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

August 16, 2017

William Guman & Associates, Ltd.
731 North Weber Street, Suite 10
Colorado Springs, Colorado 80903

Attn: Bill Guman

Re: Tactile Test Pit Observation & Septic Design
Judge Orr Road RV Park
14010 Judge Orr Road
El Paso County, Colorado

Dear Mr. Guman:

As requested, personnel of Entech Engineering, Inc. have observed additional test pits excavated at the above-referenced property for the proposed development of an RV Park. This letter provides additional soils information for the purpose of On-Site Wastewater Treatment Systems (OWTS) on the property and should be used in conjunction with the Soils, Geology, Geologic Hazard, and Wastewater Study Report performed by Entech Engineering, Inc., Job No. 160533, dated December 12, 2016.

The test pit observations were conducted to evaluate the soils on the property where absorption fields are proposed that were not initially investigated in the report referenced above. This letter presents the results of our tactile test pit observations and laboratory testing. Specific design of the septic systems is beyond the scope of this report, however findings from Entech's 2016 report and this letter will be used for the proposed RV Park OWTS designs.

TACTILE TEST PIT OBSERVATIONS:

The subsurface conditions in the vicinity of the proposed absorption fields were observed and sampled. The soils were recovered from ten test pit excavations and a profile hole drilled at one septic field location. Test Pit Nos. 1 thru 4 were observed on December 5, 2016 and Test Pit Nos. 5 thru 10 pits were observed on April 6, 2017. Soil samples were recovered to obtain soils information for determining their suitability below the proposed soil treatment areas.

The test pits were advanced to depths of approximately 8 to 10 feet below the ground surface (bgs). The excavations, soil observations, and soils recovered were obtained using a mini track hoe supplied and operated by Entech Engineering. The observations included soil type determinations (including: soil texture, soil structure, and soil grade), restrictive layers, and evidence of existing or seasonal groundwater. The locations of the test pits are presented in Figure 1.

Representative soil samples were recovered from each test pit excavation, labelled, and retained in plastic soil sampling bags. Soil sampling and tactile evaluations were performed by one of our Geologists. Test Pit Logs describing the subsurface conditions encountered in each of the excavations are included in Appendix A.

Laboratory classification testing was completed on selected soil samples recovered from the excavations for evaluating engineering properties, classification and for grouping the materials by soil types. The soil types were based on soil classifications developed by the United States Department of Agriculture Natural Resources Conservation Service (USDA – NRCS). A Summary of Tactile Test Pit Results is included with the laboratory testing which includes the test pit number, USDA soil type, associative long-term acceptance rate (LTAR), and depths to restrictive layers and seasonally occurring groundwater. The depths recorded are measured from the existing ground surface. The results for all the test pits and laboratory soil testing results from select test pits excavated on April 6, 2017 are included in Appendix B.

ON-SITE WASTEWATER TREATMENT (OWTS)

The site was evaluated for an On-Site Wastewater Treatment system for the proposed RV camp in accordance with the Regulations of the El Paso County Board of Health On-Site Wastewater Treatment Systems (OWTS) Regulations dated April 10, 2014. Due to the type of project a designed system will be required. The locations of the proposed absorption fields were determined based on the site topography to maintain gravity flow to the septic tanks and pumping chambers.

The USDA – NRCS have mapped and described the soils to exhibit moderate to moderately rapid percolation rates. The previously prepared Soils, Geology, Geologic Hazard, and Wastewater Study and findings from the recent test pit observations determined that variable soils and rock types exist at shallow depths. Due to the soil properties and stratification at the areas observed, a designed system will be required.

Soils encountered in the tactile test pits observed and tested consisted of sandy loam to gravelly sandy loam, gravelly sandy clay loam, sandy clay and clay with areas of underlying sandy claystone. Claystone was not encountered in Test Pit Nos. 5 thru 10 which were excavated north of the originally tested area, along the east property line. The limiting layer encountered in the test pits is the clay and sandy claystone. Some of the clay encountered were logged as thin lenses. The confining layers were classified predominantly as Soil Types 4A and 5 with a thin lens of clay exposed in Test Pit No. 8. These Soil Types correspond to LTAR values of 0.15, 0.10, and 0.35 gallons per day per square foot, respectively. The bedrock was encountered at 3½ to 6½ feet in the test pits located at the southeast corner of the property. The soil and rock conditions encountered in the test pits along with the type of development will require designed systems. Mottling, indicative of seasonal shallow groundwater, was observed in all but two of the test pits (Test Pit Nos. 6 and 9). Seasonal shallow groundwater is anticipated at depths ranging from 3½ to 7 feet below the existing ground surface in the tactile test pits. Absorption fields must maintain a minimum of 4 feet above groundwater or bedrock. Groundwater was encountered at 17 feet in the profile hole prepared with the percolation testing which was drilled to 20 feet.

Additional drilling for percolation testing and excavations for tactile test pit observations may identify areas that do not expose thick layers of confining clay soils and rock. The thin layers of clay exposed in Test Pit Nos. 7 and 8 can be excavated and removed from the absorption field areas during septic system installation and construction. Other areas of thin clay confining layers likely exist on the property. The thick layers of soil confining layers affect the long-term performance and sizes of the absorption fields.

CLOSING:

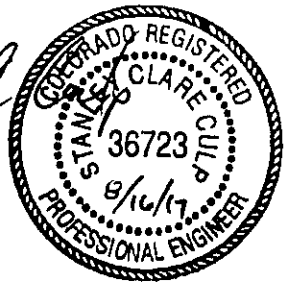
The soils investigations and testing has determined that the proposed development is suitable for On-Site Wastewater Treatment Systems (OWTS). Contamination of surface and subsurface water resources should not occur provided the OWTS systems and absorption fields are designed and evaluated during construction by a Professional Engineer with experience in OWTS designs and a Geologist. The systems shall be construction and installed according to the current El Paso County Board of Health On-Site Wastewater Treatment Systems (OWTS) Regulations and Colorado Water Quality Control Commission On-Site Wastewater Treatment System Regulations (Regulation 43). Additional soils investigations and testing will likely be required after a final development plan has been approved by the County officials.

Long term performance of the septic systems will require that the systems are monitored and properly maintained as described in the above-referenced regulations. It is anticipated that the soil treatment areas could be designed using low pressure drip systems or infiltrator type systems in bed or trench configurations. Due to the soil types that were encountered in our observations and the type of development, pressure dosed absorption fields are recommended. Since each RV site will be equipped with both a water and sewer services, the wastewater strength is initially considered as Treatment Level One (TL1) effluent. It is recommended to periodically sample the effluent in the final holding chambers after the RV Park is operational for each system to obtain wastewater strength and quality to determine if higher levels of pretreatment are warranted before the effluent is pumped to the absorption fields. Common influent and effluent wastewater constituents to be tested include but not limited to BOD, CBOD, TSS, VSS, FOG, and nitrogen species. Absorption fields must be located a minimum of 180 feet from all water wells based on the anticipated design flows, including water wells on adjacent properties. Absorption fields must also be located a minimum of 400 feet from each other.

This report has been prepared for William Guman & Associates for application to the proposed project in accordance with generally accepted soil engineering practices. No other warranty expressed or implied is made. If you have any questions or need additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.



Stan C. Culp, P.E.
Senior Engineer

SCC/scc

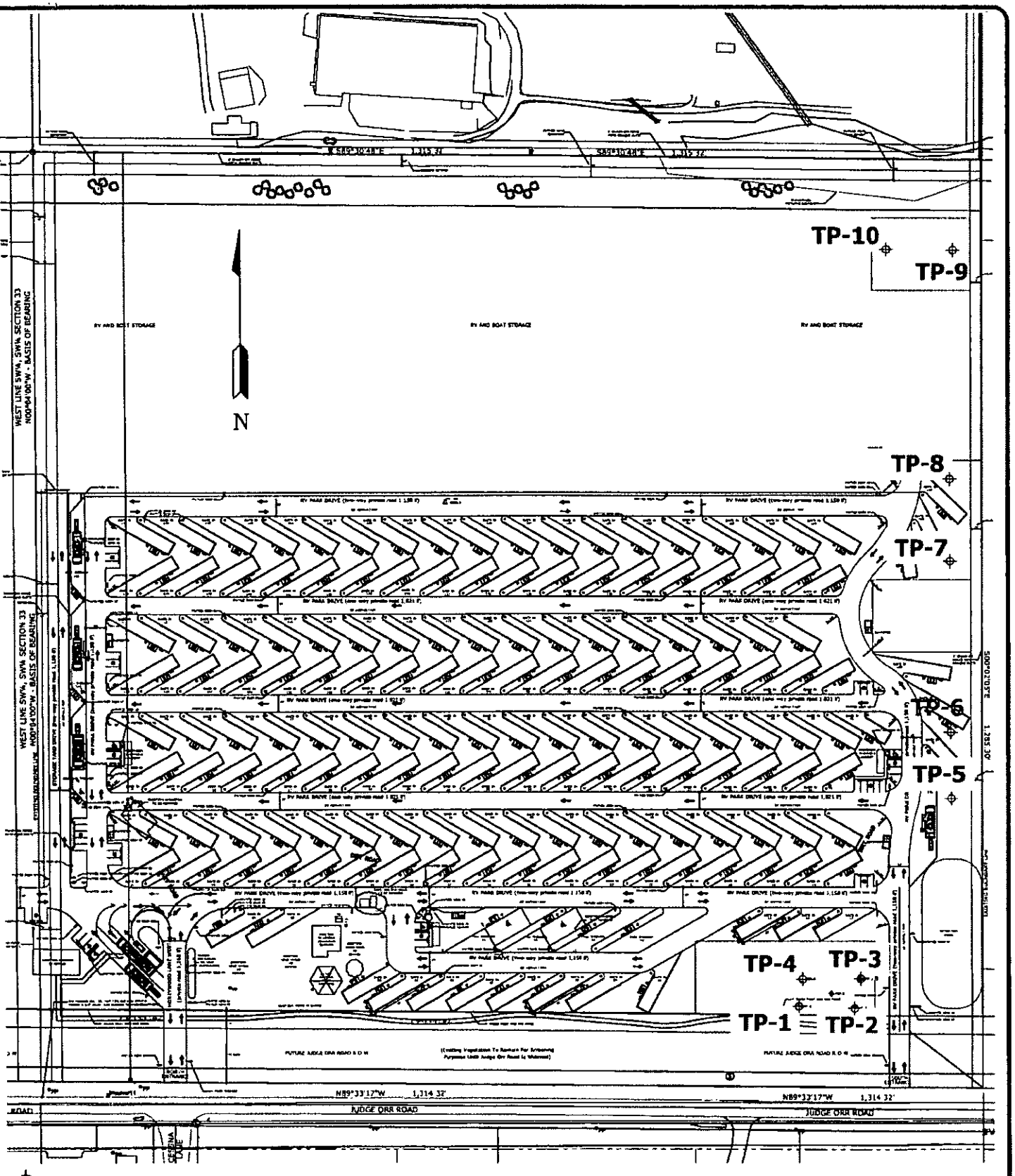
Encl.

Entech Job No. 160533
AA projects/2016/160533 sd_tpo1

Reviewed by:

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

FIGURE



⊕ TB-2- APPROXIMATE TEST BORING LOCATION AND NUMBER

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

TEST PIT LOCATION PLAN
JUDGE ORR ROAD RV PARK
14010 JUDGE ORR ROAD
EL PASO COUNTY, COLORADO
FOR: WILLIAM GUMAN & ASSOCIATES, LTD

DRAWN:	DATE:	CHECKED:	DATE:
SCC	8/16/17		

JOB NO.: 160533

FIG NO.: 1

APPENDIX A: Test Pit Logs

TEST PIT NO. 1
DATE EXCAVATED 12/5/2016
Job #

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, dark brown	1			gr	m	2
gravelly sandy loam, fine to coarse grained, brown	2			gr	m	2
	3					
sandy clay, black-brown	4			gr	w	3A
	5					
weathered to formational sandy claystone, light gray brown	6			pl	s	5
	7					
	8					
	9					
	10					

TEST PIT NO. 2
DATE EXCAVATED 12/5/2016
CLIENT WILLIAM GUMAN & ASSOCIATES, LTD
LOCATION JUDGE ORR ROAD RV PARK

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, dark brown	1			gr	m	2
gravelly sandy clay loam, fine to coarse grained, brown, with 1 - 2" sand lenses	2			gr	m	3
	3					
clay, olive gray	4			ma		4A
	5					
weathered to formational sandy claystone	6			pl	s	5
	7					
	8					
	9					
	10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l

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TEST PIT LOG

DRAWN:	DATE:	CHECKED: SCC	DATE: 8/16/17

JOB NO.: 160533
FIG NO.: A-1

TEST PIT NO. 3
DATE EXCAVATED 12/5/2016
Job # 161944

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, dark brown	1			gr	m	2
gravelly sandy loam, fine to coarse grained, brown	2			gr	m	2
	3					
	4					
	5					
weathered to formational sandy claystone, light gray brown	6			pl	s	5
	7					
	8					
	9					
	10					

TEST PIT NO. 4
DATE EXCAVATED 12/5/2016
CLIENT WILLIAM GUMAN & ASSOCIATES, LTD
LOCATION JUDGE ORR ROAD RV PARK

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, dark brown	1					
gravelly sandy loam, fine to coarse grained, brown	2			gr	m	2
	3					
weathered to formational sandy claystone, light gray brown	4			pl	s	5
	5					
	6					
	7					
	8					
	9					
	10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l

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TEST PIT LOG

DRAWN.	DATE:	CHECKED. SCC	DATE: 8/16/17

JOB NO.: 160533
FIG NO.: A-2

TEST PIT NO. 5
DATE EXCAVATED 4/6/2017
Job # 160533

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, fine to coarse grained, brown	1			gr	m	2
loamy sand, fine to coarse grained, tan	2			sg		1
	3					
	4					
	5					
	6					
clay, gray *seasonally occuring groundwater at 6.5'	7			ma		4A
	8					
	9					
	10					

TEST PIT NO. 6
DATE EXCAVATED 4/6/2017
CLIENT WILLIAM GUMAN & ASSOCIATES
LOCATION JUDGE ORR ROAD RV PARK

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy clay loam, brown	1			bl	m	3
sandy clay loam, light brown	2			bl	m	3
sandy clay, gray-brown	3			bl	w	4A
	4					
	5					
	6					
	7					
	8					
	9					
	10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l

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TEST PIT LOG

DRAWN:	DATE:	CHECKED: SCC	DATE: 8/16/17

JOB NO: 160533
FIG NO.: A-3

TEST PIT NO. 7
DATE EXCAVATED 4/6/2017
Job # 160533

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, fine to coarse grained, brown	1			gr	m	2
sandy loam, very fine to medium grained, tan	2			gr	m	2
	3					
loamy sand, fine to coarse grained, tan	4			sg		1
	5					
	6					
sandy clay, gray *seasonally occurring groundwater at 6'	7			ma		4A
	8					
loamy sand, fine to coarse grained, tan	9			sg		1
	10					

TEST PIT NO. 8
DATE EXCAVATED 4/6/2017
CLIENT WILLIAM GUMAN & ASSOCIATES
LOCATION JUDGE ORR ROAD RV PARK

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy clay loam, brown	1			bl	m	3
sandy clay loam, light brown	2			bl	m	3
loamy sand, fine to coarse grained, tan	3			sg		1
	4					
	5					
	6					
	7					
	8					
	9					
	10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l

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TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
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JOB NO.: 160533
FIG NO: A-4

TEST PIT NO. 9
DATE EXCAVATED 4/6/2017
Job # 160533

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1			gr	m	2
gravelly sandy loam, fine to coarse grained, tan	2			gr	m	2
	3					
sandy clay, gray	4			ma		4A
sandy clay loam, gray-brown	5			ma		3A
	6					
	7					
	8					
	9					
	10					

TEST PIT NO. 10
DATE EXCAVATED 4/6/2017
CLIENT WILLIAM GUMAN & ASSOCIATES
LOCATION JUDGE ORR ROAD RV PARK

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, fine to coarse grained, brown	1			gr	m	2
sandy loam, fine to coarse grained, light brown	2			gr	m	2
	3					
sandy clay loam, gray	4			gr	m	3
	5					
	6					
	7					
*seasonally occuring groundwater at 7'	8			ma		3A
	9					
	10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l

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TEST PIT LOG

DRAWN	DATE:	CHECKED:	DATE:
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JOB NO.: 160533
FIG NO.: A-5

APPENDIX B: Laboratory Test Results

Summary of Tactile Test Pit Results

Test Pit No.	Limiting Layer USDA Soil Type	LTAR Value	Depth to Bedrock (ft.)	Depth of Seasonally Occurring Groundwater (ft.)
1	5	0.10*	5*	5*
2	5	0.10*	6*	6*
3	5	0.10*	5.5*	5.5*
4	5	0.10*	3.5*	3.5*
5	4A	0.15*	N/A	6.5
6	4A	0.15*	N/A	N/A
7	4A	0.15*	N/A	6*
8	3	0.35	N/A	6*
9	4A	0.15*	N/A	N/A
10	3A	0.3*	N/A	7

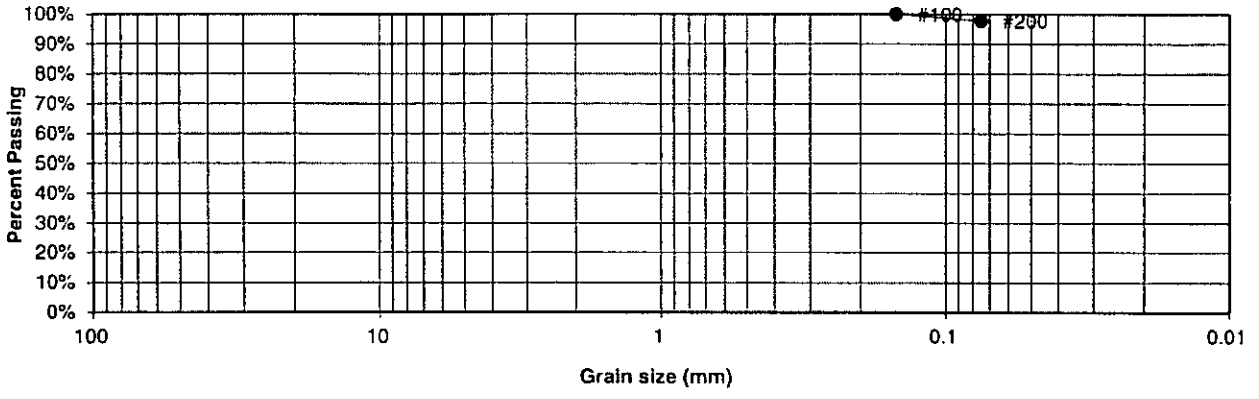
*- Conditions that will require an engineered OWTS

160533

B-1

BORING NO.	TP-5	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	6.5-9'	AASHTO CLASSIFICATION		JOB NO.	160533
CLIENT	WILLIAM GUMAN & ASSOC.				
PROJECT	JUDGE ORR ROAD RV PARK				

Sieve Analysis
Grain Size Distribution



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

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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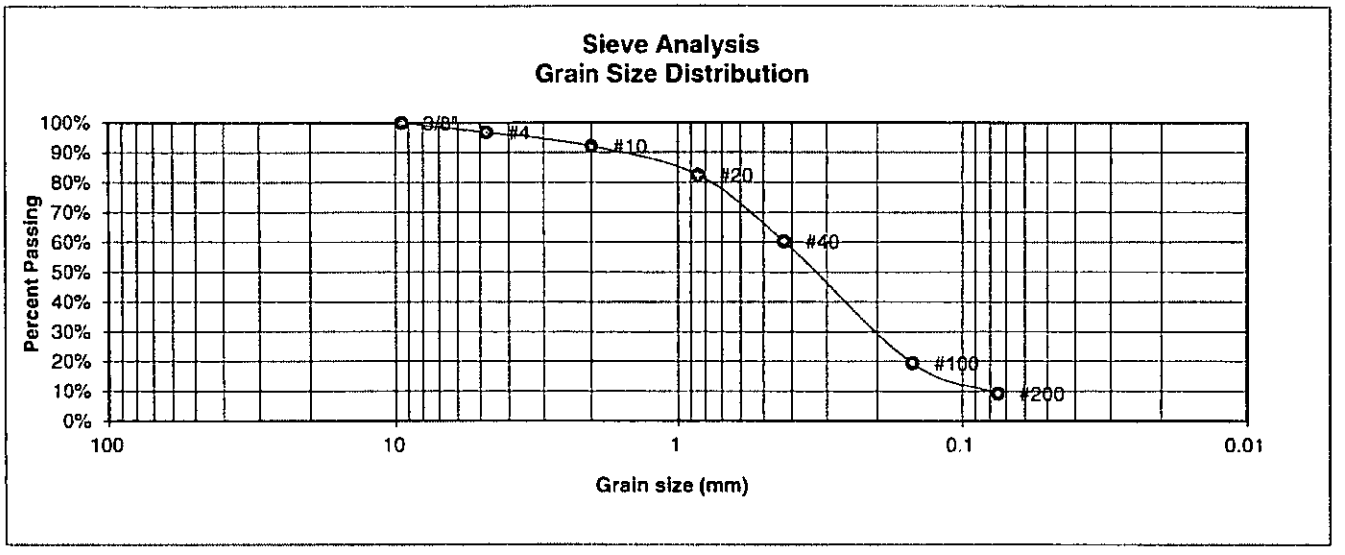
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: SCC	DATE: 8/16/17

JOB NO.: 160533
FIG NO.: B-2

BORING NO.	TP-7	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	8-10'	AASHTO CLASSIFICATION		JOB NO.	160533
CLIENT	WILLIAM GUMAN & ASSOC.				
PROJECT	JUDGE ORR ROAD RV PARK				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.8%
10	92.1%
20	82.5%
40	60.3%
100	19.4%
200	9.2%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
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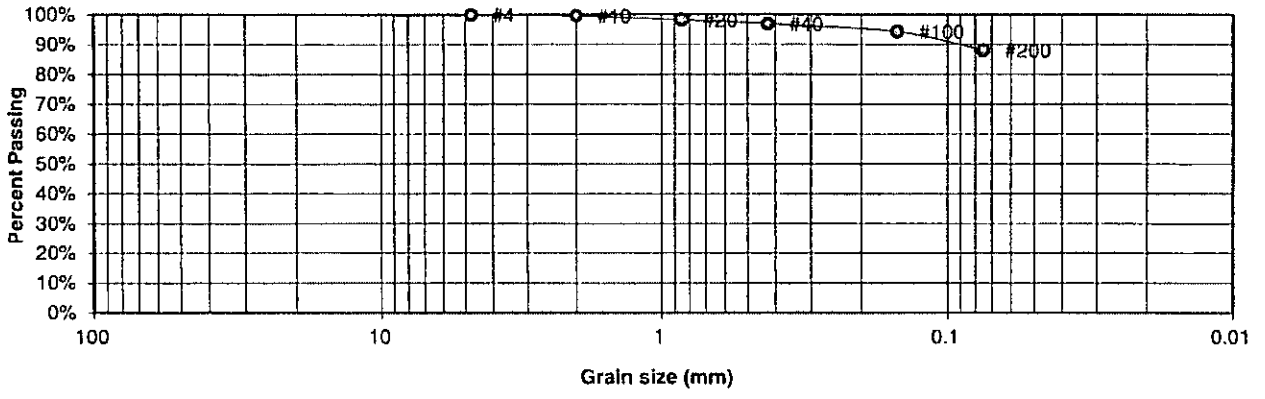
JOB NO.: 160533
FIG NO.: B-3

BORING NO.	TP-9	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	5-6'	AASHTO CLASSIFICATION		JOB NO.	160533
CLIENT	WILLIAM GUMAN & ASSOC.				
PROJECT	JUDGE ORR ROAD RV PARK				

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	98.2%
40	96.9%
100	94.3%
200	88.0%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: SCC	DATE: 8/16/17

JOB NO.: 160533
FIG NO.: B-4