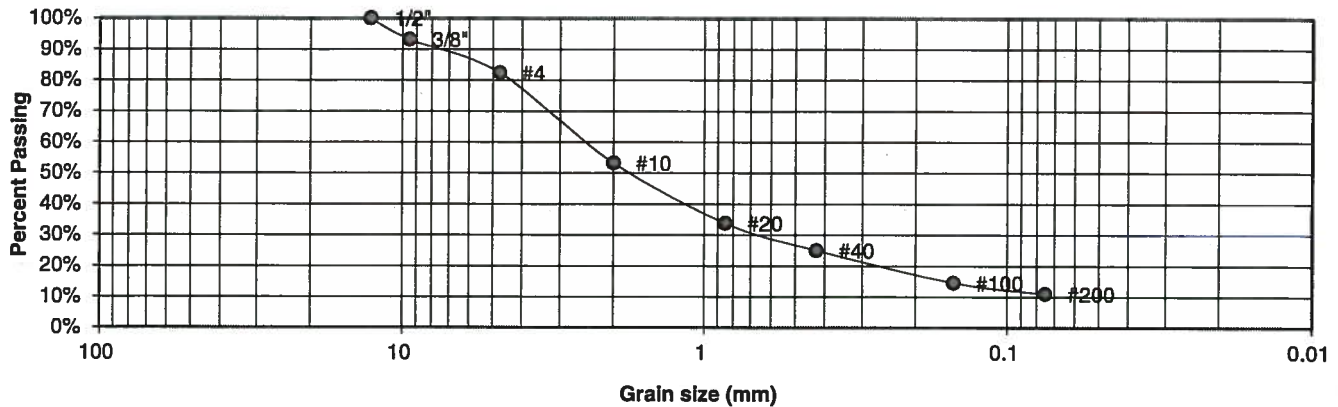
230532

FIG NO.:

B-21

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	18	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	93.1%
4	82.4%
10	53.2%
20	33.8%
40	25.0%
100	14.5%
200	11.0%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
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**

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.:

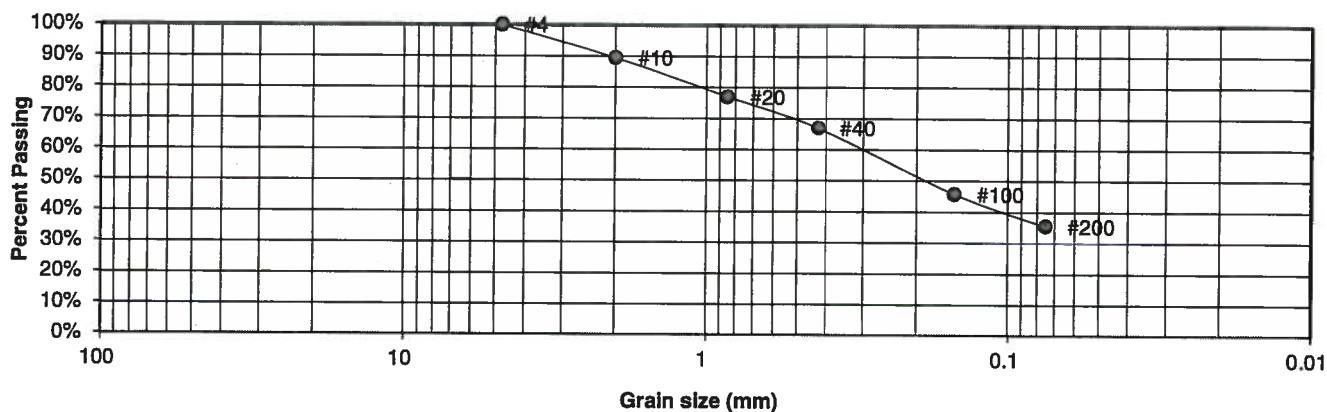
230532

FIG NO.:

B-22

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	4	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-6	<u>GROUP INDEX</u>	1

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	89.5%
20	77.0%
40	67.0%
100	45.7%
200	35.4%

<u>Atterberg Limits</u>	
Plastic Limit	14
Liquid Limit	29
Plastic Index	15

<u>Swell</u>	
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: *SW*

DATE: *4-24-23*

JOB NO.:

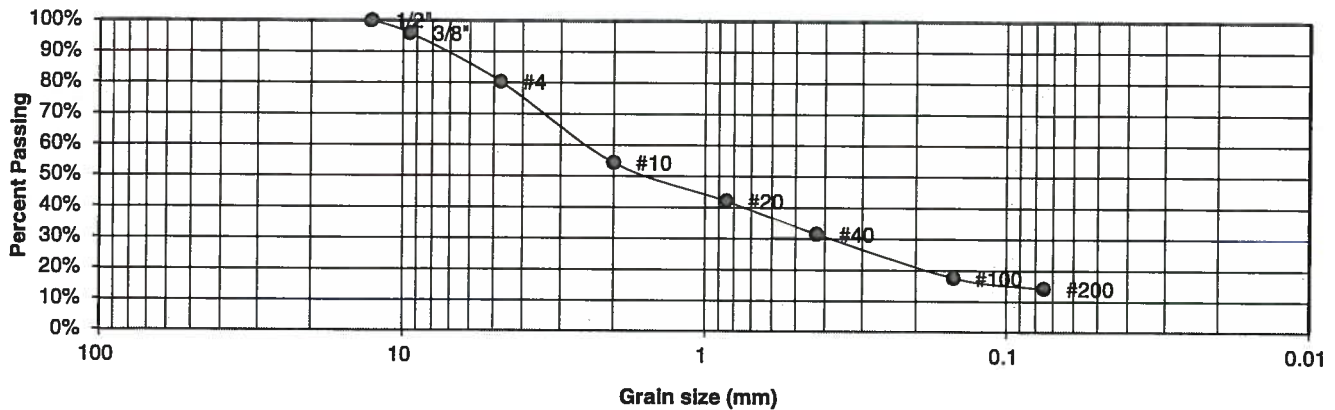
230532
FIG NO.:

B-23

UNIFIED CLASSIFICATION	SM
SOIL TYPE #	5
TEST BORING #	11
DEPTH (FT)	1-2
AASHTO CLASSIFICATION	A-1-b

CLIENT	TECH CONTRACTORS
PROJECT	SANC. AT MERIDIAN RANCH, F-1
JOB NO.	230532
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"	95.9%
4	80.3%
10	54.3%
20	42.1%
40	31.6%
100	17.5%
200	14.2%

**Atterberg
Limits**

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED: SW

DATE:

4-24-23

JOB NO.:

230532

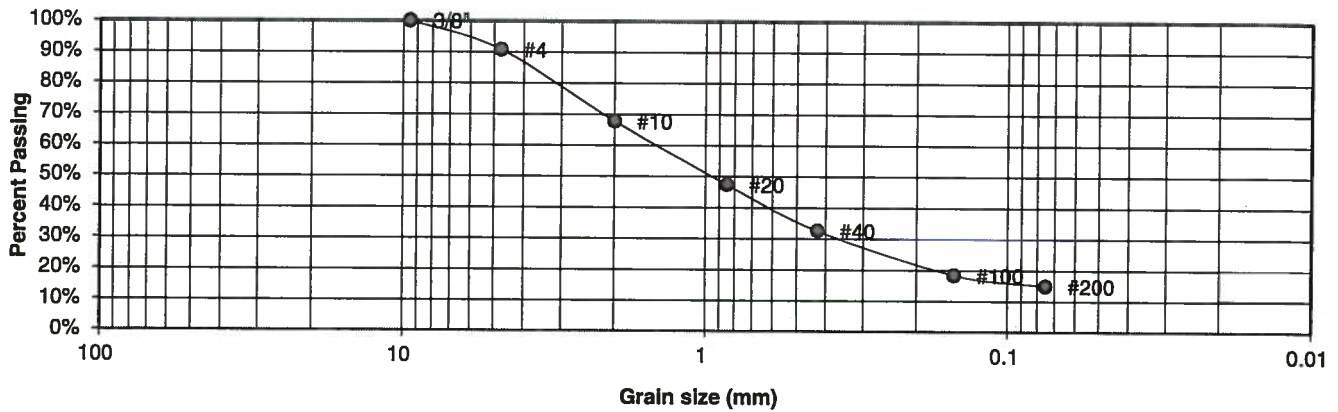
FIG NO.:

B-24

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

CLIENT TECH CONTRACTORS
PROJECT SANC. AT MERIDIAN RANCH, F-1
JOB NO. 230532
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	90.8%
10	67.8%
20	47.4%
40	32.5%
100	18.4%
200	15.0%

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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505 ELKTON DRIVE
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LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED: SW

DATE:

4-24-23

JOB NO.:

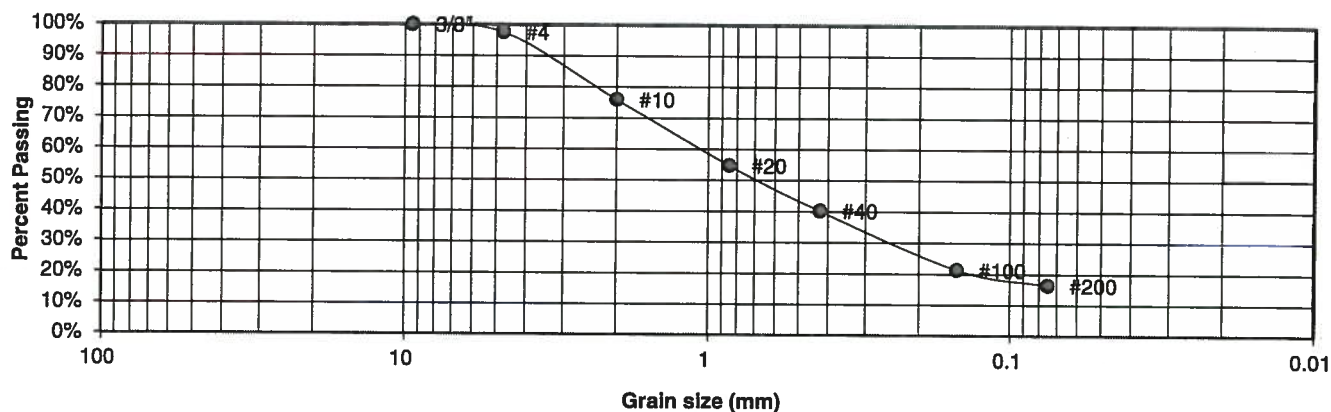
230532

FIG NO.:

B-25

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	5	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	13	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.6%
10	75.9%
20	54.8%
40	40.2%
100	21.3%
200	16.4%

<u>Atterberg Limits</u>	
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:

DATE:

SW

4-24-23

JOB NO.:

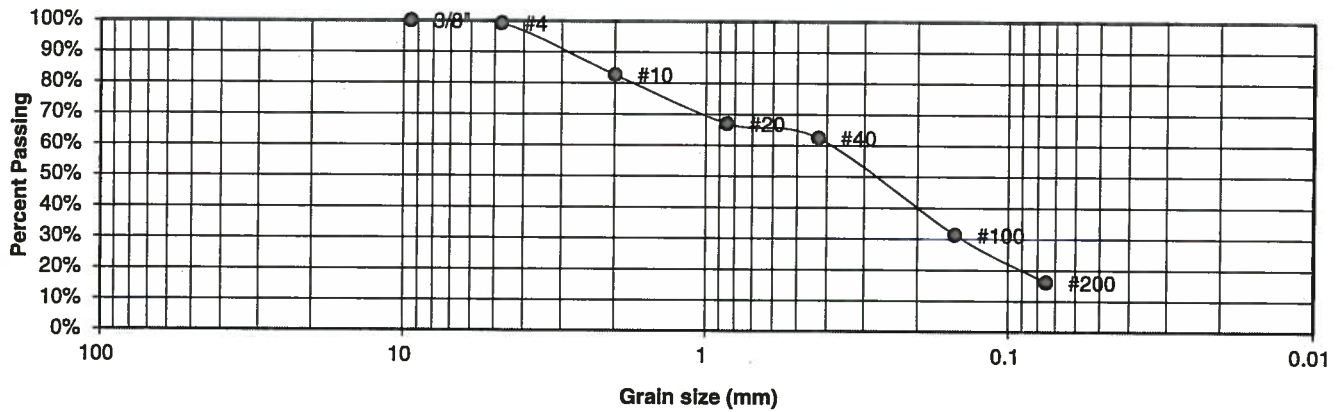
230532

FIG NO.:

B-26

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	5	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	16	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.2%
10	82.7%
20	67.0%
40	62.4%
100	31.3%
200	16.1%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>
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**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>4-24-23</i>
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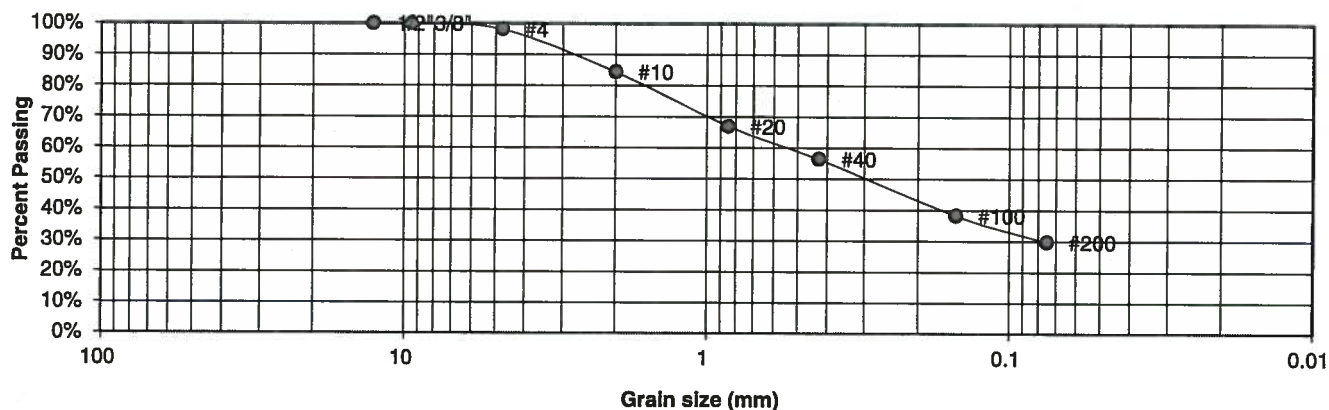
JOB NO.:

230532
FIG NO.:

B-27

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	5	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	100.0%
4	98.1%
10	84.4%
20	67.0%
40	56.4%
100	38.2%
200	29.7%

<u>Atterberg Limits</u>	
Plastic Limit	13
Liquid Limit	21
Plastic Index	8

<u>Swell</u>	
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:

4-24-23

JOB NO.:

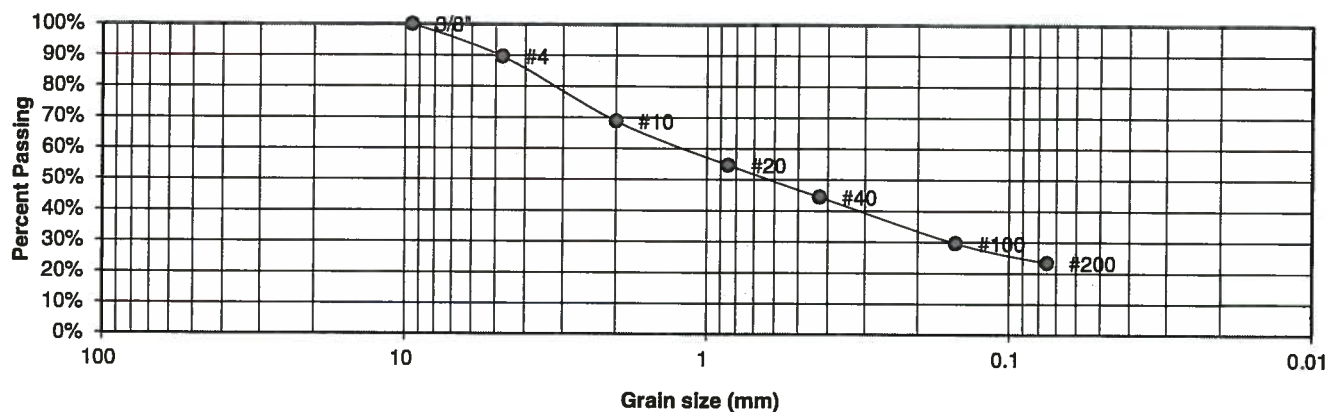
230532

FIG NO.:

B-28

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	5	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	9	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-6	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.6%
10	68.7%
20	54.7%
40	44.4%
100	29.6%
200	23.3%

<u>Atterberg Limits</u>	
Plastic Limit	15
Liquid Limit	30
Plastic Index	15

<u>Swell</u>	
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**

<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> SW	<u>DATE:</u> 4-24-23
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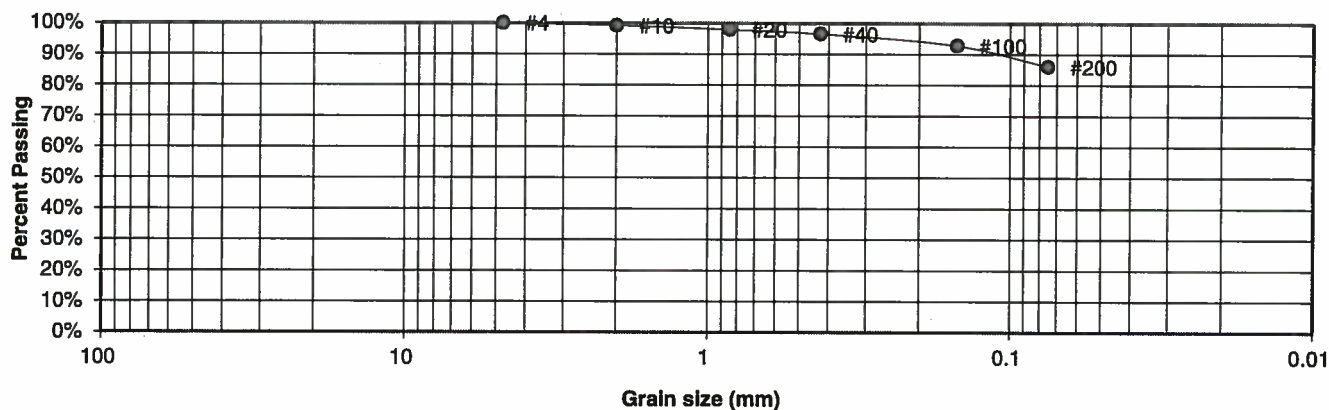
JOB NO.:

230532
FIG NO.:

B-29

<u>UNIFIED CLASSIFICATION</u>	CL	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	6	<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1
<u>TEST BORING #</u>	9	<u>JOB NO.</u>	230532
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-7-6	<u>GROUP INDEX</u>	19

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.2%
20	97.9%
40	96.5%
100	92.8%
200	86.0%

<u>Atterberg Limits</u>	
Plastic Limit	20
Liquid Limit	41
Plastic Index	21

<u>Swell</u>	
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**

DRAWN:	DATE:	CHECKED: SN	DATE: 4-24-23
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JOB NO.:

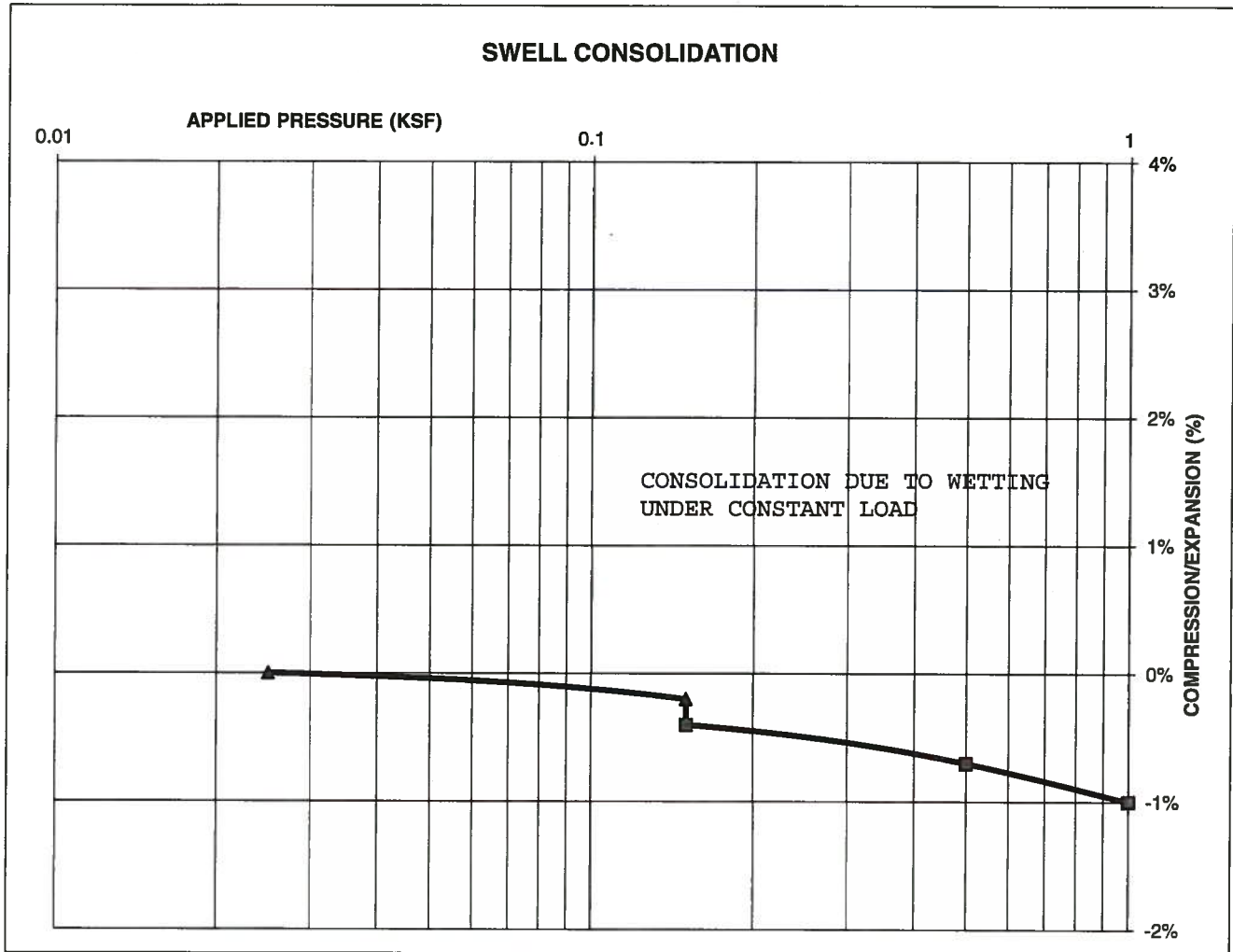
230532
FIG NO.:

8-30

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			8.6%
SWELL/CONSOLIDATION (%)			-0.2%

JOB NO. 230532
 CLIENT TECH CONTRACTORS
 PROJECT SANC. AT MERIDIAN RANCH, F-1



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SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

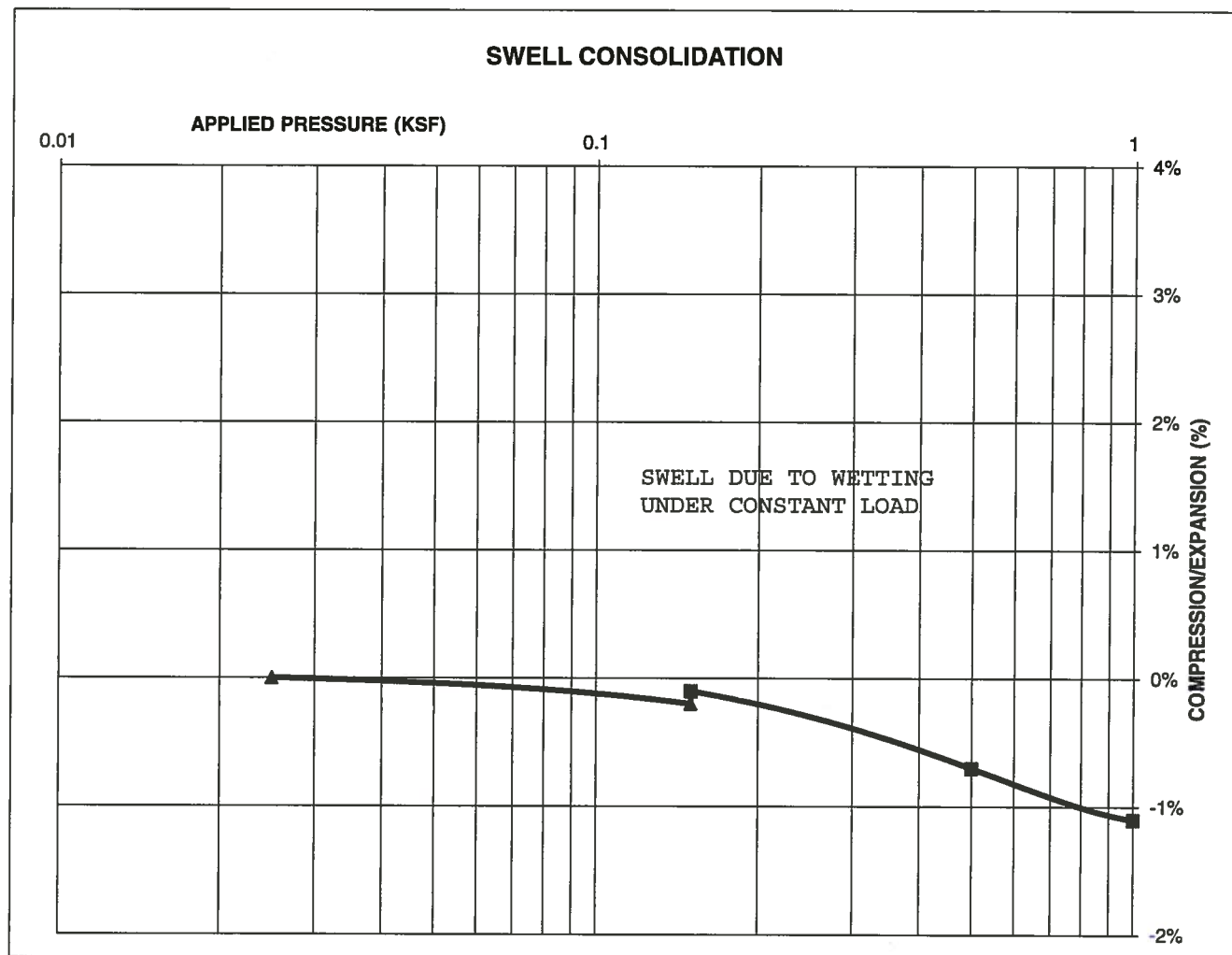
JOB NO.:
230532

FIG NO.:
B-31

CONSOLIDATION TEST RESULTS

TEST BORING #	9	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)	111		
NATURAL MOISTURE CONTENT	6.8%		
SWELL/CONSOLIDATION (%)	0.1%		

JOB NO. 230532
 CLIENT TECH CONTRACTORS
 PROJECT SANC. AT MERIDIAN RANCH, F-1



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 COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.:

230532

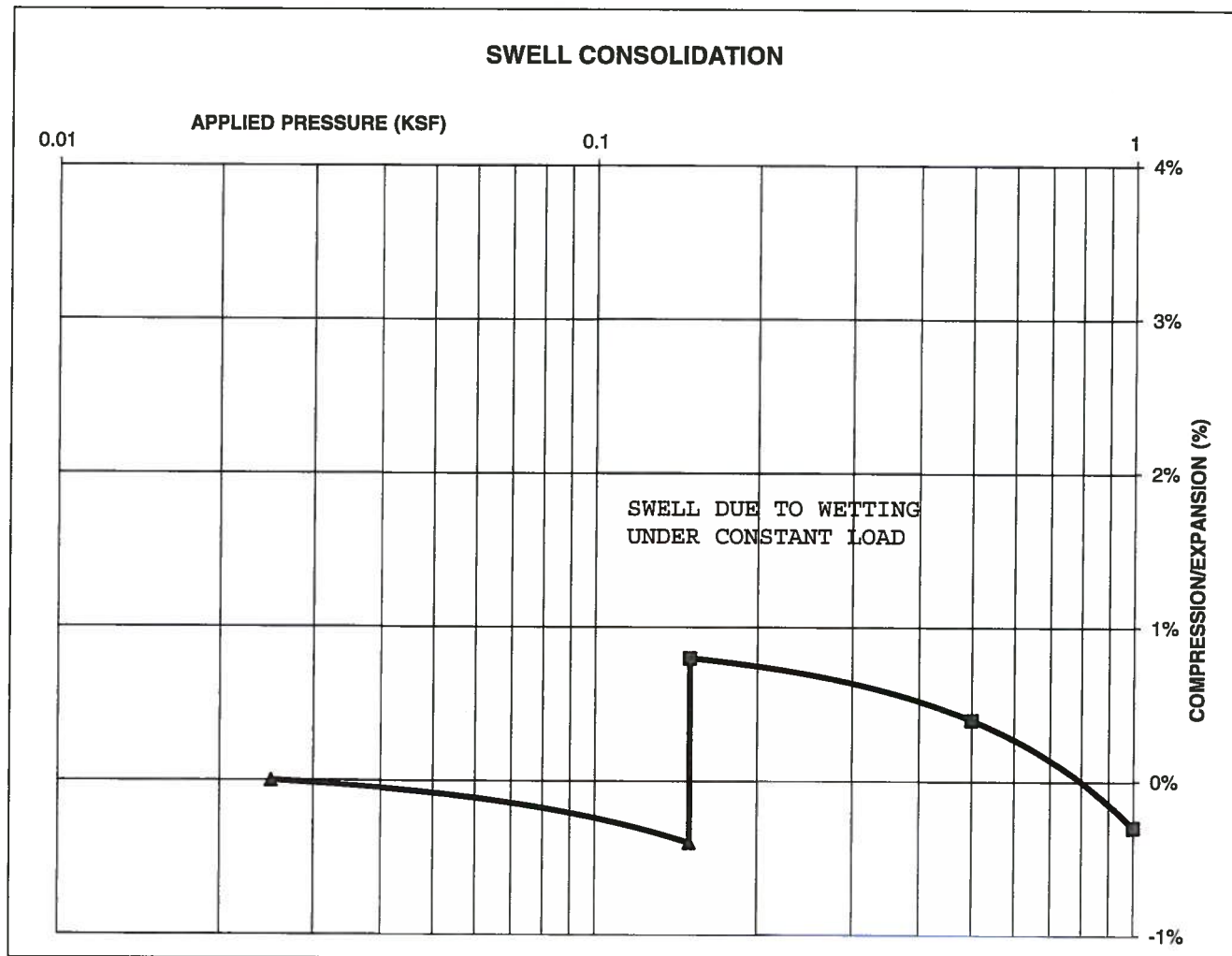
FIG NO.:

B-32

CONSOLIDATION TEST RESULTS

TEST BORING #	6	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)	115		
NATURAL MOISTURE CONTENT	11.5%		
SWELL/CONSOLIDATION (%)	1.2%		

JOB NO. 230532
 CLIENT TECH CONTRACTORS
 PROJECT SANC. AT MERIDIAN RANCH, F-1



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SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.:
 230532

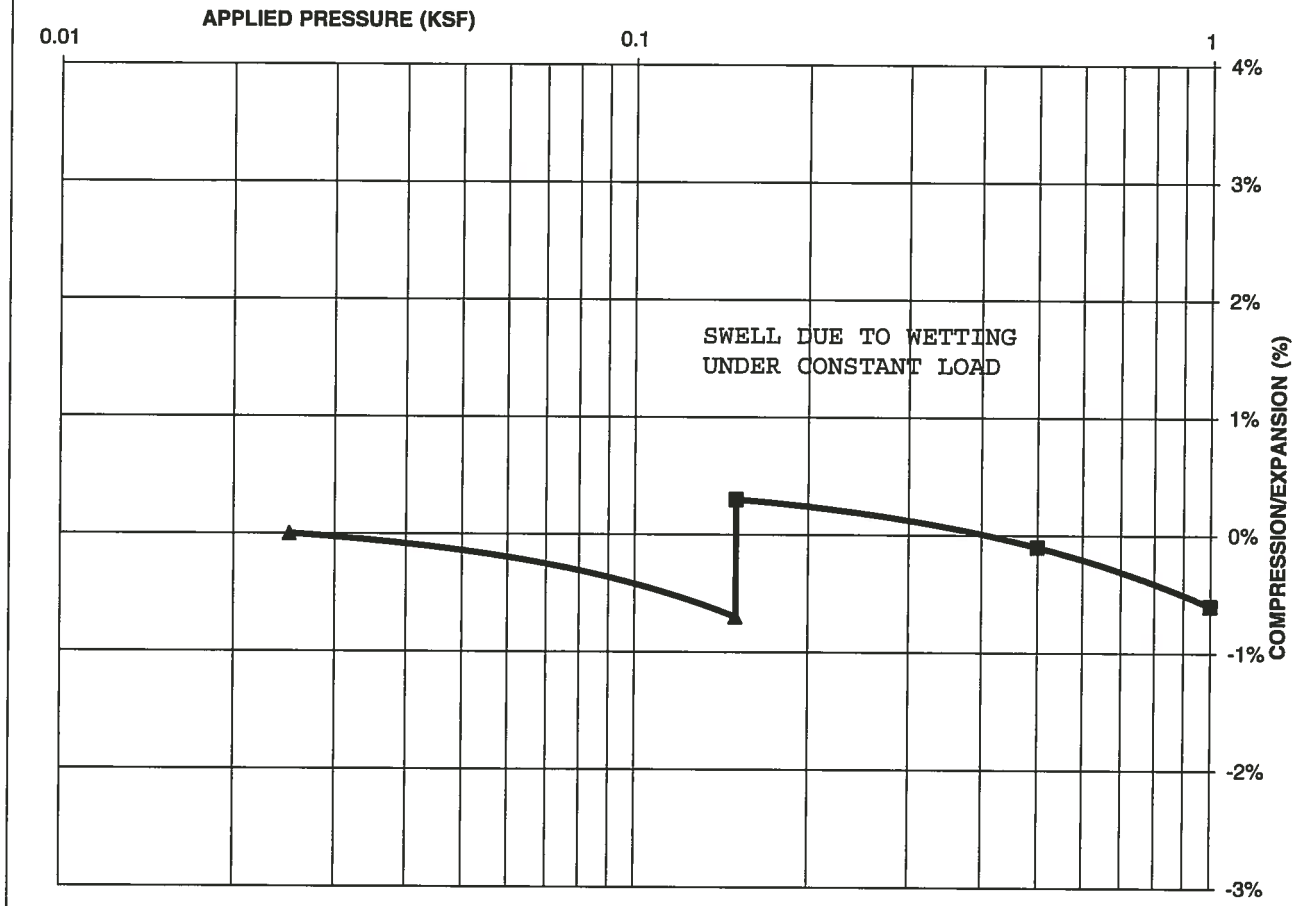
FIG NO.:
 B-33

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	5
DESCRIPTION	SC	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)	119		
NATURAL MOISTURE CONTENT	13.7%		
SWELL/CONSOLIDATION (%)	1.0%		

JOB NO. 230532
CLIENT TECH CONTRACTORS
PROJECT SANC. AT MERIDIAN RANCH, F-1

SWELL CONSOLIDATION



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SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED: *SW*

DATE: *4-24-23*

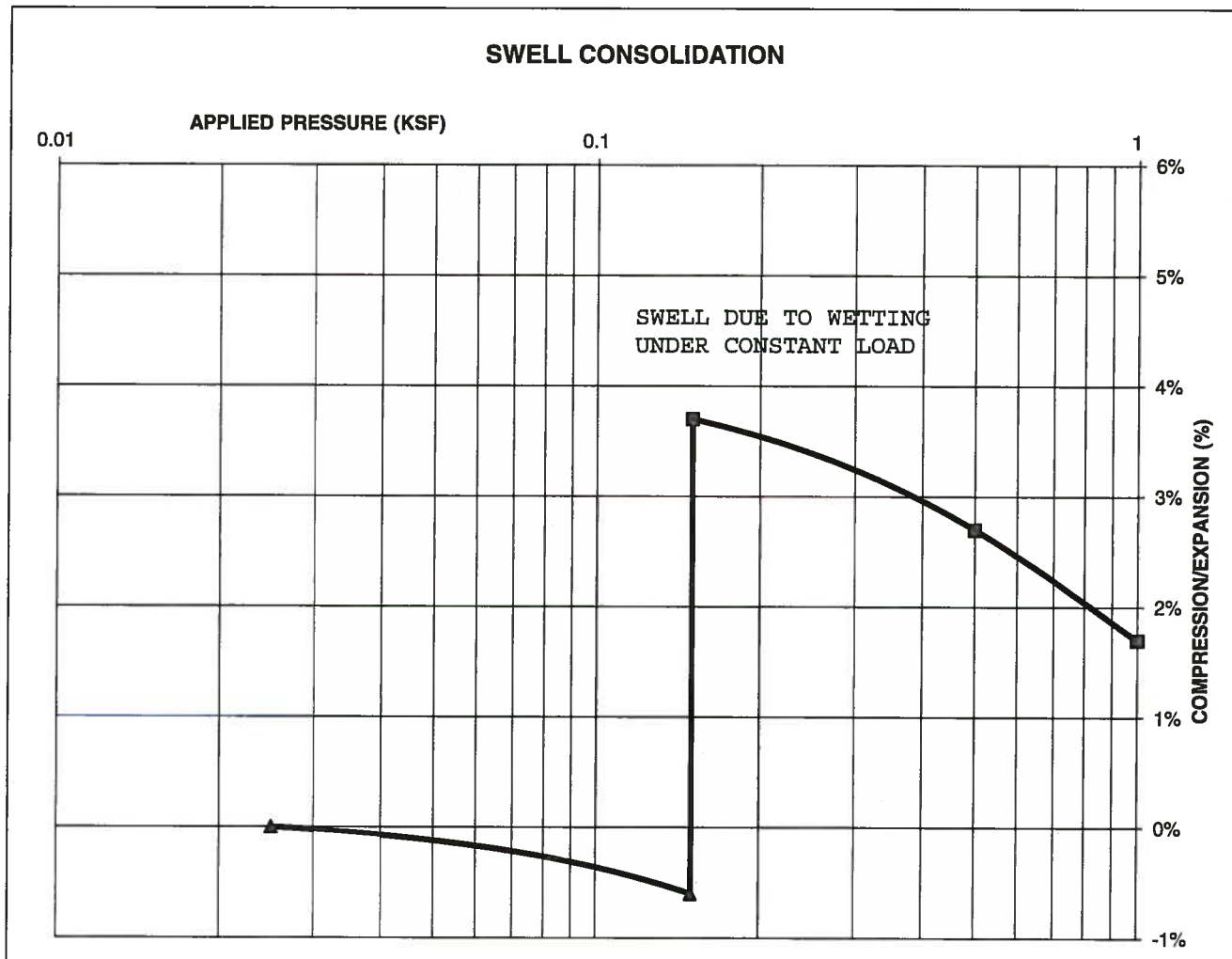
JOB NO.:
230532

FIG NO.:
B-34

CONSOLIDATION TEST RESULTS

TEST BORING #	9	DEPTH(ft)	5
DESCRIPTION	CL	SOIL TYPE	6
NATURAL UNIT DRY WEIGHT (PCF)			116
NATURAL MOISTURE CONTENT			15.7%
SWELL/CONSOLIDATION (%)			4.3%

JOB NO. 230532
 CLIENT TECH CONTRACTORS
 PROJECT SANC. AT MERIDIAN RANCH, F-1



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SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

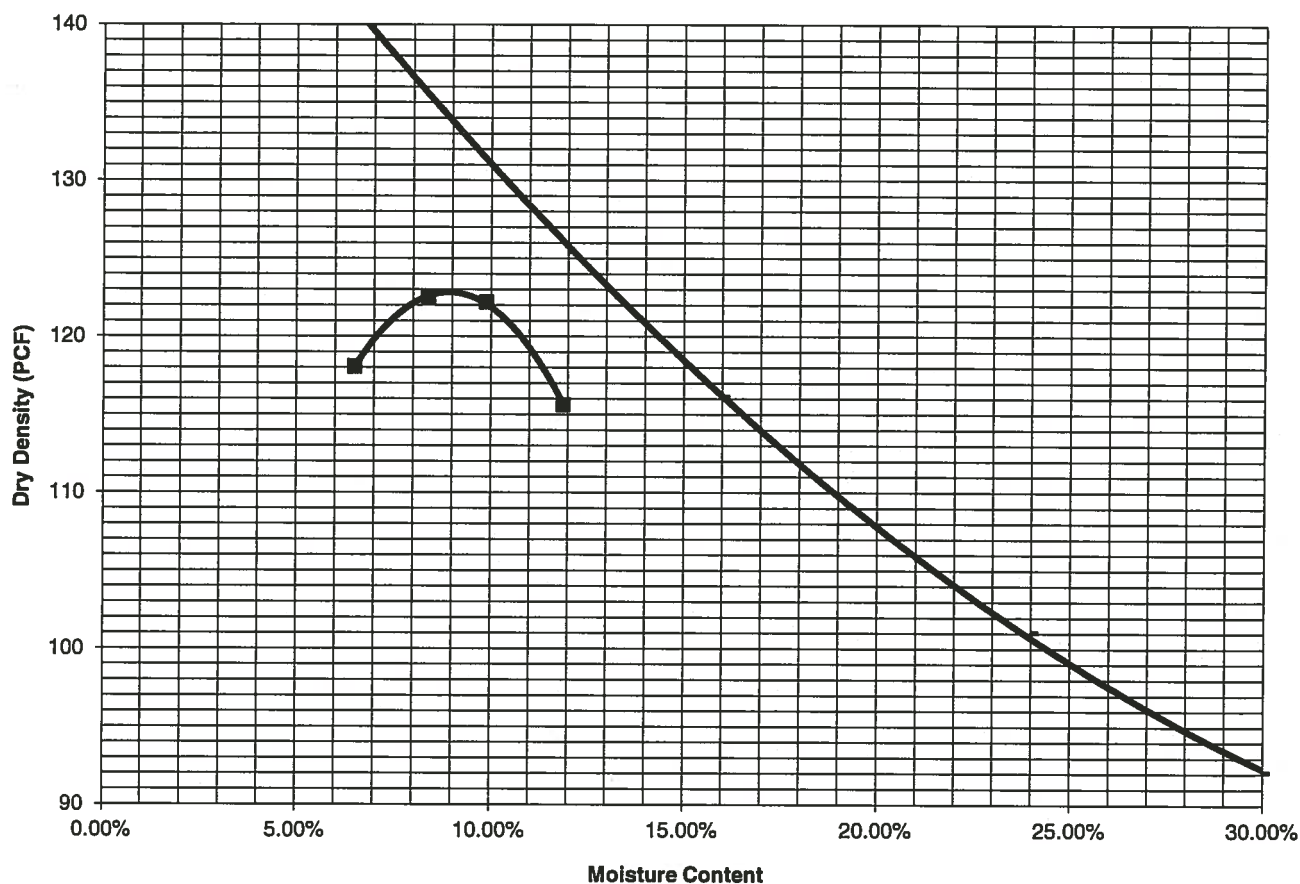
JOB NO.:
 230532

FIG NO.:
 6-35

<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1	<u>CLIENT</u>	TECH CONTRACTORS
<u>SAMPLE LOCATION</u>	TB-6 @ 0-3'	<u>JOB NO.</u>	230532
<u>SOIL DESCRIPTION</u>	FILL, SAND, CLAYEY, BROWN	<u>DATE</u>	04/11/23

<u>IDENTIFICATION</u>	SC	<u>COMPACTION TEST #</u>	1, CBR #1
<u>TEST DESIGNATION / METHOD</u>	ASTM D-1557-A	<u>TEST BY</u>	AL
<u>MAXIMUM DRY DENSITY (PCF)</u>	122.9	<u>OPTIMUM MOISTURE</u>	9.0%

Compaction Curve



■ ACTUAL POINTS - PARABOLIC FIT — ZERO AIR VOIDS



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

MOISTURE DENSITY RELATION

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.:

230532

FIG NO.:

B-37

CBR TEST LOAD DATA

JOB NO: 230532
 CLIENT: TECH CONTRACTORS
 PROJECT: SANC. AT MERIDIAN RANCH, F-1
 SOIL TYPE: 1, CBR #1

PISTON DIAMETER (cm)	PISTON AREA (in ²)						
4.958	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	73	24.39	146	48.79	177	59.15	
0.050	121	40.43	241	80.53	305	101.92	
0.075	166	55.47	331	110.61	375	125.31	
0.100	199	66.50	399	133.33	457	152.71	
0.125	234	78.20	467	156.06	558	186.47	
0.150	271	90.56	542	181.12	676	225.90	
0.175	308	102.92	616	205.85	774	258.65	
0.200	331	110.61	661	220.88	920	307.43	
0.300	455	152.05	909	303.76	1342	448.45	
0.400	514	171.76	1097	366.58	1706	570.09	
0.500	623	208.19	1288	430.41	2073	692.73	

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	357	354	399
WT. CAN	8.14	7.96	8.24
WT. CAN+WET	202.18	211.1	215.24
WT. CAN+DRY	188.74	190.43	195.02
WT. H2O	13.44	20.67	20.22
WT. DRY SOIL	180.6	182.47	186.78
MOISTURE CONTENT	7.44%	11.33%	10.83%

WET DENSITY (PCF)	128.4	136.1	139.6
DRY DENSITY (PCF)	117.8	124.9	128.1

BEARING RATIO 6.65 13.33 15.27

90% OF DRY DENSITY 115.3
 95% OF DRY DENSITY 121.7

BEARING RATIO AT 90% OF MAX	4.28 ~ R VALUE	10
BEARING RATIO AT 95% OF MAX	10.33 ~ R VALUE	30



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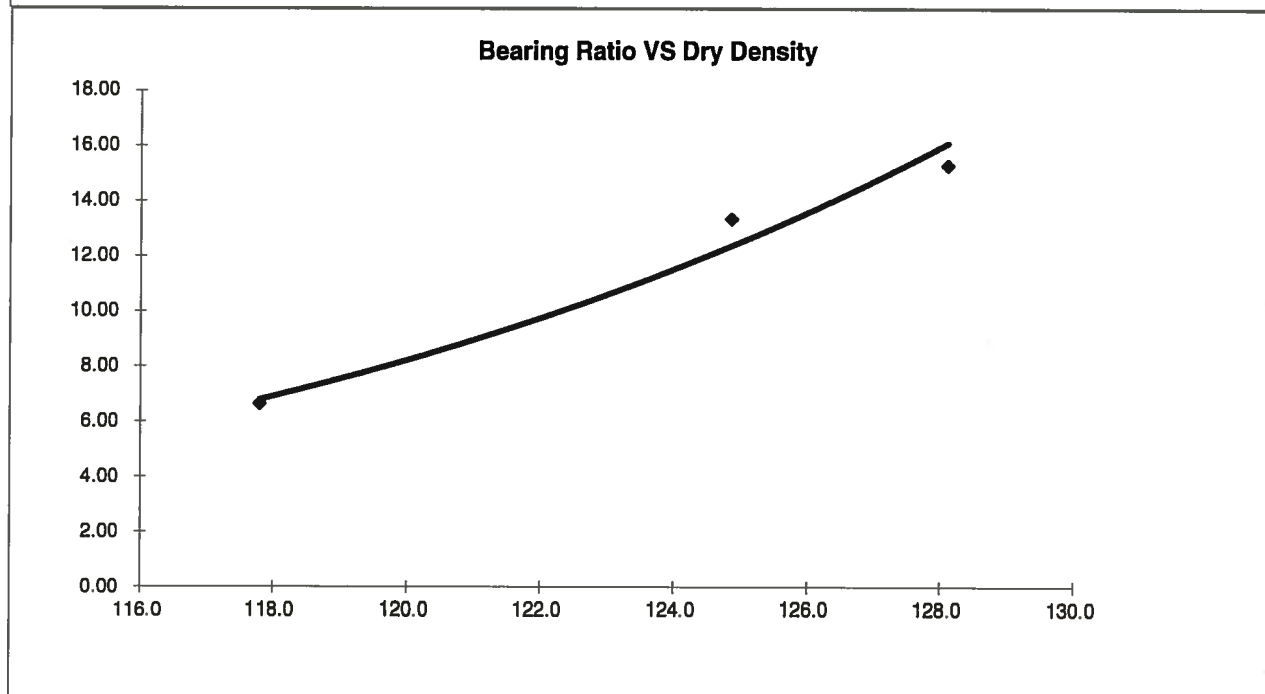
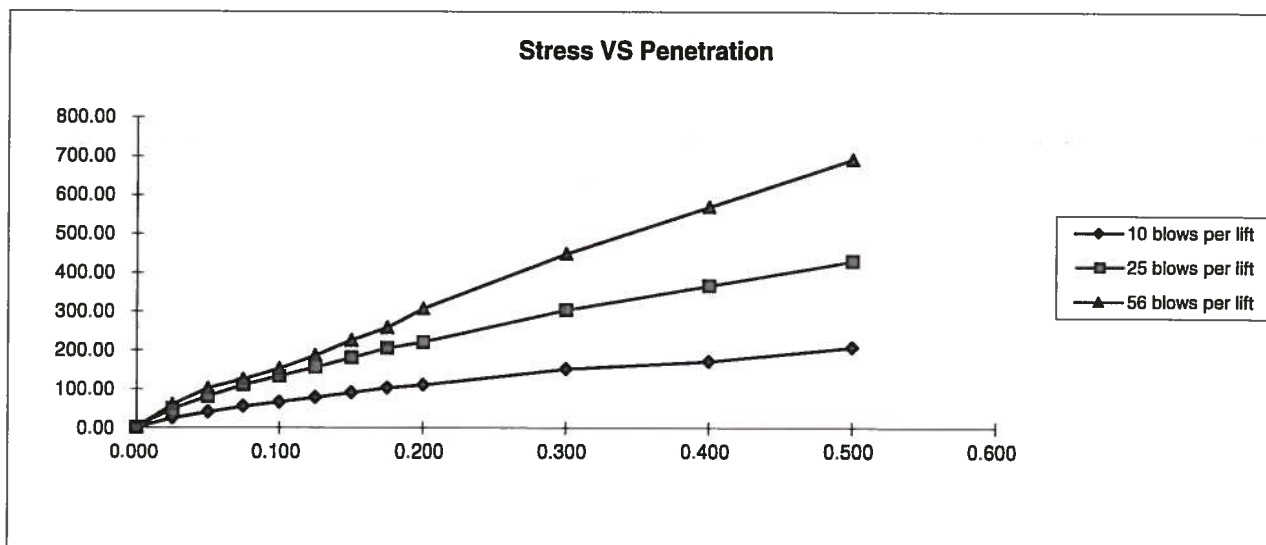
505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

CBR TEST DATA

DRAWN: DATE: CHECKED: SW DATE: 4-24-23

JOB NO.:
 230532

FIG NO.:
 B-38



BEARING RATIO AT 90% OF MAX	4.28 ~ R VALUE	10.00
BEARING RATIO AT 95% OF MAX	10.33 ~ R VALUE	30.00

JOB NO: 230532
SOIL TYPE: 1, CBR #1



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CALIFORNIA BEARING RATIO

DRAWN:

DATE:

CHECKED:

DATE:

SW

4-24-23

JOB NO.:

230532

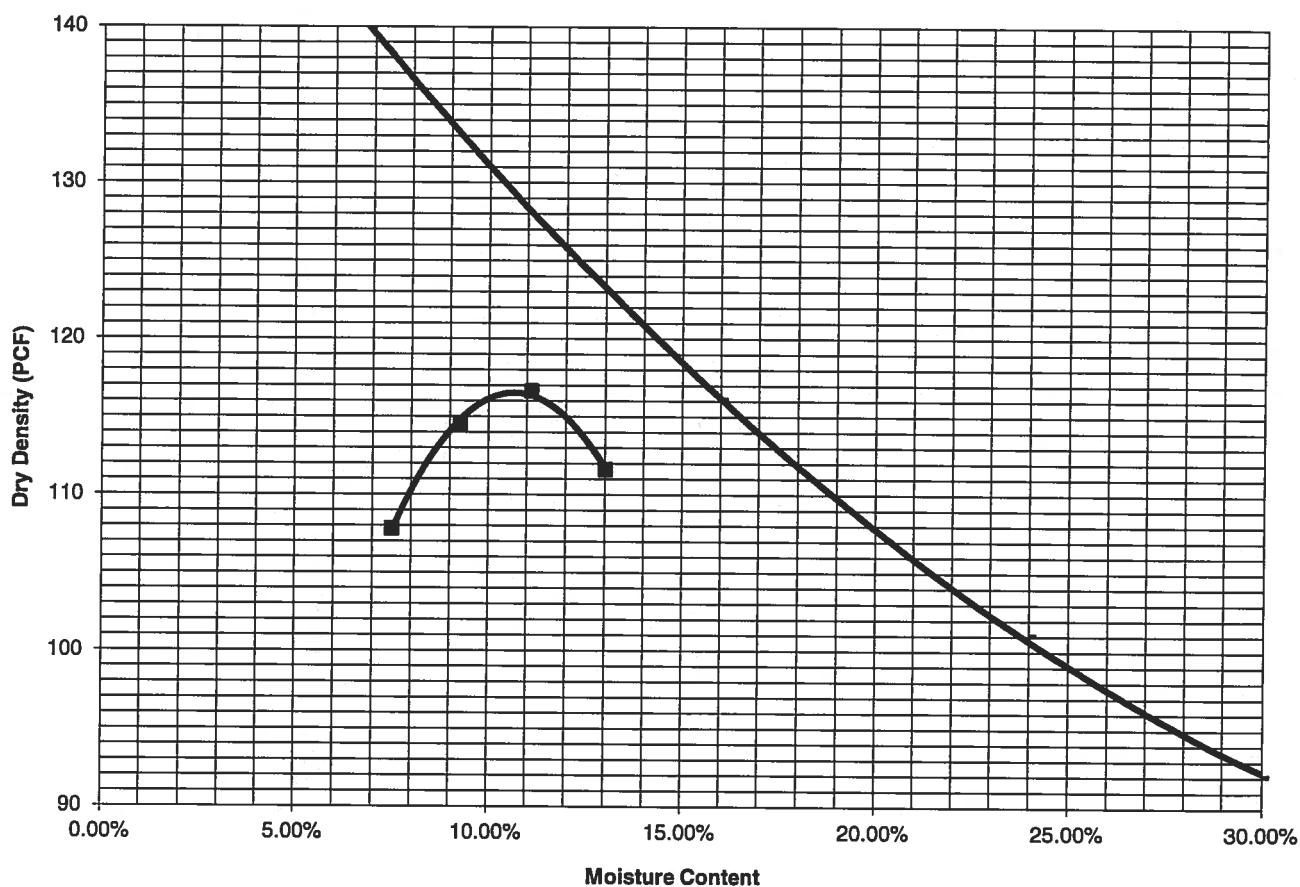
FIG NO.:

8-39

<u>PROJECT</u>	SANC. AT MERIDIAN RANCH, F-1	<u>CLIENT</u>	TECH CONTRACTORS
<u>SAMPLE LOCATION</u>	TB-18 @ 0-3'	<u>JOB NO.</u>	230532
<u>SOIL DESCRIPTION</u>	SAND, VERY CLAYEY, BROWN	<u>DATE</u>	04/11/23

<u>IDENTIFICATION</u>	SC	<u>COMPACTION TEST #</u>	2, CBR #2
<u>TEST DESIGNATION / METHOD</u>	ASTM D-698-A	<u>TEST BY</u>	AL
<u>MAXIMUM DRY DENSITY (PCF)</u>	116.9	<u>OPTIMUM MOISTURE</u>	10.8%

Compaction Curve



■ ACTUAL POINTS - - - PARABOLIC FIT — ZERO AIR VOIDS



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

MOISTURE DENSITY RELATION

DRAWN:

DATE:

CHECKED:

DATE:

4-24-23

JOB NO.:

230532

FIG NO.:

B.40

CBR TEST LOAD DATA

JOB NO: 230532
 CLIENT: TECH CONTRACTORS
 PROJECT: SANC. AT MERIDIAN RANCH, F-1
 SOIL TYPE: 2, SOIL TYPE #2

PISTON DIAMETER (cm) 4.958	PISTON AREA (in ²) 2.993		10 BLOWS		25 BLOWS		56 BLOWS	
PENETRATION DEPTH (INCHES)	MOLD # 1		MOLD # 2		MOLD # 3			
	LOAD(LBS) (LBS)	STRESS (PSI)	LOAD(LBS) (LBS)	STRESS (PSI)	LOAD(LBS) (LBS)	STRESS (PSI)		
0.000	0	0.00	0	0.00	0	0.00		
0.025	36	12.03	73	24.39	189	63.16		
0.050	47	15.71	94	31.41	272	90.89		
0.075	52	17.38	103	34.42	322	107.60		
0.100	59	19.72	118	39.43	382	127.65		
0.125	65	21.72	130	43.44	477	159.40		
0.150	75	25.06	149	49.79	518	173.10		
0.175	83	27.74	166	55.47	538	179.78		
0.200	86	28.74	171	57.14	611	204.18		
0.300	96	32.08	192	64.16	778	259.98		
0.400	109	36.42	217	72.51	862	288.05		
0.500	119	39.77	239	79.87	952	318.13		

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	303	341	347
WT. CAN	8.47	8.37	8.62
WT. CAN+WET	158.63	147.82	136.66
WT. CAN+DRY	142.28	127.81	120.02
WT. H2O	16.35	20.01	16.64
WT. DRY SOIL	133.81	119.44	111.4
MOISTURE CONTENT	12.22%	16.75%	14.94%

WET DENSITY (PCF)	116.8	122.6	132.2
DRY DENSITY (PCF)	105.5	110.7	119.3

BEARING RATIO 1.97 3.94 12.77

90% OF DRY DENSITY 107.4
 95% OF DRY DENSITY 113.4

BEARING RATIO AT 90% OF MAX	2.70 ~ R VALUE	6
BEARING RATIO AT 95% OF MAX	6.68 ~ R VALUE	14



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

CBR TEST DATA

DRAWN:

DATE:

CHECKED:

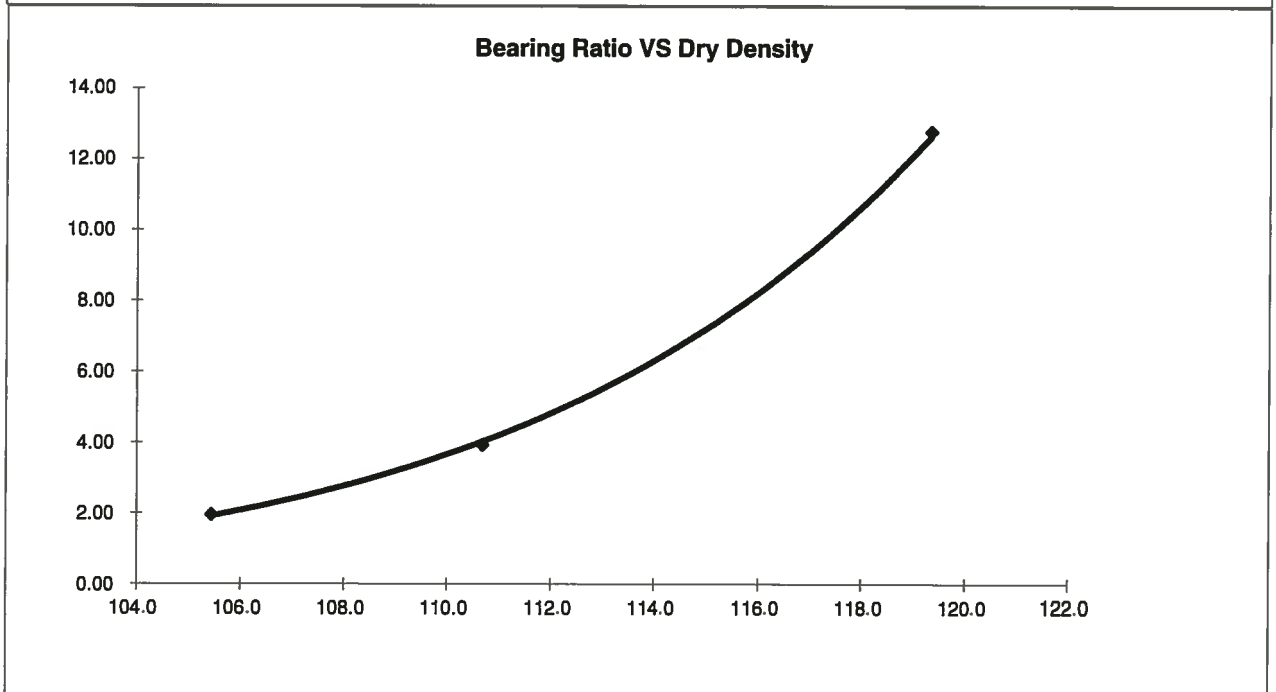
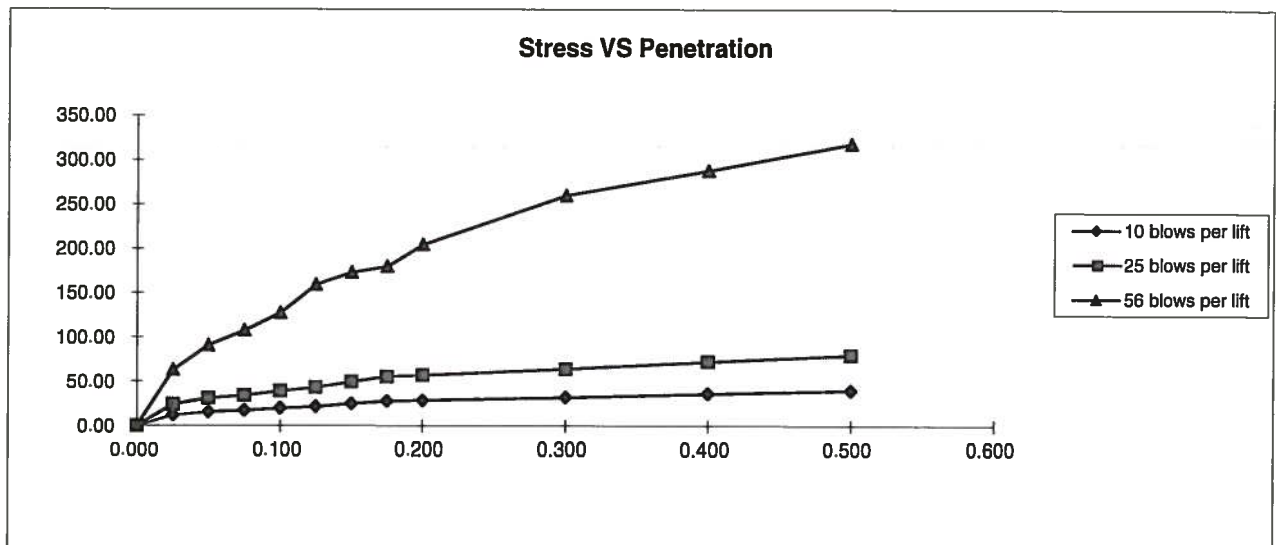
DATE:

SW

4-24-23

JOB NO.:
 230532

FIG NO.:
 B-41



BEARING RATIO AT 90% OF MAX	2.70 ~ R VALUE	6.00
BEARING RATIO AT 95% OF MAX	6.68 ~ R VALUE	14.00

JOB NO: 230532
SOIL TYPE: 2, SOIL TYPE #2



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

CALIFORNIA BEARING RATIO

DRAWN:

DATE:

CHECKED: *SW*

DATE: *4-24-23*

JOB NO.:
230532

FIG NO.:
B-42

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

TECH CONTRACTORS SANCTUARY AT MERIDIAN RANCH F-1
LOCAL ROADWAY (LOW VOLUME) SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	30
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 =	6849

Weighted Structural Number (WSN): ➔ WSN = 1.91

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. 230532
Fig. No. C-1

DESIGN CALCULATIONS

AGGREGATE BASECOURSE

DESIGN DATA

TECH CONTRACTORS SANCTUARY AT MERIDIAN RANCH F-1
LOCAL ROADWAY (LOW VOLUME) SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 36,500
Hveem Stabilometer (R Value) Results:	R = 30
Weighted Structural Number (WSN):	WSN = 1.91

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 Base Course

D_1 = Depth of Asphalt (inches)

D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1 = 4.3$ inches of Full Depth Asphalt
Use N/A inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 5.3$ inches of Aggregate
Base Course, use 6.0 inches

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 6.0 inches of Aggregate Base Course, or
2. N/A inches of Full Depth Asphalt

Job No. 230532

Fig. No. C-2

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA

SANCTUARY AT MERIDIAN RANCH FILING NO.1
URBAN LOCAL (LOW VOLUME)
SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):

ESAL = 36,500

Hveem Stabilometer (R Value) Results:

R = 30

Weighted Structural Number (WSN):

WSN = 1.91

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 - 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)

$D_1 = (WSN)/C_1 = 4.3$ inches of Full Depth Asphalt

Use N/A inches Full Depth

FOR ASPHALT + CEMENT STABILIZED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 1.4$ 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. N/A inches of Full-Depth Asphalt

Job No. 230532

Fig No. C-3

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

SANCTUARY AT MERIDIAN RANCH FILING NO.1
URBAN LOCAL SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Hveem Stabilometer (R Value) Results:	R =	30
Standard Deviation	S_o =	0.44
Loss in Serviceability	$\Delta\psi$ =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	6849

Weighted Structural Number (WSN): ➔ WSN = 2.67

DESIGN TABLES AND EQUATIONS

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

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

$$k = M_R / 19.4$$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

Reliability (%)	Z_R (z-statistic)
80	-0.84
85	-1.04
90	-1.28
93	-1.48
94	-1.56
95	-1.65
96	-1.75
97	-1.88
98	-2.05
99	-2.33
99.9	-3.09
99.99	-3.75

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

Left	Right	Difference
5.47	5.47	0.0

Job No. 230532
Fig. No. C-4

DESIGN CALCULATIONS

AGGREGATE BASECOURSE

DESIGN DATA

SANCTUARY AT MERIDIAN RANCH FILING NO.1
URBAN LOCAL SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 292,000
Hveem Stabilometer (R Value) Results:	R = 30
Weighted Structural Number (WSN):	WSN = 2.67

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 Base Course

D_1 = Depth of Asphalt (inches)

D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1 = 6.1$ inches of Full Depth Asphalt
Use N/A inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 8.3$ inches of Aggregate
Base Course, use 10.0 inches

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10.0 inches of Aggregate Base Course, or
2. N/A inches of Full Depth Asphalt

Job No. 230532

Fig. No. C-5

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA

SANCTUARY AT MERIDIAN RANCH FILING NO. 1
URBAN LOCAL - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):

ESAL = 292,000

Hveem Stabilometer (R Value) Results:

R = 30

Weighted Structural Number (WSN):

WSN = 2.67

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 - 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)

$D_1 = (WSN)/C_1 = 6.1$ inches of Full Depth Asphalt

Use N/A inches Full Depth

FOR ASPHALT + CEMENT STABILIZED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 8.3$ inches of Cement Stabilized Subgrade,
use 10.0 inches

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10.0 inches of Cement Stabilized Subgrade, or
2. N/A inches of Full-Depth Asphalt

Job No. 230532

Fig No. C-6

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

TECH CONTRACTORS SANCTUARY AT MERIDIAN RANCH FILING NO. 1
MINOR ARTERIAL -REX ROAD SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	1,971,000
Hveem Stabilometer (R Value) Results:	R =	30
Standard Deviation	S_o =	0.45
Loss in Serviceability	Δpsi =	2.5
Reliability	Reliability =	85
Reliability (z-statistic)	Z_R =	-1.04
Soil Resilient Modulus	M_R =	6849

Weighted Structural Number (WSN): ➔ WSN = 3.57

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

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

Left	Right	Difference
6.29	6.29	0.0

Job No. 230532

Fig. No. C-7

DESIGN CALCULATIONS

AGGREGATE BASE COURSE

DESIGN DATA TECH CONTRACTORS SANCTUARY AT MERIDIAN RANCH FILING
NO. 1
MINOR ARTERIAL-REX ROAD SOIL TYPE 1
Equivalent (18 kip) Single Axle Load Applications (ESAL): ESAL = 1,971,000
Hveem Stabilometer (R Value) Results: R = 30
Weighted Structural Number (WSN): WSN = 3.57

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 Base Course

D_1 = Depth of Asphalt (inches)

D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION

$D_1 = (WSN)/C_1 = 8.1$ inches of Full Depth Asphalt
Use N/A inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 12.3$ inches of Aggregate
Base Course, use 12.5 inches

RECOMMENDED ALTERNATIVES

1. 5.0 inches of Asphalt + 12.5 inches of Aggregate Base Course, or
2. N/A inches of Asphalt

Job No. 230532

Fig.No. C-8

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA

SANCTUARY AT MERIDIAN RANCH FILING NO.1
MINOR ARTERIAL- SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):

ESAL = 1,971,000

Hveem Stabilometer (R Value) Results:

R = 30

Weighted Structural Number (WSN):

WSN = 3.57

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 - 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)

$D_1 = (WSN)/C_1 = 8.1$ inches of Full Depth Asphalt

Use N/A inches Full Depth

FOR ASPHALT + CEMENT STABILIZED SUBGRADE SECTION

Asphalt Thickness (t) = inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 12.5$ inches of Cement Stabilized Subgrade,
use 12.5 inches

RECOMMENDED ALTERNATIVES

1. 5.0 inches of Asphalt + 12.5 inches of Cement Stabilized Subgrade, or
2. N/A inches of Full-Depth Asphalt

Job No. 230532

Fig No. C-9