ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
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March 14, 2017

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

Attn: Bret Haycock

Re: Pavement Recommendations
Vistas at Meridian Ranch, Filing 1, Phase 1
El Paso County, Colorado

Dear Mr. Haycock:

As requested, Entech Engineering, Inc. has obtained samples of the subgrade soils from sections of the roadways in the Vistas at Meridian Ranch Subdivision, Filing 1, Phase 1, in El Paso County, Colorado. Laboratory testing to determine the pavement support characteristics of the soils was performed. This letter presents the results of the laboratory testing and pavement recommendations for the roadways.

Project Description

The roadways in this project consist of sections of Lambert Road, Stone Valley Drive, Emerald Vista Drive, Vistas Park Drive, Morning Vista Drive, Morning Sky Court, and Meridian Vista Way. The site layout and the locations of the test borings are shown on the Site/Test Boring Location Map, Figure 1.

Subgrade Conditions

Twelve exploratory test borings were drilled in the roadways to depths of approximately 5 to 10 feet. The Boring Logs are presented in Appendix A. Sieve Analysis and Atterberg Limit testing were performed on soil samples obtained from the test borings for the purpose of classification. Sieve analyses performed indicated the percent passing the No. 200 sieve ranged from 12.6 to 71.8 percent. Atterberg Limit Tests performed on samples resulted in Liquid Limits ranging from no value to 50 and Plastic Indexes of non-plastic to 25. Three general soil types were encountered at the subgrade depth. Soil Type 1 consisted of silty to clayey sand which classified as A-4, A-2-4 and A-1-b soils based on the AASHTO classification system. The Type 2 soils consisted of silty to clayey sandstone which classified as A-2-4 and A-2-6 soils, based on the AASHTO classification system. Type 1 and 2 soils encountered on this site typically have good pavement support characteristics. The Type 3 soils consisted of sandy claystone which classified as A-6 and A-7-6 soils using the AASHTO system. Sulfate testing of the subgrade indicated that the soils exhibit a negligible potential for sulfate attack. Groundwater was not encountered in the test boring.

Swell testing was required on the Type 3 subgrade soils, based on their plastic indexes. Two samples of Type 3 soils at subgrade depth showed swells of 4.6 and 6.1. This limit is above the level in which mitigation is required (above 2.0 percent). One other swell exceeded the swell limits, however it was encountered at a depth of 10 feet below grade, which is below the subgrade influence zone. The subgrade soils in Test Boring Nos. 10 and 11 will require mitigation, due to the presence of claystone in the subgrade. Mitigation requirements are discussed later in this report. Laboratory test results are presented in Appendix B and are summarized on Table 1.

SF 16-007

California Bearing Ratio (CBR) testing was performed on samples of the Type 1 and Type 3 soils to determine the support characteristic of the subgrade soils for the roadway sections. The Type 2 soils are grouped into the Type 1 soils category as the two soils share similar characteristics. Type 2 soils were not encountered at roadway subgrade. The results of the CBR testing, are presented in Appendix B and summarized as follows:

Soil Type 1 – Silty Sand
CBR #1
R @ 90% = 71
R @ 95% = 74
Use R = 50 for design

Classification Testing

Liquid Limit	20
Plasticity Index	2
Percent Passing 200	22.7
AASHTO Classification	A-2-4
Group Index	0
Unified Soils Classification	SM

Soil Type 3 –Sandy Claystone
CBR #2
R @ 90% = 1.0
R @ 95% = 1.0
Use R = 1.0 for design

Classification Testing

Liquid Limit	39
Plasticity Index	16
Percent Passing 200	62.5
AASHTO Classification	A-6
Group Index	8
Unified Soils Classification	CL

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". A Transportation Memorandum report was prepared for this site by LSC Transportation Consultants, Inc. dated February 28, 2017, LSC Job No. 154570. This report was used to assist in determining the roadway classifications. A layout showing the Weighted Average Design ESAL's is attached in Appendix D. Morning Sky Court classifies as a local low-volume street which used an 18K ESAL value of 36,500 to determine the pavement sections. Emerald Vista Drive, Meridian Vista Way, Morning Vista Drive, and Vistas Park Drive classify as local (pavement only) residential roads, which used an 18K ESAL value of 73,500 to determine the pavement sections. Stone Valley Drive classifies as residential local (pavement only) road, which used an 18K ESAL value of 109,500 for design. Lambert Road classifies as a residential collector which used a 18k ESAL value of 821,000 for design. Pavement alternatives for asphalt over aggregate base course and cement stabilized subgrade sections are provided. Design parameters used in the pavement analysis are as follows:

Asphalt over base course has been chosen for (No CTS)

Reliability		80%
Serviceability Index Local Low Volume, Local (pavement Only)		2.0
Serviceability Index Residential Collector		2.5
Resilient Modulus	Soil Type 1 Soil Type 2	13,168 psi 2,655 psi
"R" Value Subgrade	Soil Type 1 Soil Type 2	50 1
Structural Coefficients:		
Hot Bituminous Pavement		0.44
Base Course		0.11
Cement Stabilized Subgrade		0.13

Pavement calculations are attached in Appendix C. Pavement sections recommended for the site are summarized as follows:

Pavement Sections

Local (low-volume) - ESAL = 36,500 - Morning Sky Court
Soil Type #1

Alternative	Asphalt (in)	Base Course (in)	Cement Stabilized Subgrade (in.)
1. Asphalt Over Base Course	3.0*	6.0*	--
2. Cement Stabilized Subgrade	4.0	--	10.0

Local (Pavement Only) - ESAL = 73,500 - Emerald Vista Drive, Meridian Vista Way, Morning Vista Drive, and Vista Park Drive
Soil Type 1

Alternative	Asphalt (in)	Base Course (in)	Cement Stabilized Subgrade (in.)
1. Asphalt Over Base Course	3.0*	6.0*	--
2. Cement Stabilized Subgrade	4.0	--	10.0

Local (Pavement Only) – ESAL = 109,500 Stone Valley Drive
Soil Type 1

Alternative	Asphalt (in)	Base Course (in)	Cement Stabilized Subgrade (in.)
1. Asphalt Over Base Course	3.0*	6.0*	--
2. Cement Stabilized Subgrade	4.0	--	10.0

Residential Collector – ESAL + 821,000 Lambert Road
Soil Type 1

Granular Alternative	Asphalt (in)	Base Course (in)	Cement Stabilized Subgrade (in.)
1. Asphalt Over Base Course	4.0*	8.0*	--
2. Cement Stabilized Subgrade	4.0	--	10.0

-Reworked sections providing 24 inch mitigation with imported structural fill.

Soil Type 2

Clay Alternative	Asphalt (in)	Base Course (in)	Cement Stabilized Subgrade (in.)
1. Asphalt Over Base Course	6.5	14.0	--
2. Cement Stabilized Subgrade	7.5	--	10.0

-Reworked sections providing 24 inch mitigation with reconditioned on-site clay soils.

* Minimum sections required per the El Paso County Pavement Design Criteria and Report.

Mitigation

El Paso County criteria requires mitigation of expansive soils for roadway subgrade that have a swell of 2 percent or greater with a 150 pound per square foot surcharge. Two samples at subgrade depth resulted in volume changes of 4.6 and 6.1 percent. Due to the limited area in which the expansive soils were encountered, (Test Boring Nos. 10 and 11), it is recommended that minimum of 2 feet of the claystone be removed or penetrated to suitable soils and be replaced with suitable granular fill or with conditioned site clays: The Type 1 sections should be used for imported granular fill and the Type 2 sections should be used for conditioned on-site clay. The extents of and depths of overexcavation should be field determined. Personnel of Entech Engineering, Inc. should be on-site to verify the locations and approximate depths of overexcavation during the subgrade preparation. Density testing should be performed on the fill material.

Roadway Construction - Full Depth Asphalt and Asphalt on Aggregate Base Course Alternatives

Prior to placement of the asphalt, the subgrade should be proofrolled and compacted to a minimum of 95 percent of its maximum Standard Proctor Dry Density, ASTM D-698 at -1 to +2 percent of optimum moisture content or 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ±2 percent of optimum moisture content. Any loose or soft areas should be removed and replaced with suitable materials. Base course materials should be compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture content. Special attention should be given to areas adjacent to manholes, inlet structures and valves.

Roadway Construction – Cement Stabilized Subgrade Alternative

Prior to placement of the asphalt, the subgrade shall be stabilized by addition of cement to a depth of at least 10 inches. The depth of the required cement stabilized subgrade is shown in the previous table. The amount of cement applied shall be 2.0 percent (by weight) of the subgrade's maximum dry density as determined by the Standard Proctor Test (ASTM D-698) based on laboratory cement stabilization testing. The cement should be spread evenly on the subgrade surface and be thoroughly mixed into the subgrade over an 10-inch depth such that a uniform blend of soil and cement is achieved. Prior to application or mixing of the cement, the upper 10 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 Standard Proctor Test (ASTM D-698). Satisfactory compaction of the subgrade shall occur within 90 minutes from the time of mixing the cement into the subgrade.

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

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

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

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

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. 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/rm

Encl.

Entech Job No. 170157
AAprojects/2017/170157pr

Reviewed by:

Mark H. Hauschild, P.E.
Senior Engineer

TABLE

TABLE 1

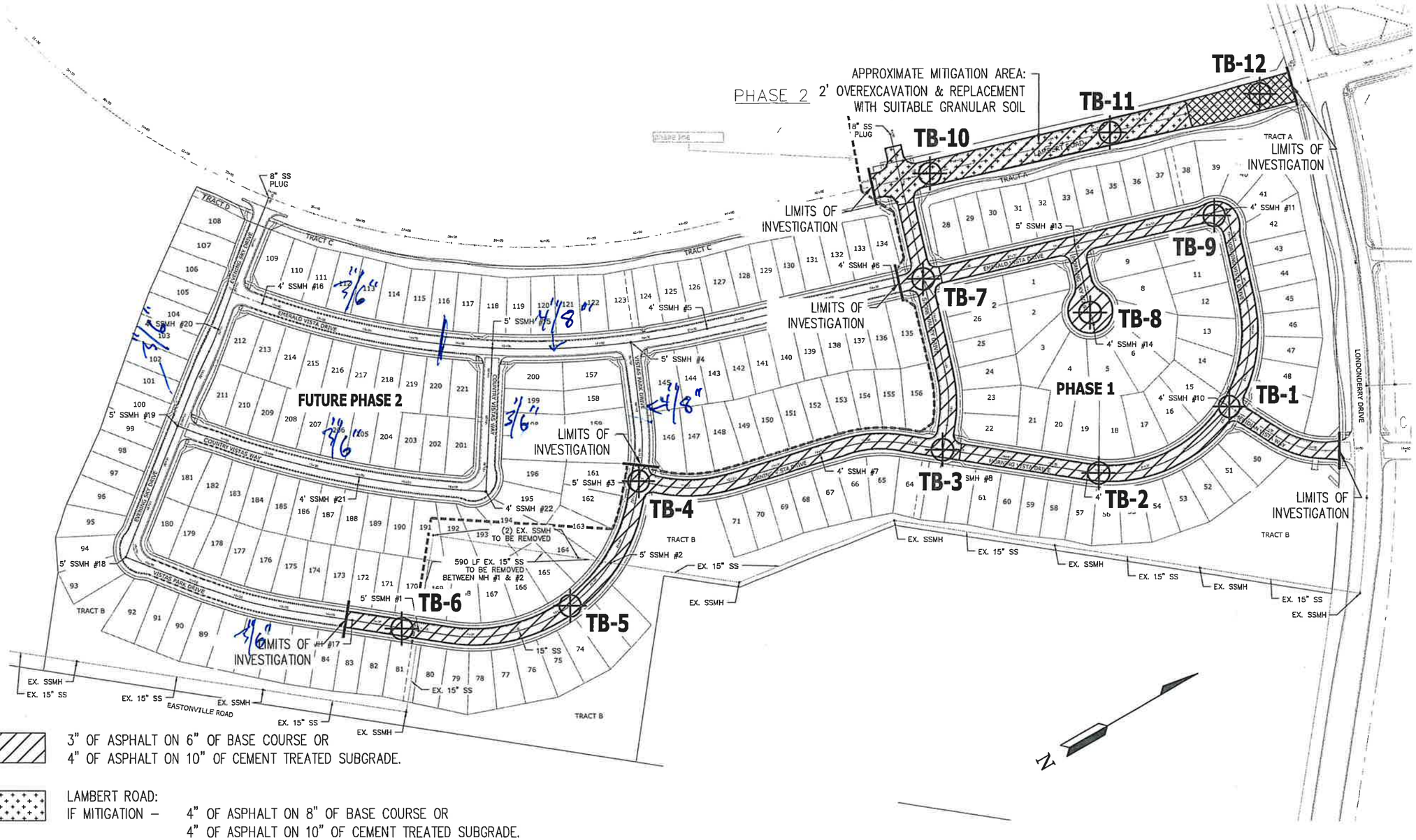
SUMMARY OF LABORATORY TEST RESULTS

CLIENT TECH CONTRACTORS
PROJECT VISTAS AT MERIDIAN RANCH
JOB NO. 170157

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	1	0-3			22.7	20	2		A-2-4		SM	SAND, SILTY
1	1	1-2			20.0	NV	NP		A-2-4		SM	SAND, SILTY
1	2	1-2			15.3	27	5		A-1-b		SM	SAND, SILTY
1	3	1-2			23.5	NV	NP		A-1-b		SM	SAND, SILTY
1	4	1-2			35.8	19	8	<0.01	A-4		SC	SAND, CLAYEY
1	5	1-2			26.8	23	2		A-2-4		SM	SAND, SILTY
1	6	1-2			17.9	NV	NP		A-1-b		SM	SAND, SILTY
1	7	1-2			12.6	NV	NP		A-1-b		SM	SAND, SILTY
1	8	1-2			18.6	NV	NP	0.02	A-1-b		SM	SAND, SILTY
1	9	1-2			22.4	NV	NP		A-1-b		SM	SAND, SILTY
1	12	1-2			14.5	NV	NP		A-1-b		SM	SAND, SILTY
1	1	10			18.2	NV	NP		A-1-b		SM	SAND, SILTY
1	7	0-3			21.0						SM	SAND, SILTY
2	7	10			29.7	25	5		A-2-4		SC-SM	SANDSTONE, CLAYEY, SILTY
2	11	5	10.0	112.3	24.6	34	13	0.01	A-2-6	0.2	SC	SANDSTONE, CLAYEY
2	12	5	9.4	113.3	23.3	36	15		A-2-6	0.1	SC	SANDSTONE, CLAYEY
3, CBR #2	10	0-3	15.3	107.5	62.5	39	16		A-6	1.8*	CL	CLAYSTONE, SANDY
3	10	1-2	15.1	119.4	71.8	39	16	0.00	A-6	4.6	CL	CLAYSTONE, SANDY
3	11	1-2	13.3	106.7	54.1	50	25		A-7-6	6.1	CH	CLAYSTONE, VERY SANDY
3	4	10	16.6	112.1	72.4	39	15	<0.01	A-6	4.2	CL	CLAYSTONE, SANDY

* - REMOLDED SAMPLE

FIGURE



3" OF ASPHALT ON 6" OF BASE COURSE OR
4" OF ASPHALT ON 10" OF CEMENT TREATED SUBGRADE.

LAMBERT ROAD:
IF MITIGATION – 4" OF ASPHALT ON 8" OF BASE COURSE OR
4" OF ASPHALT ON 10" OF CEMENT TREATED SUBGRADE.
NOT MITIGATION – 6½" OF ASPHALT ON 14" OF BASE COURSE WITH 24" OF REMOVAL/CONDITION/RECOMPACT OR
7 ½" OF ASPHALT ON 10" OF CEMENT TREATED SUBGRADE WITH 24" OF REMOVAL/CONDITION/RECOMPACT.

LAMBERT ROAD:
4" OF ASPHALT ON 8" OF BASE COURSE OR
4" OF ASPHALT ON 10" OF CEMENT TREATED SUBGRADE.

⊕ TB-2- APPROXIMATE TEST BORING LOCATION AND NUMBER

REVISION	BY

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SITE/TEST BORING LOCATION MAP
THE VISTAS AT MERIDIAN RANCH
PHASE 1
COLORADO SPRINGS, CO.
FOR: TECH CONTRACTORS

DRAWN	AL
CHECKED	DS
DATE	3/6/17
SCALE	N.T.S.
JOB NO.	170157
FIGURE No.	1

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 2/15/2017
Job # 170157

REMARKS

DRY TO 10', 2/15/17

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			28	7.9	1
5			50	8.5	1
10			24	4.9	1
15					
20					

TEST BORING NO. 2
DATE DRILLED 2/15/2017
CLIENT TECH CONTRACTORS
LOCATION VISTAS AT MERIDIAN RANCH

REMARKS

DRY TO 5', 2/15/17

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			28	8.2	1
5			42	6.6	1
10					
15					
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	3/3/17

JOB NO.: 170157
FIG NO.: A- 1

TEST BORING NO. 3
DATE DRILLED 2/15/2017
Job # 170157

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 2/15/17						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE TO DENSE, MOIST				18	6.9	1
	5			30	4.7	1
	10					
	15					
	20					

TEST BORING NO. 4
DATE DRILLED 2/15/2017
CLIENT TECH CONTRACTORS
LOCATION VISTAS AT MERIDIAN RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 2/15/17						
SAND, CLAYEY TO SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST				26	5.2	1
	5			29	4.8	1
CLAYSTONE, SANDY, GREEN BROWN, HARD, MOIST						
	10			50/9"	14.0	3
	15					
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		TJ	3/3/17

JOB NO.: 170157
FIG NO.: A- 2

TEST BORING NO. 5
DATE DRILLED 2/15/2017
Job # 170157

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 2/15/17						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST				16	4.2	1
	5			28	5.7	1
	10					
	15					
	20					

TEST BORING NO. 6
DATE DRILLED 2/15/2017
CLIENT TECH CONTRACTORS
LOCATION VISTAS AT MERIDIAN RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 2/15/17						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE TO DENSE, MOIST				25	4.0	1
	5			30	11.1	1
	10					
	15					
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: A- 3

TEST BORING NO. 7
DATE DRILLED 2/15/2017
Job # 170157

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 2/15/17						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, DENSE, MOIST				36	6.3	1
SANDSTONE, CLAYEY, SILTY, FINE TO MEDIUM GRAINED, TAN, VERY DENSE, MOIST	5			50	10.2	2
	10			50/6"	7.6	2
	15					
	20					

TEST BORING NO. 8
DATE DRILLED 2/15/2017
CLIENT TECH CONTRACTORS
LOCATION VISTAS AT MERIDIAN RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 2/15/17						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST				28	8.3	1
	5			22	6.6	1
	10					
	15					
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	3/3/17

JOB NO.: 170157
FIG NO.: A- 4

TEST BORING NO. 9
DATE DRILLED 2/15/2017
Job # 170157

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 2/15/17						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST				11	7.1	1
	5			19	3.1	1
	10					
	15					
	20					

TEST BORING NO. 10
DATE DRILLED 2/15/2017
CLIENT TECH CONTRACTORS
LOCATION VISTAS AT MERIDIAN RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 2/15/17						
CLAYSTONE, SANDY, GREEN BROWN, HARD, MOIST				50/8"	13.9	3
	5			50/7"	13.5	3
	10					
	15					
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: A- 5

TEST BORING NO. 11
DATE DRILLED 2/15/2017
Job # 170157

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 2/15/17						
CLAYSTONE, VERY SANDY, GREEN, BROWN, HARD, MOIST				50	12.9	3
SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST	5			50/6"	8.9	2
	10			50/7"	13.2	2
	15					
	20					

TEST BORING NO. 12
DATE DRILLED 2/15/2017
CLIENT TECH CONTRACTORS
LOCATION VISTAS AT MERIDIAN RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 2/15/17						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST				18	4.4	1
SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GREEN BROWN, HARD, MOIST	5			50/11"	12.8	2
	10					
	15					
	20					

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TEST BORING LOG

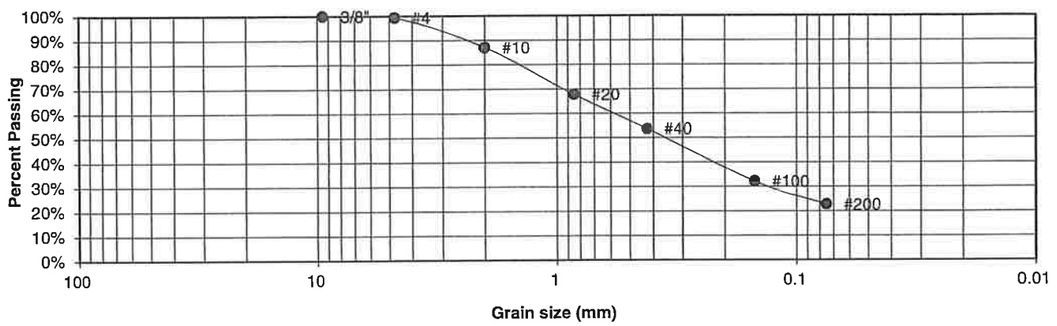
DRAWN:	DATE:	CHECKED:	DATE:
		DJ	2/15/17

JOB NO.: 170157
FIG NO.: A- 6

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1, CBR #1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	1	JOB NO.	170157
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.4%
10	87.1%
20	67.8%
40	53.8%
100	32.1%
200	22.7%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	20
Plastic Index	2

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

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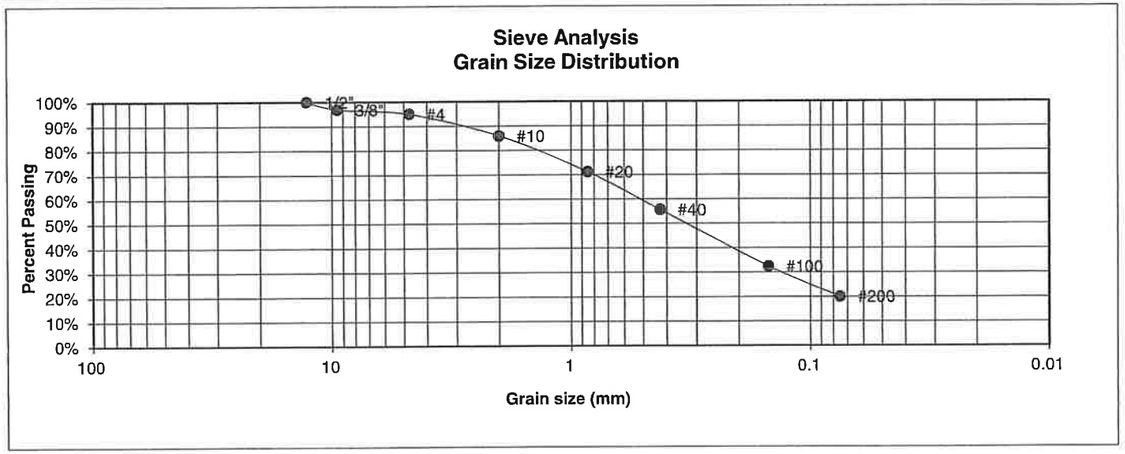
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-1

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	1	JOB NO.	170157
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.9%
4	95.0%
10	85.9%
20	71.2%
40	55.7%
100	32.4%
200	20.0%

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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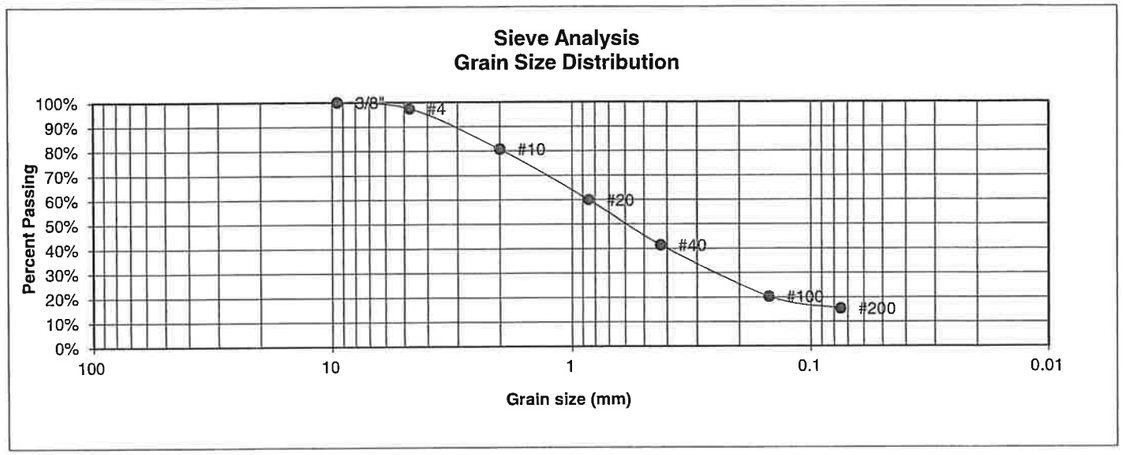
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/31/17

JOB NO.: 170157
FIG NO.: B-2

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	2	JOB NO.	170157
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	97.5%
10	80.7%
20	59.9%
40	41.4%
100	20.2%
200	15.3%

Atterberg Limits	
Plastic Limit	22
Liquid Limit	27
Plastic Index	5

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

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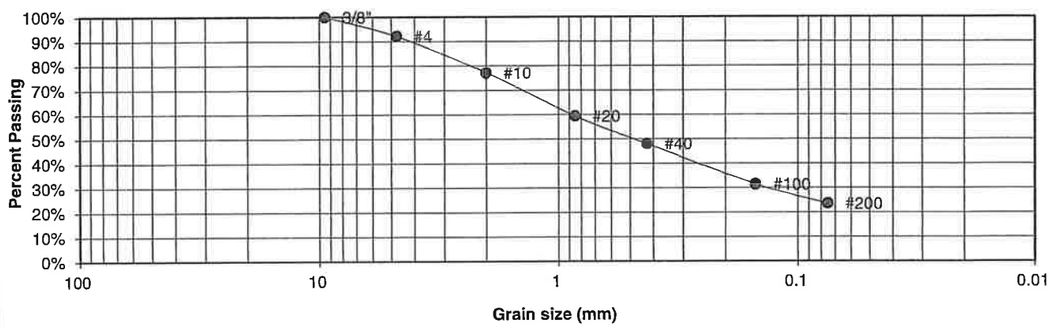
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-3

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	3	JOB NO.	170157
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.1%
10	77.1%
20	59.4%
40	48.0%
100	31.4%
200	23.5%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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LABORATORY TEST RESULTS

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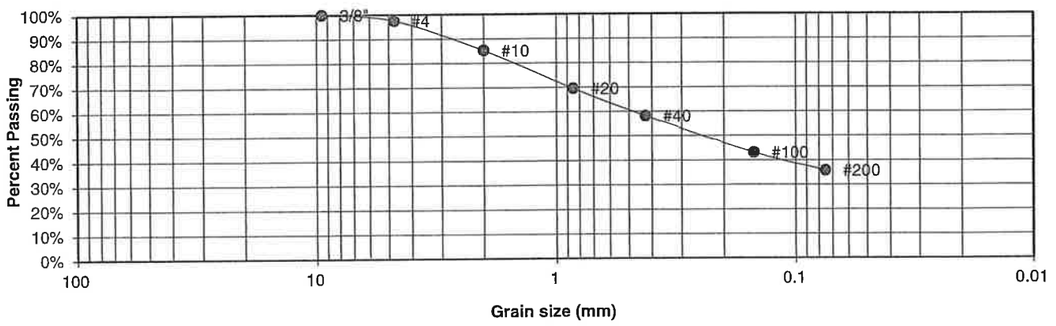
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-4

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	4	JOB NO.	170157
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-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	97.6%
10	85.2%
20	69.5%
40	58.2%
100	43.1%
200	35.8%

Atterberg Limits

Plastic Limit	11
Liquid Limit	19
Plastic Index	8

Swell

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

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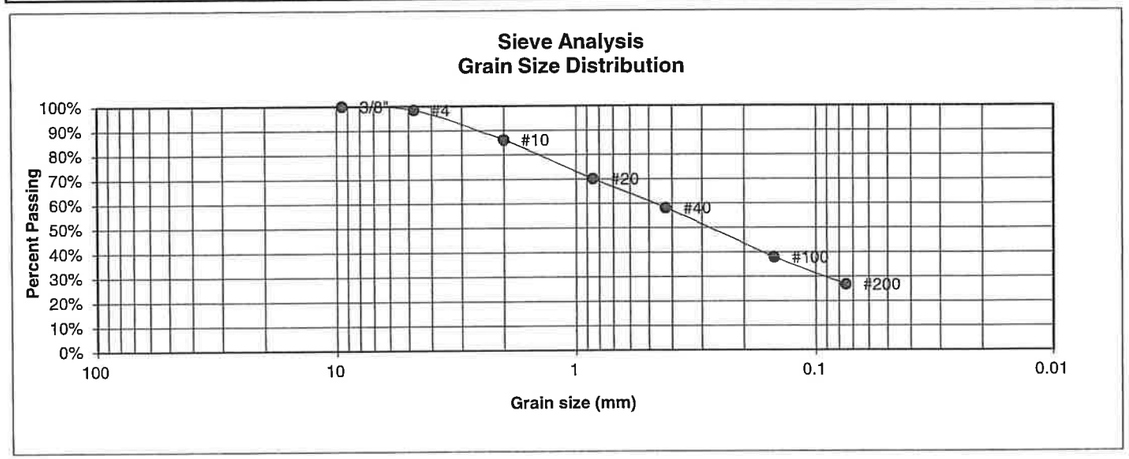
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/8/17

JOB NO.: 170157
FIG NO.: B-5

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	5	JOB NO.	170157
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.5%
10	86.0%
20	70.1%
40	58.1%
100	38.0%
200	26.8%

Atterberg Limits	
Plastic Limit	21
Liquid Limit	23
Plastic Index	2

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

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LABORATORY TEST RESULTS

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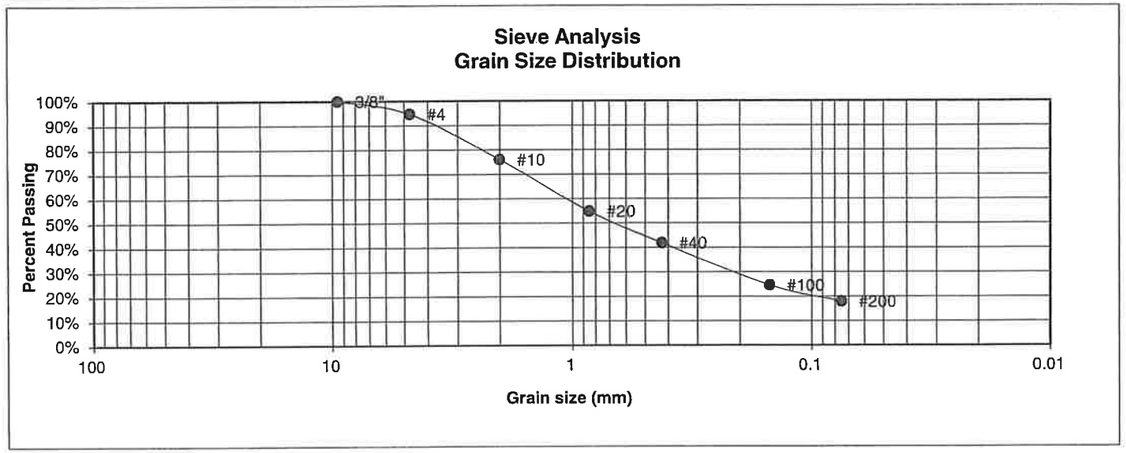
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-6

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	6	JOB NO.	170157
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	94.7%
10	76.1%
20	54.9%
40	41.9%
100	24.6%
200	17.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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

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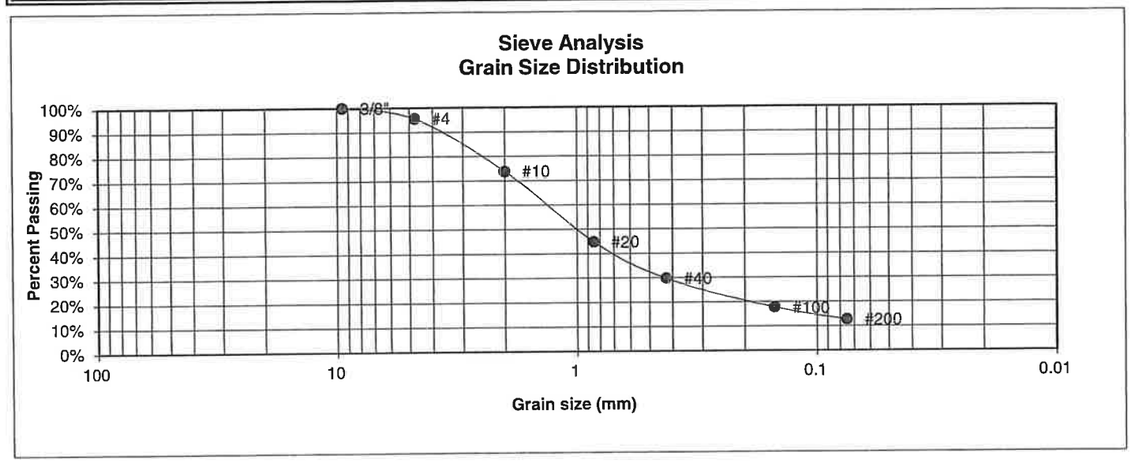
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-7

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	7	JOB NO.	170157
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	95.5%
10	73.8%
20	44.8%
40	29.7%
100	17.6%
200	12.6%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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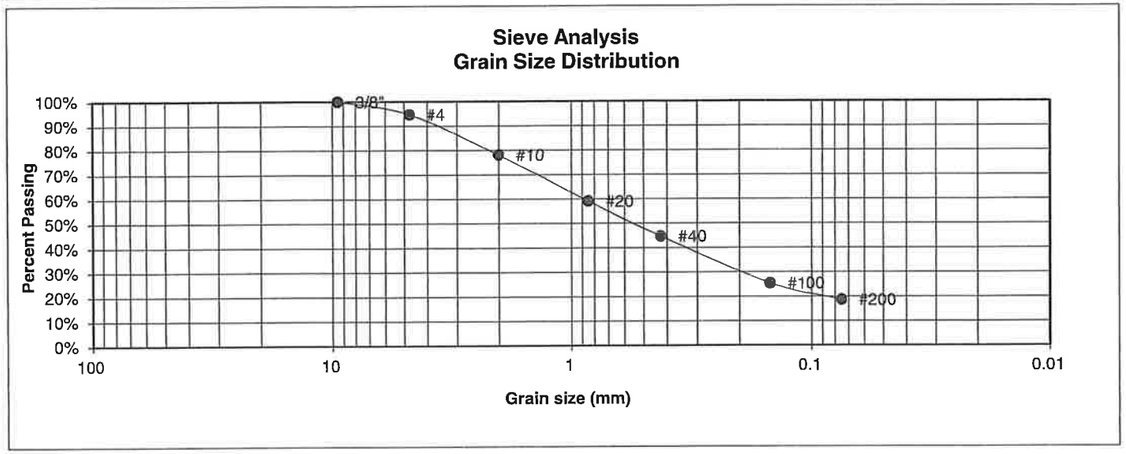
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-8

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	8	JOB NO.	170157
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	94.7%
10	78.1%
20	59.1%
40	44.7%
100	25.5%
200	18.6%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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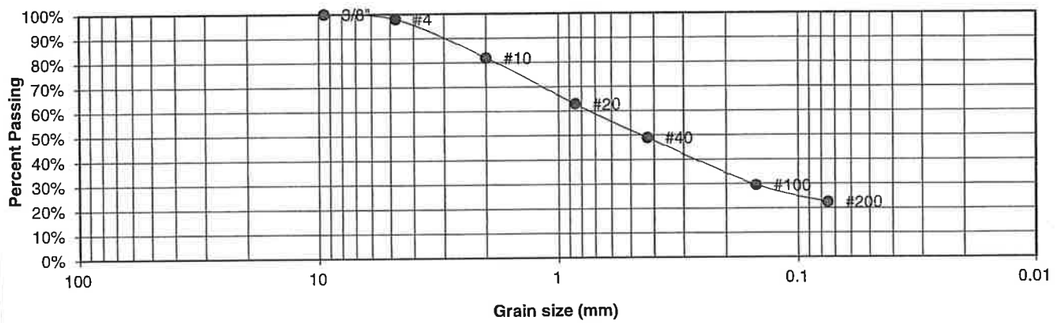
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	5/31/17

JOB NO.: 170157
FIG NO.: B-9

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	9	JOB NO.	170157
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.9%
10	81.9%
20	62.8%
40	48.9%
100	29.3%
200	22.4%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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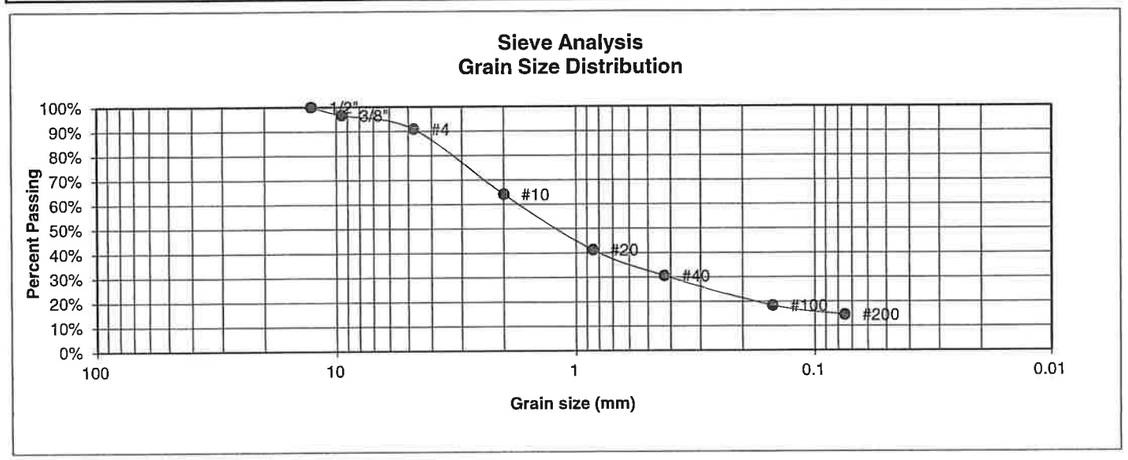
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-10

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	12	JOB NO.	170157
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"	96.6%
4	90.9%
10	64.1%
20	41.3%
40	30.6%
100	18.3%
200	14.5%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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

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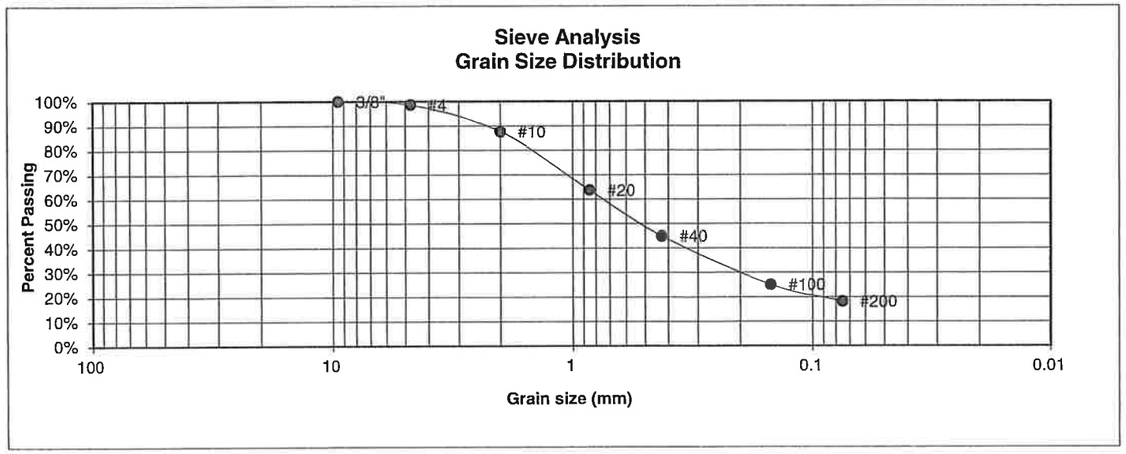
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: DS	DATE: 3/3/17

JOB NO.: 170157
FIG NO.: B-11

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	1	JOB NO.	170157
DEPTH (FT)	10	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	98.6%
10	87.6%
20	63.7%
40	44.9%
100	25.2%
200	18.2%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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LABORATORY TEST RESULTS

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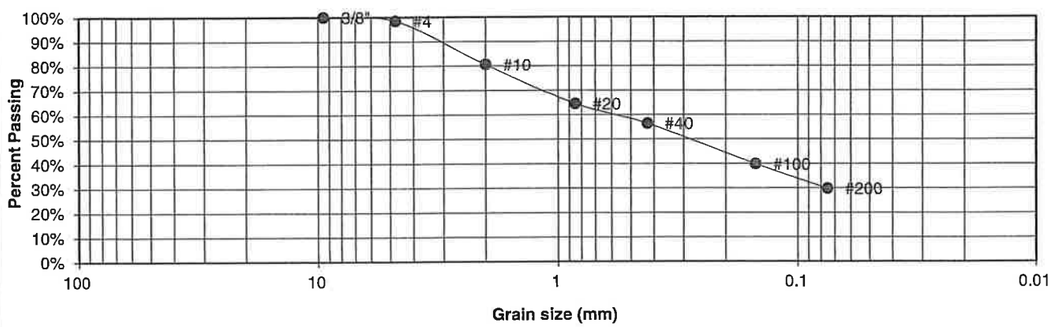
JOB NO.: 170157
FIG NO.: B-12

UNIFIED CLASSIFICATION	SC-SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	7	JOB NO.	170157
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.4%
10	80.6%
20	64.6%
40	56.4%
100	39.8%
200	29.7%

Atterberg Limits	
Plastic Limit	20
Liquid Limit	25
Plastic Index	5

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

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LABORATORY TEST RESULTS

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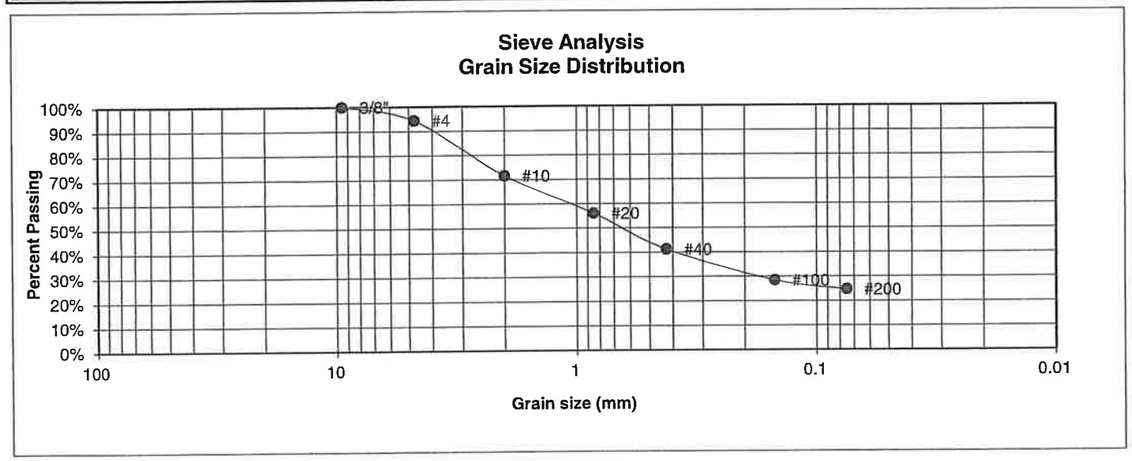
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-14

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	11	JOB NO.	170157
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.4%
10	71.6%
20	56.1%
40	41.2%
100	28.4%
200	24.6%

Atterberg Limits

Plastic Limit	21
Liquid Limit	34
Plastic Index	13

Swell

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

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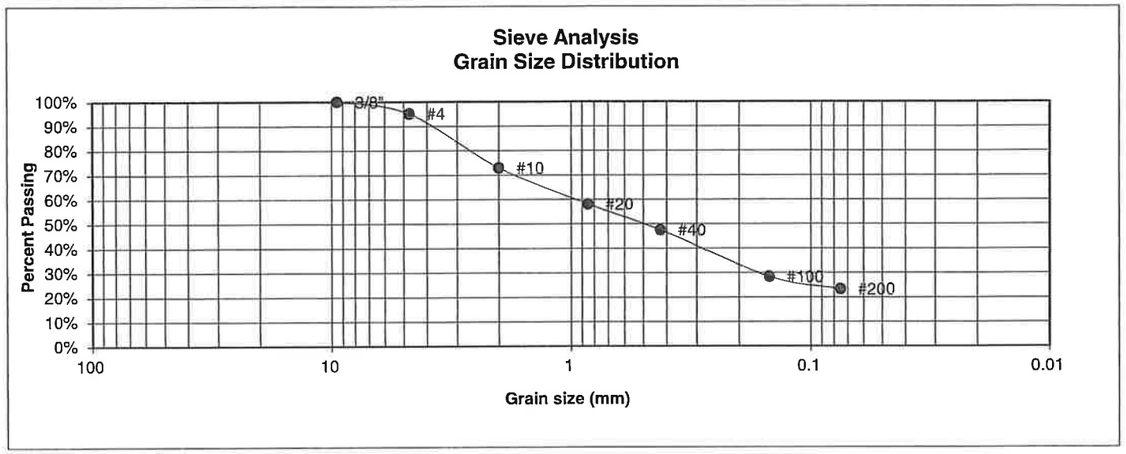
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	3/3/17

JOB NO.: 170157
FIG NO.: B-5

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	12	JOB NO.	170157
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.2%
10	72.9%
20	58.1%
40	47.5%
100	28.4%
200	23.3%

Atterberg Limits	
Plastic Limit	21
Liquid Limit	36
Plastic Index	15

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

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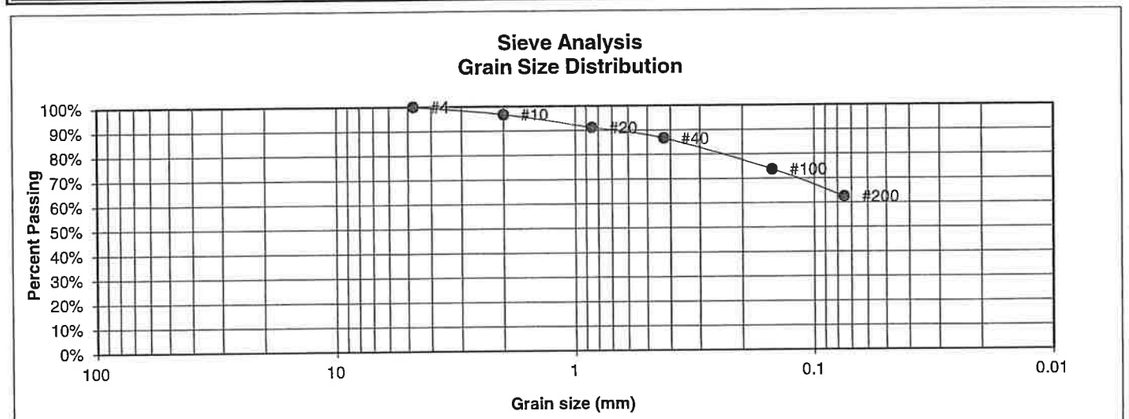
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DV	3/3/17

JOB NO.: 170157
FIG NO.: B-16

UNIFIED CLASSIFICATION	CL	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3, CBR #2	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	10	JOB NO.	170157
DEPTH (FT)	0-3	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"	
4	100.0%
10	96.7%
20	91.2%
40	86.7%
100	73.7%
200	62.5%

Atterberg Limits	
Plastic Limit	23
Liquid Limit	39
Plastic Index	16

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

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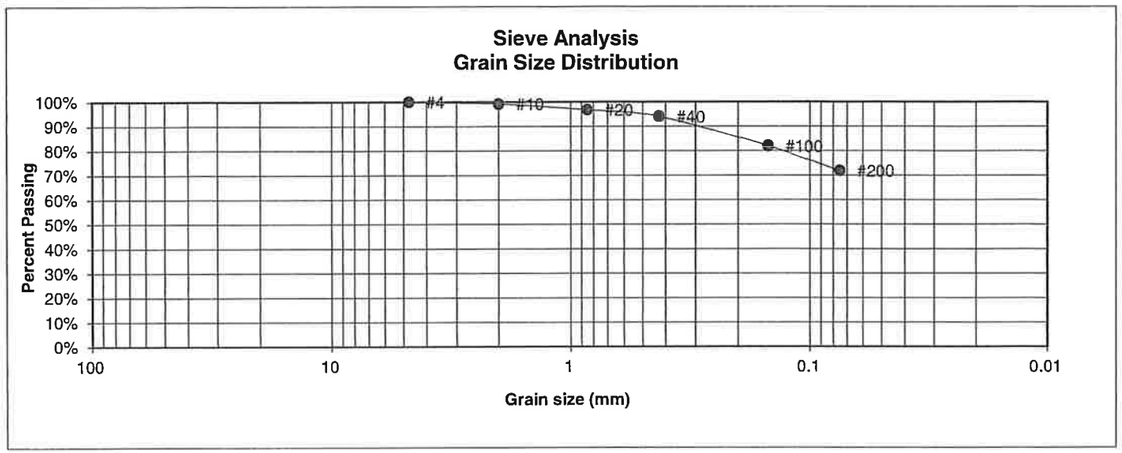
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/2/17

JOB NO.: 170157
FIG NO.: B-17

UNIFIED CLASSIFICATION	CL	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	10	JOB NO.	170157
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	11



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.2%
20	96.8%
40	93.9%
100	81.9%
200	71.8%

Atterberg Limits	
Plastic Limit	23
Liquid Limit	39
Plastic Index	16

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

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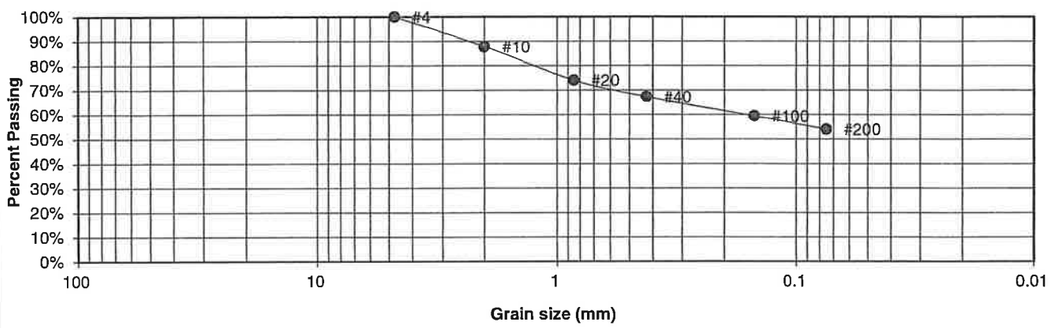
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-18

UNIFIED CLASSIFICATION	CH	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	11	JOB NO.	170157
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-7-6	GROUP INDEX	11

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	87.8%
20	74.1%
40	67.3%
100	59.4%
200	54.1%

Atterberg Limits	
Plastic Limit	25
Liquid Limit	50
Plastic Index	25

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

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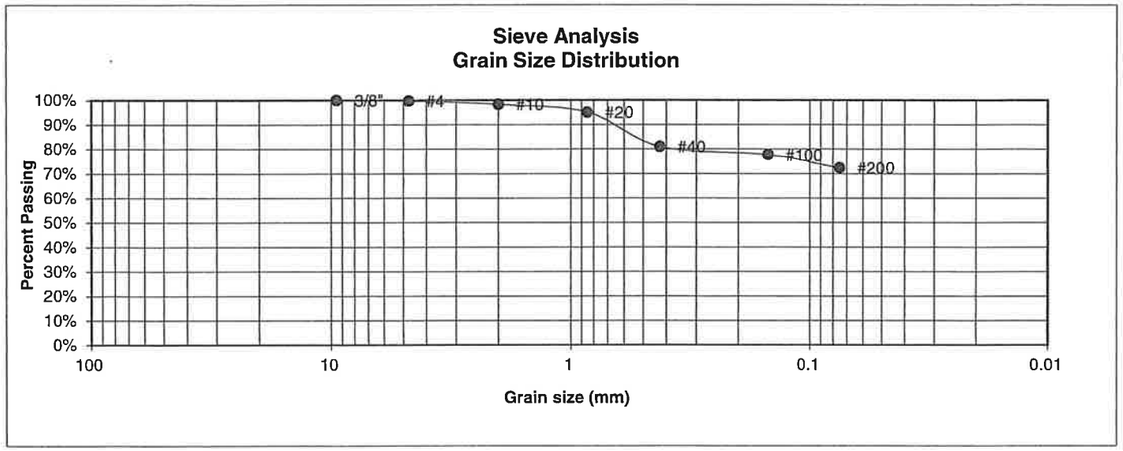
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-19

UNIFIED CLASSIFICATION	CL	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	VISTAS AT MERIDIAN RANCH
TEST BORING #	4	JOB NO.	170157
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	10



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	98.3%
20	95.1%
40	81.0%
100	77.7%
200	72.4%

Atterberg Limits	
Plastic Limit	24
Liquid Limit	39
Plastic Index	15

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

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

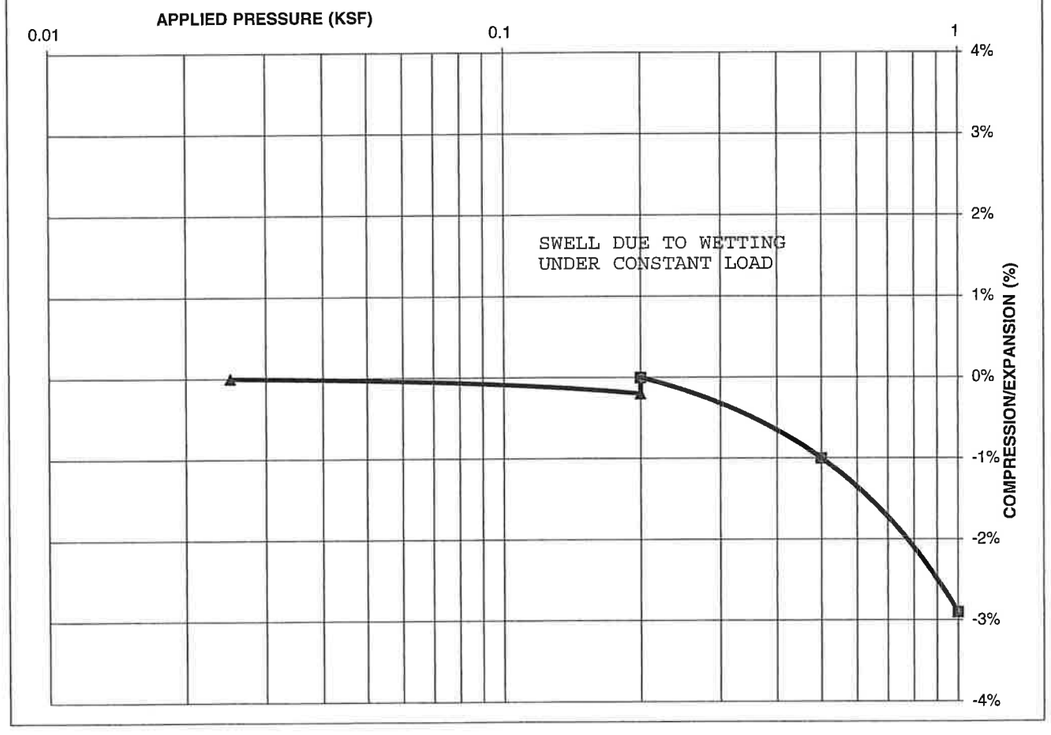
JOB NO.: 170157
FIG NO.: B-20

CONSOLIDATION TEST RESULTS

TEST BORING #	11	DEPTH(ft)	5
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			10.0%
SWELL/CONSOLIDATION (%)			0.2%

JOB NO. 170157
CLIENT TECH CONTRACTORS
PROJECT VISTAS AT MERIDIAN RANCH

SWELL CONSOLIDATION



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SWELL CONSOLIDATION
TEST RESULTS

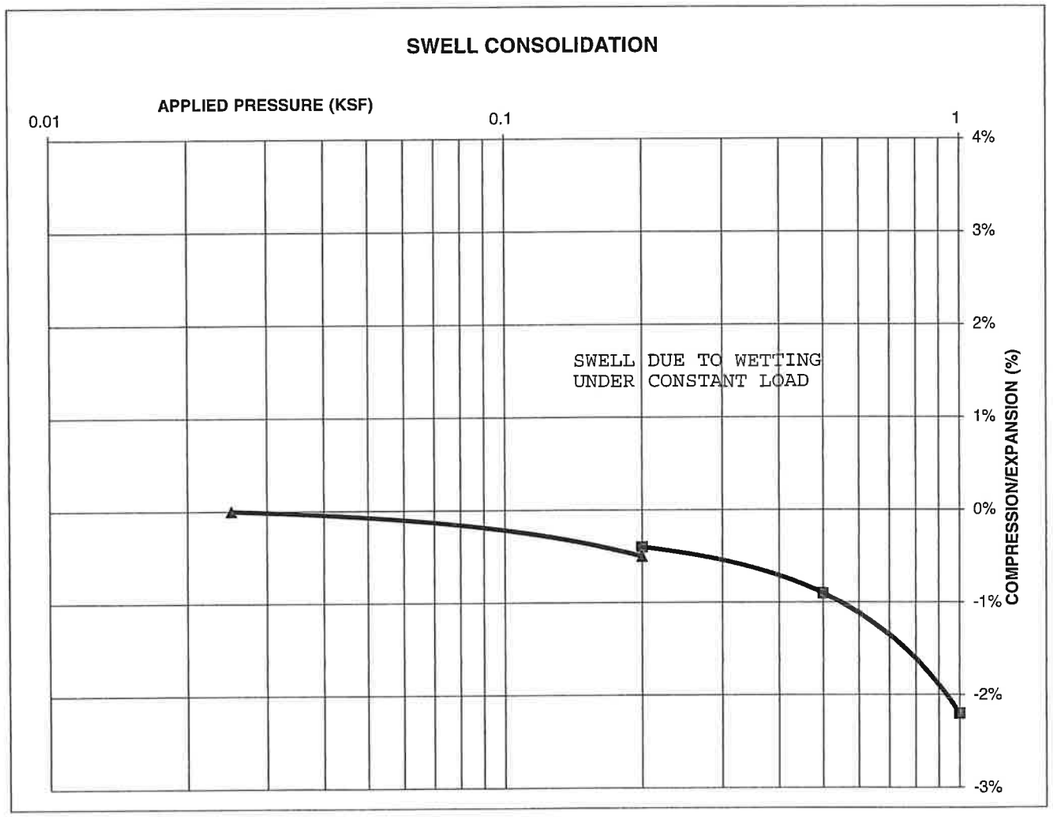
DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-21

CONSOLIDATION TEST RESULTS

TEST BORING #	12	DEPTH(ft)	5
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			9.4%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 170157
CLIENT TECH CONTRACTORS
PROJECT VISTAS AT MERIDIAN RANCH



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SWELL CONSOLIDATION
TEST RESULTS

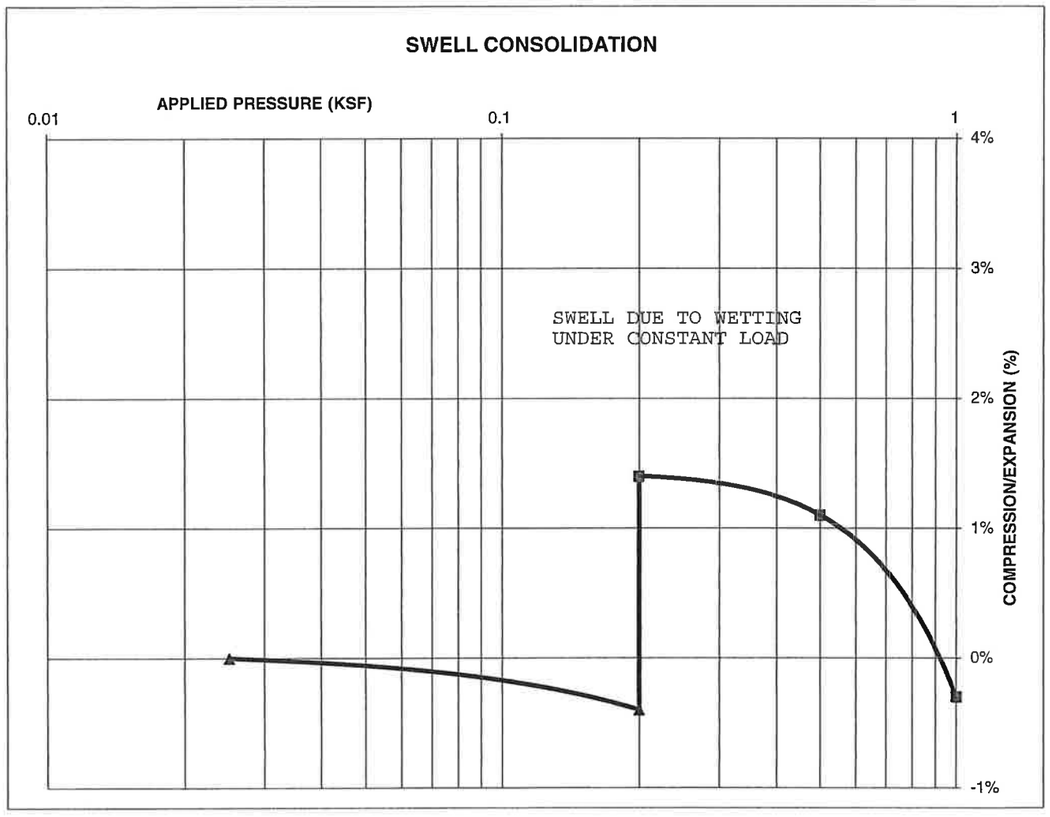
DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-22

CONSOLIDATION TEST RESULTS

TEST BORING #	10	DEPTH(ft)	0-3
DESCRIPTION	CL	SOIL TYPE	3, CBR #2
NATURAL UNIT DRY WEIGHT (PCF)			107
NATURAL MOISTURE CONTENT			15.3%
SWELL/CONSOLIDATION (%)			1.8%

JOB NO. 170157
CLIENT TECH CONTRACTORS
PROJECT VISTAS AT MERIDIAN RANCH
REMOLDED SAMPLE



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SWELL CONSOLIDATION
TEST RESULTS

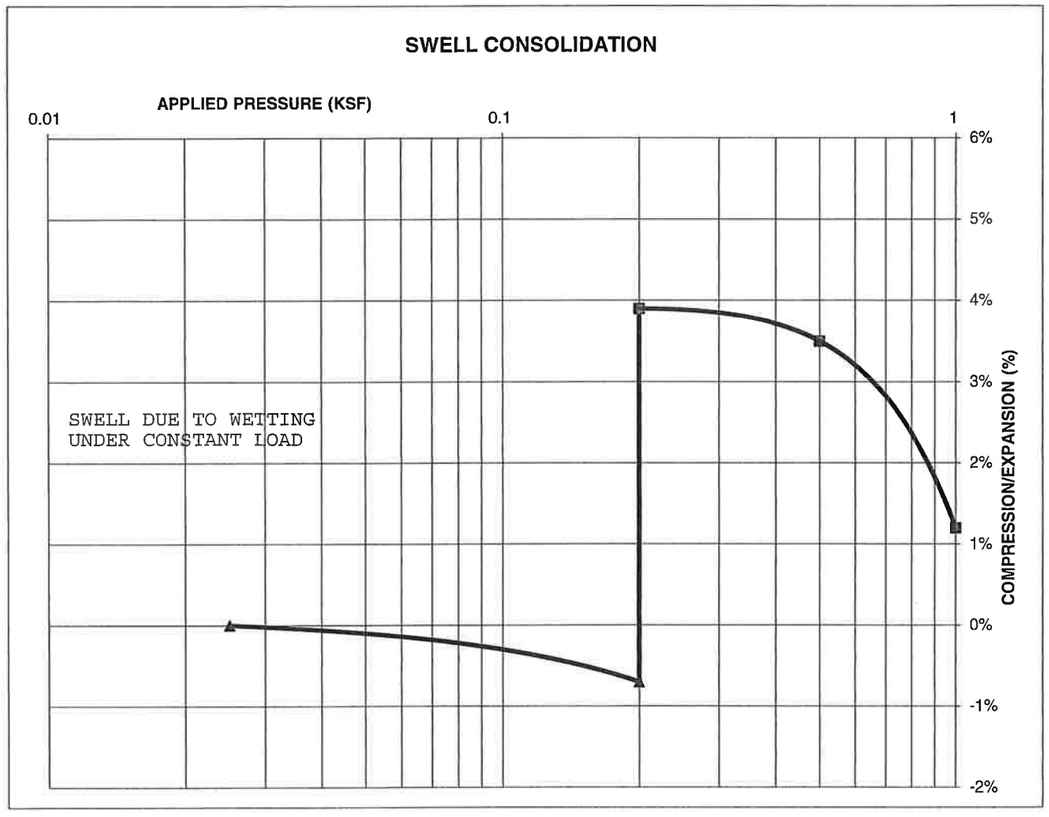
DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-23

CONSOLIDATION TEST RESULTS

TEST BORING #	10	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			15.1%
SWELL/CONSOLIDATION (%)			4.6%

JOB NO. 170157
CLIENT TECH CONTRACTORS
PROJECT VISTAS AT MERIDIAN RANCH



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SWELL CONSOLIDATION
TEST RESULTS

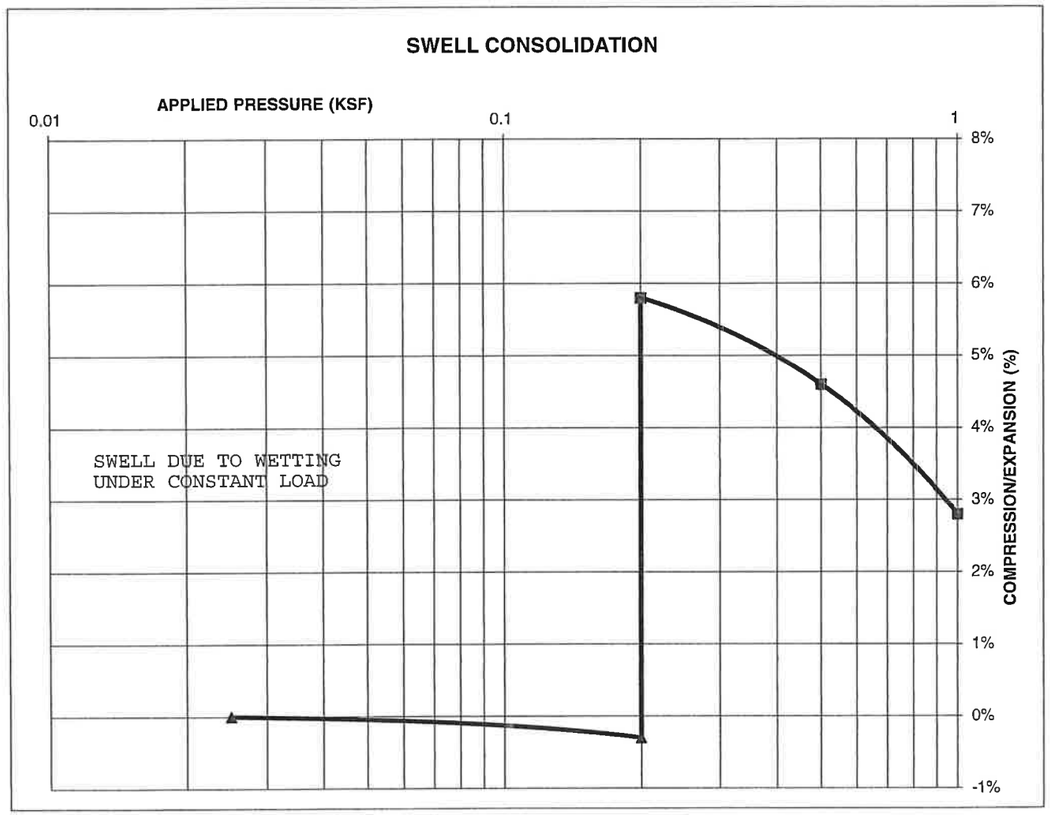
DRAWN:	DATE:	CHECKED:	DATE:
		DJ	3/3/17

JOB NO.: 170157
FIG NO.: B-24

CONSOLIDATION TEST RESULTS

TEST BORING #	11	DEPTH(ft)	1-2
DESCRIPTION	CH	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			107
NATURAL MOISTURE CONTENT			13.3%
SWELL/CONSOLIDATION (%)			6.1%

JOB NO. 170157
CLIENT TECH CONTRACTORS
PROJECT VISTAS AT MERIDIAN RANCH



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SWELL CONSOLIDATION
TEST RESULTS

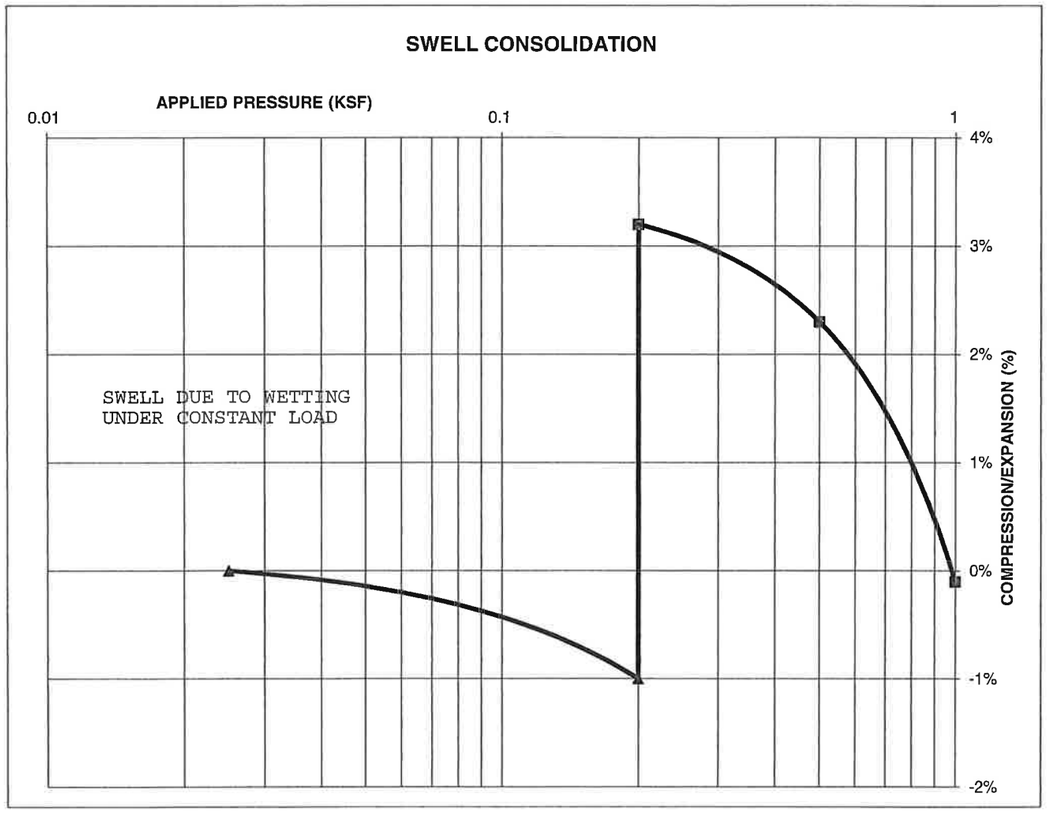
DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-25

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			16.6%
SWELL/CONSOLIDATION (%)			4.2%

JOB NO. 170157
CLIENT TECH CONTRACTORS
PROJECT VISTAS AT MERIDIAN RANCH



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		TDS	3/31/17

JOB NO.: 170157
FIG NO.: B-26

CLIENT	TECH CONTRACTORS	JOB NO.	170157
PROJECT	VISTAS AT MERIDIAN RANCH	DATE	2/27/2017
LOCATION	VISTAS AT MERIDIAN RANCH	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-4	1-2	0		<0.01
TB-8	1-2	0		0.02
TB-10	1-2	0		0.00
TB-4	10	0		<0.01
TB-11	5	0		0.01

QC BLANK PASS

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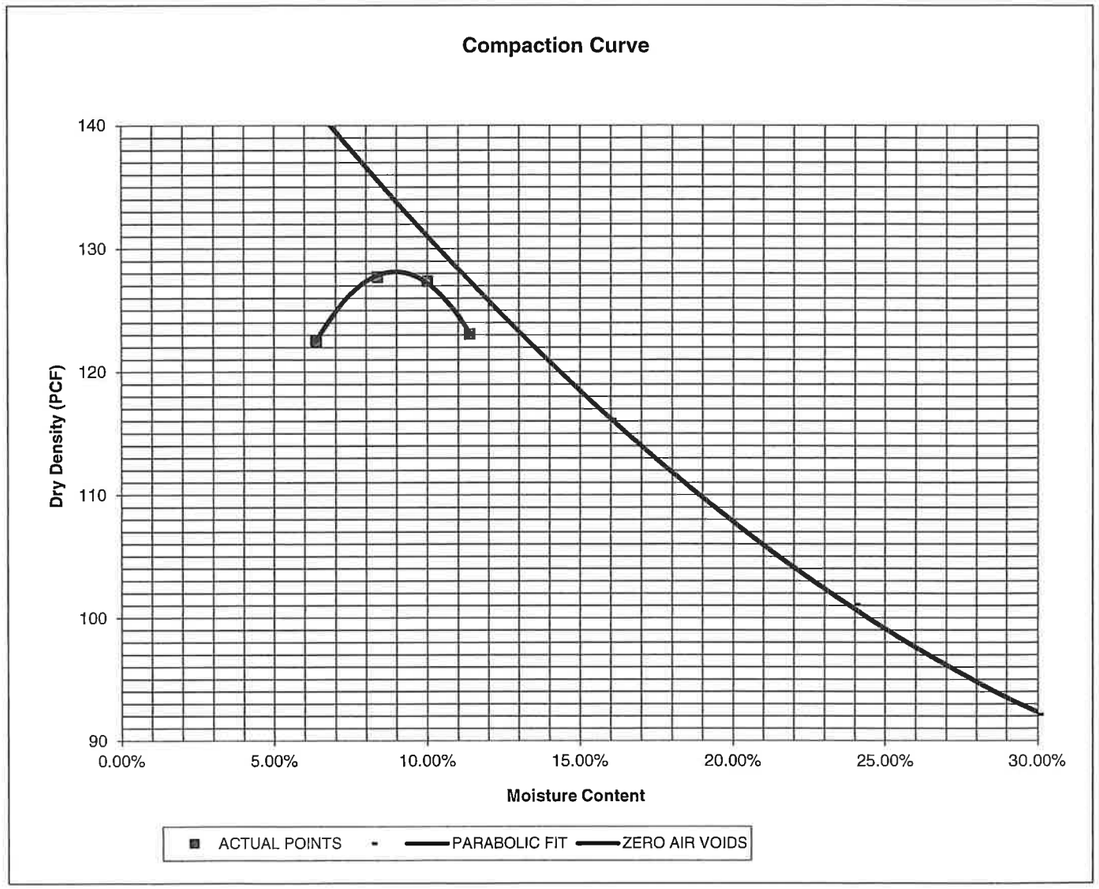
LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-27

PROJECT	VISTAS AT MERIDIAN RANCH	CLIENT	TECH CONTRACTORS
SAMPLE LOCATION	TB-1 @ 0-3'	JOB NO.	170157
SOIL DESCRIPTION	SAND, SILTY, BROWN	DATE	02/21/17

IDENTIFICATION	SM	COMPACTION TEST #	1, SOIL TYPE #1
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	GE
MAXIMUM DRY DENSITY (PCF)	128.1	OPTIMUM MOISTURE	9.0%



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MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-28

CBR TEST LOAD DATA

JOB NO: 170157
CLIENT: TECH CONTRACTORS
PROJECT: VISTAS AT MERIDIAN RANCH
SOIL TYPE: 1, CBR #1

PISTON DIAMETER (cm)	PISTON AREA (in^2)
4.958	2.99250919

	10 BLOWS		*25 BLOWS*		*56 BLOWS*	
PENETRATION	MOLD # 13		MOLD # 9		MOLD # 18	
DEPTH (INCHES)	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	117	39.10	187	62.49	236	78.86
0.050	205	68.50	470	157.06	505	168.75
0.075	355	118.63	635	212.20	719	240.27
0.100	596	199.16	879	293.73	1010	337.51
0.125	674	225.23	1082	361.57	1380	461.15
0.150	903	301.75	1226	409.69	1680	561.40
0.175	1151	384.63	1464	489.22	1878	627.57
0.200	1363	455.47	1653	552.38	2144	716.46
0.300	1550	517.96	2245	750.21	3950	1319.96
0.400	1894	632.91	2828	945.03	5244	1752.38
0.500	2065	690.06	3333	1113.78	6000	2005.01

FINAL MOISTURE CONTENT

	MOLD # 13	MOLD # 9	MOLD # 18
CAN #	303	342	340
WT. CAN	6.09	7.36	8.22
WT. CAN+WET	145.96	112.84	83.43
WT. CAN+DRY	128.65	101.23	75.66
WT. H20	17.31	11.61	7.77
WT. DRY SOIL	122.56	93.87	67.44
MOISTURE CONTENT	14.12%	12.37%	11.52%
WET DENSITY (PCF)	123.5	129.1	136.9
DRY DENSITY (PCF)	113.3	118.4	125.6
BEARING RATIO	19.92	29.37	33.75

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

BEARING RATIO AT 90% OF MAX	23.61 ~ R VALUE	71
BEARING RATIO AT 95% OF MAX	31.36 ~ R VALUE	74

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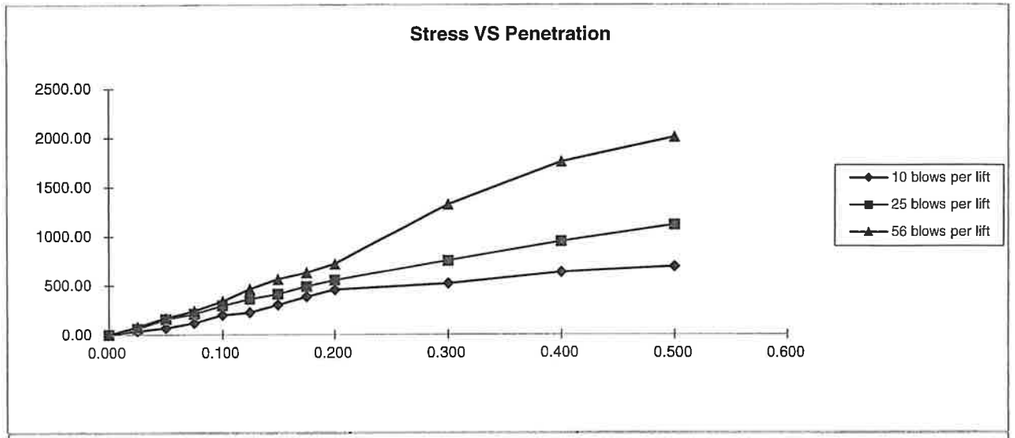
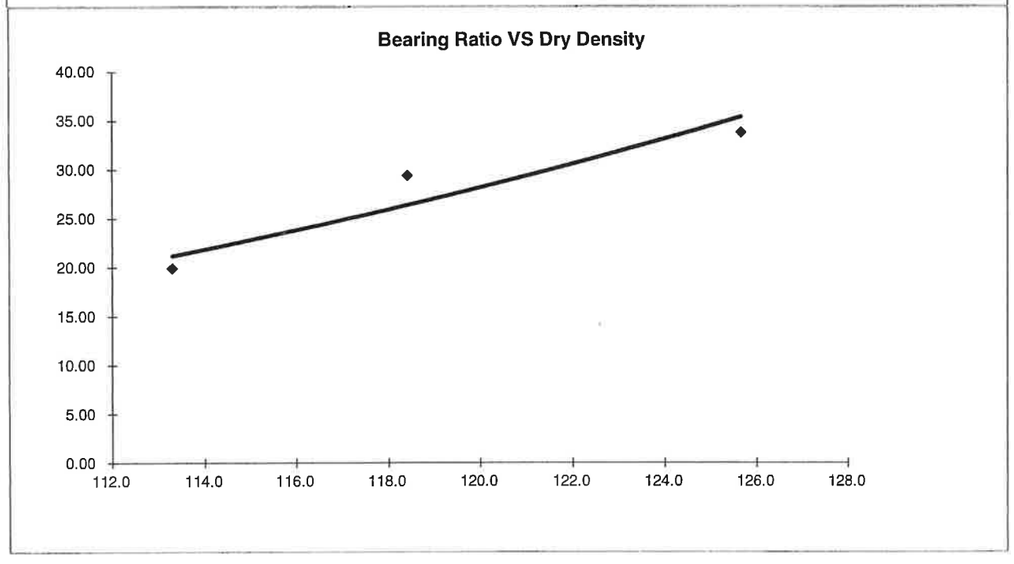
CBR TEST DATA

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/9/17

JOB NO.: 170157
FIG NO.: B-29





BEARING RATIO AT 90% OF MAX	23.61	~ R VALUE	71.00
BEARING RATIO AT 95% OF MAX	31.36	~ R VALUE	74.00

JOB NO: 170157
SOIL TYPE: 1, CBR #1

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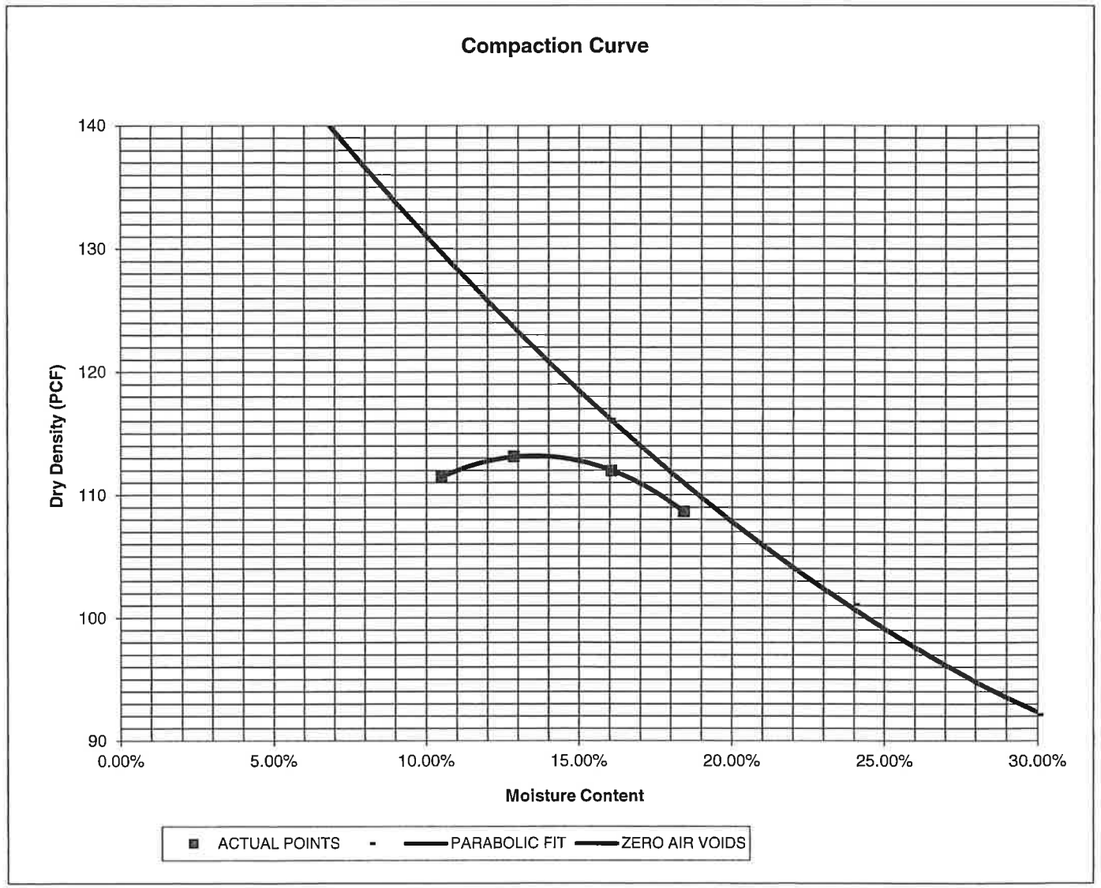
CALIFORNIA BEARING RATIO

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	3/3/17

JOB NO.: 170157
FIG NO.: B-30

PROJECT	VISTAS AT MERIDIAN RANCH	CLIENT	TECH CONTRACTORS
SAMPLE LOCATION	TB-10 @ 0-3'	JOB NO.	170157
SOIL DESCRIPTION	CLAYSTONE, SANDY, BROWN	DATE	02/16/17

IDENTIFICATION	CL	COMPACTION TEST #	2, SOIL TYPE #3
TEST DESIGNATION / METHOD	ASTM D-698-A	TEST BY	DC
MAXIMUM DRY DENSITY (PCF)	113.1	OPTIMUM MOISTURE	13.6%



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COLORADO SPRINGS, COLORADO 80907

MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-31

CBR TEST LOAD DATA

JOB NO: 170157
CLIENT: TECH CONTRACTORS
PROJECT: VISTAS AT MERIDIAN RANCH
SOIL TYPE: 3, CBR #2

PISTON DIAMETER (cm)	PISTON AREA (in^2)
4.958	2.99250919

	10 BLOWS		*25 BLOWS*		*56 BLOWS*	
PENETRATION	MOLD # 17		MOLD # 3		MOLD # 12	
DEPTH (INCHES)	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	21	7.02	29	9.69	38	12.70
0.050	23	7.69	37	12.36	46	15.37
0.075	27	9.02	45	15.04	48	16.04
0.100	30	10.03	46	15.37	53	17.71
0.125	32	10.69	53	17.71	58	19.38
0.150	34	11.36	61	20.38	68	22.72
0.175	36	12.03	65	21.72	68	22.72
0.200	38	12.70	63	21.05	68	22.72
0.300	33	11.03	63	21.05	69	23.06
0.400	35	11.70	68	22.72	76	25.40
0.500	38	12.70	69	23.06	86	28.74

FINAL MOISTURE CONTENT

MOLD #	17		3		12
CAN #	342		340		112
WT. CAN	6.23		6.93		9.52
WT. CAN+WET	116.35		124.25		126.31
WT. CAN+DRY	89.6		97.31		100.72
WT. H20	26.75		26.94		25.59
WT. DRY SOIL	83.37		90.38		91.2
MOISTURE CONTENT	32.09%		29.81%		28.06%

WET DENSITY (PCF)	110.8	120.3	128.9
DRY DENSITY (PCF)	97.6	105.9	113.4

BEARING RATIO	1.00	1.54	1.77

90% OF DRY DENSITY	101.8
95% OF DRY DENSITY	107.4

BEARING RATIO AT 90% OF MAX	1.27	~ R VALUE	1
BEARING RATIO AT 95% OF MAX	1.58	~ R VALUE	1

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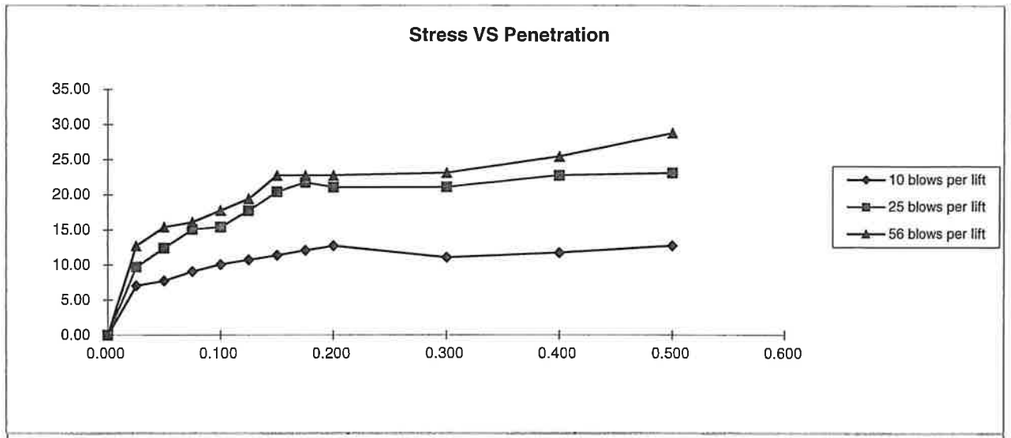
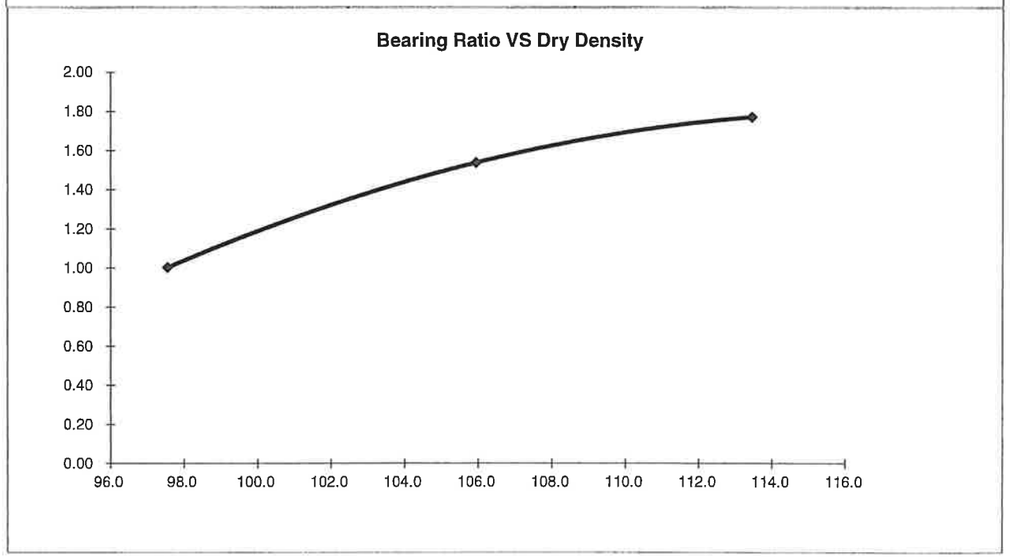
CBR TEST DATA

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/9/17

JOB NO.: 170157
FIG NO.: B-32





BEARING RATIO AT 90% OF MAX	1.27	~ R VALUE	1.00
BEARING RATIO AT 95% OF MAX	1.58	~ R VALUE	1.00

JOB NO: 170157
SOIL TYPE: 3, CBR #2

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CALIFORNIA BEARING RATIO

DRAWN:	DATE:	CHECKED:	DATE:
		DS	3/3/17

JOB NO.: 170157
FIG NO.: B-33

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL LOW-VOLUME

SOIL TYPE 1, CBR # 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 =	0.45
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	13168

Weighted Structural Number (WSN): → WSN = 1.46

DESIGN TABLES AND EQUATIONS

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

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

$k = M_R / 19.4$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

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

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

Left	Right	Difference
4.56	4.56	0.0

Job No. 170157
Fig. No. C-1

DESIGN CALCULATIONS

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL LOW-VOLUME

SOIL TYPE 1, CBR # 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 = 0.11 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)

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

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = [3] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 1.3 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. 4.0 inches of Asphalt

Job No. 170157
Fig. No. C-2

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA: THE VISTAS AT MERIDIAN RANCH - LOCAL LOW VOULME.

SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	1.47

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.13 Strength Coefficient - Cement Treated Subgrade.

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

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

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

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches USE 4 INCH MINIMUM.
$D_2 = ((WSN) - (t)(C_1))/C_2$ = -2.2 inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 4.0 inches of Full Depth Asphalt

Job No. 170157
Fig. No. C-3

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL (PAVEMENT ONLY 73.5K)

SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	73,500
Hveem Stabilometer (R Value) Results:	R =	50
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 =	13168

Weighted Structural Number (WSN): → WSN = 1.66

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
4.87	4.87	0.0

Job No. 170157
Fig. No. C-4

DESIGN CALCULATIONS

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL (PAVEMENT ONLY 73.5K)
SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	73,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	1.66

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.11 Strength Coefficient - Aggregate Base Course

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

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 3.8 inches of Full Depth Asphalt
Use 4.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = [3] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 3.1 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. 4.0 inches of Asphalt

Job No. 170157
Fig. No. C-5

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA: THE VISTAS AT MERIDIAN RANCH - LOCAL (PAVEMENT ONLY 73.5K)

SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	73,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	1.66

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.13 Strength Coefficient - Cement Treated Subgrade.

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

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 3.8 inches of Full Depth Asphalt
Use 4.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches USE 4 INCH MINIMUM.
$D_2 = ((WSN) - (t)(C_1))/C_2$ = -0.8 inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 4.0 inches of Full Depth Asphalt

Job No. 170157
Fig. No. C-6

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL (PAVEMENT ONLY 109.5K)

SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	109,500
Hveem Stabilometer (R Value) Results:	R =	50
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 =	13168

Weighted Structural Number (WSN): → WSN = 1.78

DESIGN TABLES AND EQUATIONS

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

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

$k = M_R / 19.4$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

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

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

Left	Right	Difference
5.04	5.04	0.0

Job No. 170157
Fig. No. C-7

DESIGN CALCULATIONS

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL (PAVEMENT ONLY 109.5K)
SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	109,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	1.78

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.11 Strength Coefficient - Aggregate Base Course

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

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 4.0 inches of Full Depth Asphalt
Use 4.5 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = [3] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 4.2 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. 4.5 inches of Asphalt

Job No. 170157
Fig. No. C-8

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA: THE VISTAS AT MERIDIAN RANCH - LOCAL (PAVEMENT ONLY 109.5K)

SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	109,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	1.78

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.13 Strength Coefficient - Cement Treated Subgrade.

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

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 4.0 inches of Full Depth Asphalt
Use 4.5 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches USE 4 INCH MINIMUM.
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 0.2 inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 4.5 inches of Full Depth Asphalt

Job No. 170157
Fig. No. C-9

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL (RES. COLLECTOR)

SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	821,000
Hveem Stabilometer (R Value) Results:	R =	50
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 =	13168

Weighted Structural Number (WSN): → WSN = 2.48

DESIGN TABLES AND EQUATIONS

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

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

$k = M_R / 19.4$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

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

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

Left	Right	Difference
5.91	5.91	0.0

Job No. 170157
Fig. No. C-16

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA: THE VISTAS AT MERIDIAN RANCH - LOCAL (RES. COLLECTOR)

SOIL TYPE 1, CBR # 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	821,000
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	2.48

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.13 Strength Coefficient - Cement Treated Subgrade.

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

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 5.6 inches of Full Depth Asphalt
Use 6.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches USE 4 INCH MINIMUM.
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 5.5 inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 6.0 inches of Full Depth Asphalt

Job No. 170157
Fig. No. C-12

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL (RES. COLLECTOR)

SOIL TYPE 3 , CBR # 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	821,000
Hveem Stabilometer (R Value) Results:	R =	1
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 =	2655

Weighted Structural Number (WSN): → WSN = 4.39

DESIGN TABLES AND EQUATIONS

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

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

$k = M_R / 19.4$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

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

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

Left	Right	Difference
5.91	5.91	0.0

Job No. 170157
Fig. No. C-13

DESIGN CALCULATIONS

DESIGN DATA THE VISTAS AT MERIDIAN RANCH - LOCAL (RES. COLLECTOR)

SOIL TYPE 3, CBR # 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	821,000
Hveem Stabilometer (R Value) Results:	R =	1
Weighted Structural Number (WSN):	WSN =	4.39

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.11 Strength Coefficient - Aggregate Base Course

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

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 10.0 inches of Full Depth Asphalt
Use 10.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 6.5 inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 13.9 inches of Aggregate Base Course, use 14.0 inches

RECOMMENDED ALTERNATIVES

1. 6.5 inches of Asphalt + 14.0 inches of Aggregate Base Course, or
2. 10.0 inches of Asphalt

Job No. 170157
Fig. No. C-M

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA: THE VISTAS AT MERIDIAN RANCH - LOCAL (RES. COLLECTOR)

SOIL TYPE 3, CBR # 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	821,000
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	4.39

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.13 Strength Coefficient - Cement Treated Subgrade.

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

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 10.0 inches of Full Depth Asphalt
Use 10.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 7.5 inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 8.4 inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 7.5 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 10.0 inches of Full Depth Asphalt

Job No. 170157
Fig. No. C-18

APPENDIX D: Weighted Average Design ESAL's from Transportation Memorandum Report by LSC Transportation Consultants, Inc., dated February 28, 2017, Job No. 154570

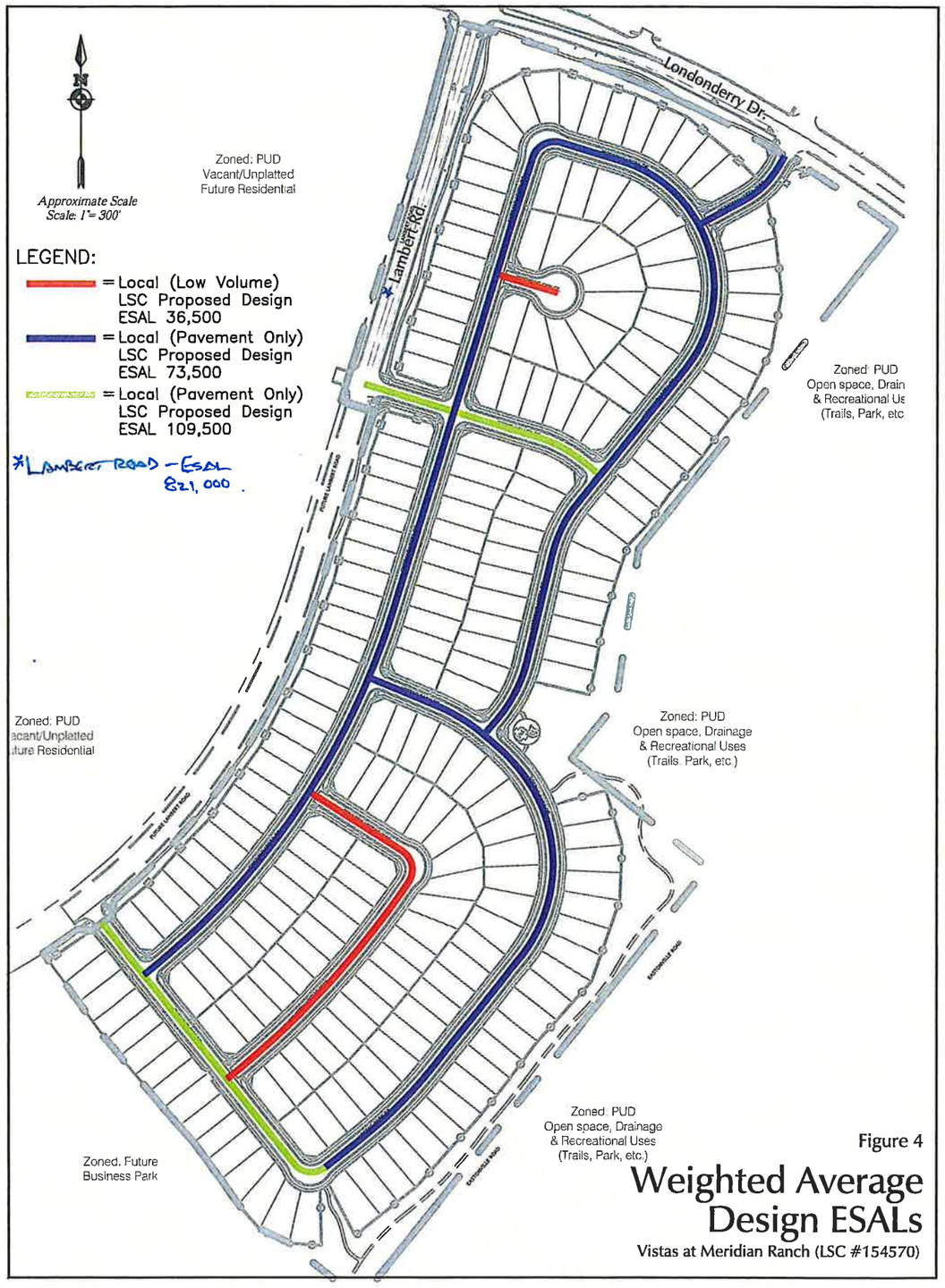

Figure 4

Weighted Average Design ESALs

Vistas at Meridian Ranch (LSC #154570)