



Image Attachment

ADVANCED TERRA TESTING

CLIENT	Yeh & Associates	BORING NO.	B1-12
JOB NO.	2546-97	DEPTH	40
PROJECT	ES US 550 S. / 160 Contractor	SAMPLE NO.	
PROJECT NO.	217-376	DATE SAMPLED	
LOCATION	--	DESCRIPTION	



NOTES

File name: 2546_97_Image_18_03_23_08_09_00

Appendix E.3 – Wildlife and Livestock Crossings - Laboratory Test Results



YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 217-376

Project Name: 22420: US 550 S Connection to US 160 Wildlife and Livestock Crossings

Date: 7/10/2018

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION			
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS		
A-01	bulk	0-9.5	13.1		106.1	19.2	0	20	80	42	21	21								A-7-6 (17)	CL		
A-01	MC	9.5	12.2	104.4														7063					
A-01	bulk	10.5-14.5	10.5				0	17	83	40	17	23									A-6 (18)	CL	
A-01	MC	29.5	8.7	89.2			0	22	78	28	19	9										A-4 (5)	CL
A-01	bulk	48.5-53.5	0.6				30	66	4	NV	NP	NP										A-1-a (0)	SP
A-02	MC	19.5	13.1	85.2			0	11	89	39	24	15				-3.4						A-6 (14)	CL
A-02	bulk	30-32	6.6				5	71	24	NV	NP	NP	8.5	ND	0.0011		3500					A-2-4 (0)	SM
A-02	bulk	59.5-64.5	0.4				25	71	4	NV	NP	NP										A-1-a (0)	SP
A-03	MC	4.5	11.7	113.0																		8357	
A-03	bulk	5.5-9.5	11.0				0	19	81	43	20	23										A-7-6 (18)	CL
A-03	bulk	29.5-34.5	7.5				1	56	43	26	22	4										A-4 (0)	SM
WX-01	SS	9.5	8.9				0	12	88	32	19	13										A-6 (11)	CL
WX-01	bulk	19-24	11.3				0	19	81	29	15	14										A-6 (9)	CL
WX-01	SS	29	13.1				0	39	61	NV	NP	NP										A-4 (0)	ML
WX-02	MC	19	17.2	109.3												-0.1							
WX-02	bulk	34-39	3.5				56	34	10	NV	NP	NP										A-1-a (0)	GP-GM
WX-03	MC	9	19.3	106.2			0	6	94	34	16	18										A-6 (16)	CL
WX-03	MC	19	17.8	109.5																			

bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity



YEH & ASSOCIATES, INC

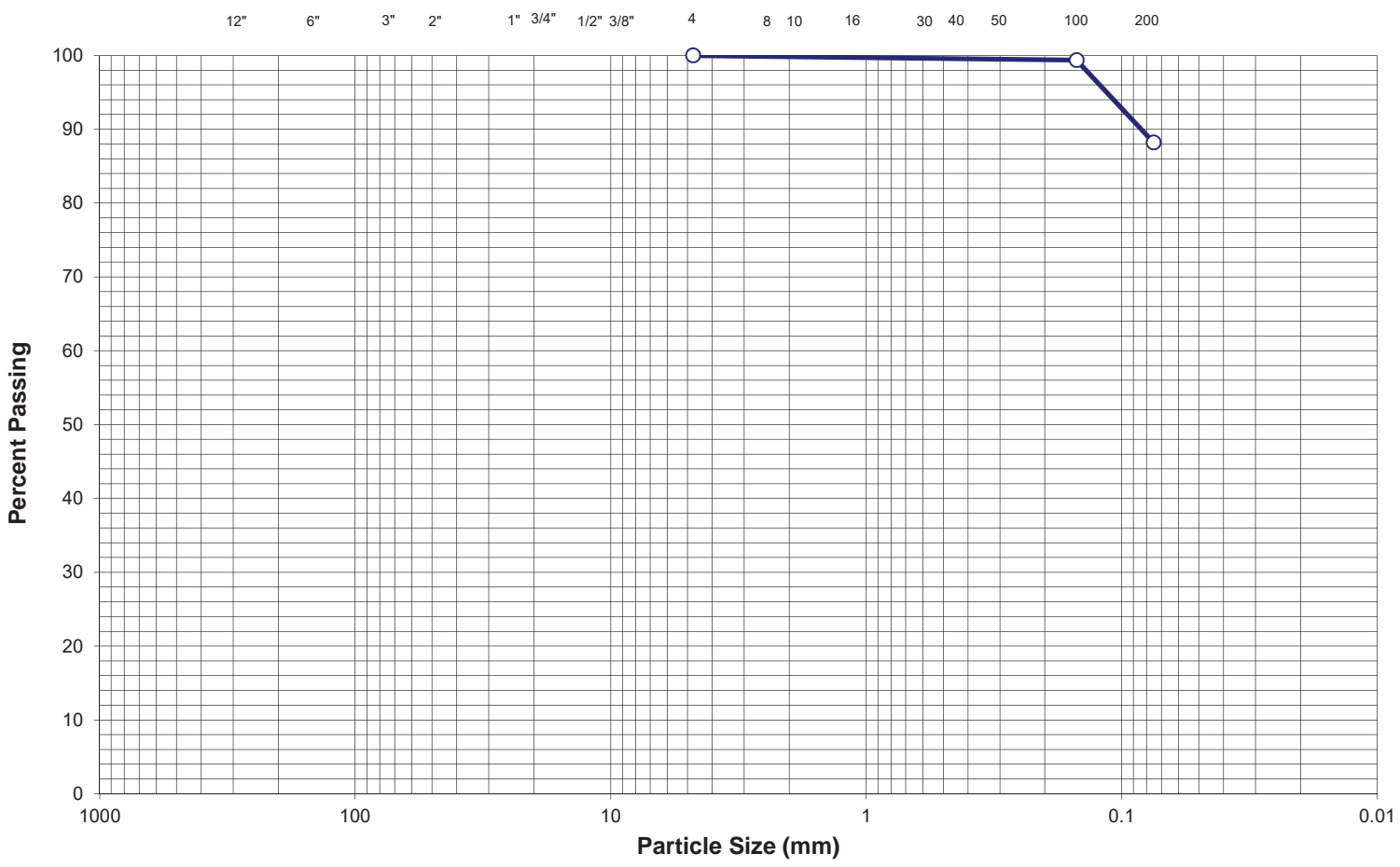
Summary of Laboratory Test Results

Project No: 217-376 Project Name: 22420: US 550 S Connection to US 160 Wildlife and Livestock Crossings Date: 7/10/2018


Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION	
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS
WX-04	MC	14	11.2	111.4												0.3					
WX-04	bulk	24-29	3.7				44	42	14	NV	NP	NP								A-1-a (0)	GM
WX2-01	bulk	8-13	19.2				0	8	92	40	12	28	8.6	0.024	0.0054		1100			A-6 (25)	CL
WX2-01	MC	13	17.3	105.9																	
WX2-02	bulk	8-13	19.7				0	20	80	47	16	31								A-7-6 (24)	CL
WX2-03	MC	13	15.7	106.8																	
WX2-03	SS	23	5.1				22	64	14	NV	NP	NP								A-1-b (0)	SM
WX2-04	MC	8	16.3	111.4																	
WX2-04	MC	13	17.3	111.3																	
WX2-04	bulk	18-23	5.2				33	52	15	NV	NP	NP								A-1-b (0)	SM

bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity

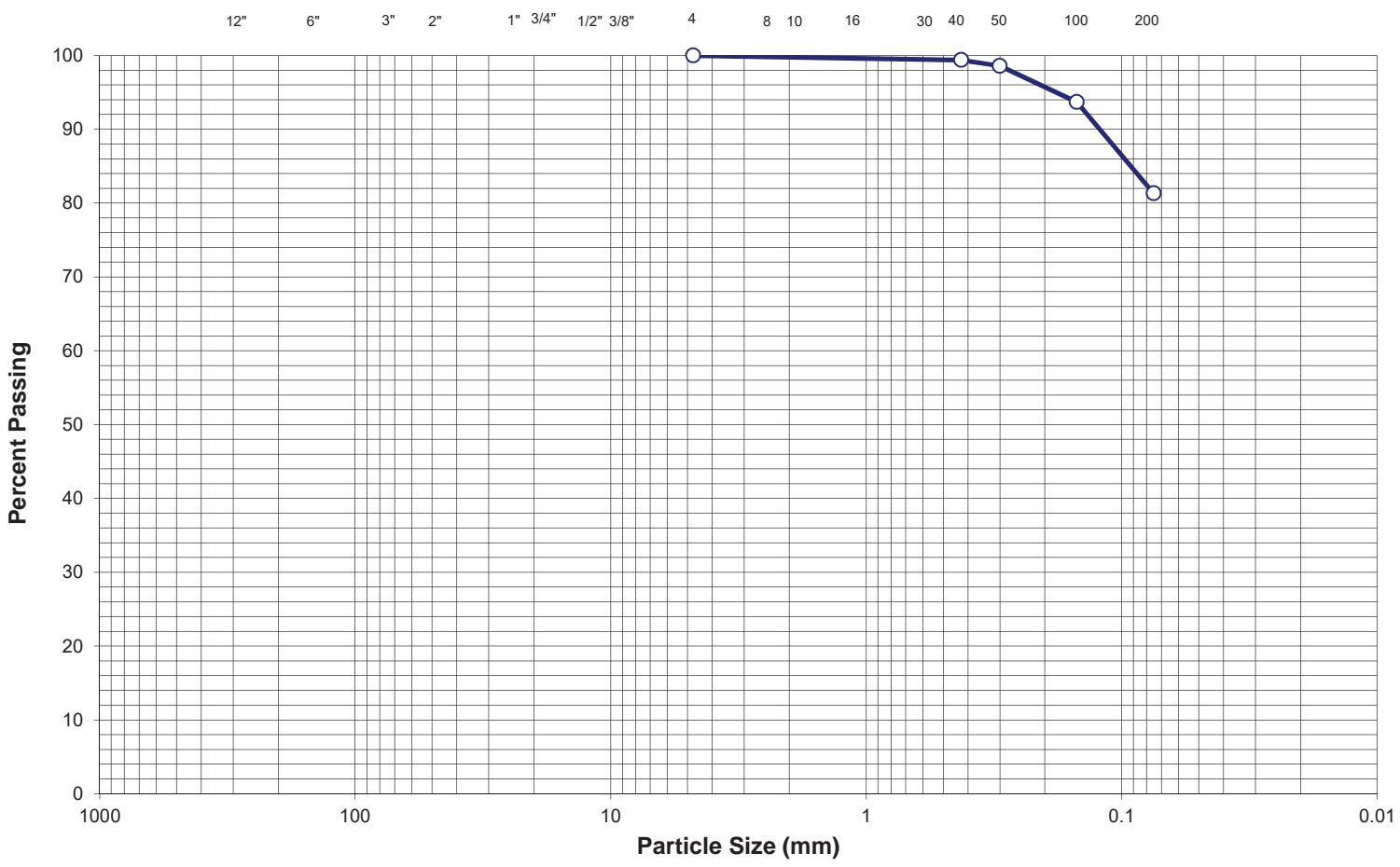
Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm



Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
#4	100
#10	-
#40	-
#100	99
#200	88.2

Gravel (%)	0	LL	32	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	12	PL	19	Boring:	WX-01	
Fines (%)	88	PI	13	Sample Depth (ft):	9	
Sample Classification:	Medium plasticity CLAY, brown	USCS:	CL	AASHTO:	A-6 (11)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/21/18
						Project No.: 217-376 Figure No.: -

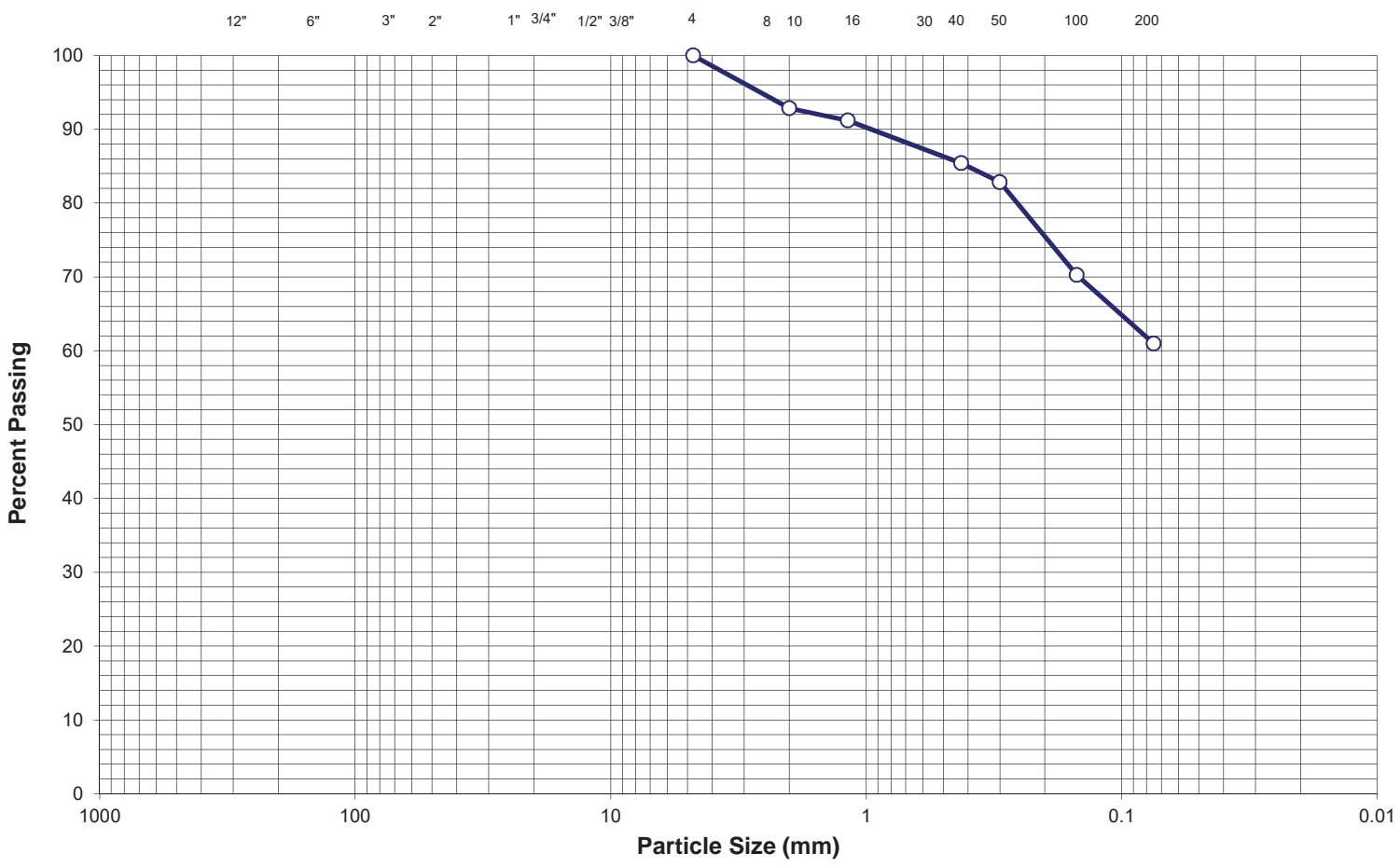
Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	-
#40	99
#200	81.3

Gravel (%)	0	LL	29	Project Name:	US 550 S / US 160 Connector	
Sand (%)	19	PL	15	Boring:	WX-01	
Fines (%)	81	PI	14	Sample Depth (ft):	19-24	
Sample Classification:	Medium plasticity CLAY w/ sand	USCS:	CL	AASHTO:	A-6 (9)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/21/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

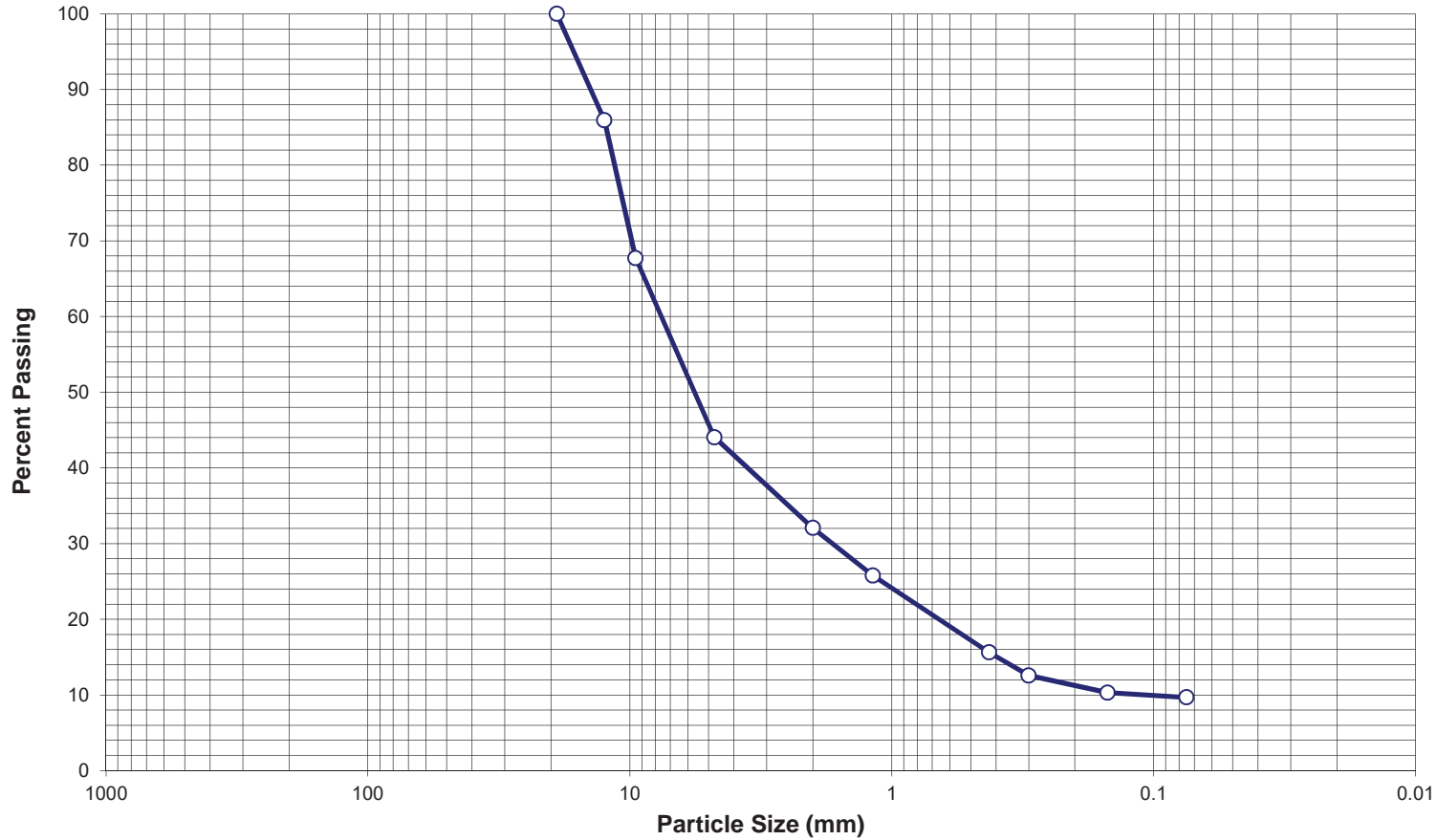


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	93
#40	85
#200	61.0


Gravel (%)	0	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	39	PL	NP	Boring:	WX-01	
Fines (%)	61	PI	NP	Sample Depth (ft):	29	
Sample Classification:	Sandy SILT, brown	USCS:	ML	AASHTO:	A-4 (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/21/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

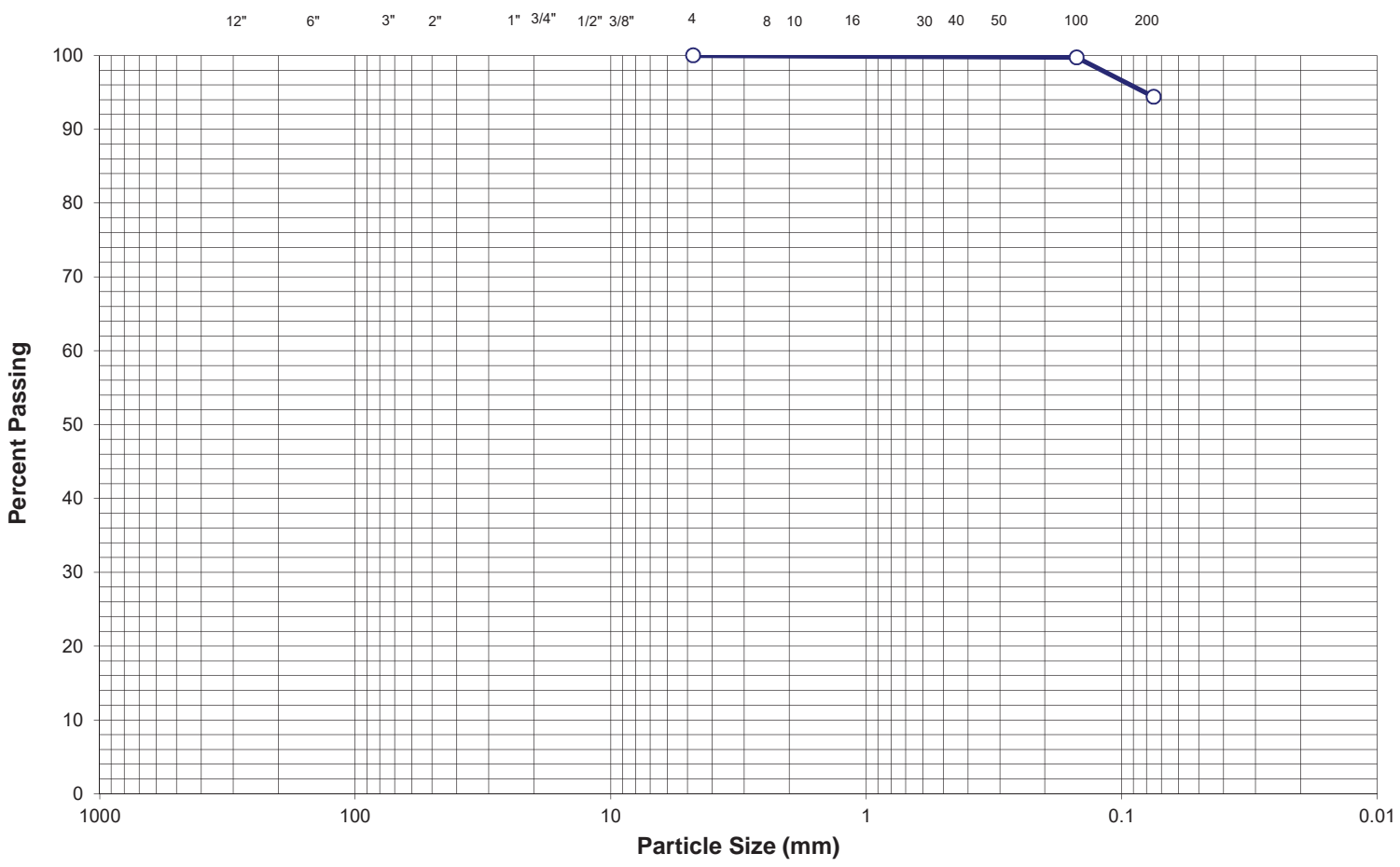
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200



Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	86
3/8"	68
#4	44
#10	32
#40	16
#200	9.7

Gravel (%)	56	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	34	PL	NP	Boring:	WX-02	
Fines (%)	10	PI	NP	Sample Depth (ft):	34-39	
Sample Classification:	Poorly graded GRAVEL w/ sand	USCS:	GP-GM	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/21/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

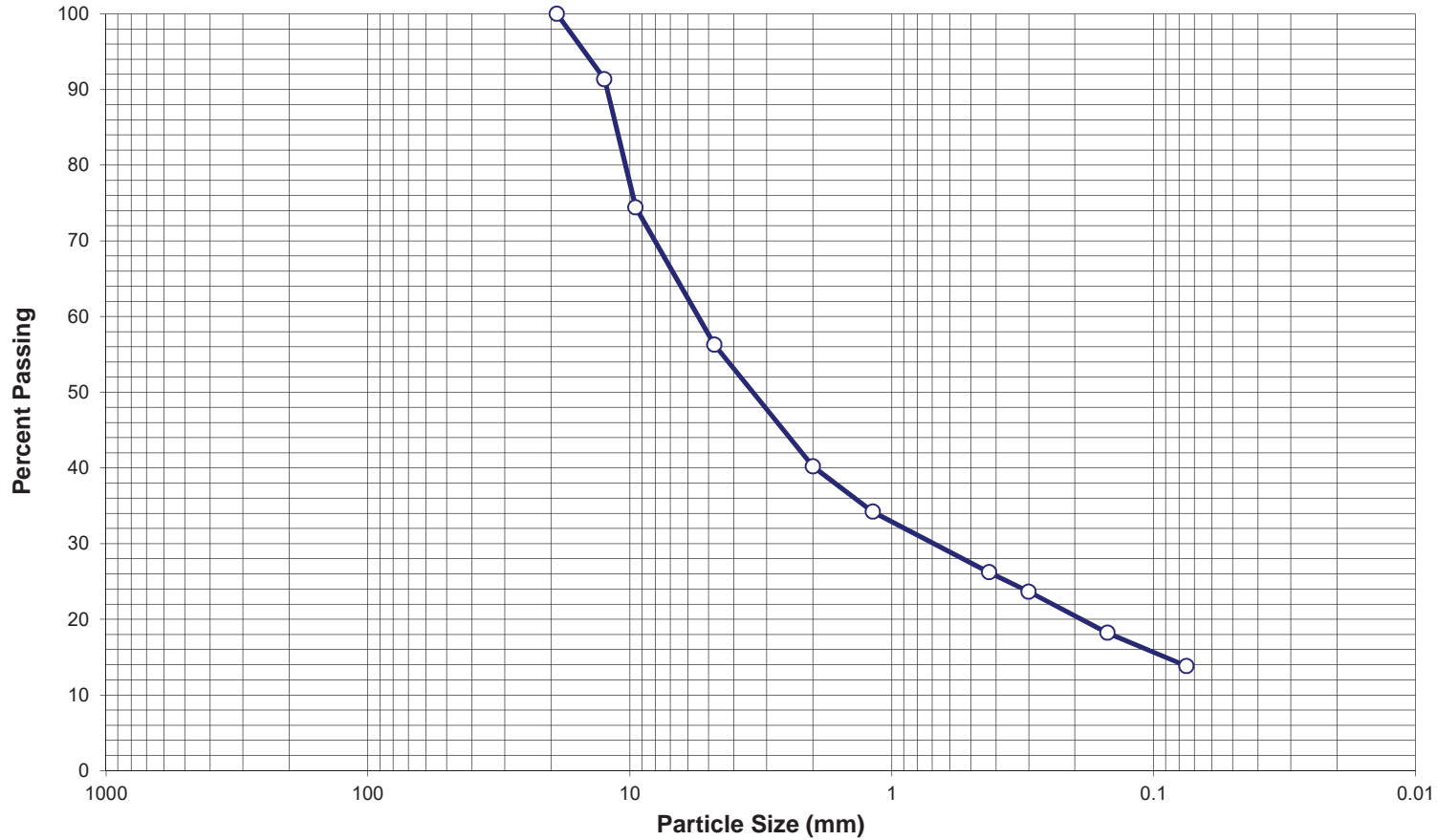


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	-
#40	-
#200	94.4


Gravel (%)	0	LL	34	Project Name:	US 550 S / US 160 Connector		
Sand (%)	6	PL	16	Boring:	WX-03		
Fines (%)	94	PI	18	Sample Depth (ft):	9		
Sample Classification:	Medium plasticity CLAY, dark brown	USCS:	CL	AASHTO:	A-6 (16)	<p align="center">SIEVE ANALYSIS</p>	
				Drawn By:	KM	Project No.:	217-376
				Checked By:	BB	Figure No.:	-
				Date:	02/20/18		

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

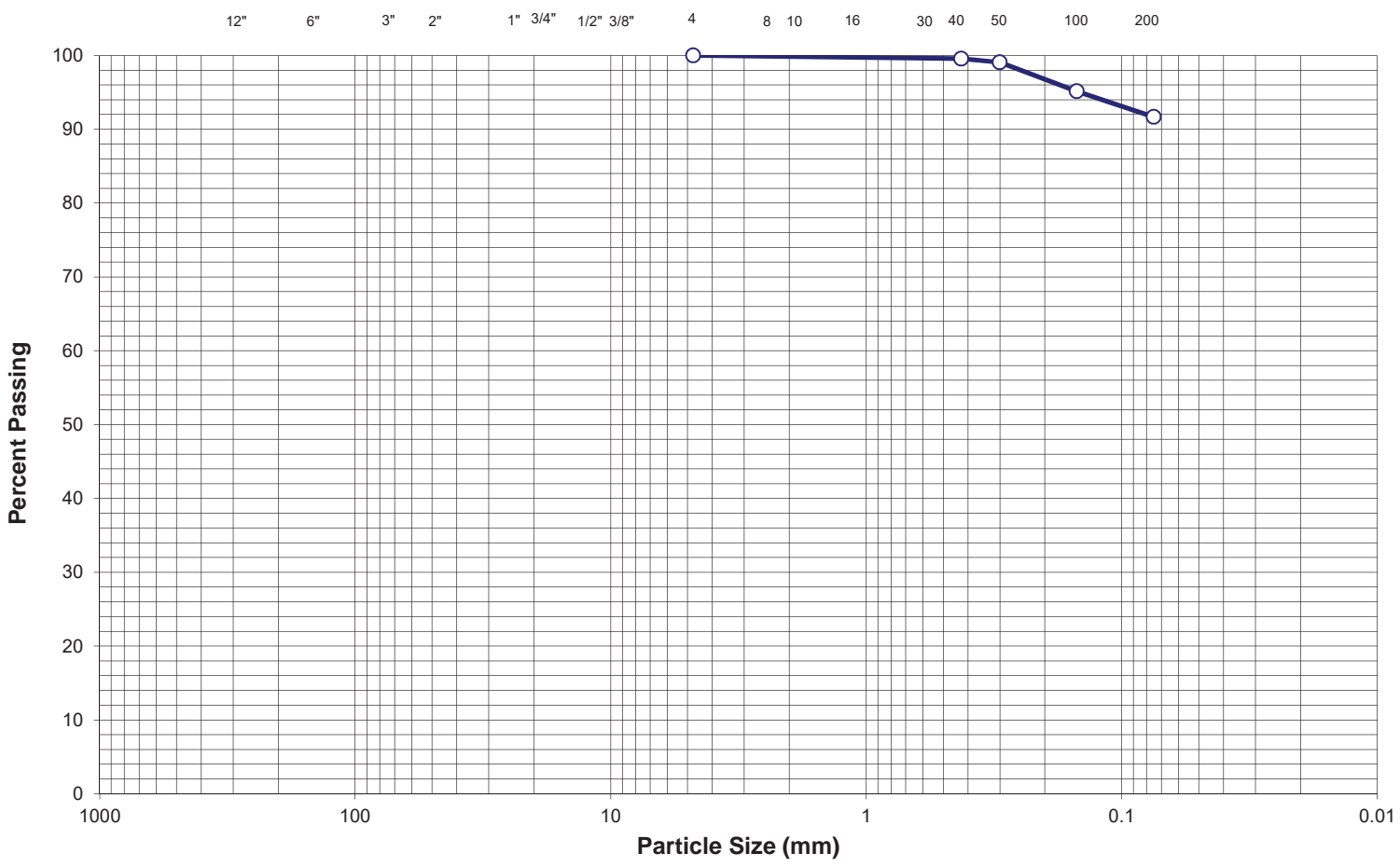
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200



Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	91
3/8"	74
#4	56
#10	40
#40	26
#200	13.8

Gravel (%)	44	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	42	PL	NP	Boring:	WX-04	
Fines (%)	14	PI	NP	Sample Depth (ft):	24-29	
Sample Classification:	Silty GRAVEL w/ sand	USCS:	GM	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/21/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

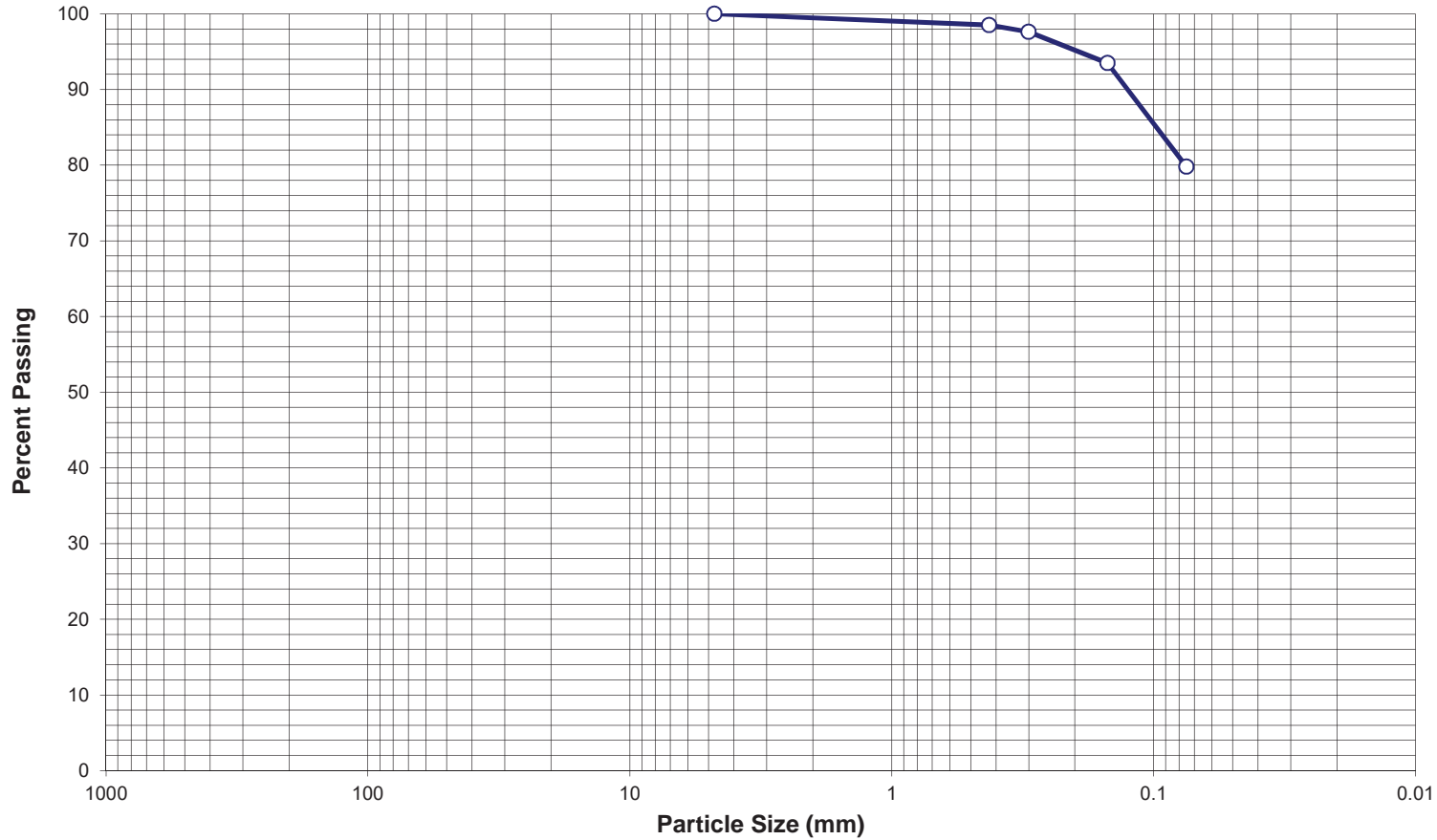


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	-
#40	100
#200	91.7


Gravel (%)	0	LL	40	Project Name:	US 550 S / US 160 Connector	
Sand (%)	8	PL	12	Boring:	WX2-01	
Fines (%)	92	PI	28	Sample Depth (ft):	8-13	
Sample Classification:	Medium plasticity CLAY, trace sand	USCS:	CL	AASHTO:	A-6 (25)	<p align="center">SIEVE ANALYSIS</p> <p>Drawn By: KM Checked By: BB Date: 05/04/18</p>
						<p>Project No.: 217-376</p> <p>Figure No.: -</p>

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

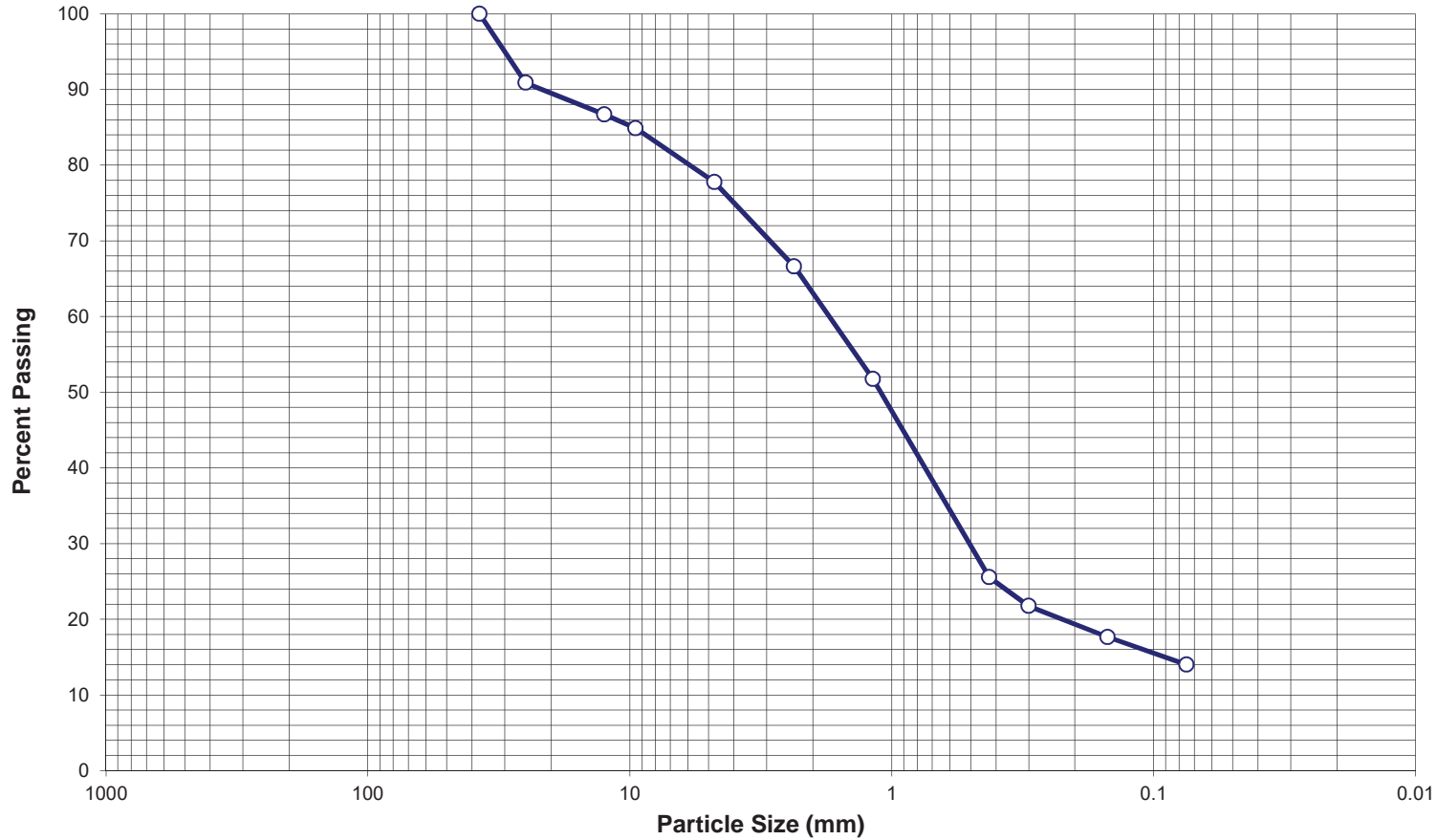


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	-
#40	99
#200	79.8


Gravel (%)	0	LL	47	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	20	PL	16	Boring:	WX2-02	
Fines (%)	80	PI	31	Sample Depth (ft):	8-13	
Sample Classification:	Medium plasticity Clay with some sand	USCS:	CL	AASHTO:	A-7-6 (24)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 05/04/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

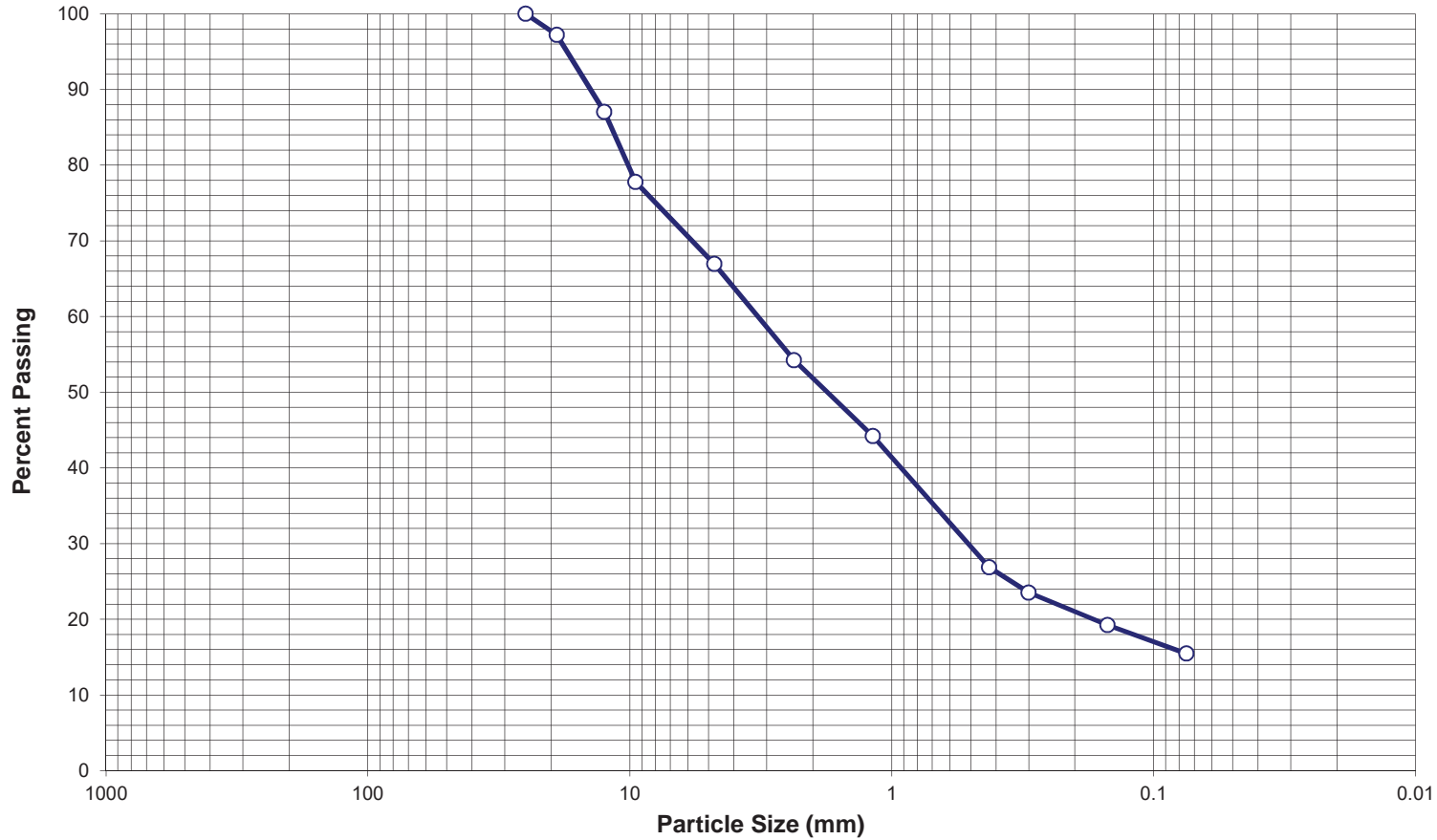


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	100
1"	91
3/4"	-
1/2"	87
3/8"	85
#4	78
#10	67
#40	26
#200	14.0


Gravel (%)	22	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	64	PL	NP	Boring:	WX2-03	
Fines (%)	14	PI	NP	Sample Depth (ft):	23	
Sample Classification:	silty SAND with some gravel		USCS:	AASHTO:		Drawn By: KM Checked By: BB Date: 05/04/18
		SM		A-1-b (0)		Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

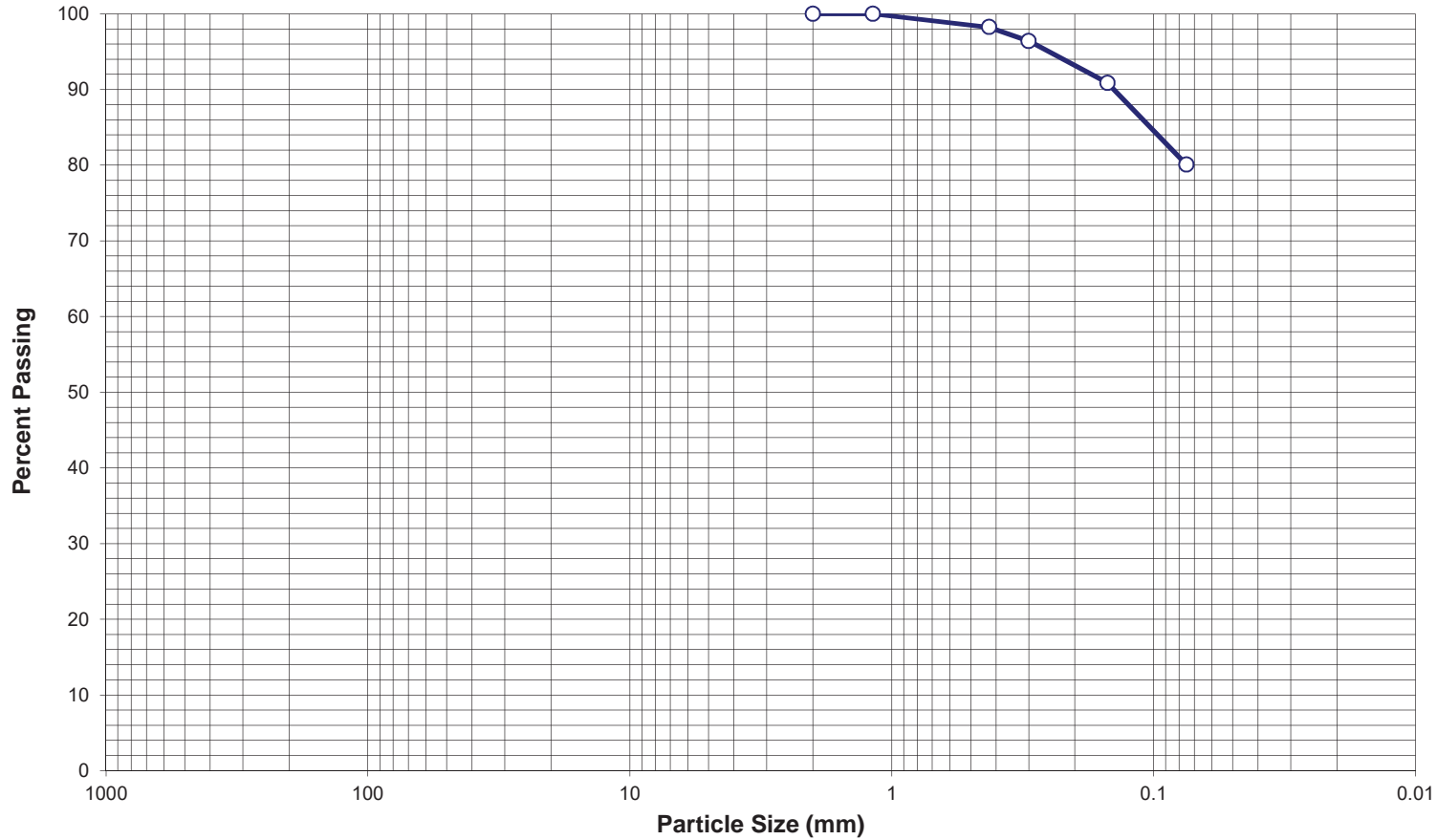


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	100
3/4"	97
1/2"	87
3/8"	78
#4	67
#10	54
#40	27
#200	15.5


Gravel (%)	33	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants												
Sand (%)	52	PL	NP	Boring:	WX2-04													
Fines (%)	15	PI	NP	Sample Depth (ft):	18-23													
Sample Classification:	silty SAND with some gravel		USCS:	AASHTO:		<table border="1"> <tr> <td>Drawn By:</td> <td>KM</td> <td>Project No.:</td> <td>217-376</td> </tr> <tr> <td>Checked By:</td> <td>BB</td> <td>Figure No.:</td> <td>-</td> </tr> <tr> <td>Date:</td> <td>05/04/18</td> <td></td> <td></td> </tr> </table>	Drawn By:	KM	Project No.:	217-376	Checked By:	BB	Figure No.:	-	Date:	05/04/18		
Drawn By:	KM	Project No.:	217-376															
Checked By:	BB	Figure No.:	-															
Date:	05/04/18																	
		SM	A-1-b (0)															

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

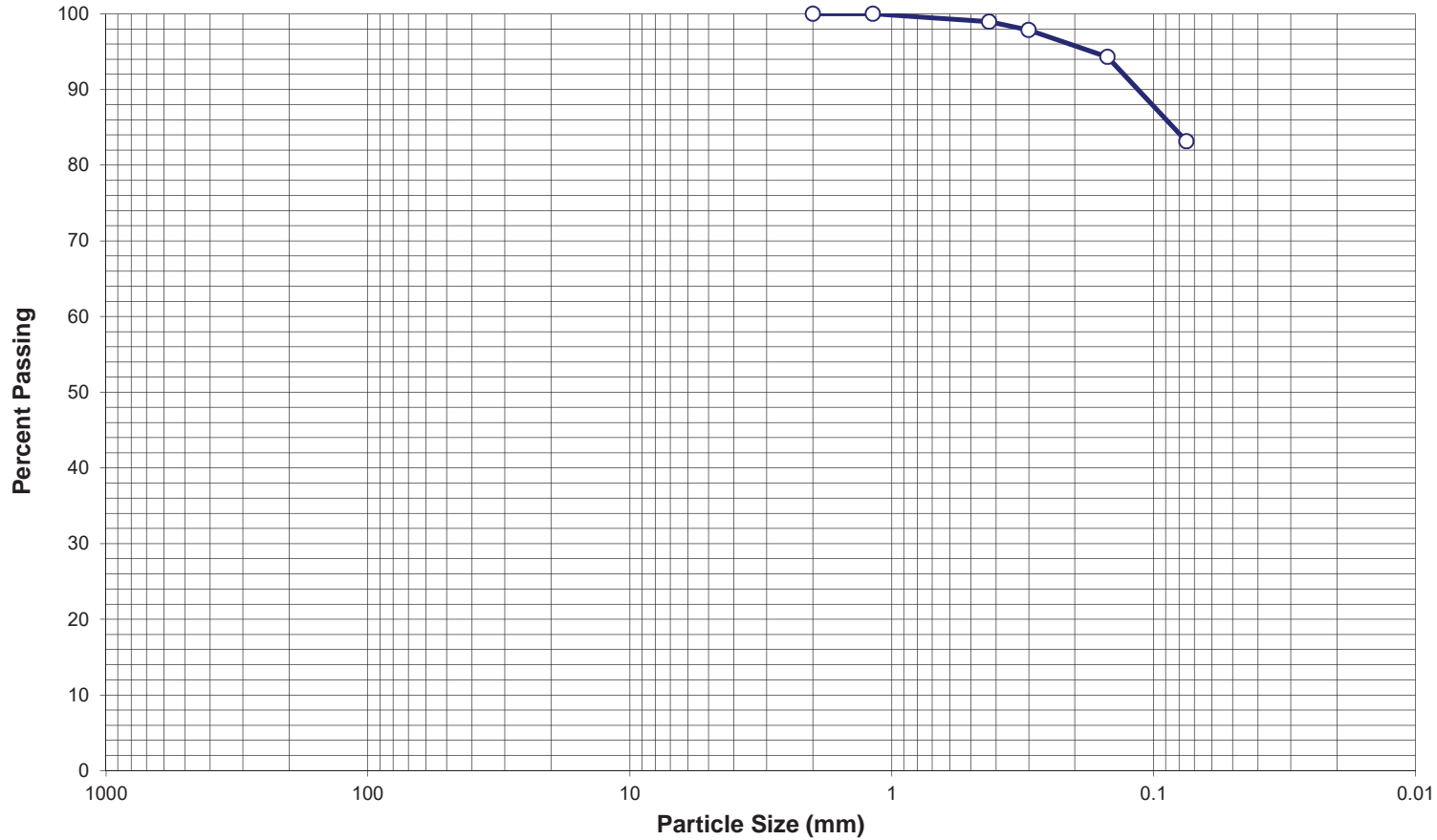


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	98
#200	80.1


Gravel (%)	0	LL	42	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	20	PL	21	Boring:	A-01	
Fines (%)	80	PI	21	Sample Depth (ft):	0-9.5	
Sample Classification:	sandy CLAY	USCS:	CL	AASHTO:	A-7-6 (17)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 12/28/17
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

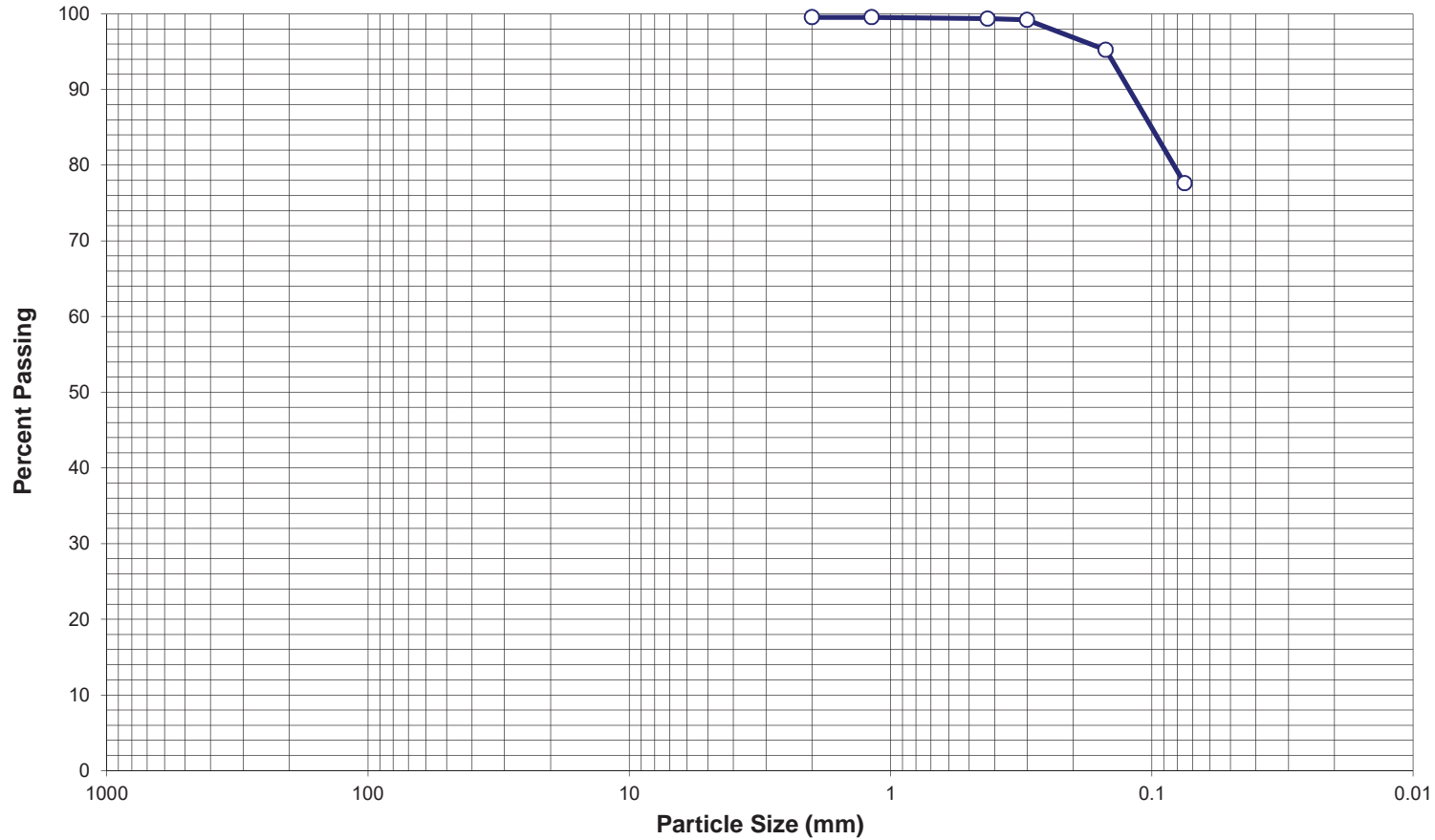


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	-
#10	100
#40	99
#200	83.2


Gravel (%)	0	LL	40	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	17	PL	17	Boring:	A-01	
Fines (%)	83	PI	23	Sample Depth (ft):	9.5-14.5	
Sample Classification:	sandy CLAY		USCS:	AASHTO:		SIEVE ANALYSIS Drawn By: KM Checked By: LQ Date: 12/19/17
		CL	A-6 (18)		Project No.: 217-376 Figure No.: -	

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

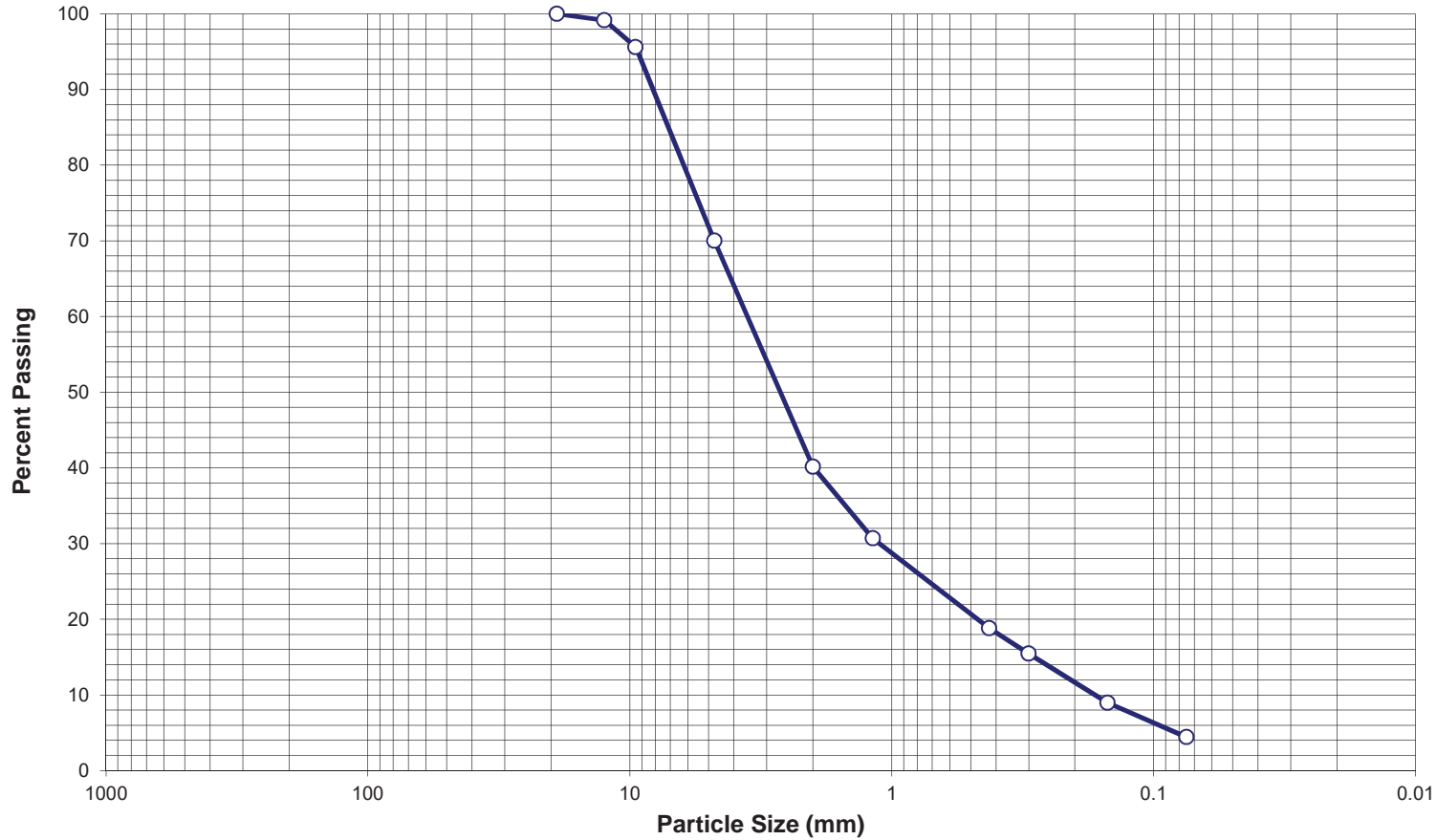


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	100
#4	100
#10	100
#40	99
#200	77.6


Gravel (%)	0	LL	28	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	22	PL	19	Boring:	A-01	
Fines (%)	78	PI	9	Sample Depth (ft):	29.5	
Sample Classification:	sandy CLAY	USCS:	CL	AASHTO:	A-4 (5)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 12/28/17
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

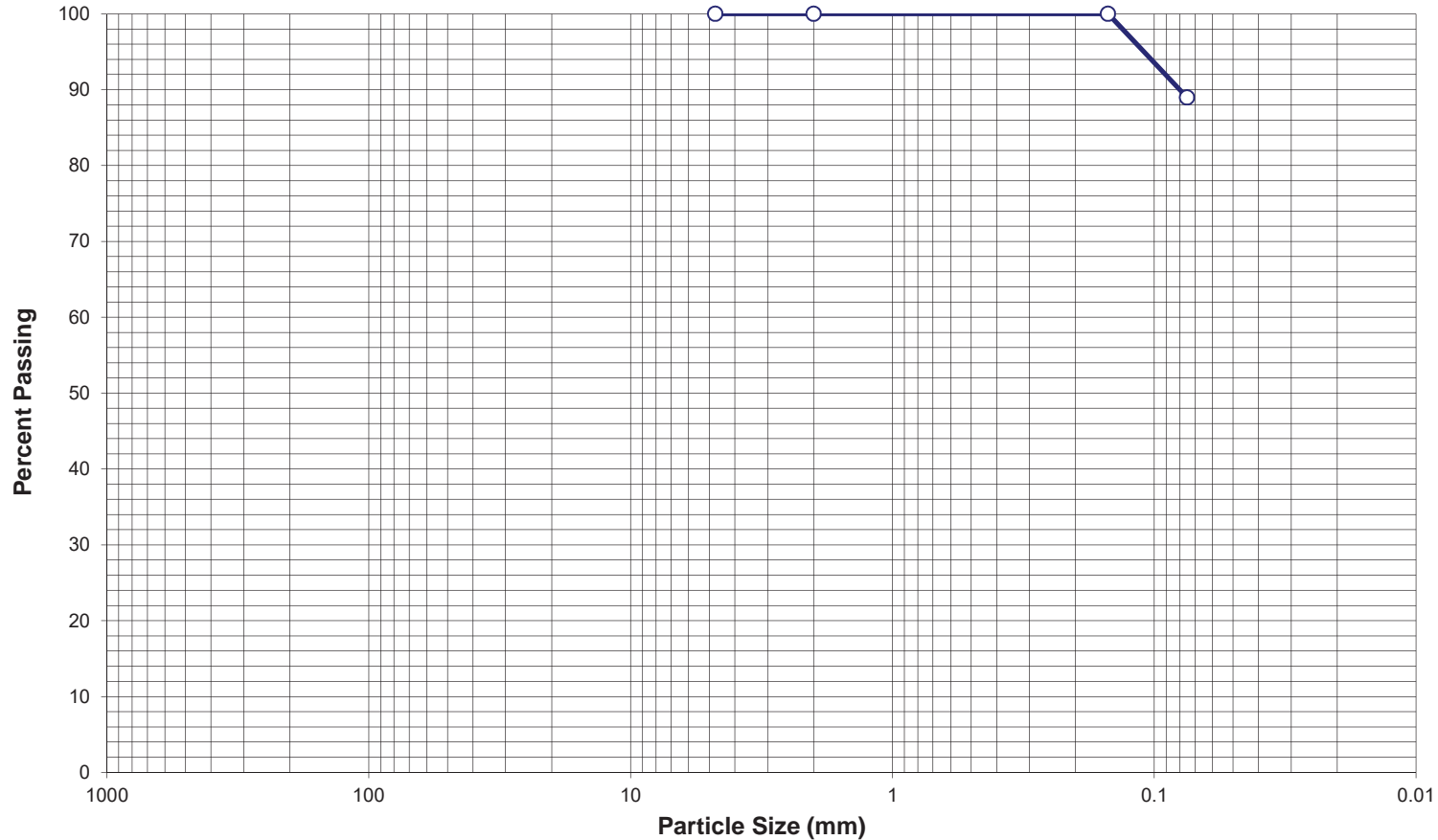


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	99
3/8"	96
#4	70
#10	40
#40	19
#200	4.4


Gravel (%)	30	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	66	PL	NP	Boring:	A-01	
Fines (%)	4	PI	NP	Sample Depth (ft):	48.5-53.5	
Sample Classification:	Poorly graded SAND w/ gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 12/11/17
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

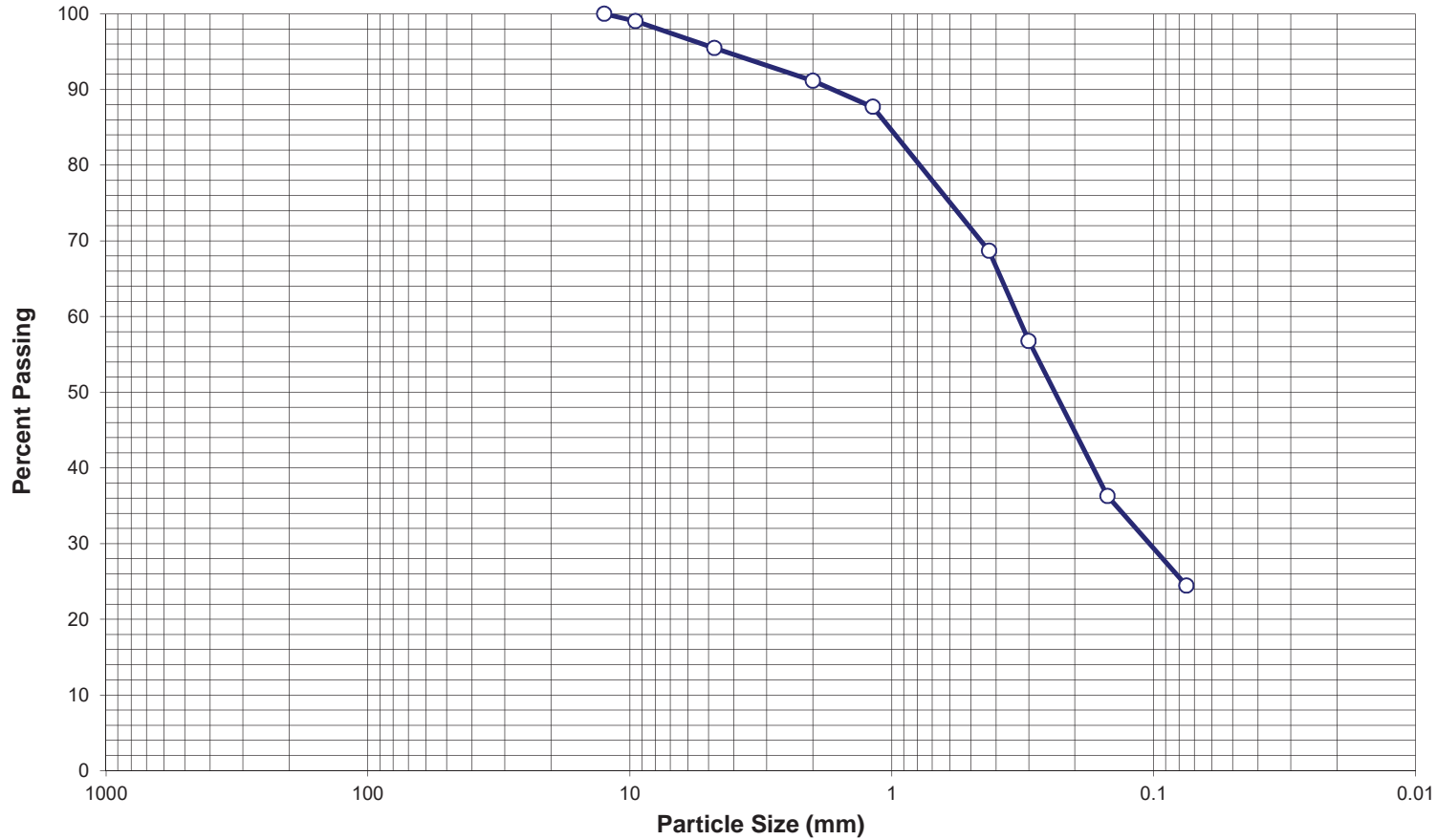


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	-
#40	-
#200	89.0


Gravel (%)	0	LL	39	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	11	PL	24	Boring:	A-02	
Fines (%)	89	PI	15	Sample Depth (ft):	19.5	
Sample Classification:	Clay, trace sand	USCS:	CL	AASHTO:	A-6 (14)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 12/13/17
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

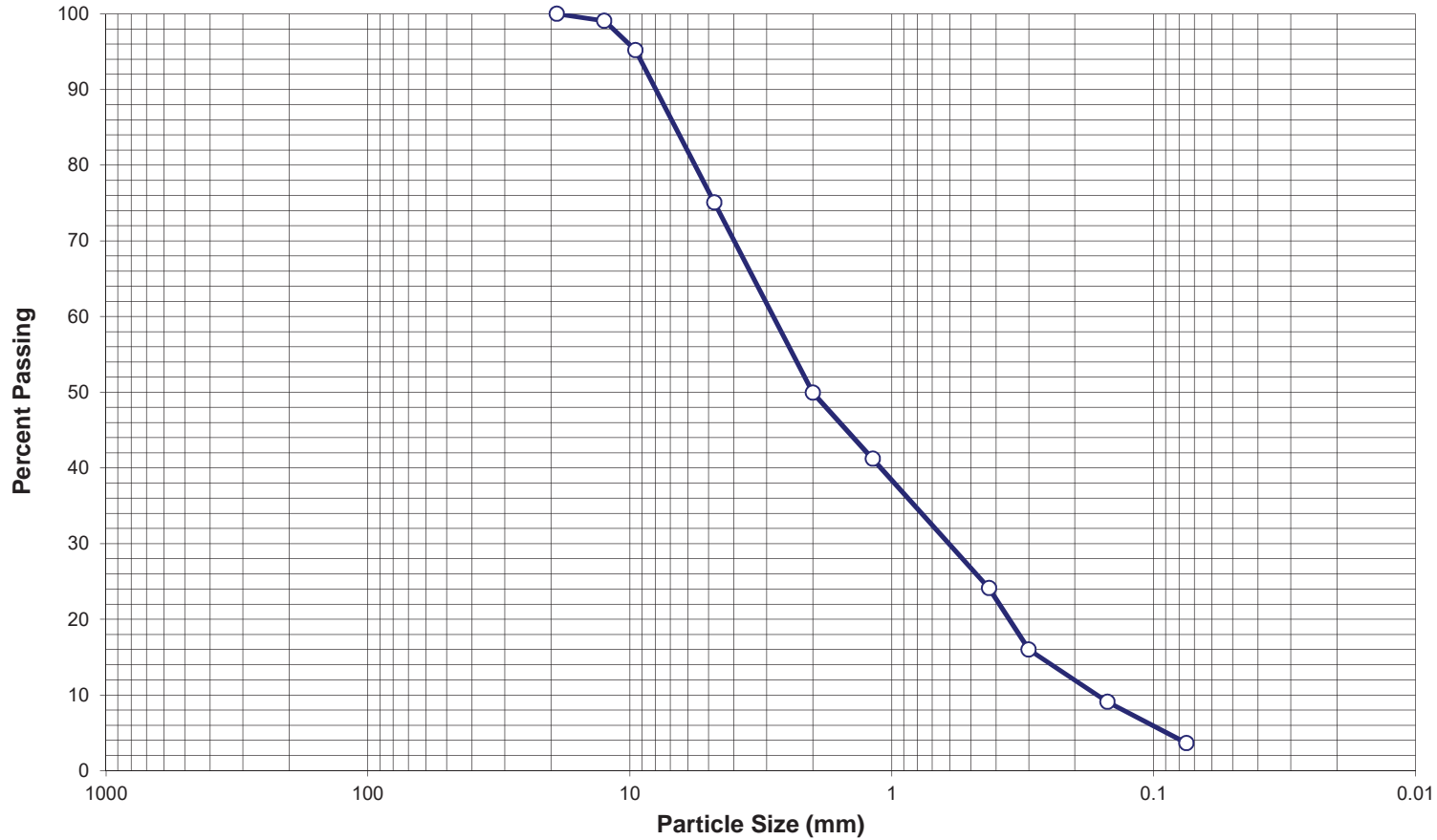


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	100
3/8"	99
#4	95
#10	91
#40	69
#200	24.5


Gravel (%)	5	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	71	PL	NP	Boring:	A-02	
Fines (%)	24	PI	NP	Sample Depth (ft):	30-32	
Sample Classification:	Silty SAND, trace gravel	USCS:	SM	AASHTO:	A-2-4 (0)	SIEVE ANALYSIS Drawn By: KM Checked By: AH Date: 12/13/17
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

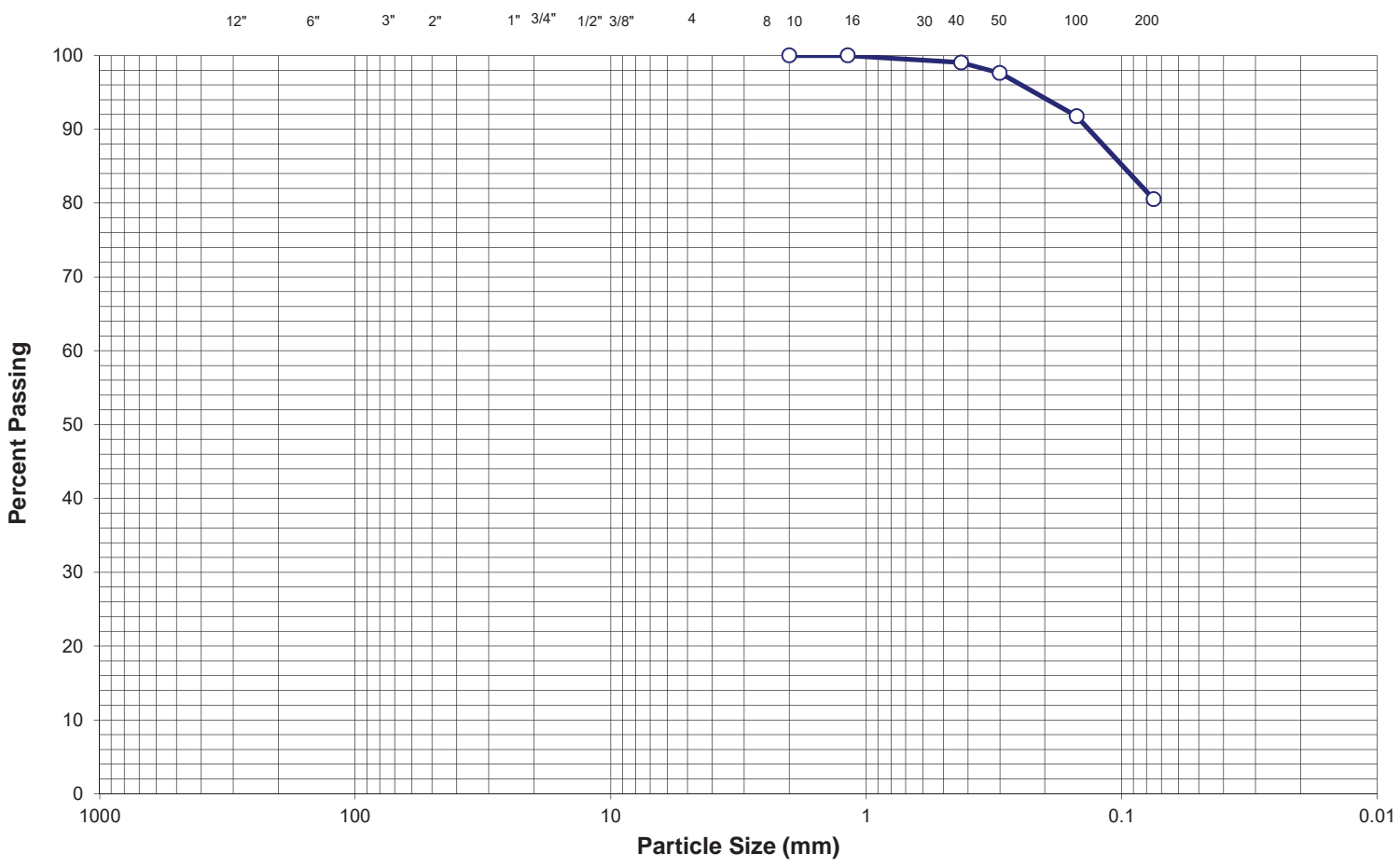
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	99
3/8"	95
#4	75
#10	50
#40	24
#200	3.6

Gravel (%)	25	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	71	PL	NP	Bornig:	A-02	
Fines (%)	4	PI	NP	Sample Depth (ft):	59.5-64.5	
Sample Classification:	Poorly graded SAND w/gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: LQ Date: 12/11/17
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

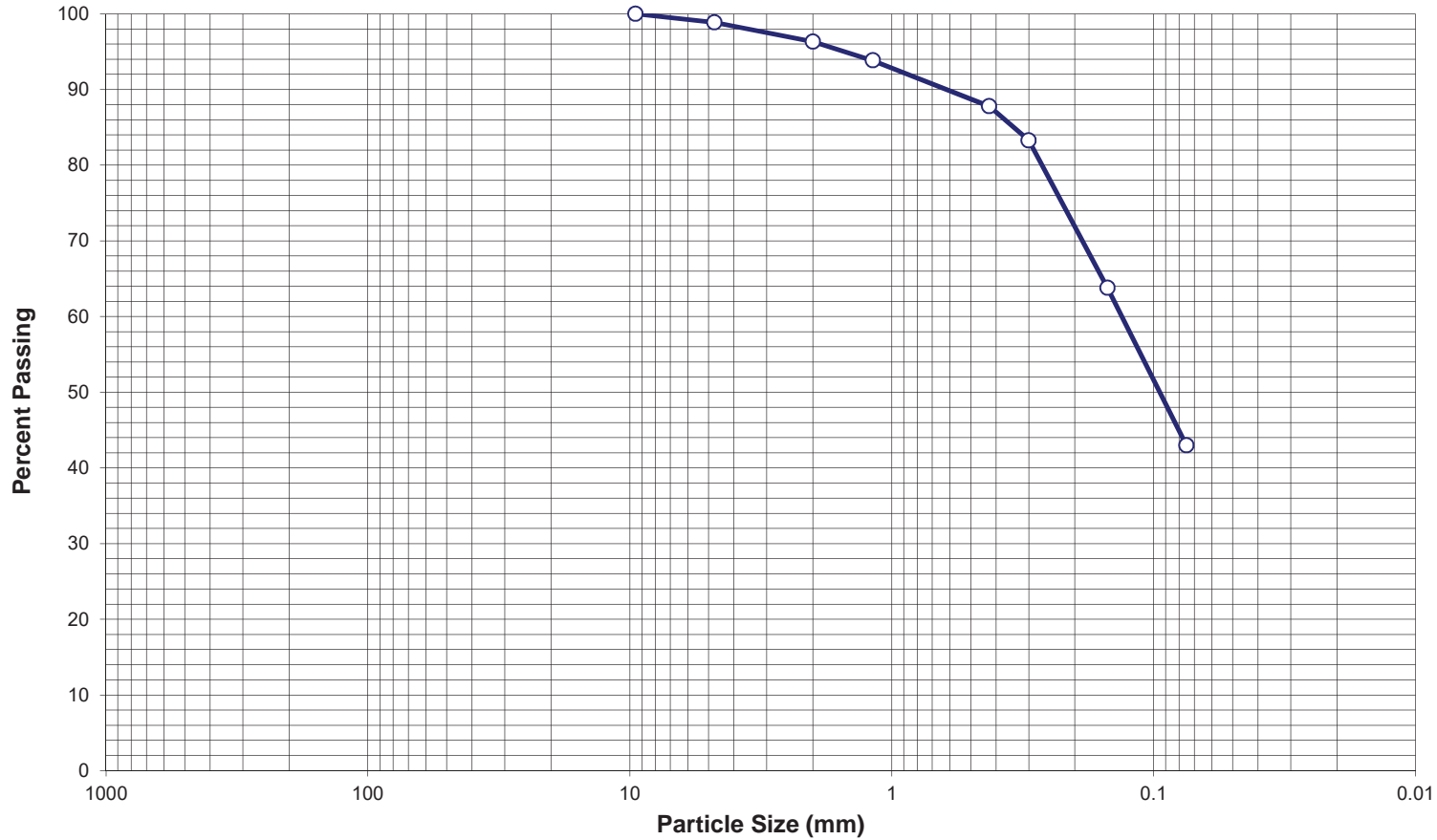


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	99
#200	80.5


Gravel (%)	0	LL	43	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants												
Sand (%)	19	PL	20	Boring:	A-03													
Fines (%)	81	PI	23	Sample Depth (ft):	4.5-9.5													
Sample Classification:	sandy CLAY		USCS:	AASHTO:		<table border="1"> <tr> <td>Drawn By:</td> <td>KM</td> <td>Project No.:</td> <td>217-376</td> </tr> <tr> <td>Checked By:</td> <td>BB</td> <td>Figure No.:</td> <td>-</td> </tr> <tr> <td>Date:</td> <td>12/27/17</td> <td></td> <td></td> </tr> </table>	Drawn By:	KM	Project No.:	217-376	Checked By:	BB	Figure No.:	-	Date:	12/27/17		
Drawn By:	KM	Project No.:	217-376															
Checked By:	BB	Figure No.:	-															
Date:	12/27/17																	
		CL		A-7-6 (18)														

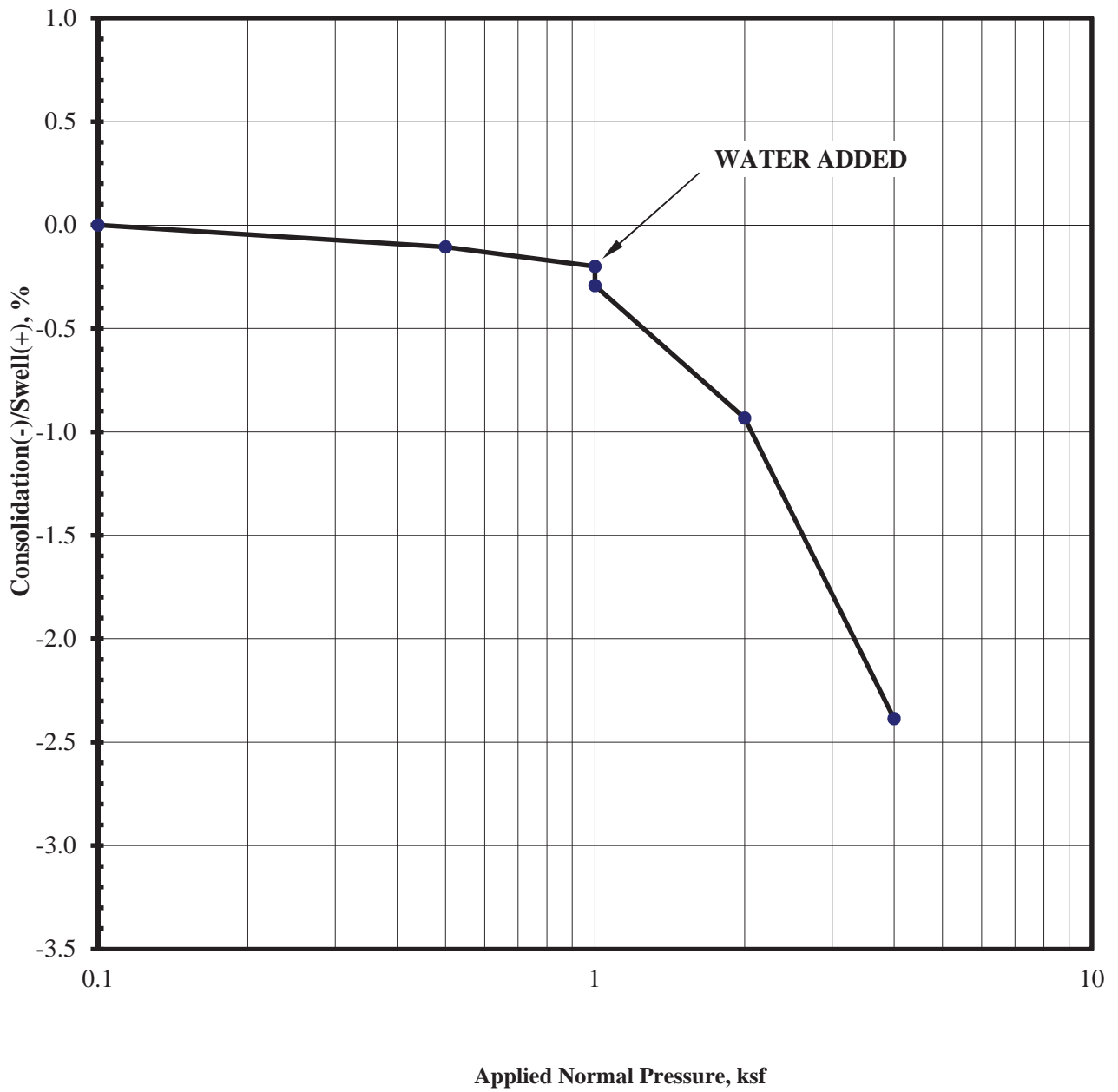
Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

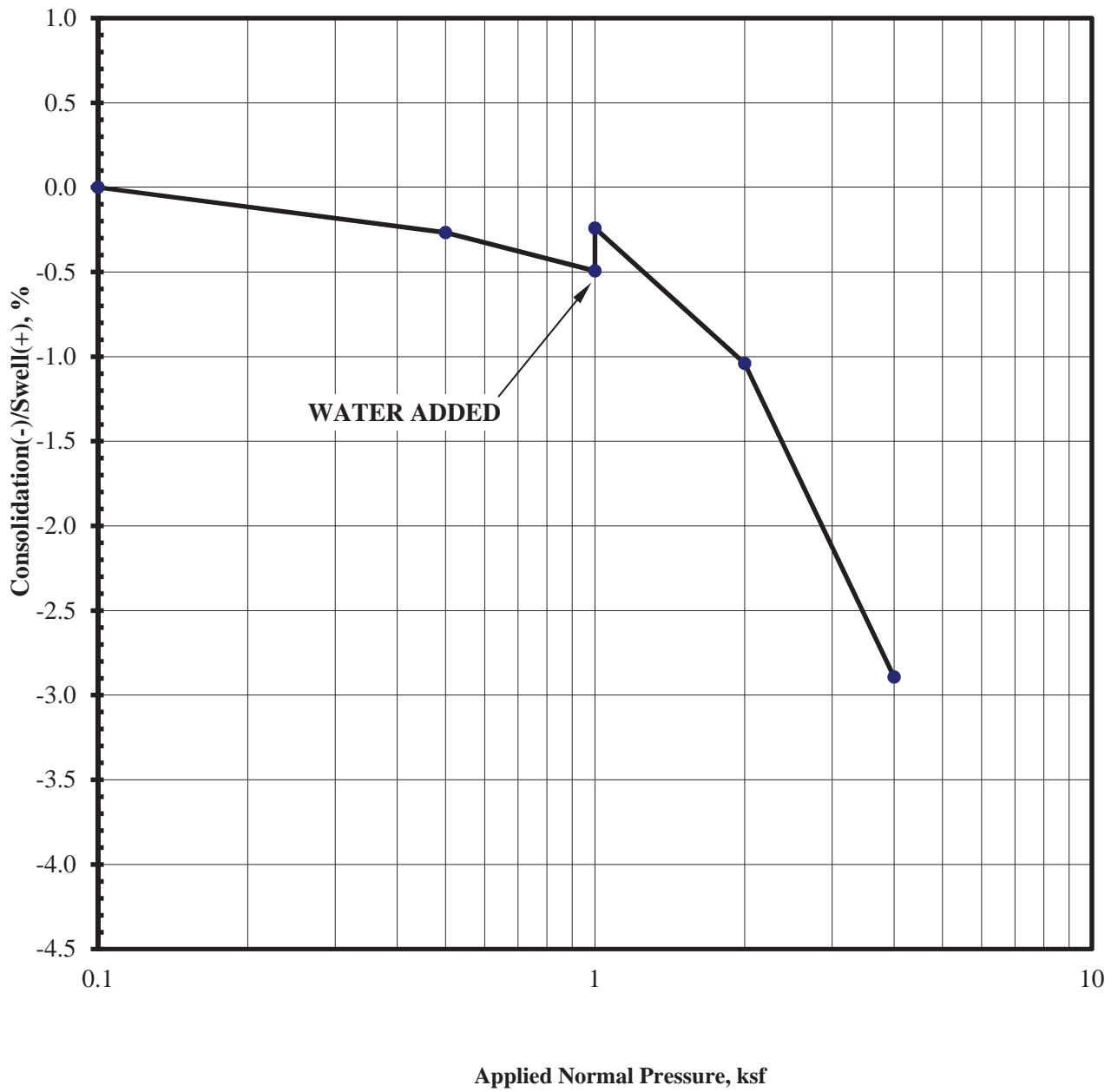


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	100
#4	99
#10	96
#40	88
#200	43.0

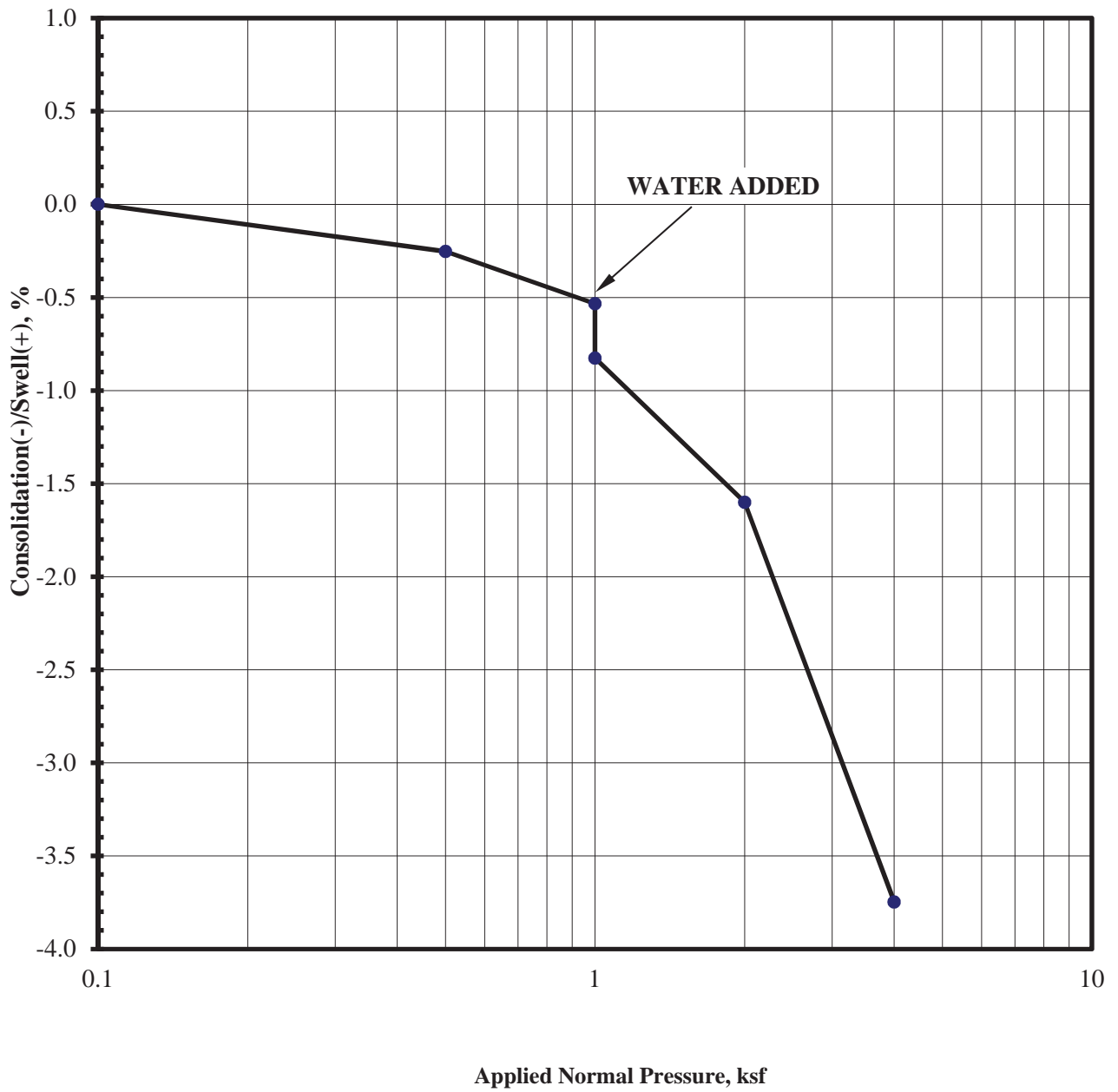
Gravel (%)	1	LL	26	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	56	PL	22	Boring:	A-03		
Fines (%)	43	PI	4	Sample Depth (ft):	29.5-34.5		
Sample Classification:	silty SAND		USCS: SM	AASHTO:	A-4 (0)	SIEVE ANALYSIS	
				Drawn By:	KM	Project No.:	217-376
				Checked By:	AH	Figure No.:	-
				Date:	12/27/17		



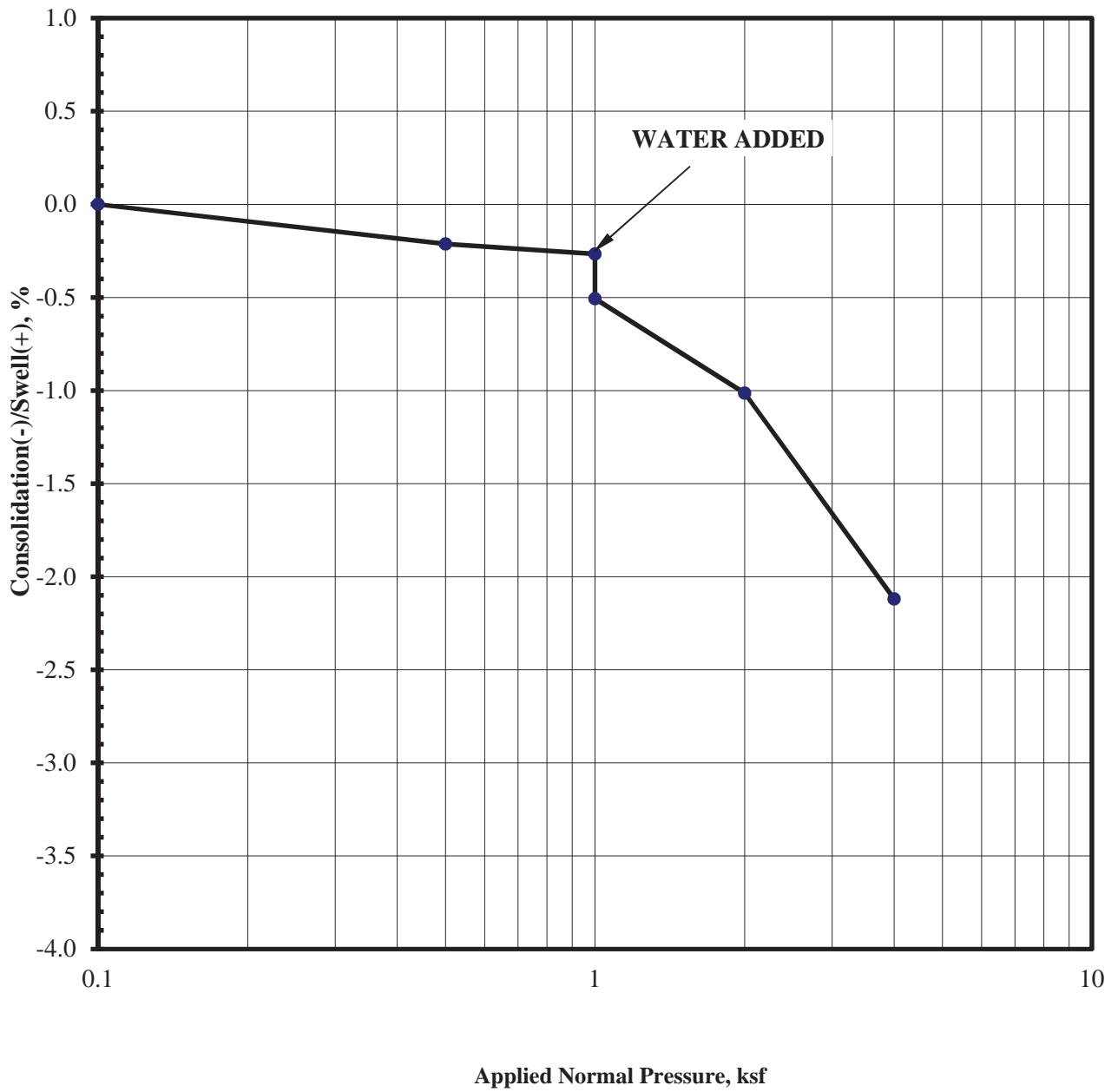
Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WX-02	19	109.3	17.2	-0.1	Medium plasticity CLAY w/ sand, brown	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	BB
YEH & ASSOCIATES, INC							



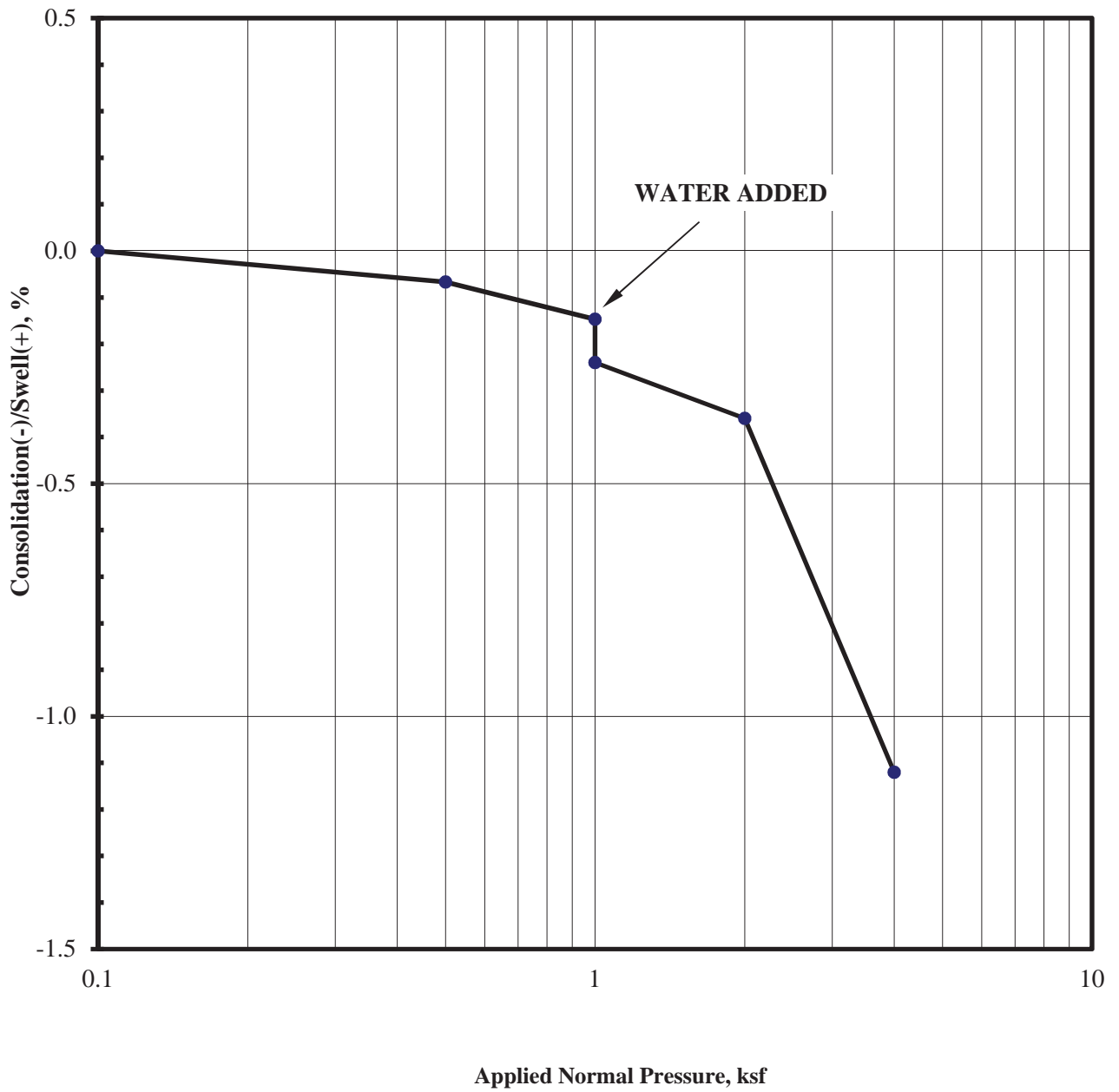
Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WX-04	14	111.4	11.2	0.3	Medium plasticity CLAY, brown	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector				Checked By:	BB	
YEH & ASSOCIATES, INC							



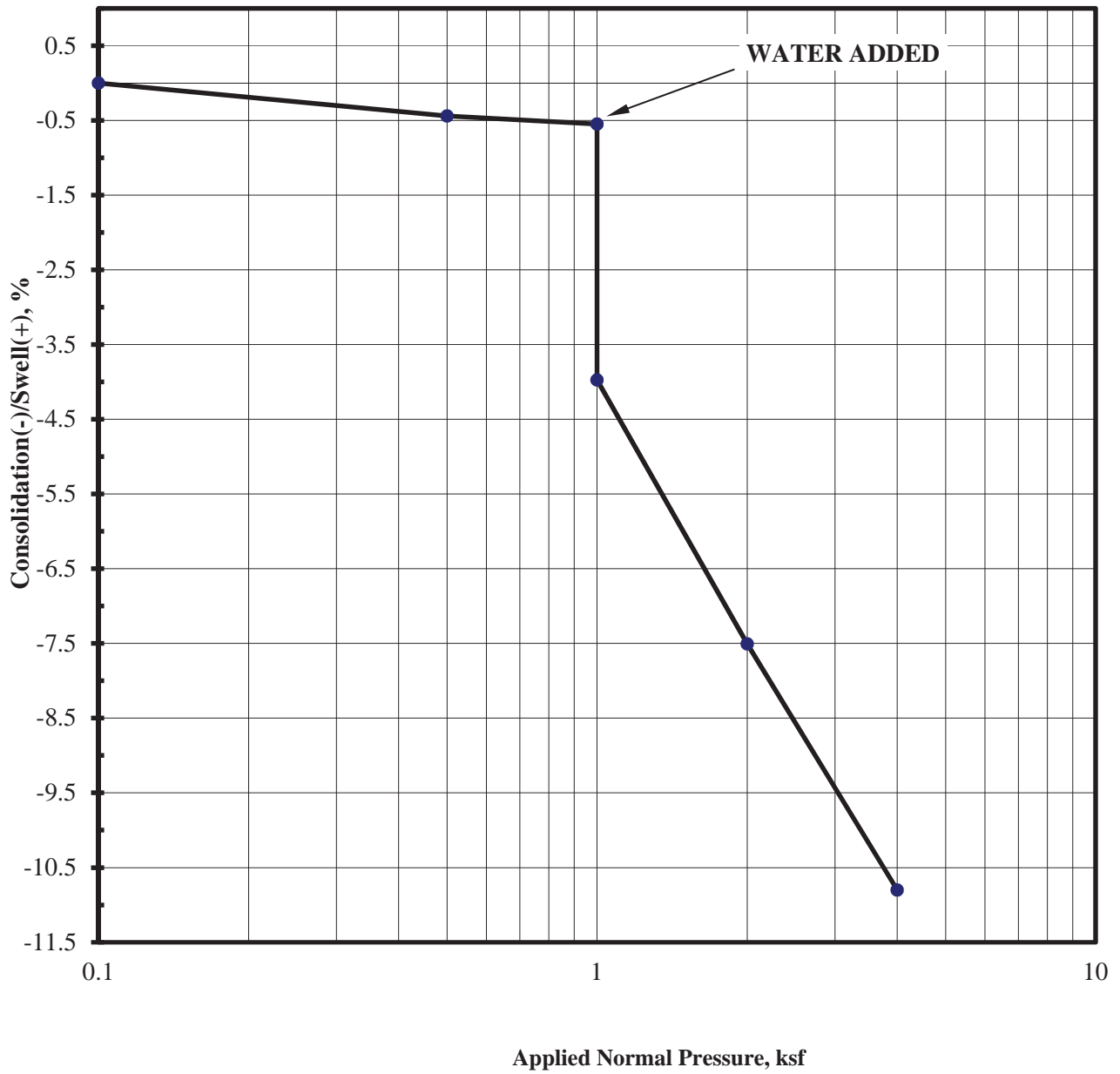
Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WX2-01	13	105.9	17.3	-0.3	Med. plasticity CLAY w/ sand, red-brown	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	BB
YEH & ASSOCIATES, INC							



Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WX2-03	13	106.8	15.7	-0.2	Med. plasticity CLAY w/ sand, red-brown	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector				Checked By:	BB	
YEH & ASSOCIATES, INC							

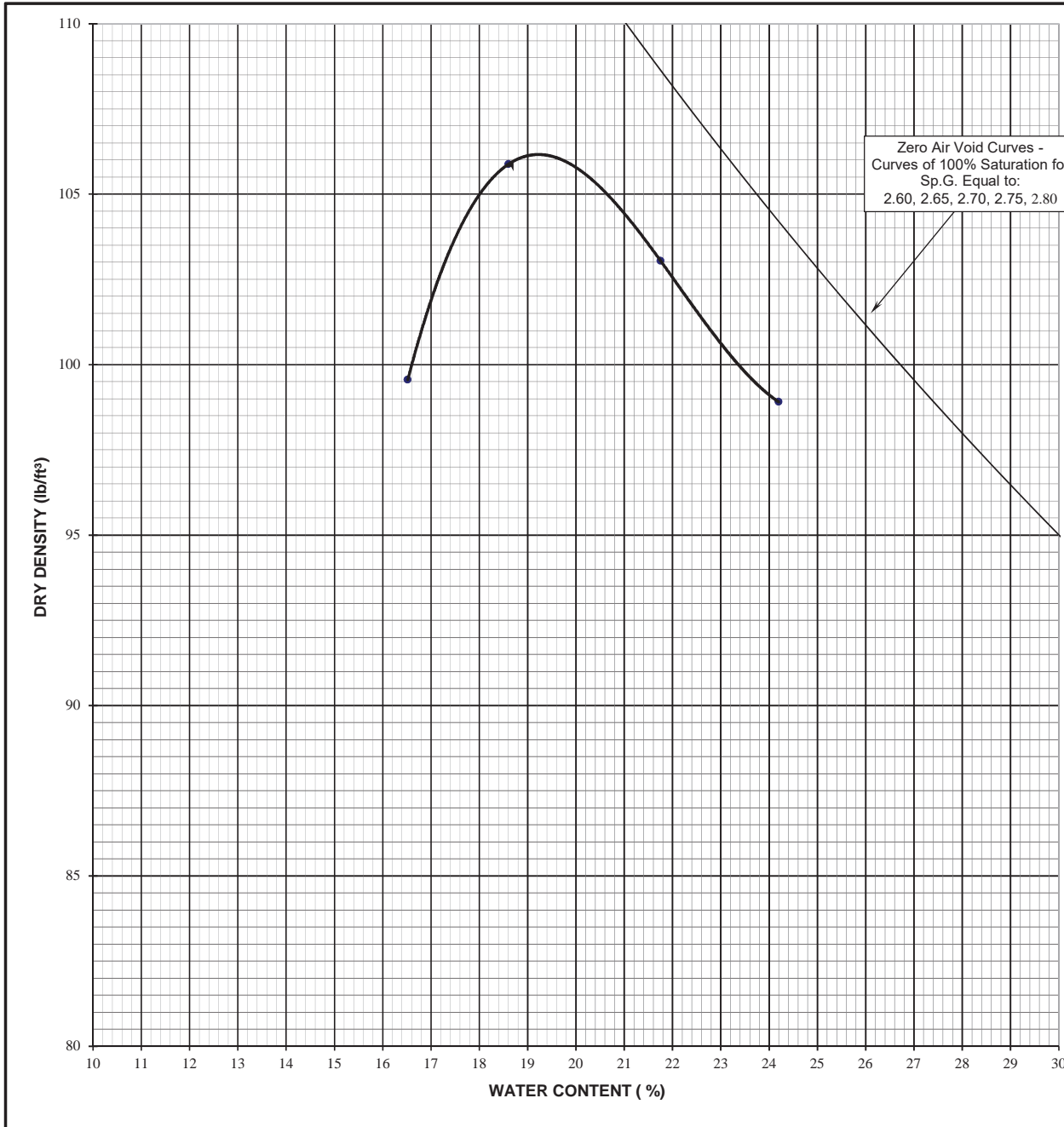


Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WX2-04	13	111.2	17.3	-0.1	Med. plasticity CLAY w/ sand, red-brown	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	BB
YEH & ASSOCIATES, INC							



Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
A-02	19.5	85.2	13.1	-3.4	Lean CLAY, tan	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	BB
YEH & ASSOCIATES, INC							

MOISTURE - DENSITY RELATIONSHIP



Project No: 217-376	
Job name: US 550 S/US 160 Connector	
Maximum Dry Density (pcf):	106.1
Optimum Moisture Content(%):	19.2
Sampled by: Barney Bunker	
Boring #:	A-01
Depth :	0-9.5'
Soil Description: Silty CLAY, tan	
USCS Group Name:	CL
AASHTO Group Symbol:	A-7-6
AASHTO Group Index:	17
Specific Gravity	n/a
Atterberg (ASTM D - 4318)	
LL:	42
PL:	21
PI:	21
Gradation (ASTM D-422, D-136)	
#4	100
#10	100
#40	98
#200	80.1
AASHTO Designation:	T99
Method:	A
Preparation Method:	Wet
Mold Size:	4"
Hammer Type:	Manual
Sampled By:	B. Bunker
Date sampled:	11/29/17
Tested By:	K. Moran
Date:	12/29/17
Reviewed By:	A. Hotchkiss
Date:	12/29/17

Appendix E.4 – Retaining Walls - Laboratory Test Results



YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 217-376

Project Name: 22420: US 550 S Connection to US 160 Retaining Wall Laboratory Results

Date: 7/10/2018

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION	
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS
WA-01	bulk	9.5-14.5	1.1			42	54	4	NV	NP	NP								A-1-a (0)	SP	
WA-01	bulk	49.5-54.5	8.6			2	65	33	25	22	3								A-2-4 (0)	SM	
WA-02	bulk	0-4.5	4.8			19	53	28	NV	NP	NP								A-2-4 (0)	SM	
WA-02	bulk	19.5-24.5	11.5			61	36	3	NV	NP	NP								A-1-a (0)	GP	
WA-02	bulk	39.5-44.5	5.4			61	37	2	NV	NP	NP								A-1-a (0)	GP	
WA-03	bulk	0-4.5	4.7			19	58	23	NV	NP	NP								A-1-b (0)	SM	
WA-03	SS	19.5	2.8			53	38	9	NV	NP	NP								A-1-a (0)	GP-GM	
WA-03	bulk	54.5-59.5	9.3			0	44	56	27	21	6	9.5	0.011	<0.00106		1400			A-4 (1)	ML-CL	

bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity



YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 217-376 Project Name: 22420: US 550 S Connection to US 160 Retaining Wall Laboratory Results Date: 7/10/2018

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION	
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS
WB-01	bulk	4.5-9.5	1.4			40	48	12	20	18	2								A-1-a (0)	SM	
WB-01	bulk	34.5-44.5	0.5			38	60	2	NV	NP	NP	8.5	0.002	<0.00100		14000			A-1-a (0)	SP	
WB-02	bulk	19.5-24.5	0.5			51	46	3	NV	NP	NP								A-1-a (0)	GP	
WB-02	bulk	44.5-49.5	1.3			43	49	8	NV	NP	NP								A-1-a (0)	SP-SM	
WB-02	CORE	55.25-55.75	4.5	135.4													1162				
WB-02	CORE	67.2-67.7	3.4	132.2													263				
WB-03	MC	9.5	13.9	102.9											1.5						
WB-03	bulk	19.5-24.5	0.7			28	70	2	NV	NP	NP								A-1-a (0)	SP	
WB-03	bulk	54.5-59.5	19.0			0	40	60	32	21	11	8.5	0.014	≤0.00117		1100			A-6 (4)	CL	
WB-04	MC	9.5	12.9	117.4																n/a, sample crumbled	
WB-04	bulk	9.5-14.5	14.3			0	12	88	45	21	24								A-7-6 (22)	CL	
WB-04	bulk	49.5-54.5	5.6			65	32	3	NV	NP	NP								A-1-a (0)	GP	
WB-05	SS	4.5	8.8			0	18	82	42	16	26								A-7-6 (20)	CL	
WB-05	MC	14.5	14.8	108.0											-0.4						
WB-05	bulk	24.5-29.5	5.9			46	50	4	NV	NP	NP								A-1-a (0)	SP	
WB-05	bulk	49.5-54.5	3.3			48	23	29	NV	NP	NP								A-2-4 (0)	GM	
WB-05	bulk	54.5-59.5	14.2			0	47	53	39	22	17	8.5	0.012	<0.00106		1400			A-6 (6)	CL	
WB-05	bulk (remold)	59.5-64.5							34	25	9				0.6						

bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity



YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 217-376

Project Name: 22420: US 550 S Connection to US 160 Retaining Wall Laboratory Results

Date: 7/10/2018

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION								
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS							
WB-06	MC	4.5	13.7	110.5			0	36	64	46	14	32								A-7-6 (17)	CL							
WB-06	MC	9.5	9.6	97.6												0.5												
WB-06	MC	14.5	9.2	94.9														1472										
WB-06	bulk	14.5-19.5	11.0				0	10	90	34	18	16	8.4	0.010	0.00623		1300				A-6 (14)	CL						
WB-06	bulk (remold)									33	17	16				0.3												
WB-06	CORE	65.25-64.50		(wet) 155.8														3057										
WB-07	bulk	9.5-14.5	13.4				0	16	84	59	19	40										A-7-6 (35)	CH					
WB-07	bulk	29.5-34.5	55.0 (added dilution)				59	34	7	NV	NP	NP											A-1-a (0)	GP-GM				
WB-07	bulk	44.5-49.5	10.3				0	63	37	34	20	14	8.3	0.012	<0.00105		1600						A-6 (1)	SC				
WB-07	CORE	64.7-65.2	3.5	139.5														3728										
WB-08	MC	9.5	7.5	98.6												-1.0												
WB-08	bulk	34.5-39.5	7.1				55	42	3	NV	NP	NP												A-1-a (0)	GP			
WB-08	MC	59.5	13.2	91.5			0	70	30	39	22	17																
WB-08	bulk	59.5-69.5	9.4				0	32	68	37	18	19	8.6	0.018	<0.00108		1400								A-6 (11)	CL		
WB-09	MC	9.5	9.6	95.6			0	23	77	31	16	15													A-6 (10)	CL		
WB-09	bulk	14.5-24.5	11.5		107.0	18.4	0	14	86	34	20	14														A-6 (11)	CL	
WB-09	bulk	24.5-29.5	8.0				15	59	26	32	21	11															A-2-6 (0)	SC
WB-09	bulk	49.5-54.5	10.4				0	58	42	41	24	17															A-7-6 (3)	SC

bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity



YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 217-376

Project Name: 22420: US 550 S Connection to US 160 Retaining Wall Laboratory Results

Date: 7/10/2018

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION	
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS
WC-01	SS (remold)								28	16	12				0.3						
WC-01	bulk	4.5-9.5	0.9				38	58	4	NV	NP	NP								A-1-a (0)	SP
WC-01	bulk	34.5-39.5	8.7				15	51	34	37	16	21								A-2-6 (2)	SC
WC-01	CORE (slaking)	39.5-43.5	7.8	122.3			0	52	48	35	25	10									bedrock, Shale
WC-02	bulk	9.5-14.5	1.0				46	50	4	NV	NP	NP								A-1-a (0)	SP
WC-02	CORE	43.9-44.6	0.5	159.3													7224				
WC-03	bulk	0-4.5	3.8				23	54	23	27	19	8								A-2-4 (0)	SC
WC-03	MC	29.5	12.1	109.2			0	82	18	40	22	18								A-2-6 (0)	SC
WC-03	bulk	29.5-34.5	9.5				1	56	43	35	19	16	8.5	0.002	<0.00108		2000			A-6 (3)	SC
WC-03	CORE	48.3-48.8		(wet) 153.1													1675				
WE-01	SS	4.0	7.6				0	28	72	26	18	8								A-4 (4)	CL
WE-01	bulk	4-9	14.9				0	16	84	29	19	10	8.5	0.054	0.00784		1000			A-4 (7)	CL
WE-01	MC	9	14.8	107.4											-0.2						
WE-01	bulk	19-24	1.8				58	34	8	NV	NP	NP								A-1-a (0)	GP-GM
WE-02	bulk	9-14	18.4				0	26	74	33	15	18								A-6 (11)	CL
WF-01	MC	8	13.1	116.6												4.3					
WF-01	bulk	8-13	10.8				0	15	85	50	12	38								A-7-6 (32)	CH
WF-02	MC	3	13.8	101.7												-0.8					

bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity



YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

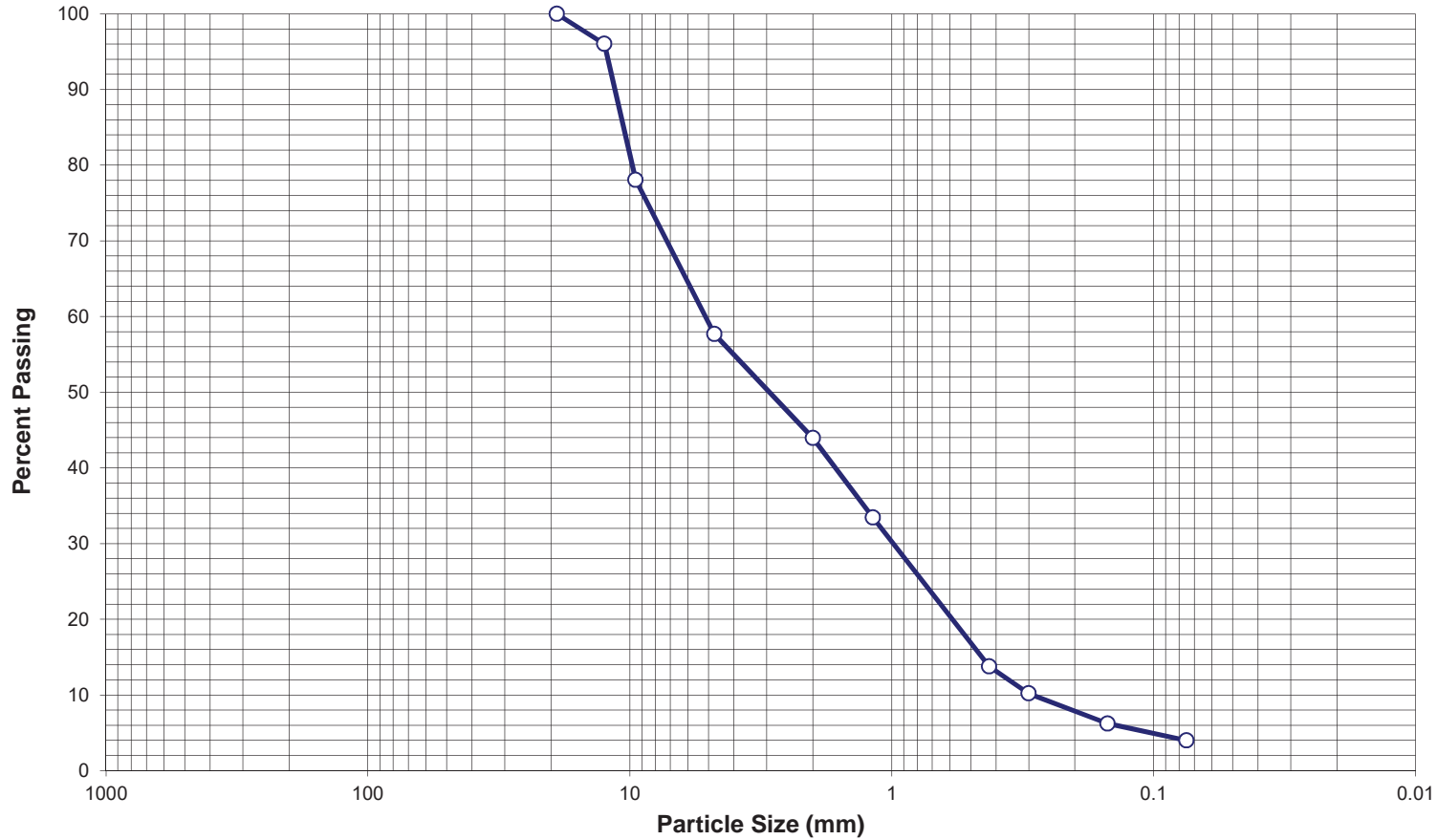
Project No: 217-376 Project Name: 22420: US 550 S Connection to US 160 Retaining Wall Laboratory Results Date: 7/10/2018

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION	
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS
WF-02	MC	8	9.4			0	24	76	31	23	8								A-4 (5)	ML	
R-10	bulk	4-9	5.8			0	66	34	NV	NP	NP	8.8	0.007	≤0.00105		2800			A-2-4 (0)	SM	
R-10	MC	14	9.4	93.6																	
R-11	bulk	9.5-14.5	6.2			9	54	37	25	21	4								A-4 (0)	SM-SC	
R-11	MC	14.5	13.6	103.9																	
R-12	bulk	4.5-9.5	5.0			49	22	29	37	17	20	8.5	0.019	0.00118		1600			A-2-6 (0)	GC	
R-12	bulk	19.5-24.5	4.7			40	47	13	NV	NP	NP	8.6	0.014	0.00576		2700			A-1-b (0)	SM	


bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

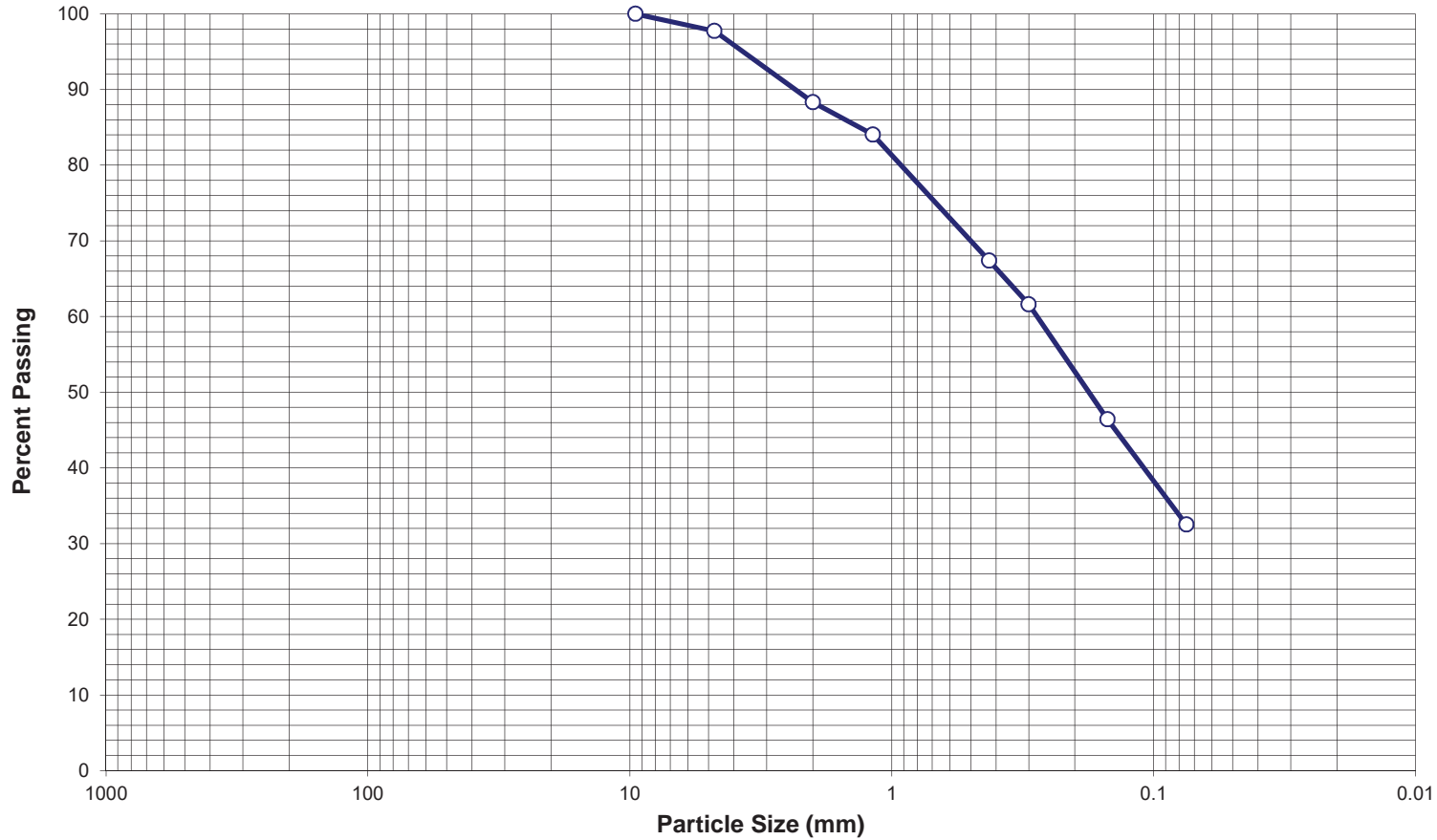


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	96
3/8"	78
#4	58
#10	44
#40	14
#200	4.0


Gravel (%)	42	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	54	PL	NP	Boring:	WA-01	
Fines (%)	4	PI	NP	Sample Depth (ft):	9.5-14.5	
Sample Classification:	poorly graded SAND, w/ gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/01/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

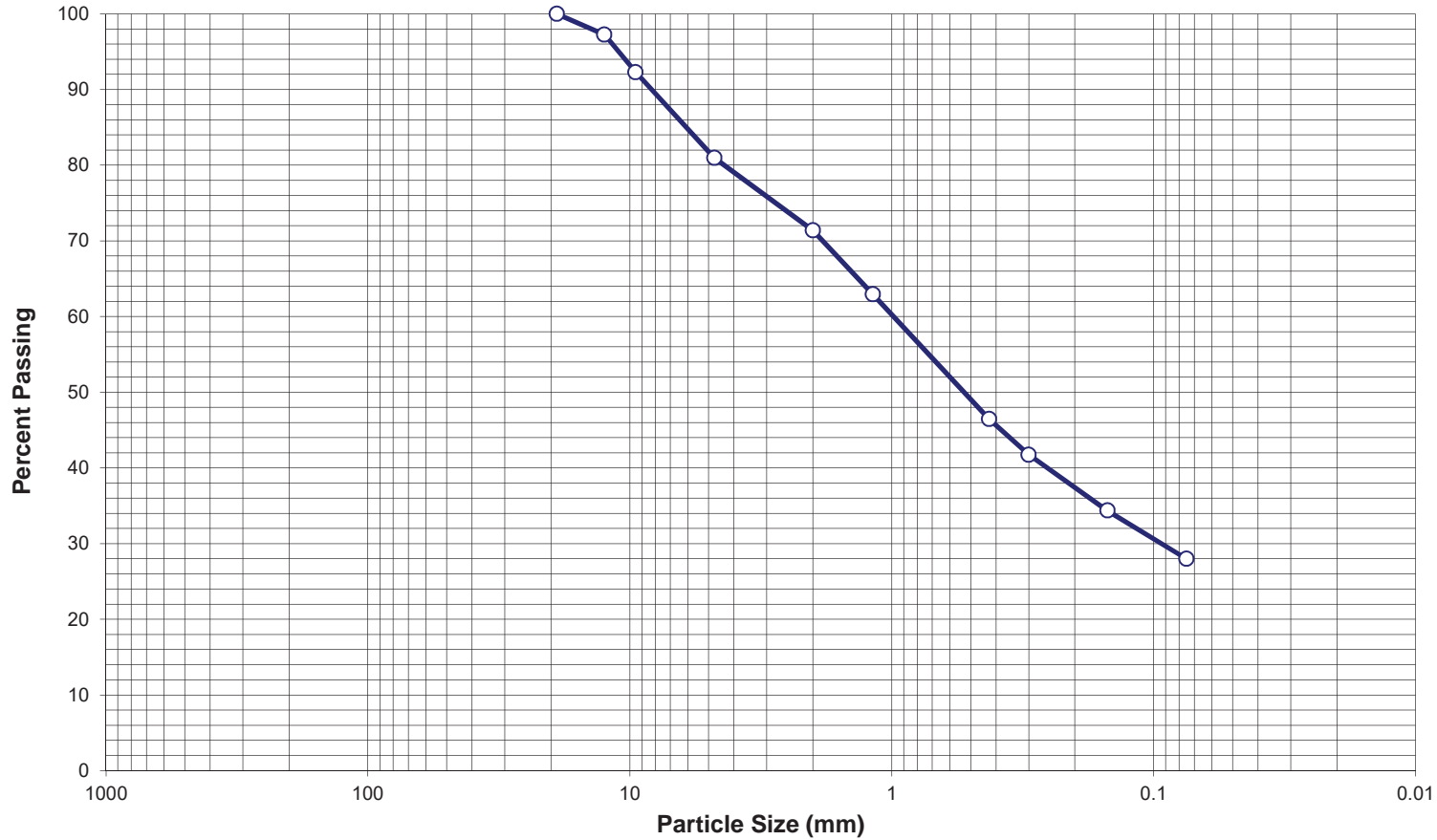


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	100
#4	98
#10	88
#40	67
#200	32.5


Gravel (%)	2	LL	25	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	65	PL	22	Boring:	WA-01	
Fines (%)	33	PI	3	Sample Depth (ft):	49.5-54.5	
Sample Classification:	silty SAND (crushed bedrock)		USCS:	AASHTO:		SIEVE ANALYSIS
		SM		A-2-4	(0)	Drawn By: KM Checked By: BB Date: 02/06/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

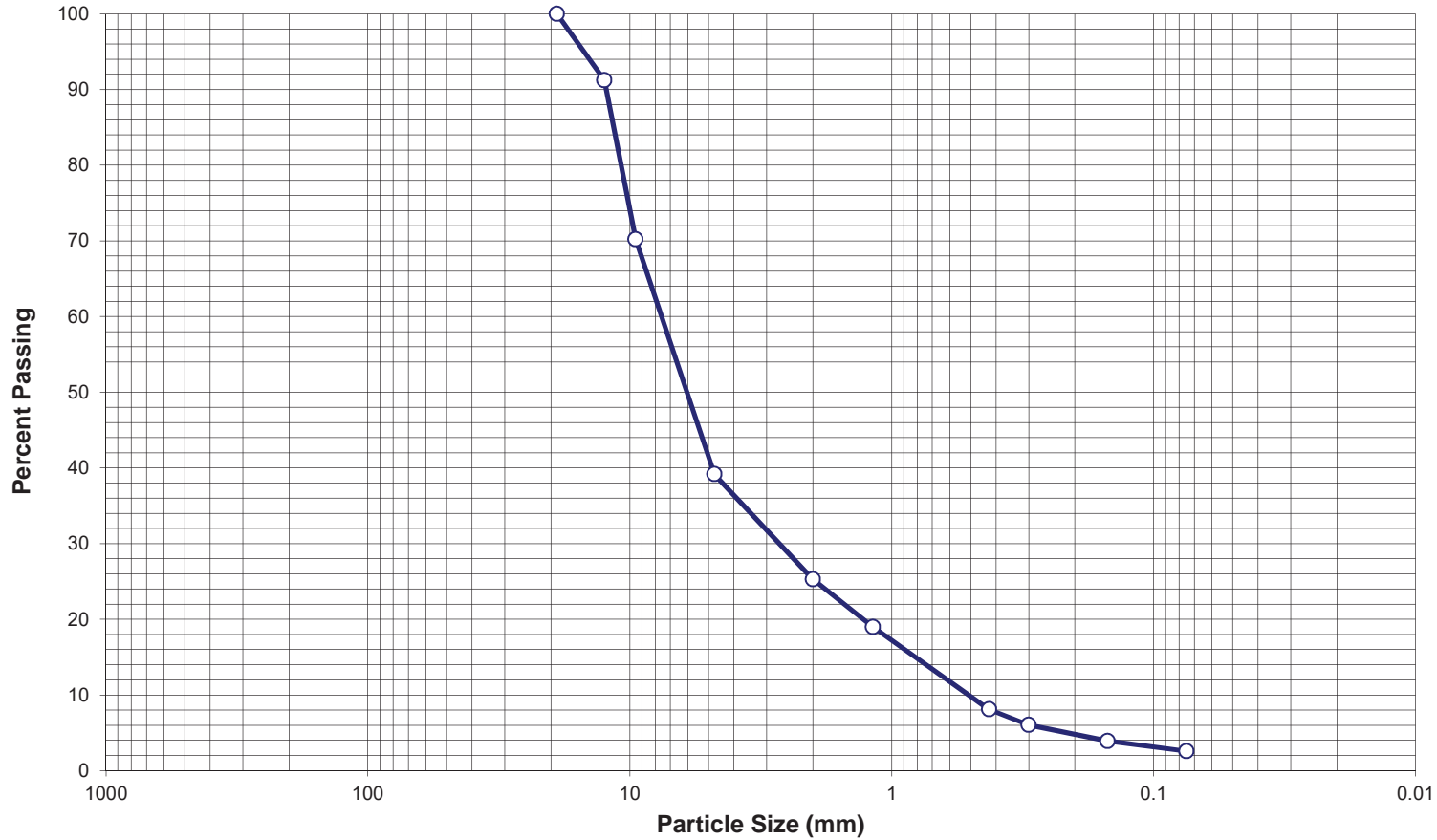


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	97
3/8"	92
#4	81
#10	71
#40	46
#200	28.0


Gravel (%)	19	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants												
Sand (%)	53	PL	NP	Boring:	WA-02													
Fines (%)	28	PI	NP	Sample Depth (ft):	0-4.5													
Sample Classification:	silty SAND w/ gravel		USCS:	AASHTO:		<table border="1"> <tr> <td>Drawn By:</td> <td>KM</td> <td>Project No.:</td> <td>217-376</td> </tr> <tr> <td>Checked By:</td> <td>BB</td> <td>Figure No.:</td> <td>-</td> </tr> <tr> <td>Date:</td> <td>02/06/18</td> <td></td> <td></td> </tr> </table>	Drawn By:	KM	Project No.:	217-376	Checked By:	BB	Figure No.:	-	Date:	02/06/18		
Drawn By:	KM	Project No.:	217-376															
Checked By:	BB	Figure No.:	-															
Date:	02/06/18																	
		SM	A-2-4 (0)															

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

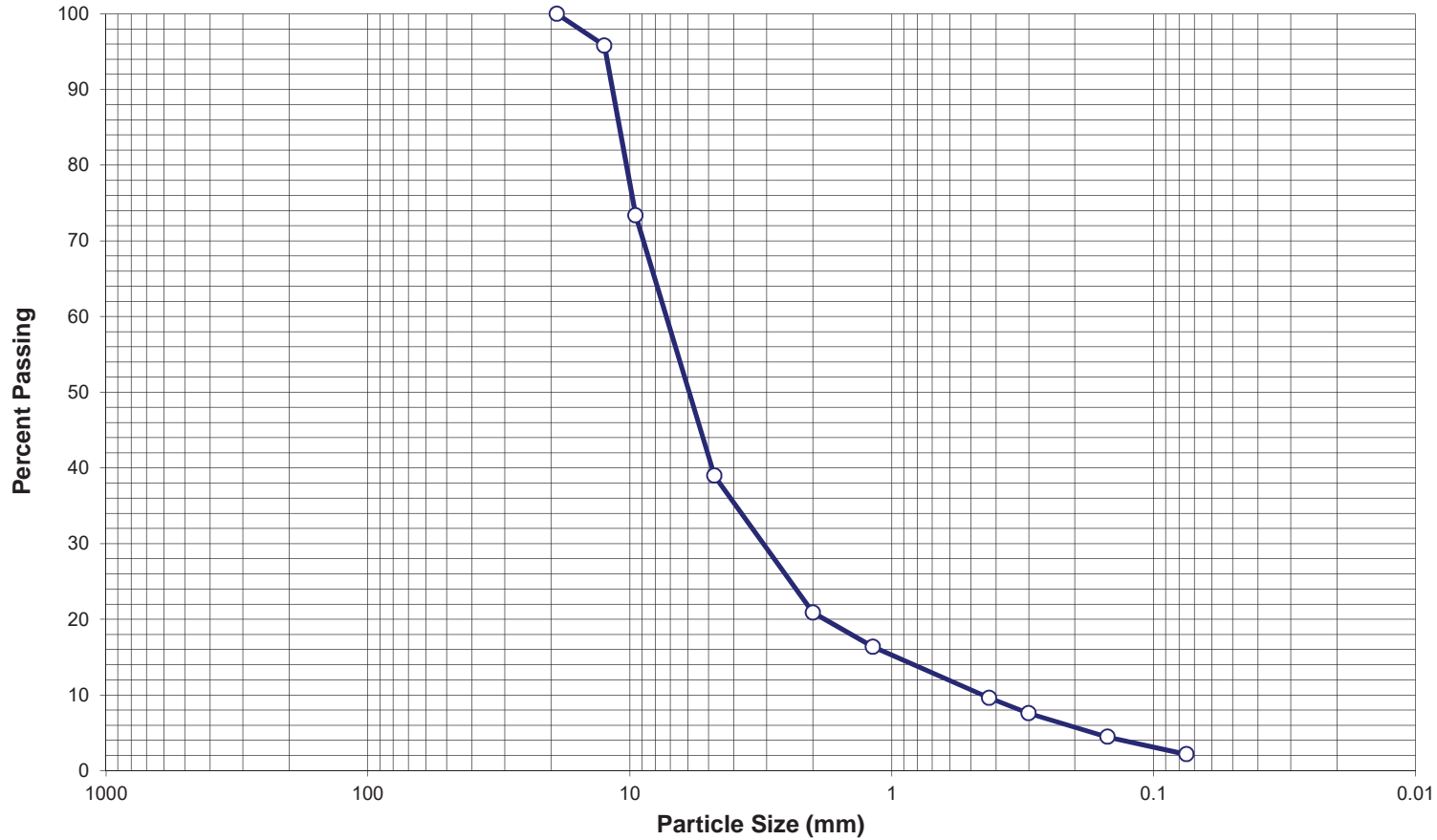


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	91
3/8"	70
#4	39
#10	25
#40	8
#200	2.6


Gravel (%)	61	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	36	PL	NP	Boring:	WA-02	
Fines (%)	3	PI	NP	Sample Depth (ft):	19.5-24.5	
Sample Classification:	poorly graded GRAVEL w/sand	USCS:	GP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/07/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

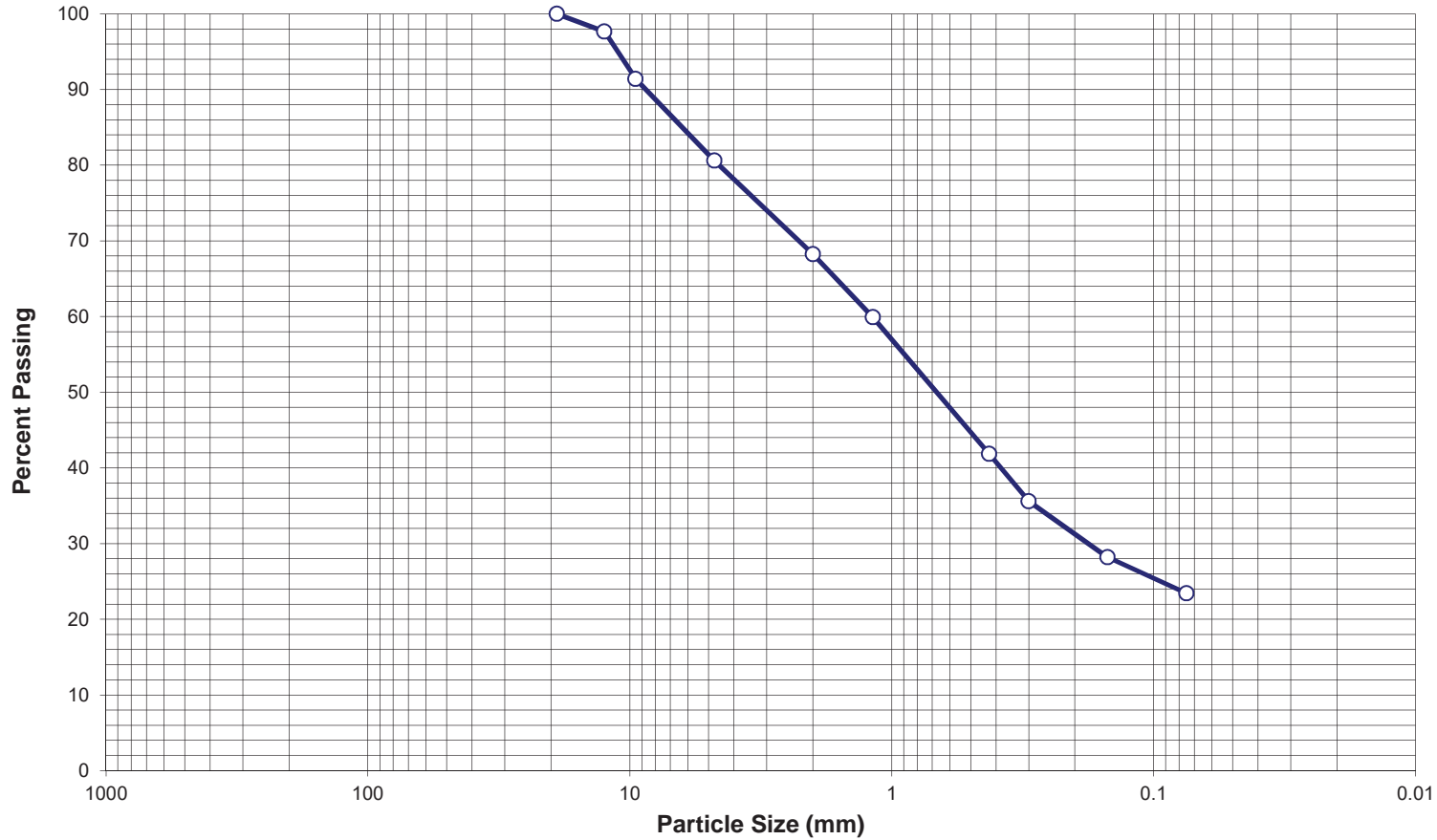


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	96
3/8"	73
#4	39
#10	21
#40	10
#200	2.2


Gravel (%)	61	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	37	PL	NP	Boring:	WA-02	
Fines (%)	2	PI	NP	Sample Depth (ft):	39.5-44.5	
Sample Classification:	poorly graded GRAVEL, w/ sand	USCS:	GP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/07/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

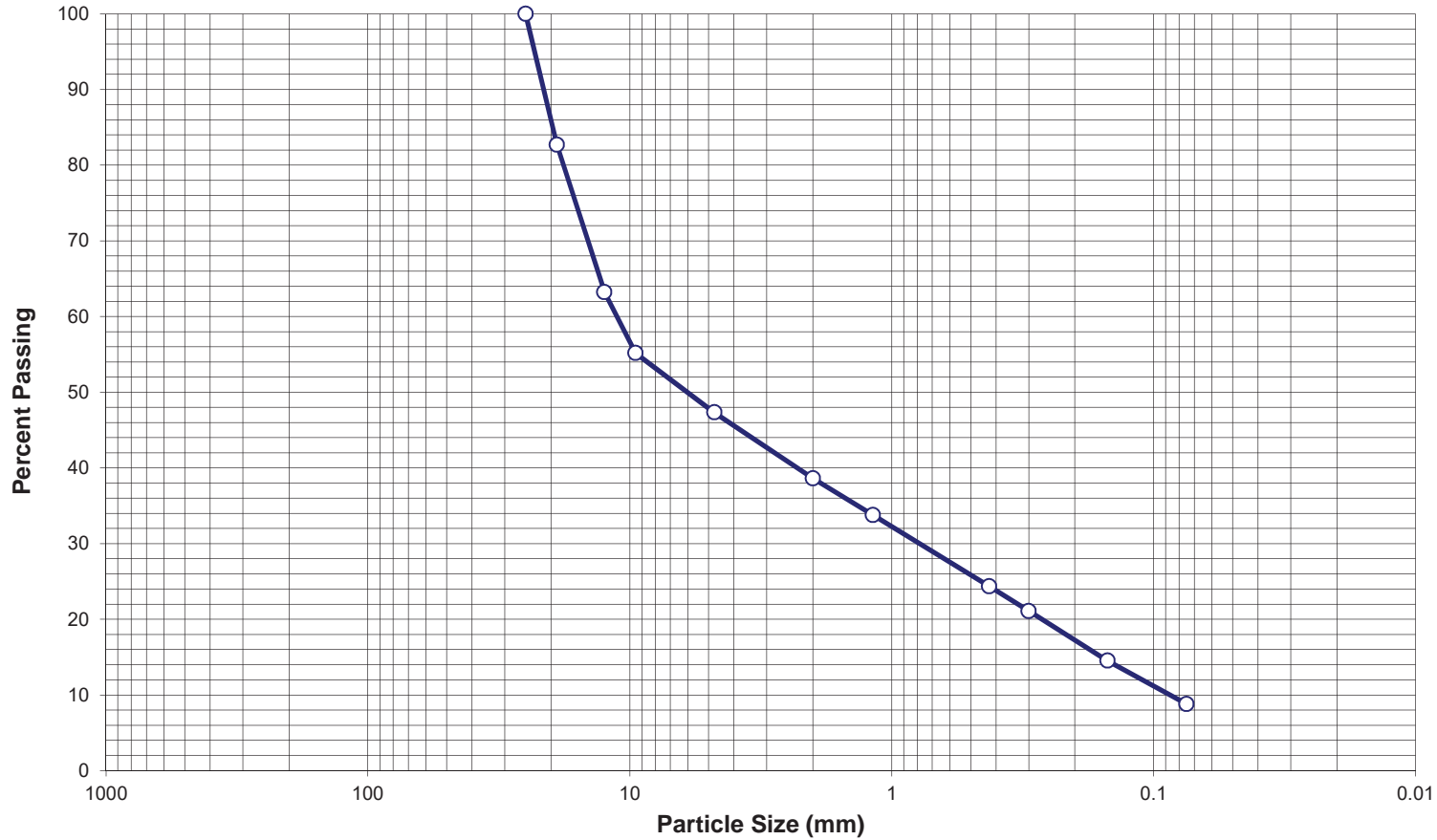


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	98
3/8"	91
#4	81
#10	68
#40	42
#200	23.4


Gravel (%)	19	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants												
Sand (%)	58	PL	NP	Boring:	WA-03													
Fines (%)	23	PI	NP	Sample Depth (ft):	0-4.5													
Sample Classification:	silty SAND w/ gravel		USCS:	AASHTO:		<table border="1"> <tr> <td>Drawn By:</td> <td>KM</td> <td>Project No.:</td> <td>217-376</td> </tr> <tr> <td>Checked By:</td> <td>BB</td> <td>Figure No.:</td> <td>-</td> </tr> <tr> <td>Date:</td> <td>02/08/18</td> <td></td> <td></td> </tr> </table>	Drawn By:	KM	Project No.:	217-376	Checked By:	BB	Figure No.:	-	Date:	02/08/18		
Drawn By:	KM	Project No.:	217-376															
Checked By:	BB	Figure No.:	-															
Date:	02/08/18																	
		SM	A-1-b (0)															

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

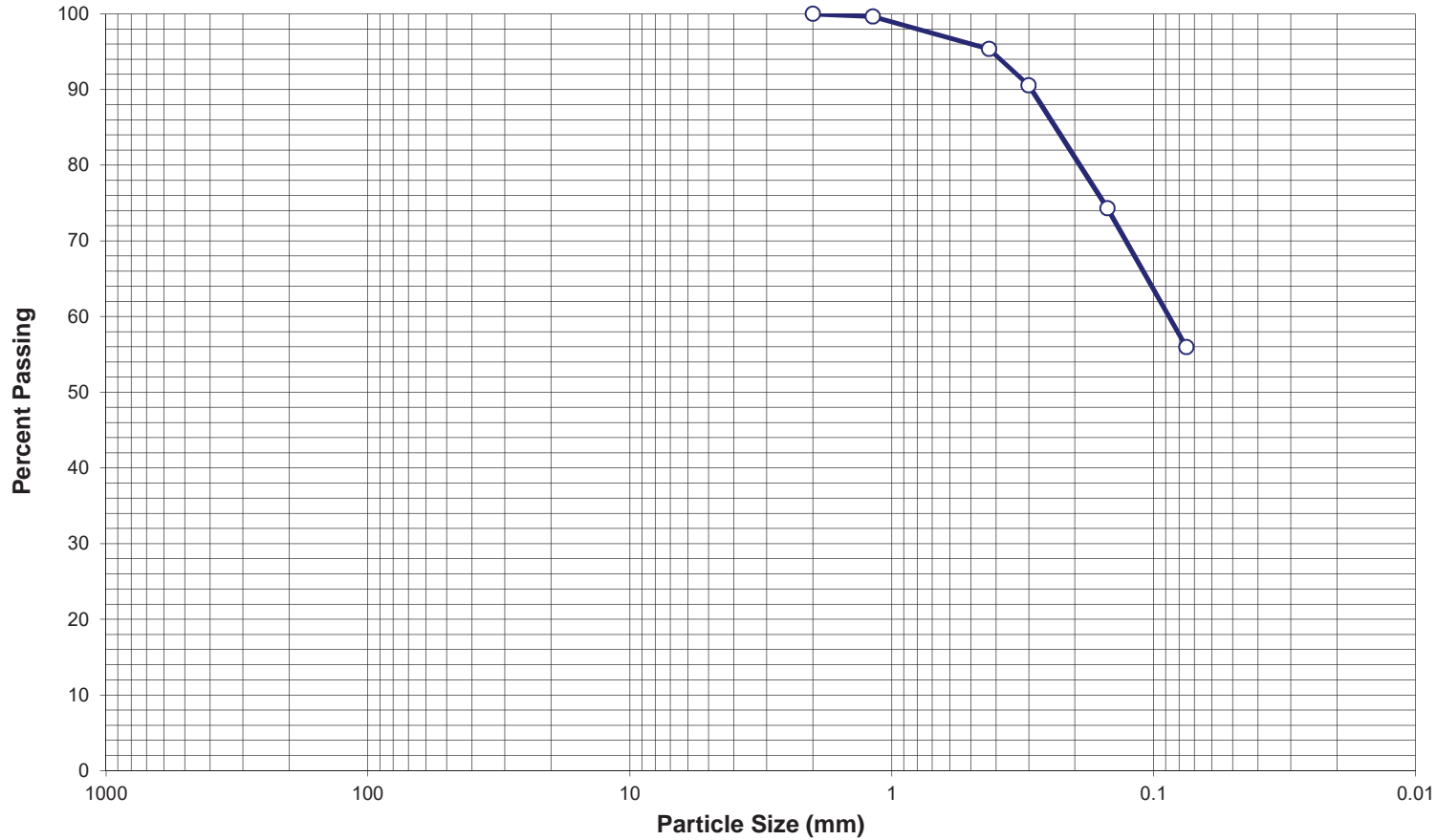


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	100
3/4"	83
1/2"	63
3/8"	55
#4	47
#10	39
#40	24
#200	8.8


Gravel (%)	53	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	38	PL	NP	Boring:	WA-03		
Fines (%)	9	PI	NP	Sample Depth (ft):	19.5		
Sample Classification:	poorly graded GRAVEL w/ sand	USCS:	GP-GM	AASHTO:	A-1-a (0)	SIEVE ANALYSIS	
				Drawn By:	KM	Project No.:	217-376
				Checked By:	BB	Figure No.:	-
				Date:	02/08/18		

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

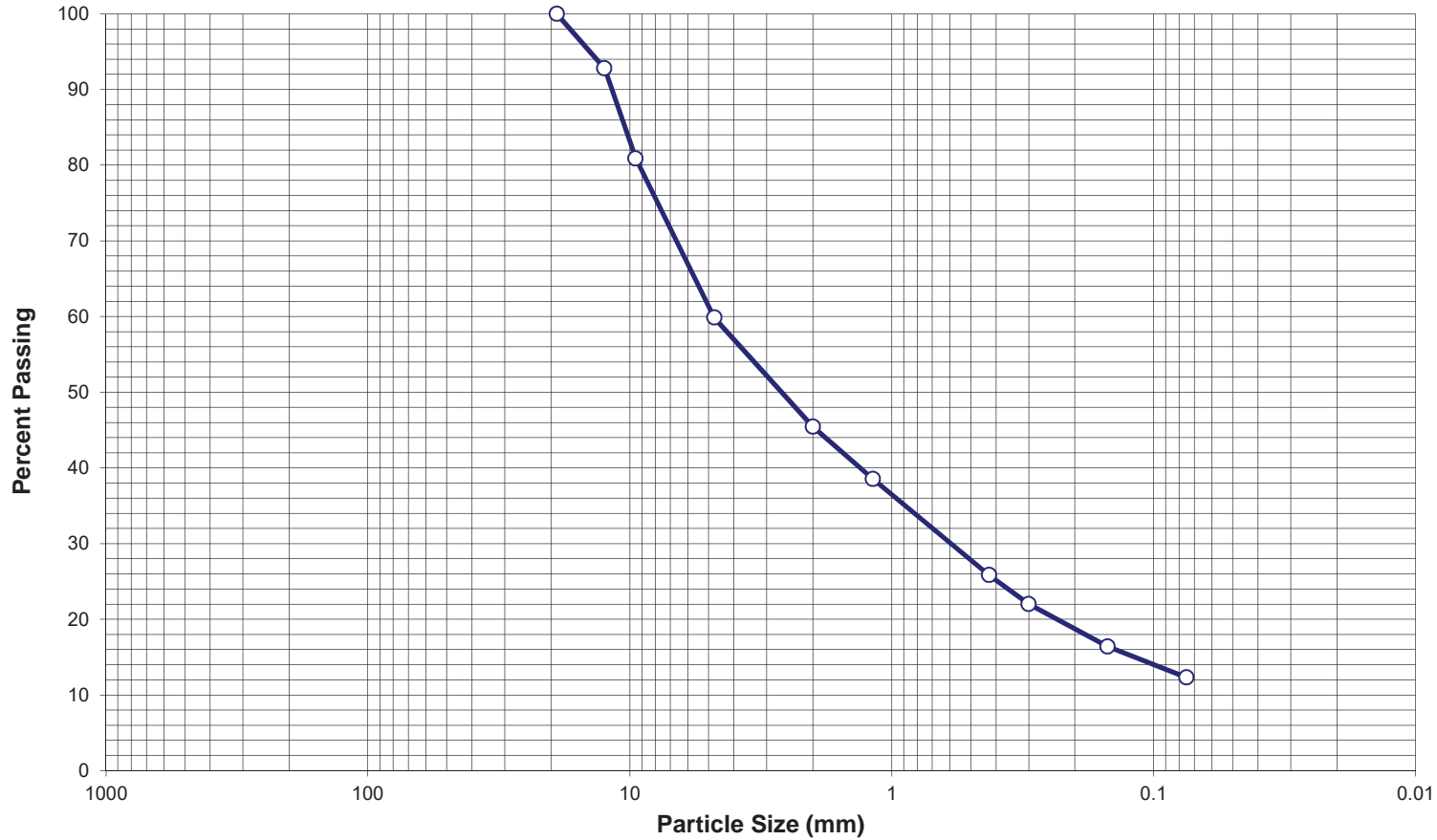


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	95
#200	56.0


Gravel (%)	0	LL	27	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	44	PL	21	Boring:	WA-03	
Fines (%)	56	PI	6	Sample Depth (ft):	54.5-59.5	
Sample Classification:	sandy - silty CLAY (crushed bedrock)	USCS:	ML-CL	AASHTO:	A-4 (1)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 01/30/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

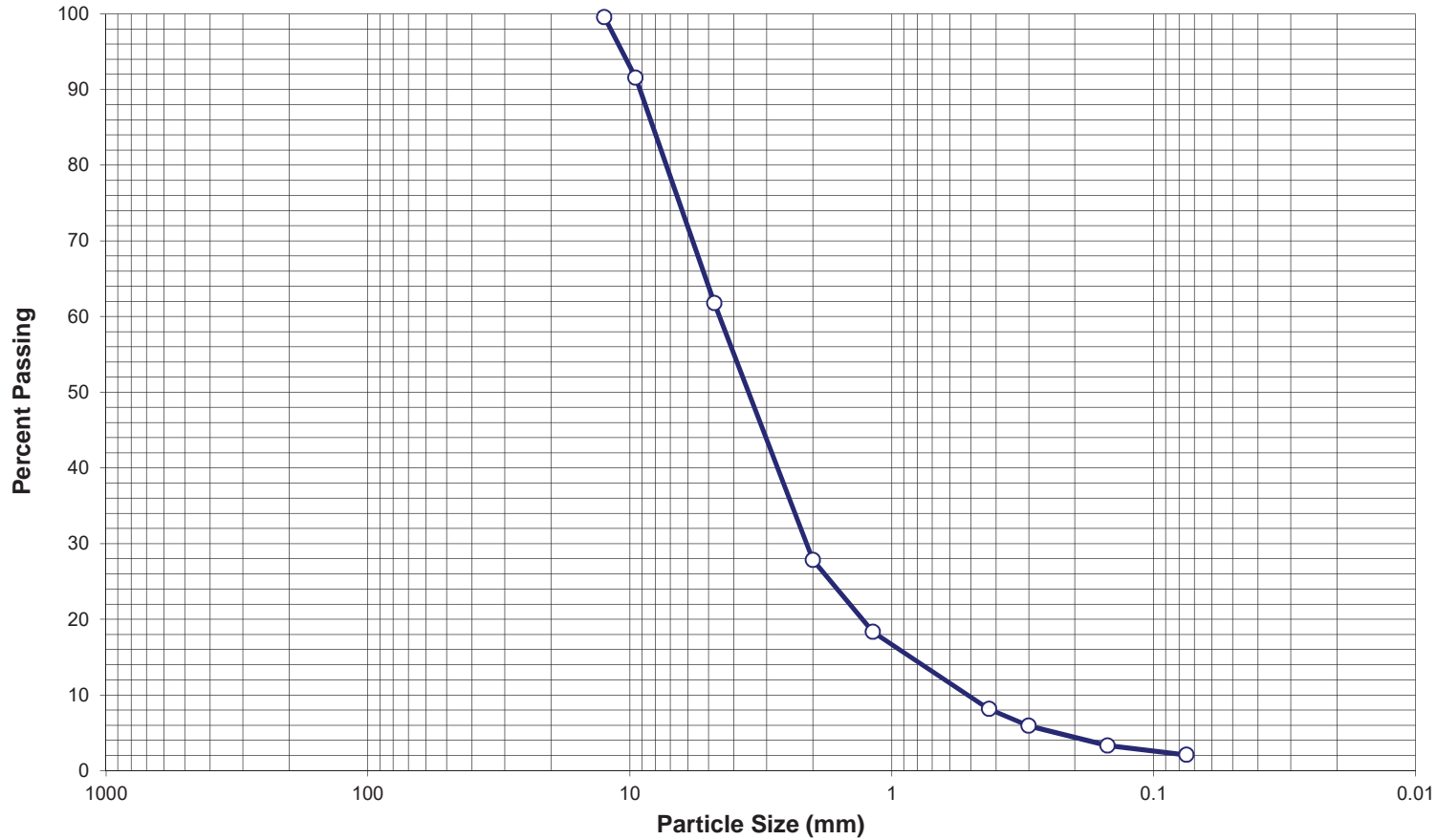


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	100
3/4"	100
1/2"	93
3/8"	81
#4	60
#10	45
#40	26
#200	12.3


Gravel (%)	40	LL	20	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants												
Sand (%)	48	PL	18	Boring:	WB-01													
Fines (%)	12	PI	2	Sample Depth (ft):	4.5-9.5													
Sample Classification:	silty SAND w/ gravel		USCS:	AASHTO:		<table border="1"> <tr> <td>Drawn By:</td> <td>KM</td> <td>Project No.:</td> <td>217-376</td> </tr> <tr> <td>Checked By:</td> <td>KM</td> <td>Figure No.:</td> <td>-</td> </tr> <tr> <td>Date:</td> <td>01/02/18</td> <td></td> <td></td> </tr> </table>	Drawn By:	KM	Project No.:	217-376	Checked By:	KM	Figure No.:	-	Date:	01/02/18		
Drawn By:	KM	Project No.:	217-376															
Checked By:	KM	Figure No.:	-															
Date:	01/02/18																	
		SM	A-1-a (0)															

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

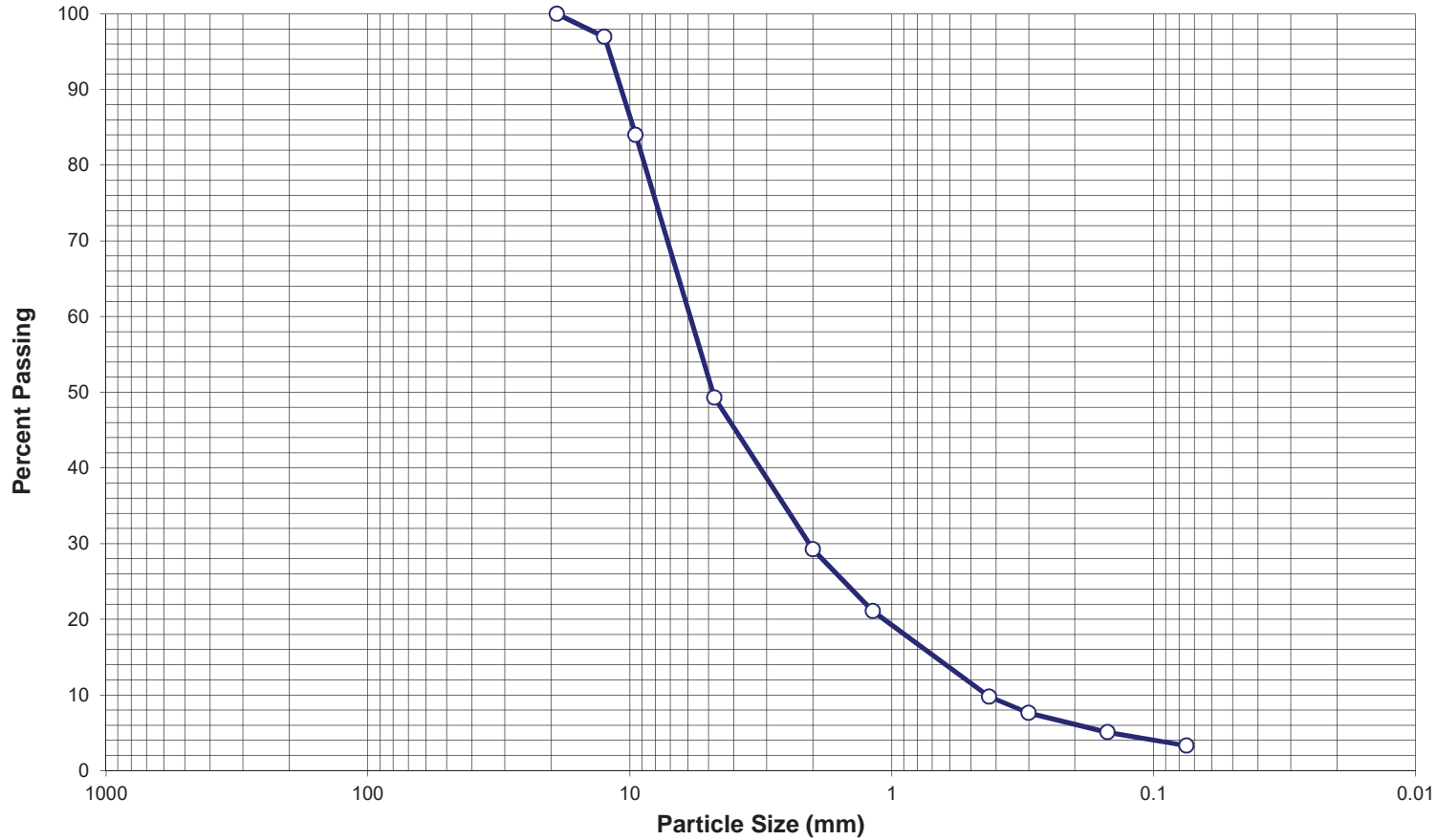


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	100
3/8"	92
#4	62
#10	28
#40	8
#200	2.1


Gravel (%)	38	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	60	PL	NP	Boring:	WB-01	
Fines (%)	2	PI	NP	Sample Depth (ft):	34.5-44.5	
Sample Classification:	poorly graded SAND w/ gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/18/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

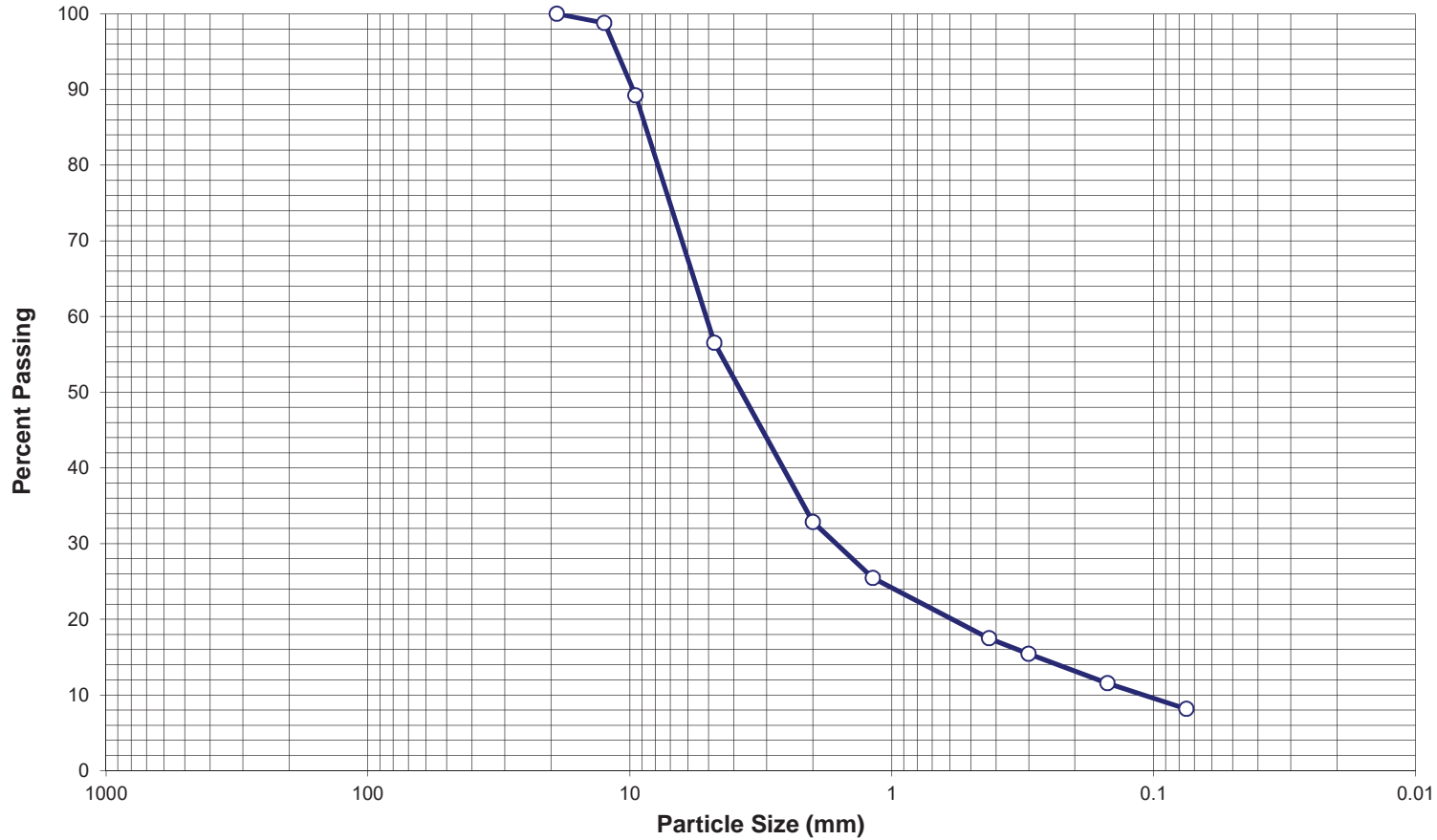


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	97
3/8"	84
#4	49
#10	29
#40	10
#200	3.3


Gravel (%)	51	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	46	PL	NP	Boring:	WB-02	
Fines (%)	3	PI	NP	Sample Depth (ft):	19.5-24.5	
Sample Classification:	poorly graded GRAVEL w/ sand	USCS:	GP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 01/02/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

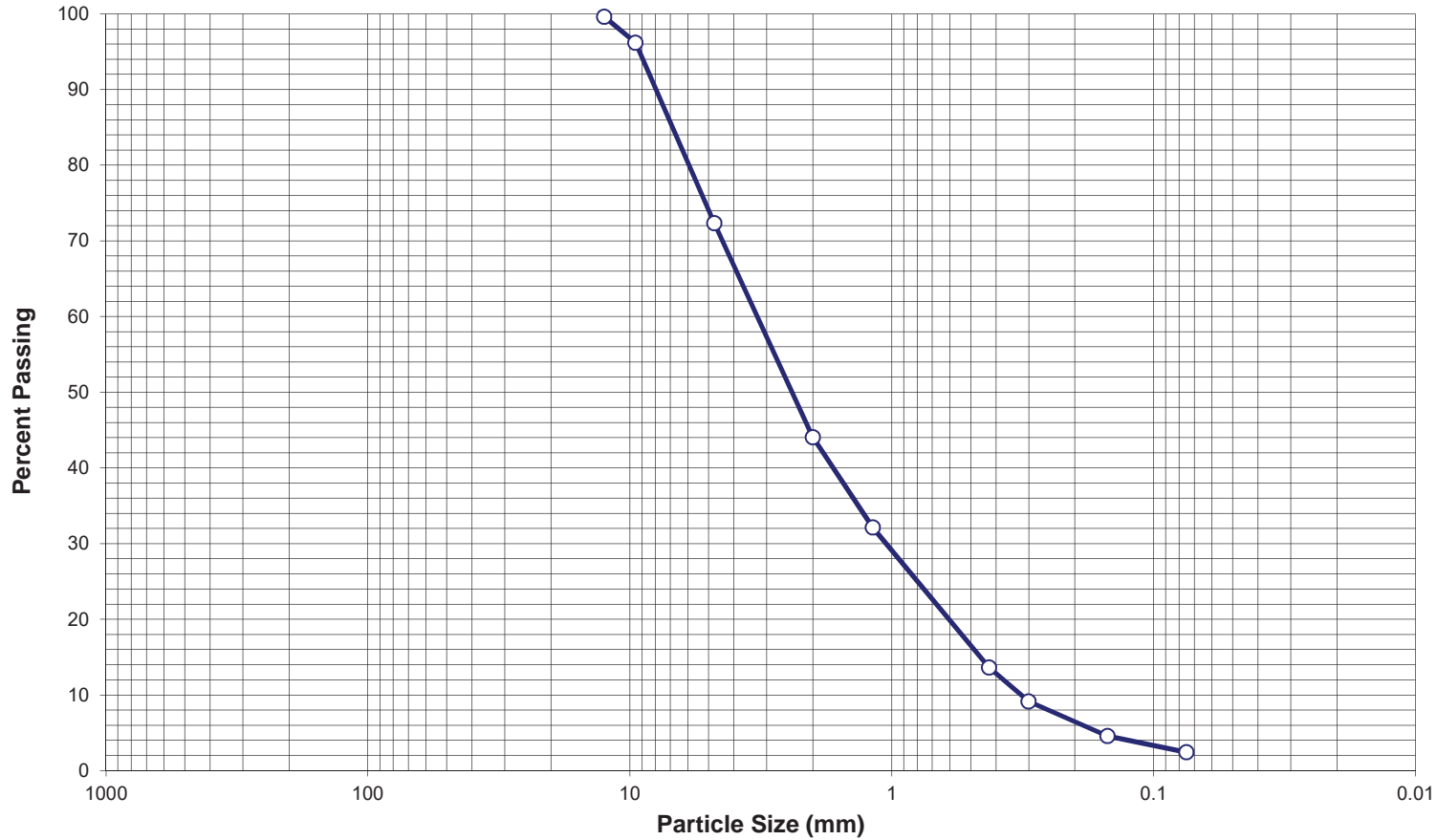


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	100
3/4"	100
1/2"	99
3/8"	89
#4	57
#10	33
#40	17
#200	8.2


Gravel (%)	43	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	49	PL	NP	Boring:	WB-02	
Fines (%)	8	PI	NP	Sample Depth (ft):	44.5-49.5	
Sample Classification:	poorly graded SAND, w/ silt and gravel	USCS:	SP-SM	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/02/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

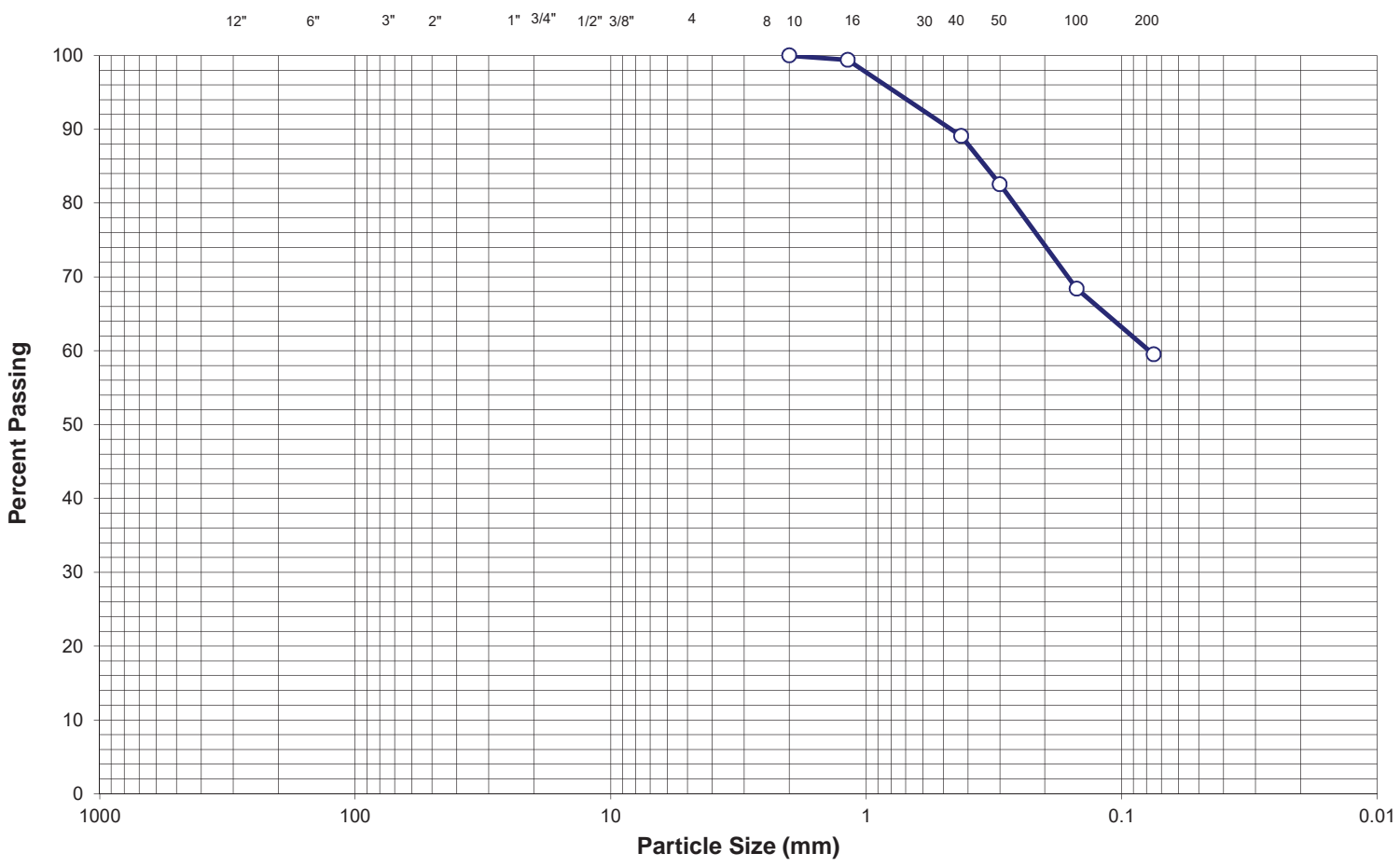
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	100
3/8"	96
#4	72
#10	44
#40	14
#200	2.4

Gravel (%)	28	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	70	PL	NP	Boring:	WB-03	
Fines (%)	2	PI	NP	Sample Depth (ft):	19.5-24.5	
Sample Classification:	poorly graded SAND w/ gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: LQ Date: 12/13/17
						Project No.: 217-376 Figure No.: -

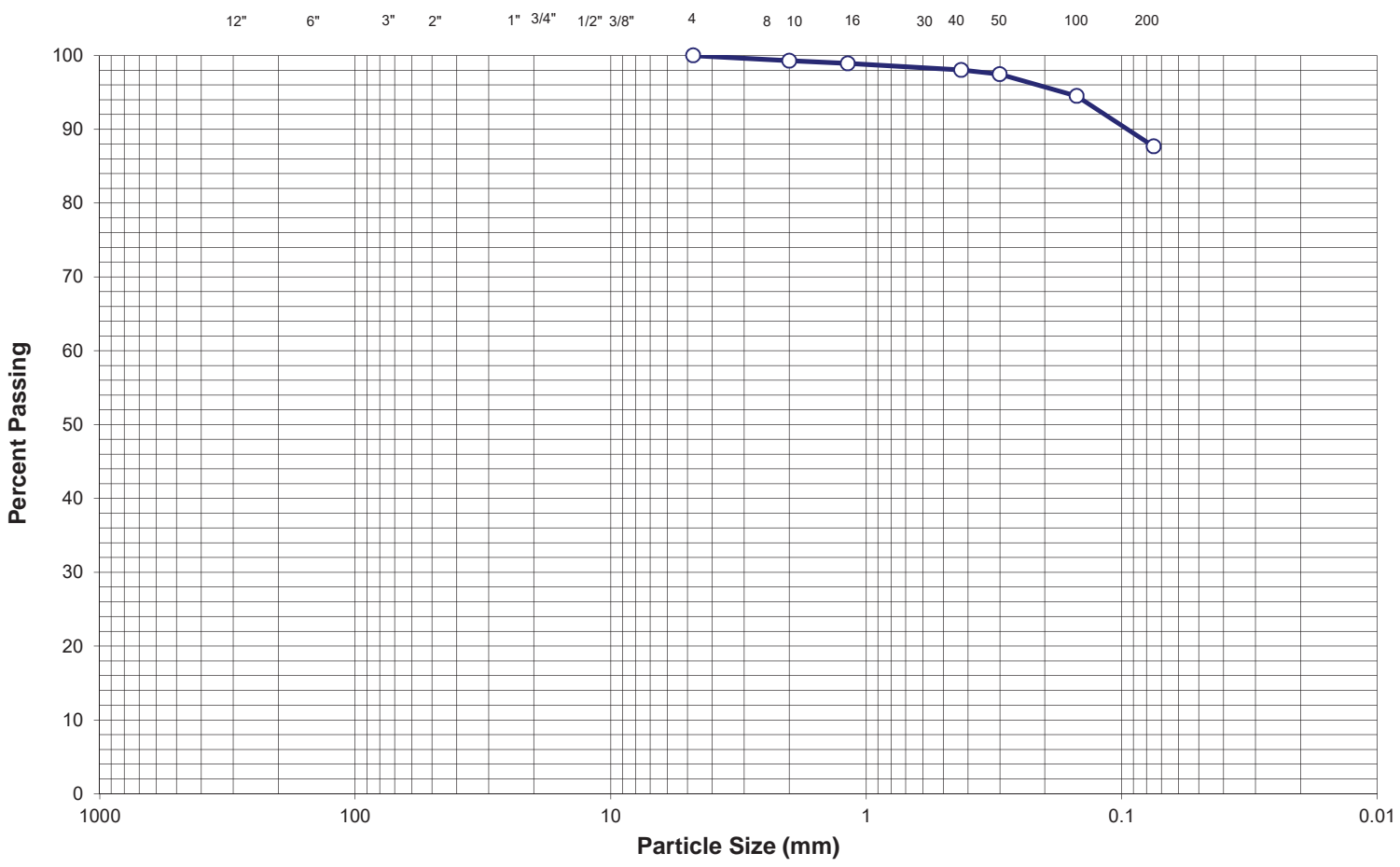
Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	89
#200	59.5

Gravel (%)	0	LL	32	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	40	PL	21	Boring:	WB-03	
Fines (%)	60	PI	11	Sample Depth (ft):	54.5-59.5	
Sample Classification:	sandy CLAY (weathered bedrock)		USCS:	AASHTO:		SIEVE ANALYSIS Drawn By: KM Checked By: LQ Date: 12/13/17
		CL		A-6 (4)		Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

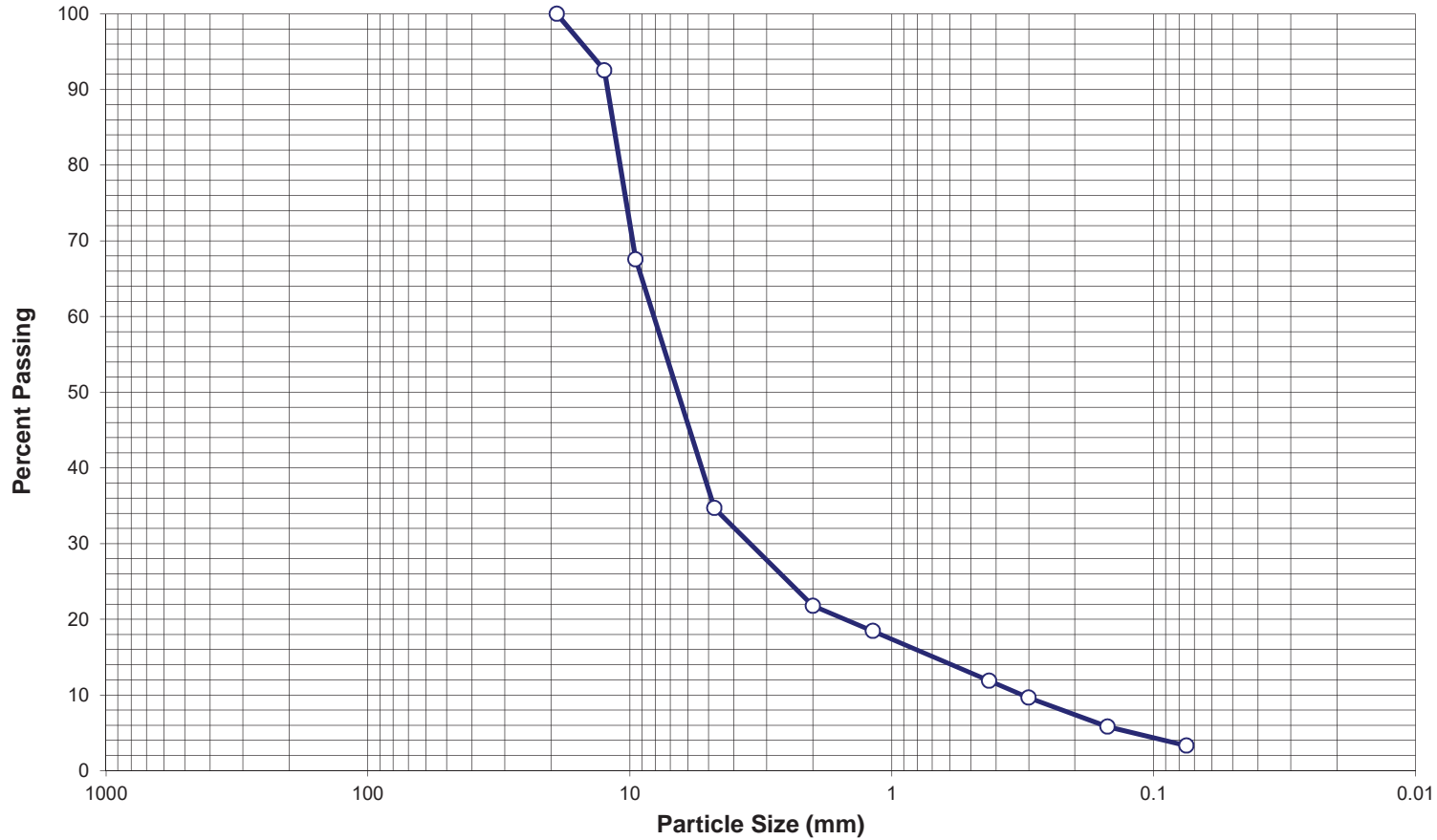


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	99
#40	98
#200	87.7


Gravel (%)	0	LL	45	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	12	PL	21	Boring:	WB-04	
Fines (%)	88	PI	24	Sample Depth (ft):	9.5-14.5	
Sample Classification:	sandy CLAY		USCS:	AASHTO:		Drawn By: KM Checked By: LQ Date: 12/27/17
		CL		A-7-6 (22)		Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

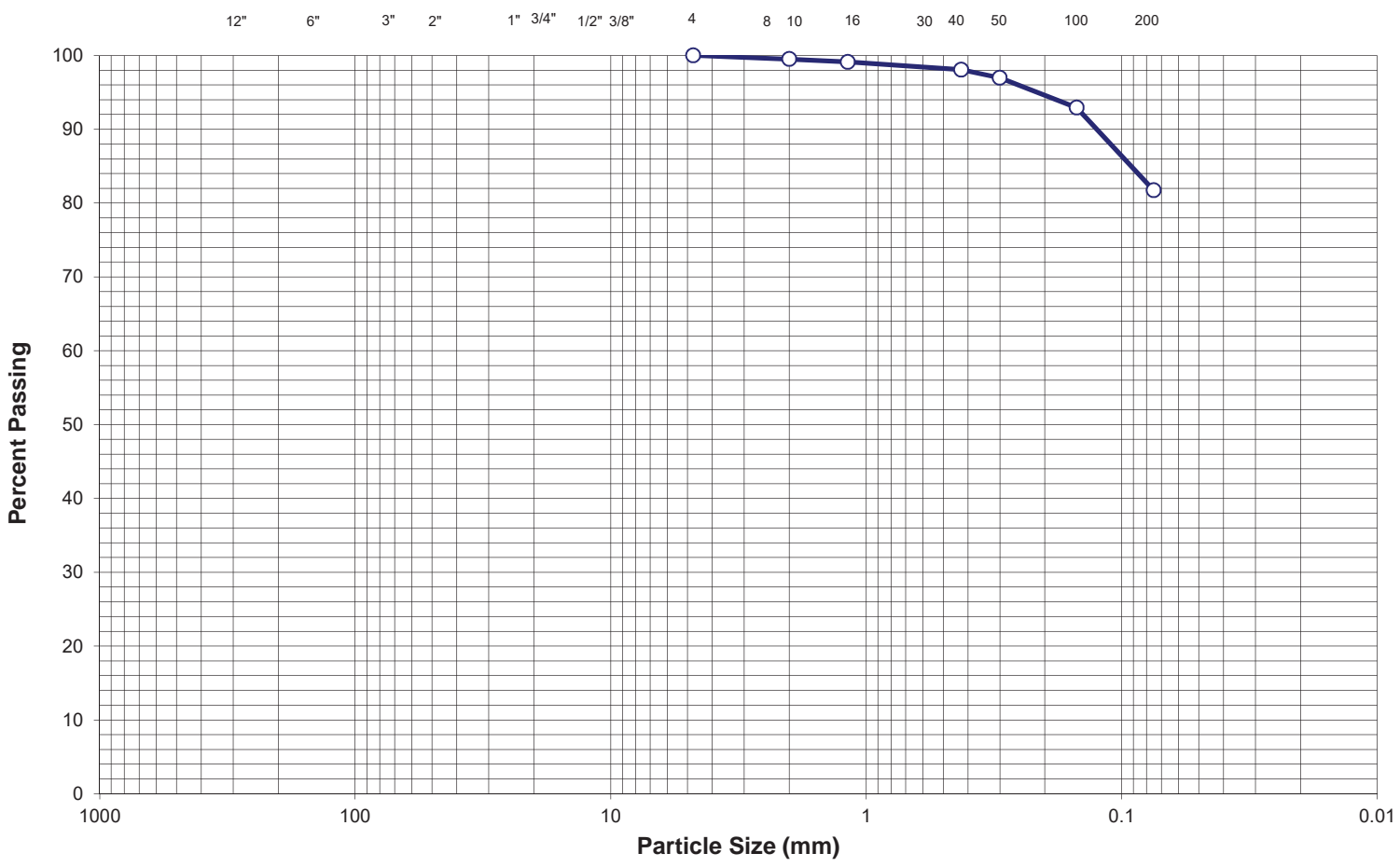
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	100
3/4"	100
1/2"	93
3/8"	68
#4	35
#10	22
#40	12
#200	3.3

Gravel (%)	65	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	32	PL	NP	Boring:	WB-04	
Fines (%)	3	PI	NP	Sample Depth (ft):	49.5-54.5	
Sample Classification:	poorly graded GRAVEL, with sand	USCS:	GP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 12/27/17
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

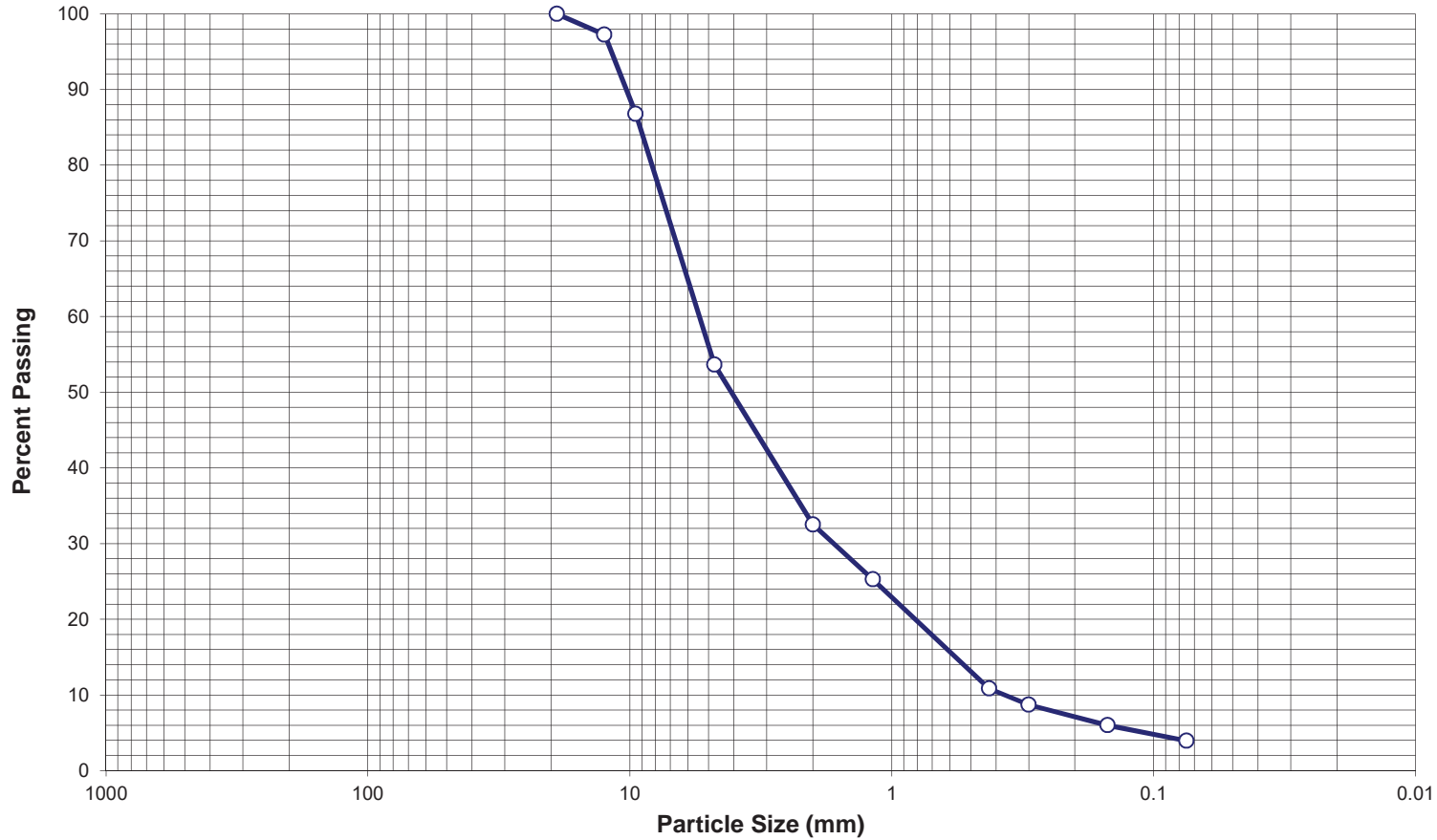


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	99
#40	98
#200	81.7


Gravel (%)	0	LL	42	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants												
Sand (%)	18	PL	16	Boring:	WB-05													
Fines (%)	82	PI	26	Sample Depth (ft):	4.5													
Sample Classification:	sandy CLAY		USCS:	AASHTO:		<table border="1"> <tr> <td>Drawn By:</td> <td>KM</td> <td>Project No.:</td> <td>217-376</td> </tr> <tr> <td>Checked By:</td> <td>KM</td> <td>Figure No.:</td> <td>-</td> </tr> <tr> <td>Date:</td> <td>01/02/18</td> <td></td> <td></td> </tr> </table>	Drawn By:	KM	Project No.:	217-376	Checked By:	KM	Figure No.:	-	Date:	01/02/18		
Drawn By:	KM	Project No.:	217-376															
Checked By:	KM	Figure No.:	-															
Date:	01/02/18																	
		CL		A-7-6 (20)														

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

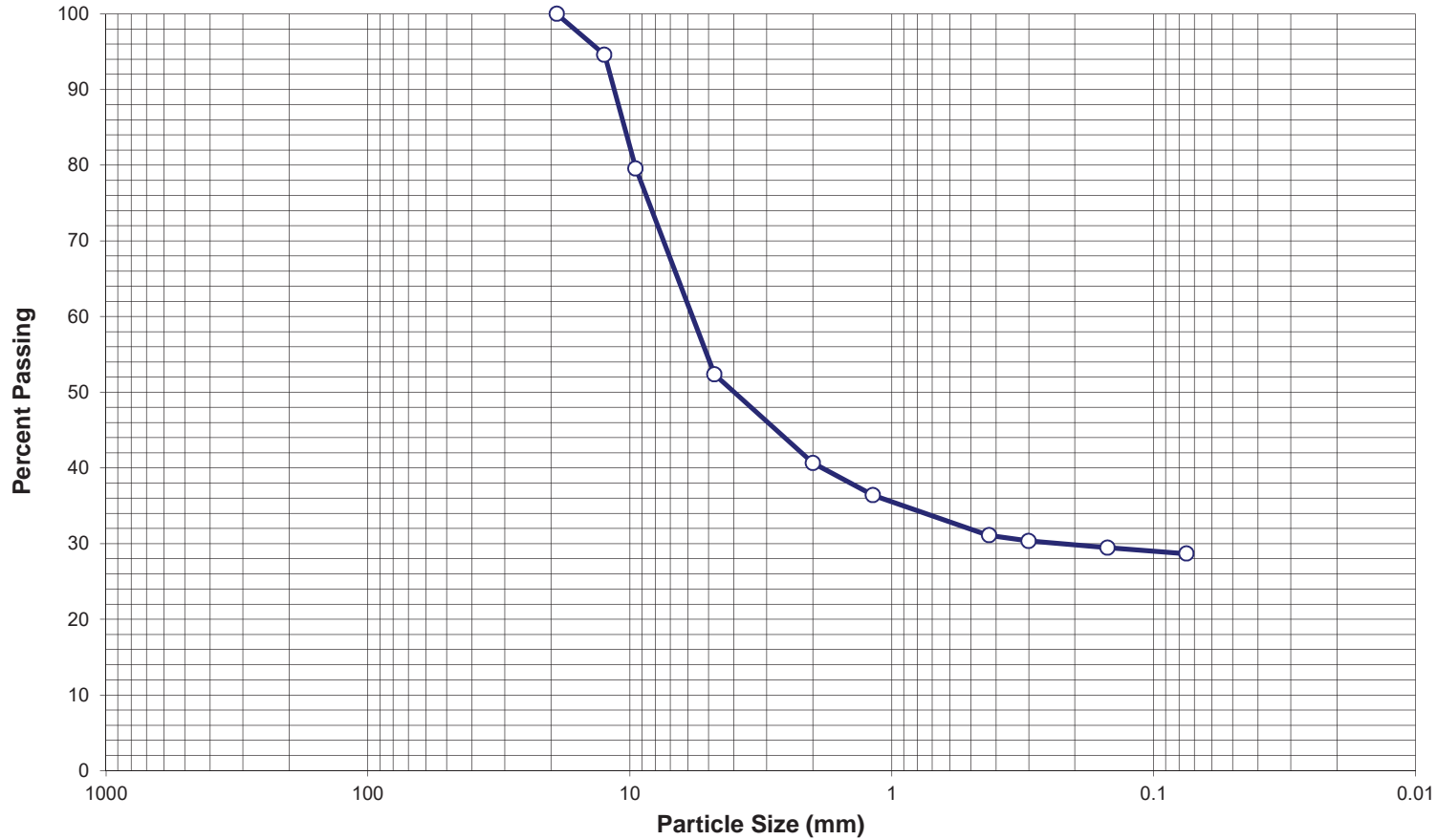


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	100
3/4"	100
1/2"	97
3/8"	87
#4	54
#10	33
#40	11
#200	4.0


Gravel (%)	46	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	50	PL	NP	Boring:	WB-05	
Fines (%)	4	PI	NP	Sample Depth (ft):	24.5-29.5	
Sample Classification:	poorly graded SAND w/gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 01/02/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

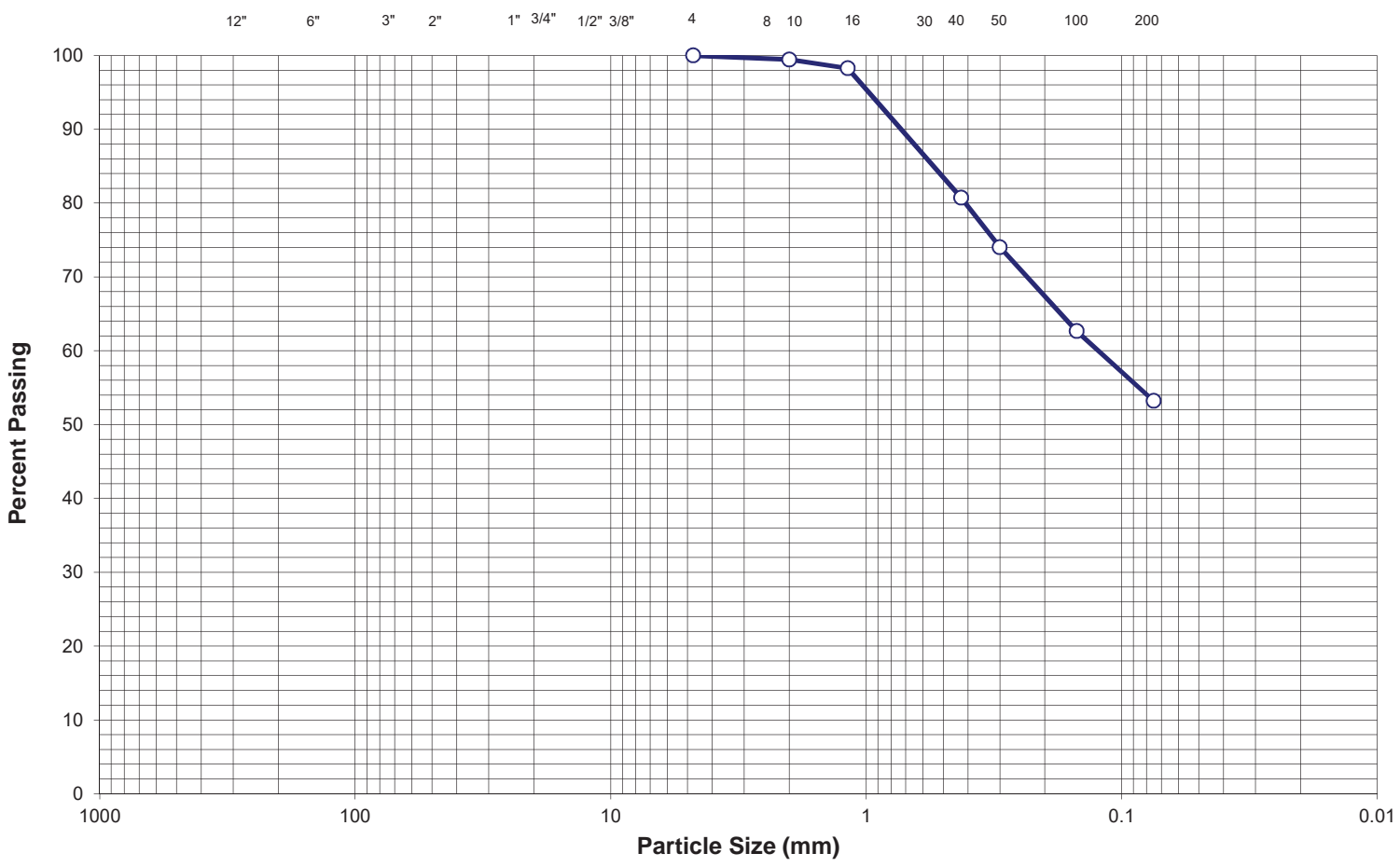
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	95
3/8"	80
#4	52
#10	41
#40	31
#200	28.7

Gravel (%)	48	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	23	PL	NP	Boring:	WB-05	
Fines (%)	29	PI	NP	Sample Depth (ft):	49.5-54.5	
Sample Classification:	silty GRAVEL w/ sand		USCS:	AASHTO:		SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/04/18
		GM	A-2-4 (0)		Project No.: 217-376 Figure No.: -	

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

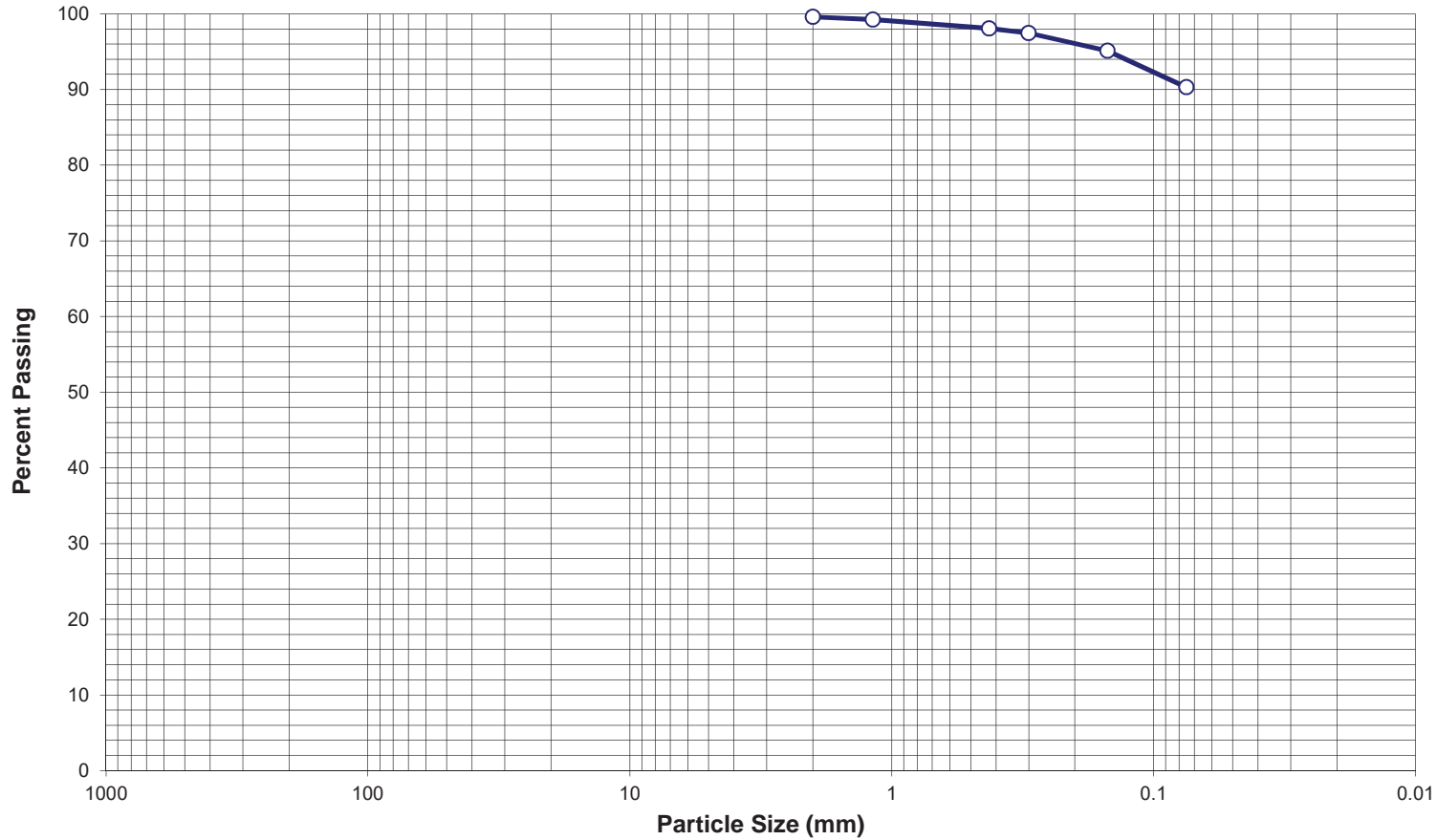


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	99
#40	81
#200	53.2


Gravel (%)	0	LL	39	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	47	PL	22	Boring:	WB-05	
Fines (%)	53	PI	17	Sample Depth (ft):	54.5-59.5	
Sample Classification:	sandy CLAY (crushed bedrock)	USCS:	CL	AASHTO:	A-6 (6)	SIEVE ANALYSIS Drawn By: KM Checked By: AH Date: 01/16/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

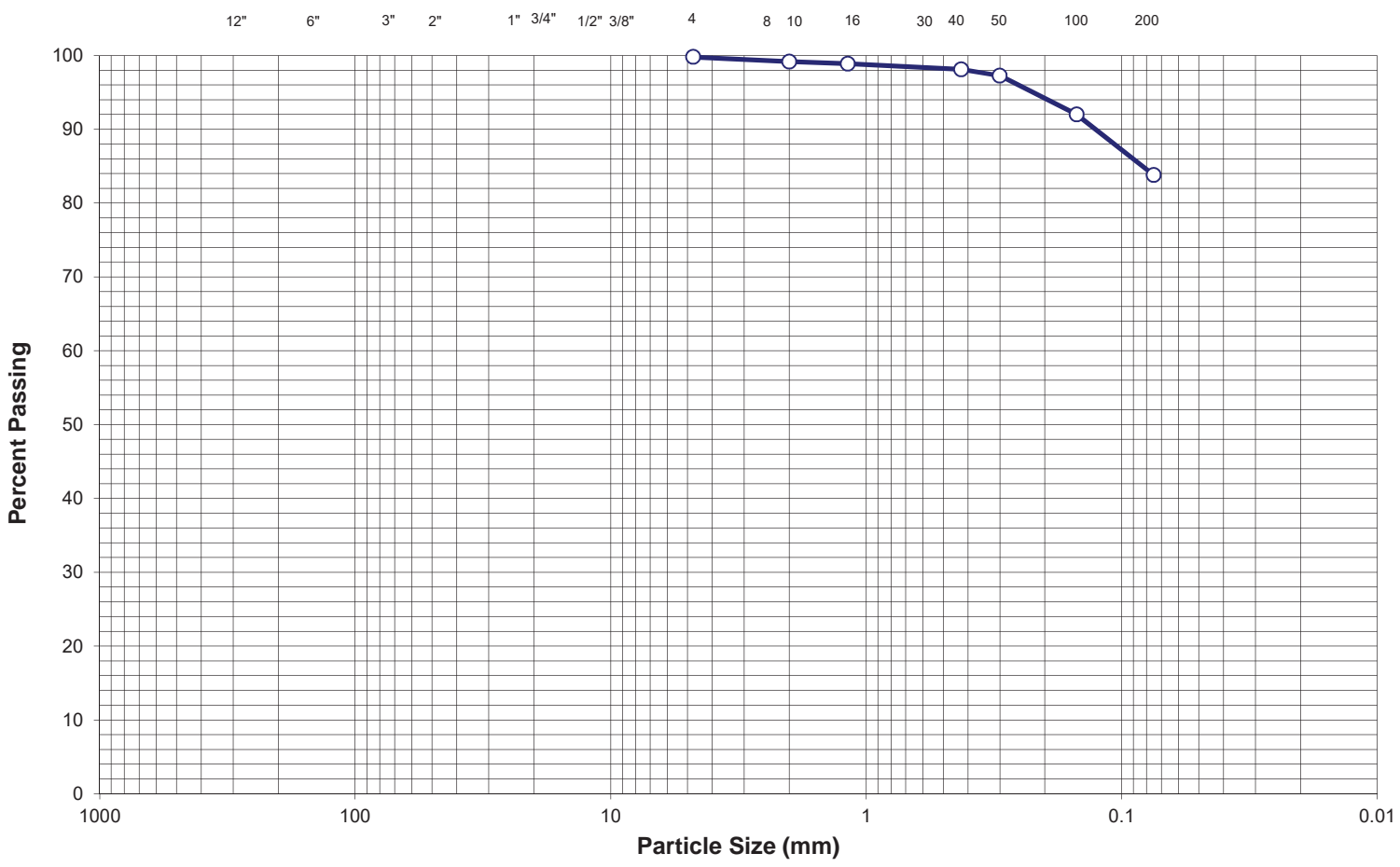
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	98
#200	90.3

Gravel (%)	0	LL	34	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	10	PL	18	Boring:	WB-06	
Fines (%)	90	PI	16	Sample Depth (ft):	14.5-19.5	
Sample Classification:	CLAY, trace sand	USCS:	CL	AASHTO:	A-6 (14)	SIEVE ANALYSIS Drawn By: KM Checked By: AH Date: 01/16/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

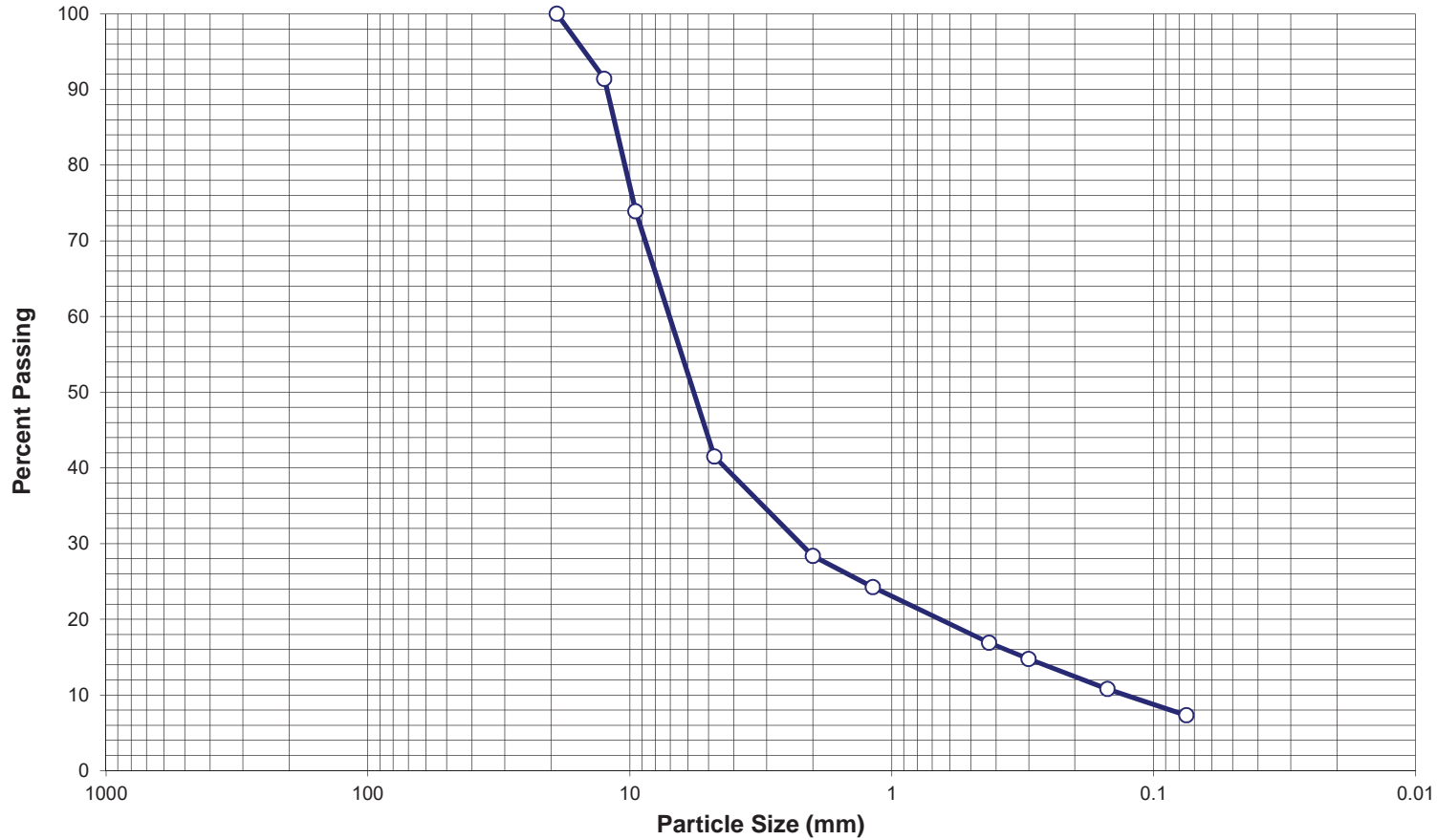


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	100
#4	100
#10	99
#40	98
#200	83.8


Gravel (%)	0	LL	59	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	16	PL	19	Boring:	WB-07	
Fines (%)	84	PI	40	Sample Depth (ft):	9.5-14.5	
Sample Classification:	high plasticity sand CLAY	USCS:	CH	AASHTO:	A-7-6 (35)	SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/04/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

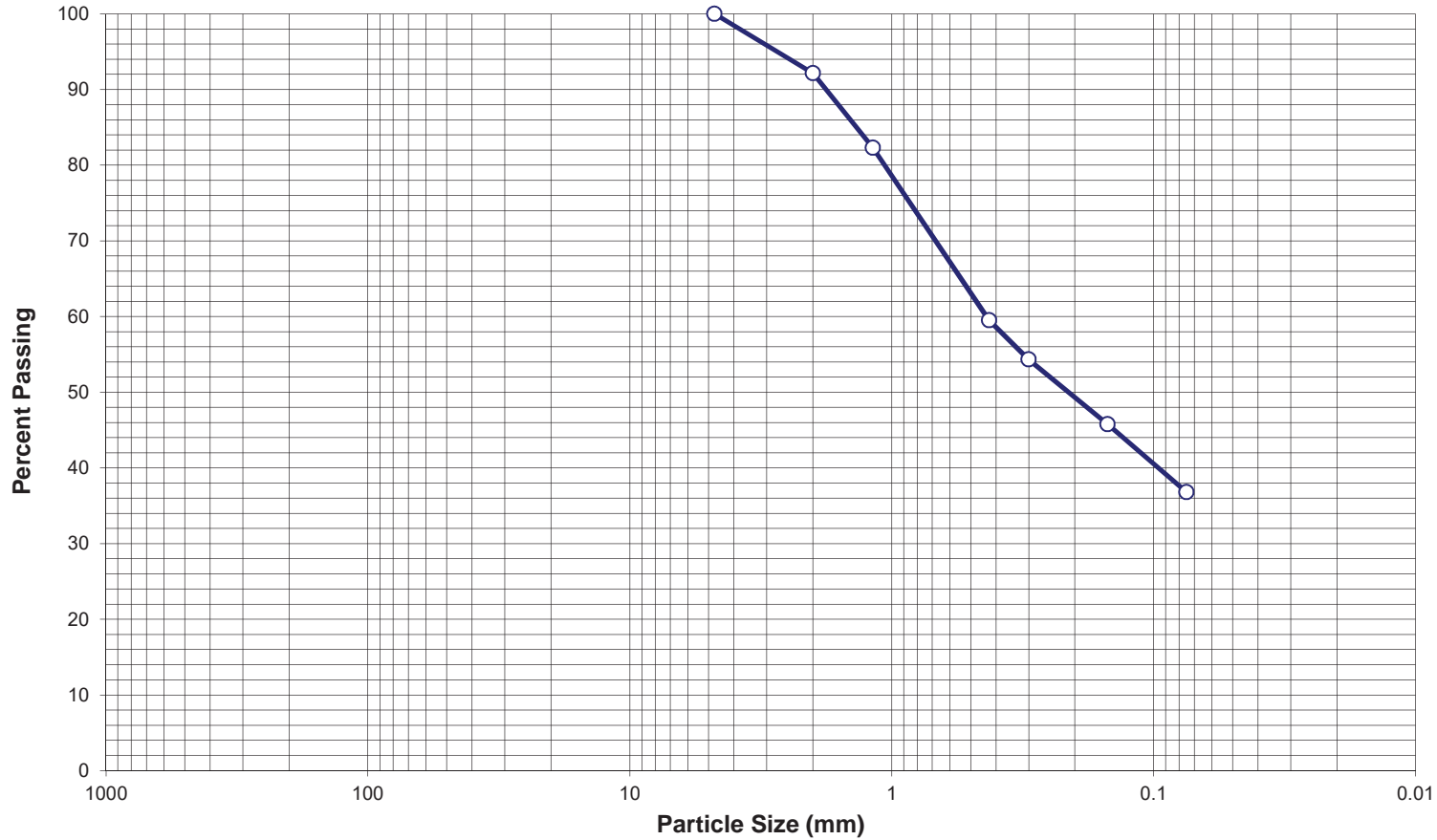


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	91
3/8"	74
#4	41
#10	28
#40	17
#200	7.3


Gravel (%)	59	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	34	PL	NP	Boring:	WB-07	
Fines (%)	7	PI	NP	Sample Depth (ft):	29.5-34.5	
Sample Classification:	poorly graded GRAVEL w/ silt and sand	USCS:	GP-GM	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/04/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

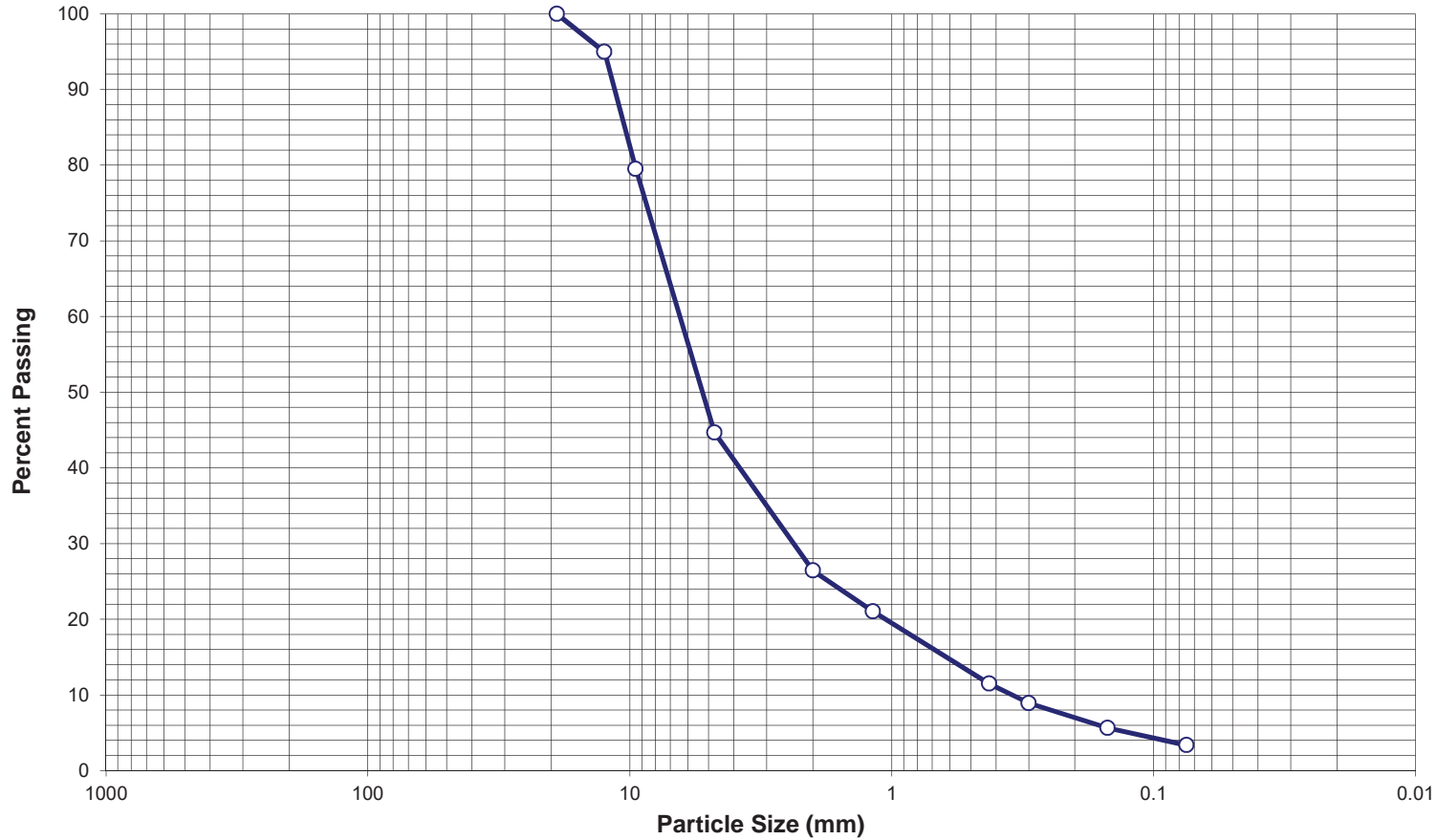


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	92
#40	60
#200	36.8


Gravel (%)	0	LL	34	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	63	PL	20	Boring:	WB-07		
Fines (%)	37	PI	14	Sample Depth (ft):	44.5-49.5		
Sample Classification:	clayey SAND (crushed bedrock)	USCS:	SC	AASHTO:	A-6 (1)	SIEVE ANALYSIS	
				Drawn By:	KM	Project No.:	217-376
				Checked By:	BB	Figure No.:	-
				Date:	01/18/18		

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

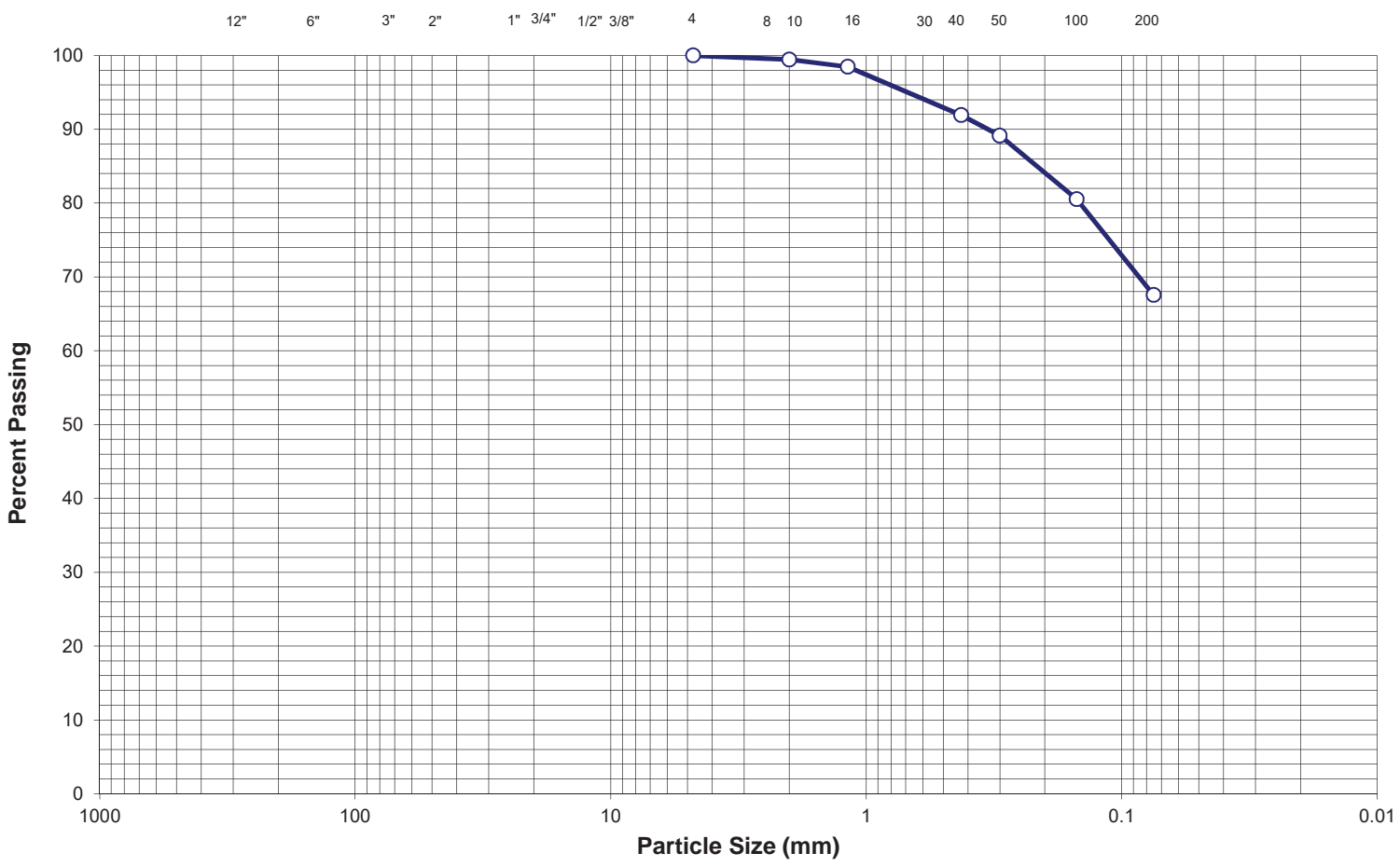
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	95
3/8"	80
#4	45
#10	26
#40	11
#200	3.4

Gravel (%)	55	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	42	PL	NP	Boring:	WB-08	
Fines (%)	3	PI	NP	Sample Depth (ft):	34.5-39.5	
Sample Classification:	poorly graded GRAVEL w/ Sand	USCS:	GP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: AH Date: 01/16/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

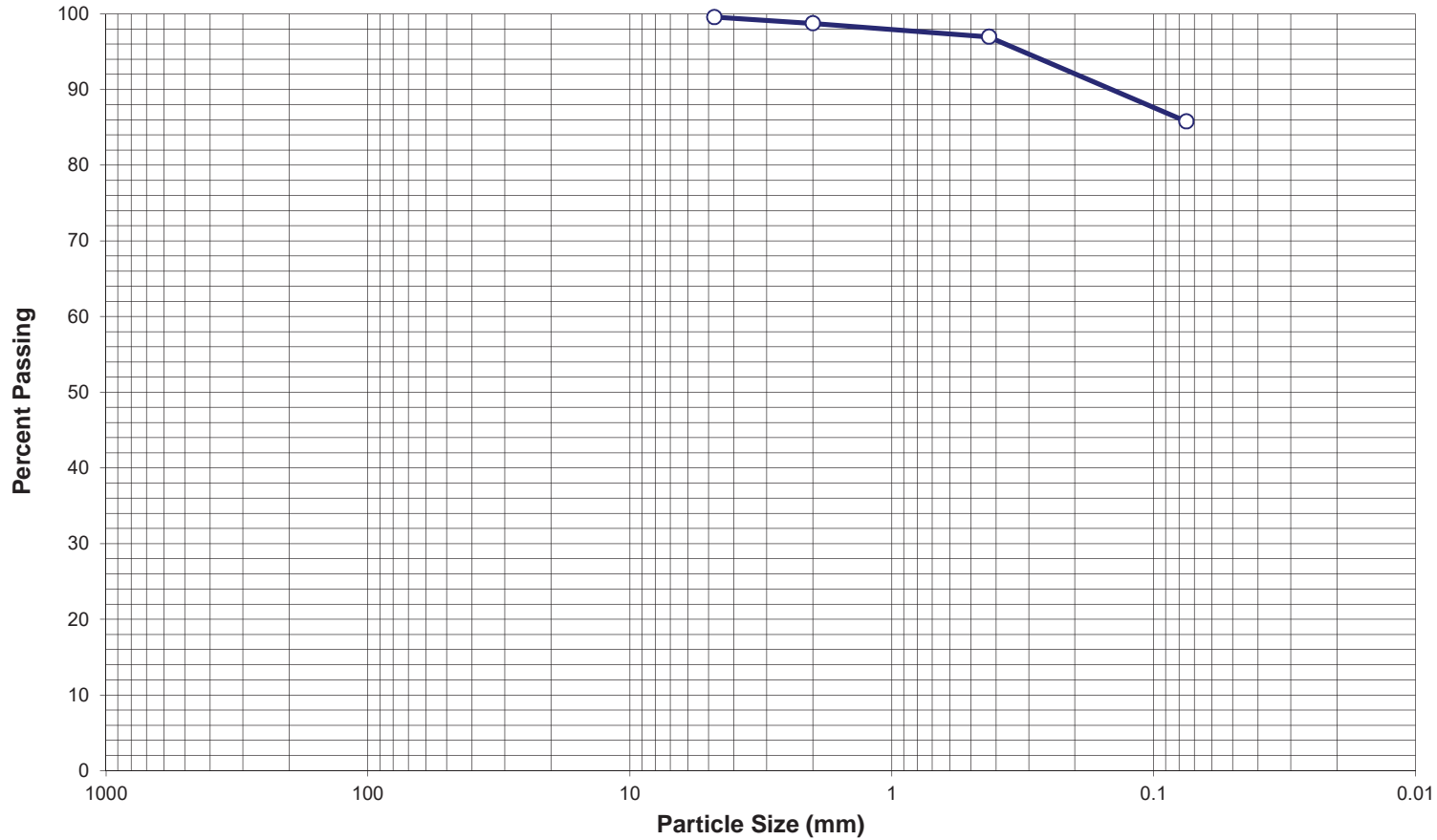


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	99
#40	92
#200	67.5


Gravel (%)	0	LL	37	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	32	PL	18	Boring:	WB-08	
Fines (%)	68	PI	19	Sample Depth (ft):	59.5-69.5	
Sample Classification:	sandy CLAY (weathered bedrock)	USCS:	CL	AASHTO:	A-6 (11)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 01/18/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

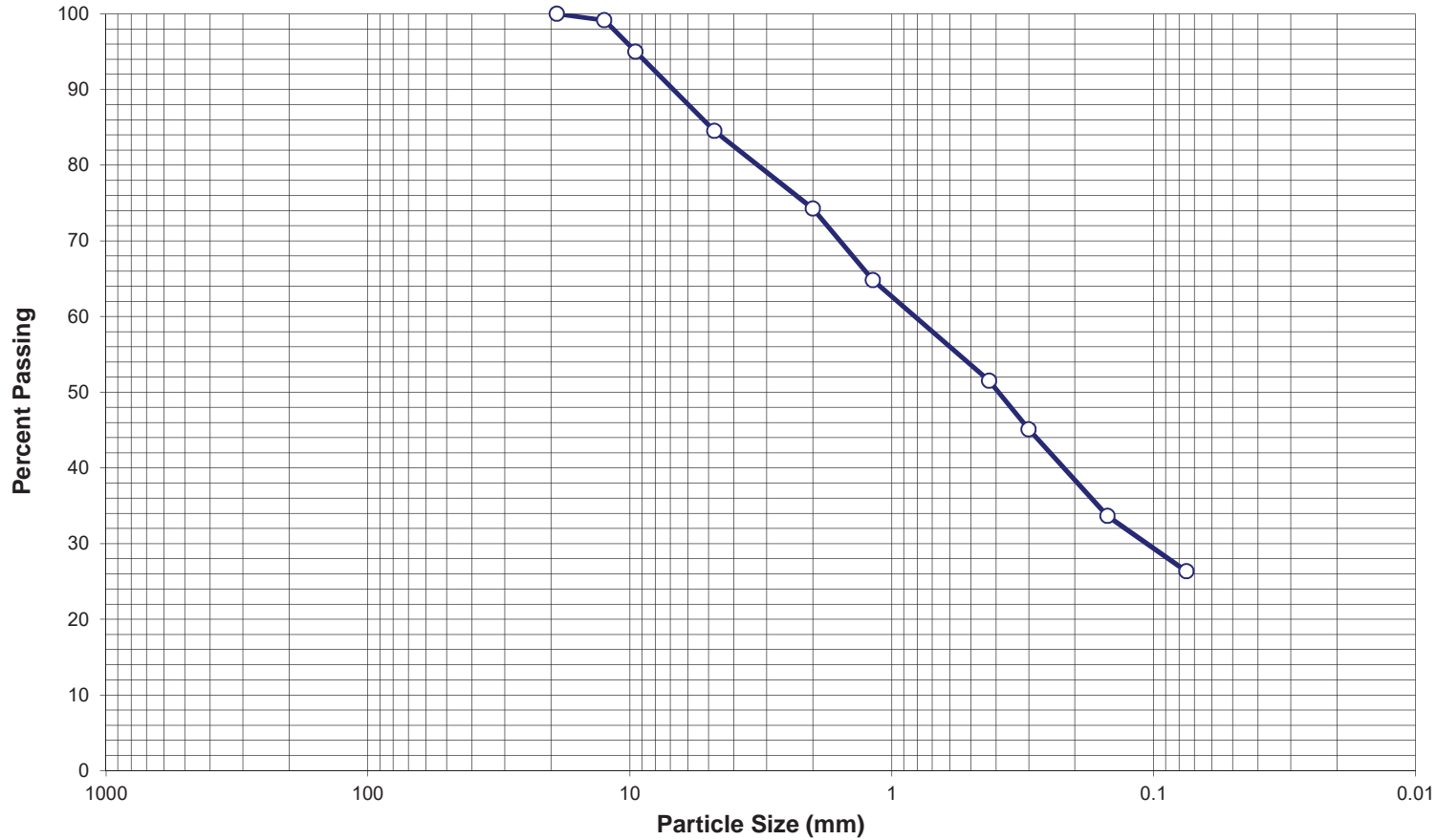


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	99
#40	97
#200	85.8


Gravel (%)	0	LL	34	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	14	PL	20	Boring:	WB-09	
Fines (%)	86	PI	14	Sample Depth (ft):	14.5-24.5	
Sample Classification:	sandy CLAY	USCS:	CL	AASHTO:	A-6 (11)	SIEVE ANALYSIS Drawn By: KM Checked By: AH Date: 01/26/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

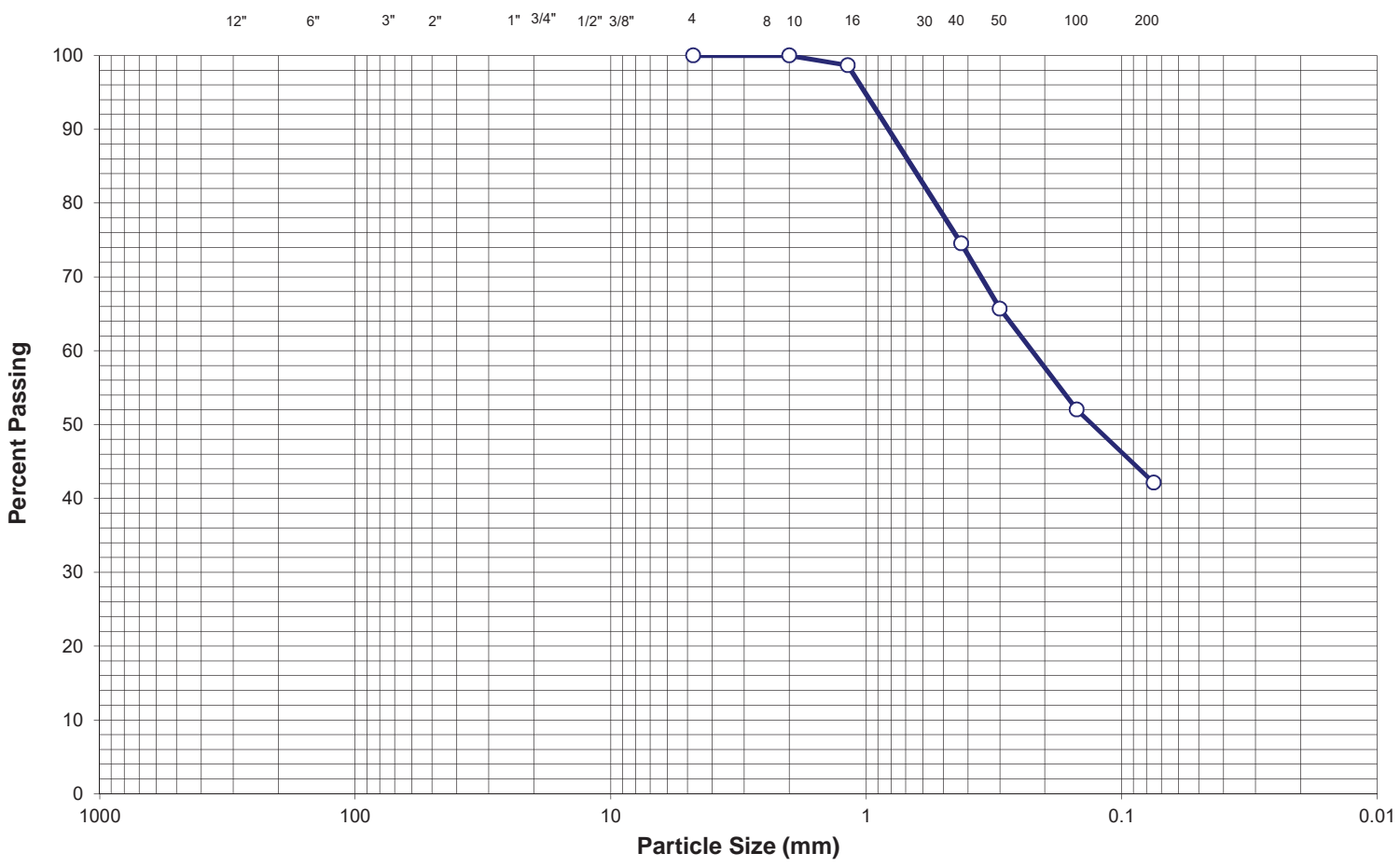
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	99
3/8"	95
#4	85
#10	74
#40	52
#200	26.3

Gravel (%)	15	LL	32	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	59	PL	21	Boring:	WB-09	
Fines (%)	26	PI	11	Sample Depth (ft):	24.5-29.5	
Sample Classification:	clayey SAND w/ gravel	USCS:	SC	AASHTO:	A-2-6 (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 01/19/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

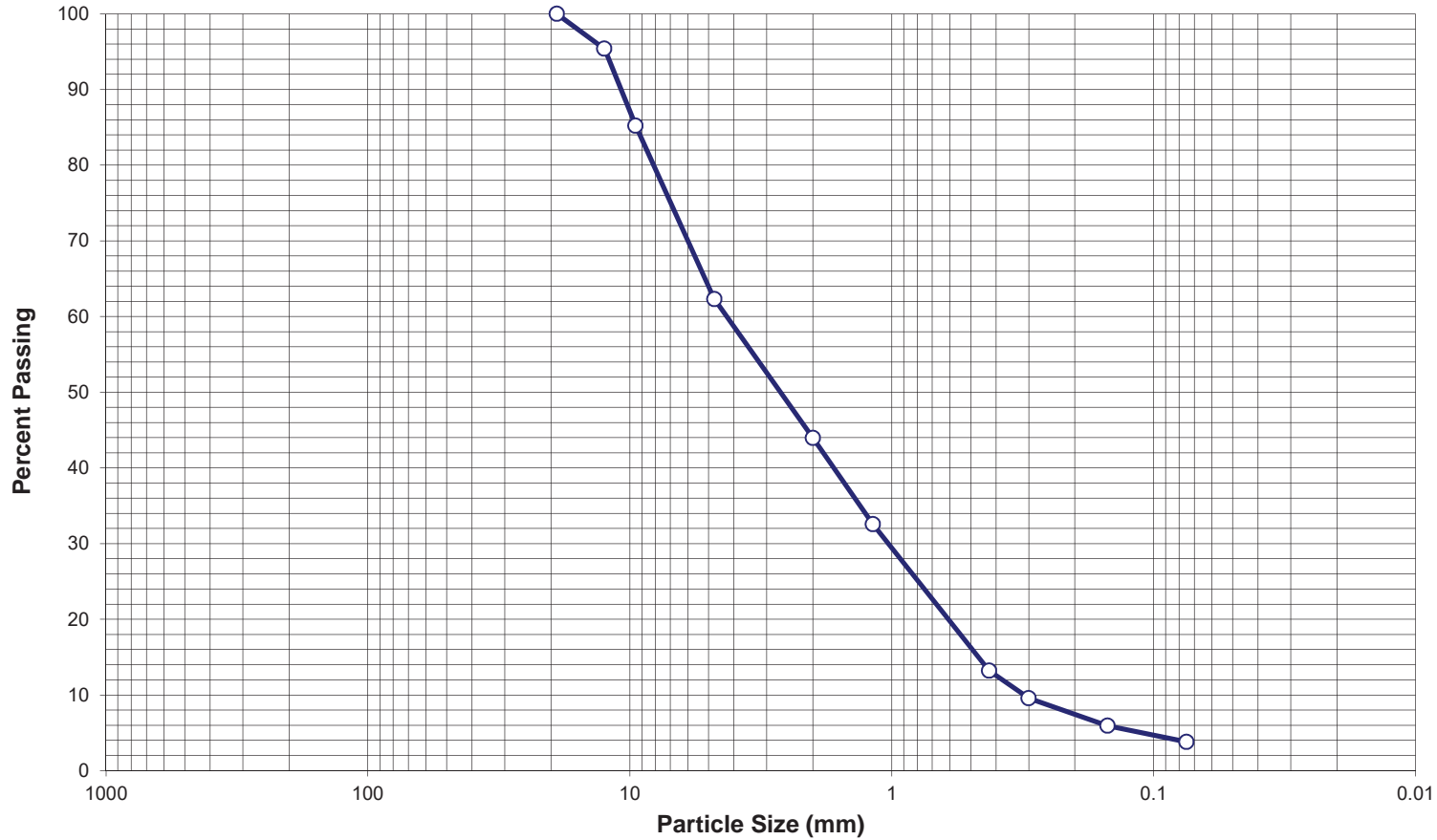


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	75
#200	42.1


Gravel (%)	0	LL	41	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	58	PL	24	Boring:	WB-09	
Fines (%)	42	PI	17	Sample Depth (ft):	49.5-54.5	
Sample Classification:	clayey SAND		USCS:	AASHTO:		SIEVE ANALYSIS Drawn By: KM Checked By: AH Date: 01/19/18
		SC	A-7-6 (3)		Project No.: 217-376 Figure No.: -	

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

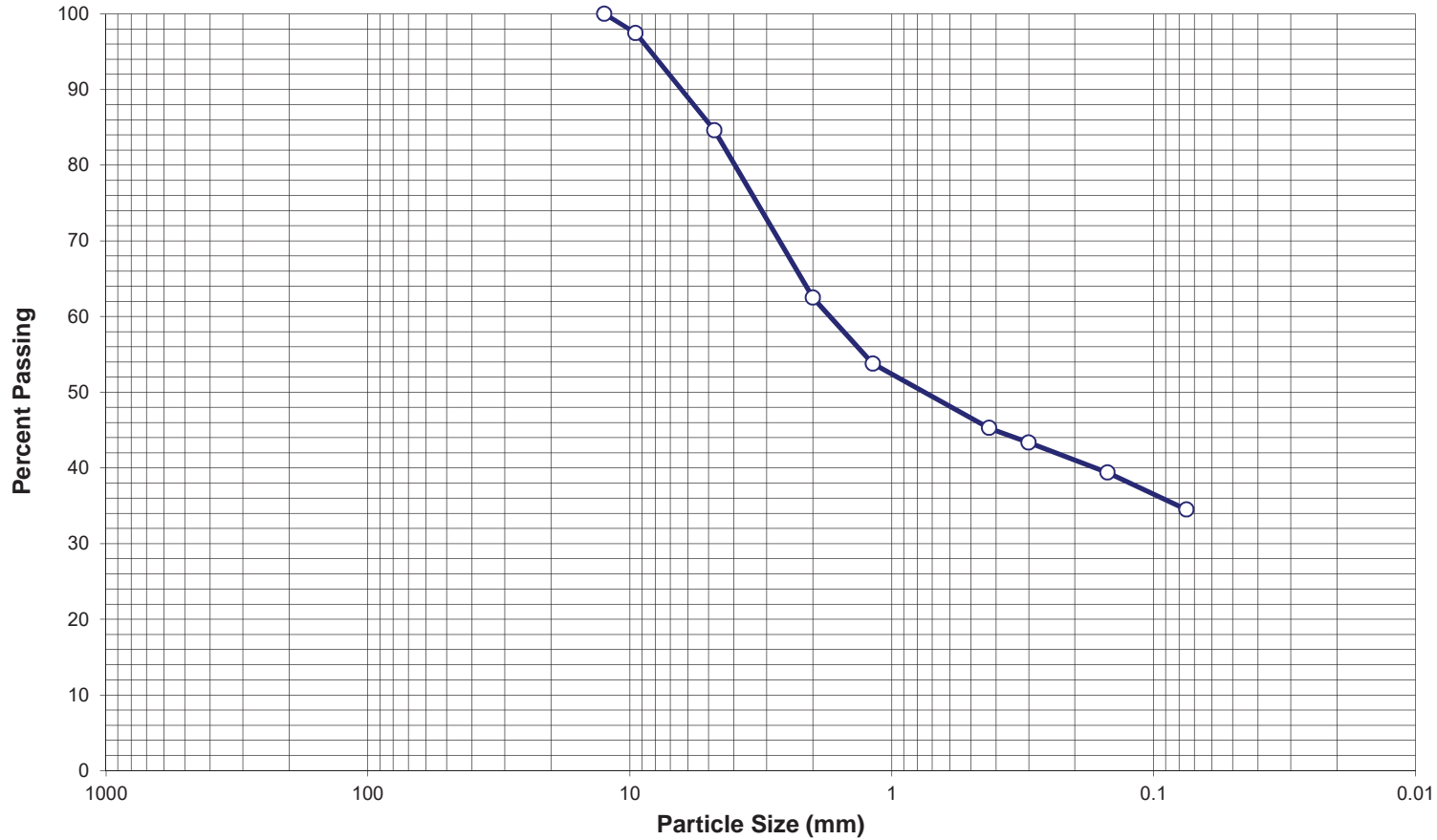


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	95
3/8"	85
#4	62
#10	44
#40	13
#200	3.8


Gravel (%)	38	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	58	PL	NP	Boring:	WC-01	
Fines (%)	4	PI	NP	Sample Depth (ft):	4.5-9.5	
Sample Classification:	poorly graded SAND w/ gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/17/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

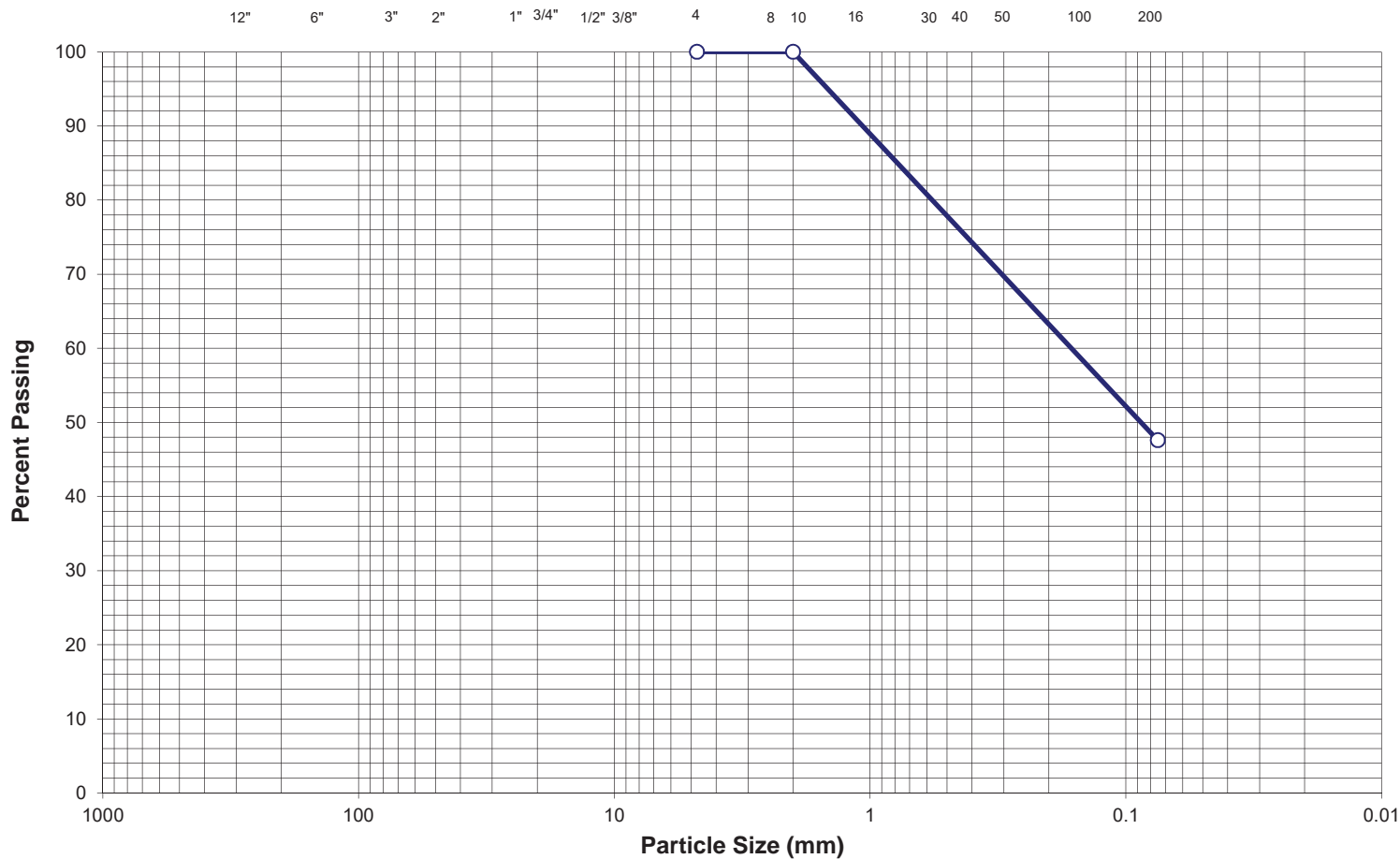
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	100
3/8"	97
#4	85
#10	63
#40	45
#200	34.5

Gravel (%)	15	LL	37	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	51	PL	16	Boring:	WC-01	
Fines (%)	34	PI	21	Sample Depth (ft):	34.5-39.5	
Sample Classification:	clayey SAND w/ gravel (crushed bedrock)	USCS:	SC	AASHTO:	A-2-6 (2)	SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/17/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

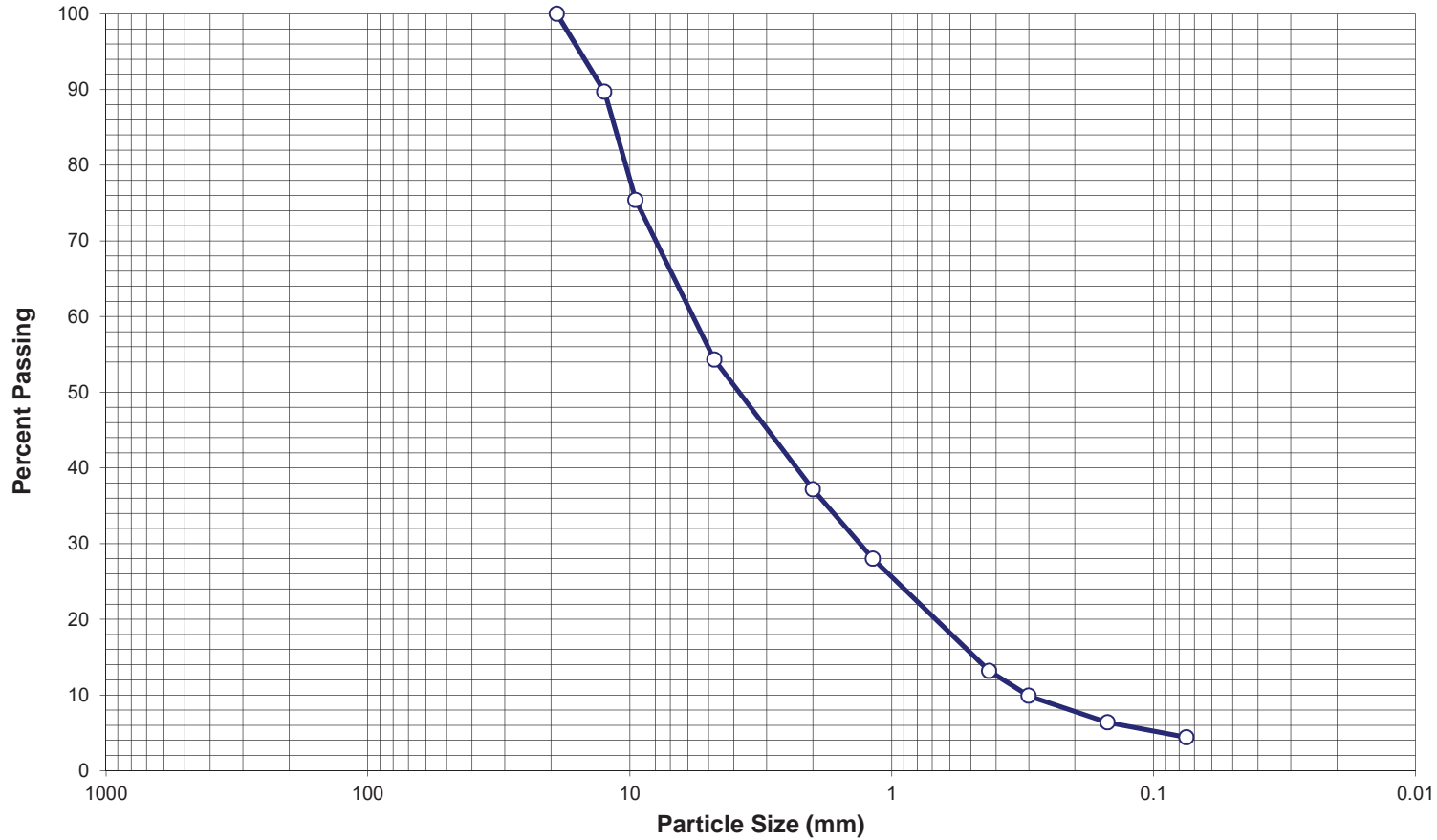


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	-
#200	47.6


Gravel (%)	0	LL	35	Project Name:	US 550 S/ 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	52	PL	25	Boring:	WC-01	
Fines (%)	48	PI	10	Sample Depth (ft):	39.5-43.5	
Sample Description:				Bedrock CORE, Shale, rust, yellow, tan (2)		SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/01/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

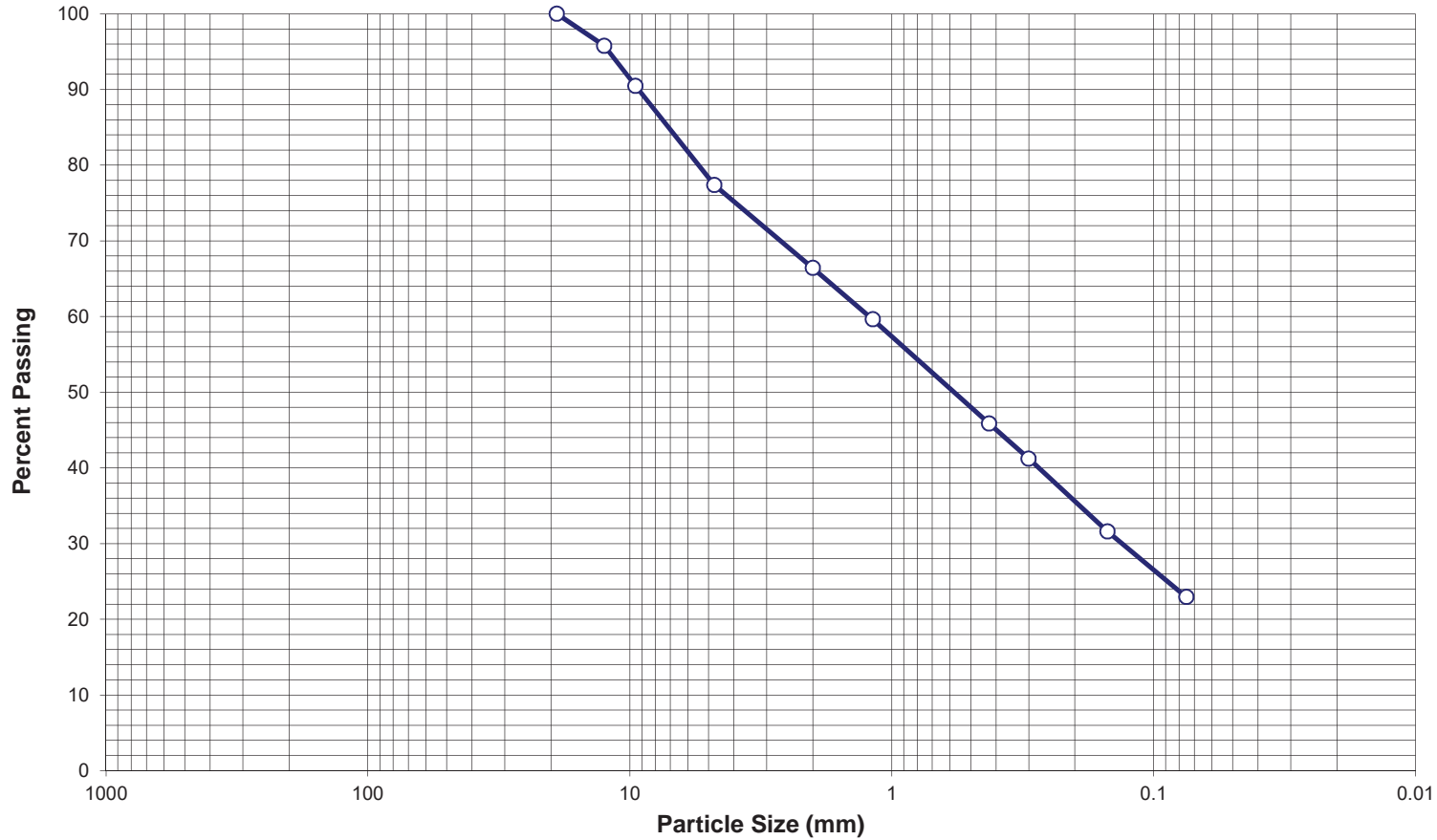


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	90
3/8"	75
#4	54
#10	37
#40	13
#200	4.4


Gravel (%)	46	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	50	PL	NP	Boring:	WC-02	
Fines (%)	4	PI	NP	Sample Depth (ft):	9.5-14.5	
Sample Classification:	poorly graded SAND w/ gravel	USCS:	SP	AASHTO:	A-1-a (0)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 02/08/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

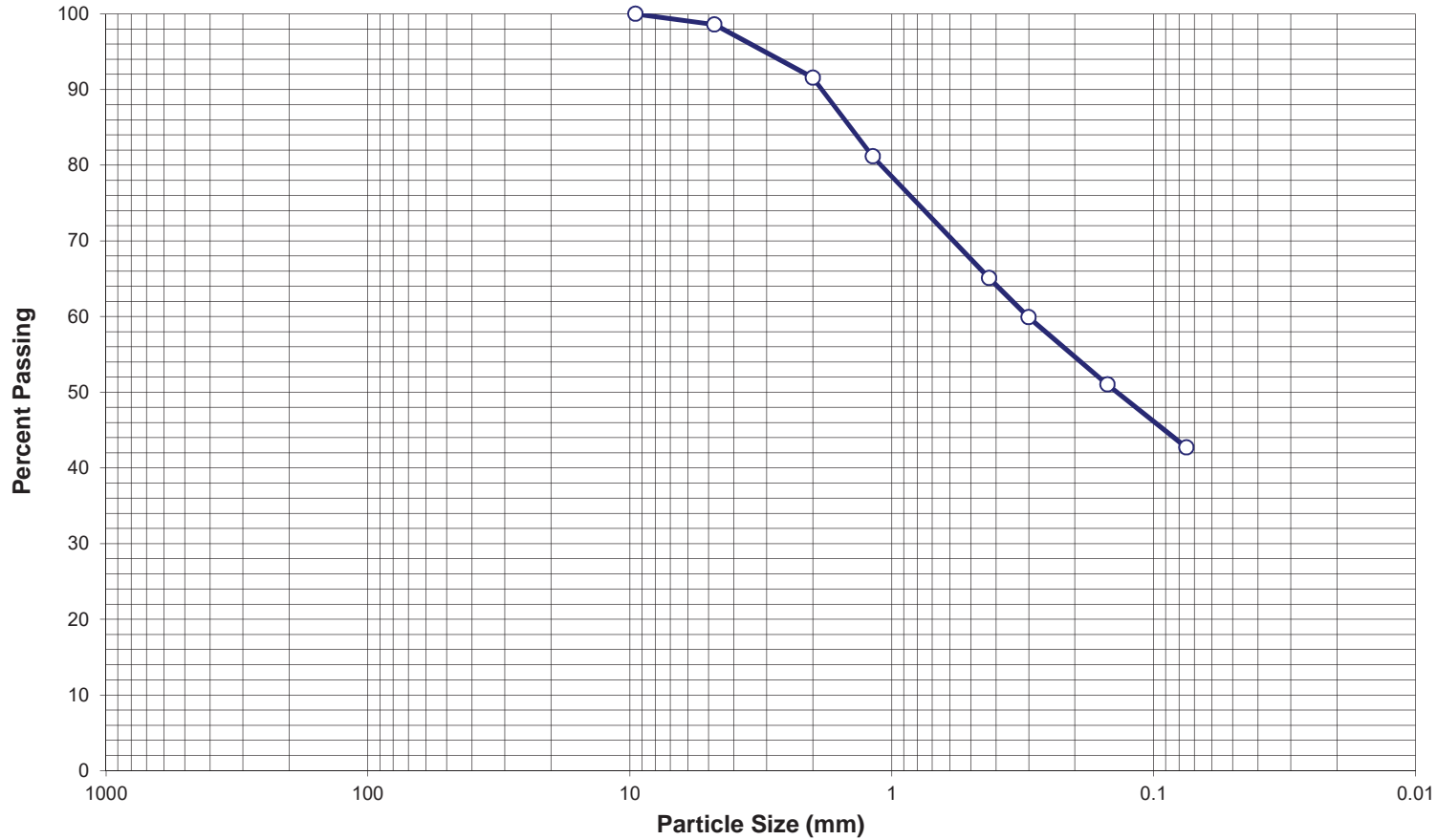


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	100
1/2"	96
3/8"	90
#4	77
#10	66
#40	46
#200	22.9


Gravel (%)	23	LL	27	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	54	PL	19	Boring:	WC-03	
Fines (%)	23	PI	8	Sample Depth (ft):	0-4.5	
Sample Classification:	clayey SAND w/ gravel	USCS:	SC	AASHTO:	A-2-4 (0)	SIEVE ANALYSIS Drawn By: KM Checked By: KM Date: 01/17/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

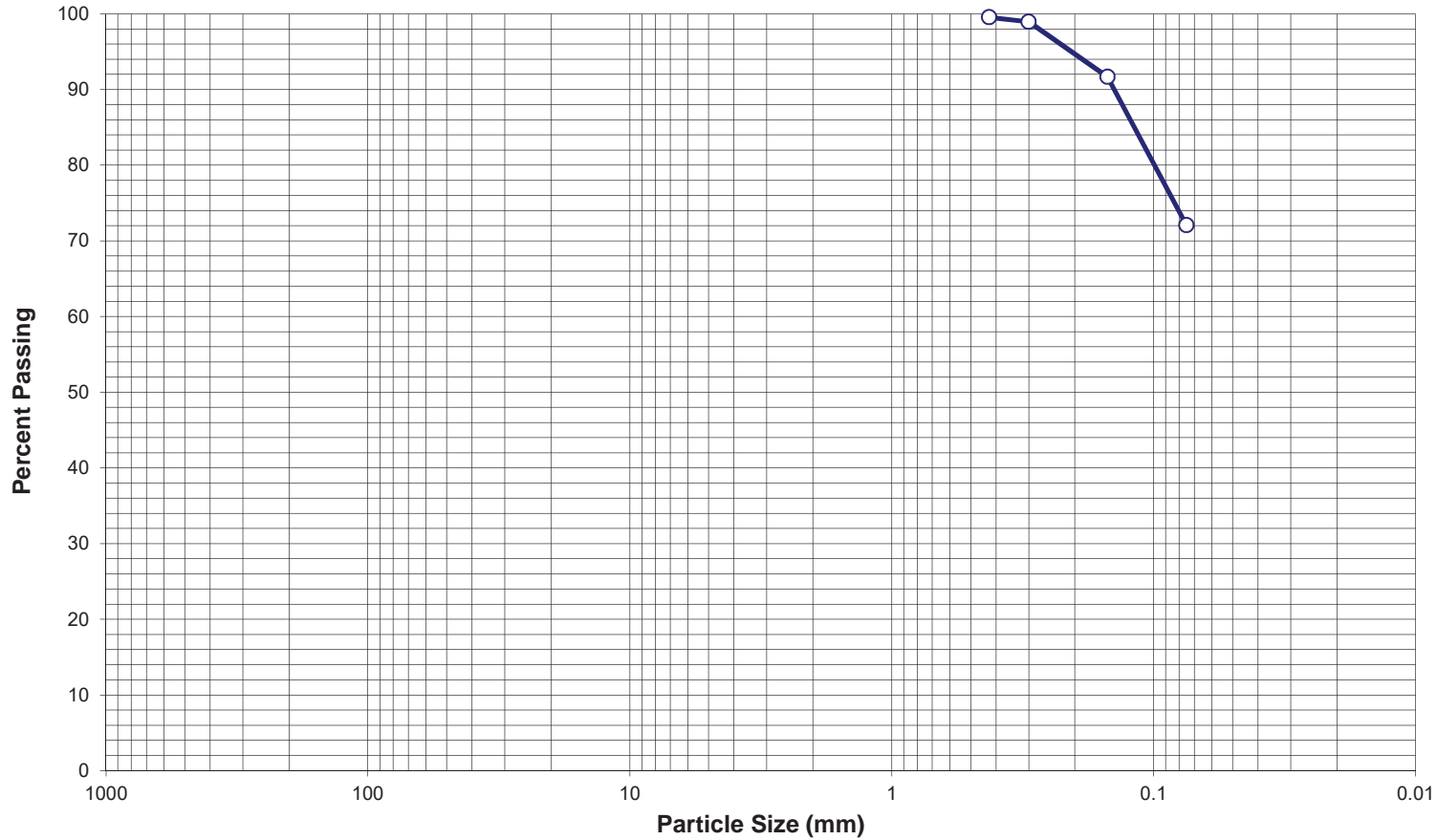


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4"	-
1/2"	-
3/8"	100
#4	99
#10	92
#40	65
#200	42.7


Gravel (%)	1	LL	35	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	56	PL	19	Boring:	WC-03	
Fines (%)	43	PI	16	Sample Depth (ft):	29.5-34.5	
Sample Classification:	clayey SAND (crushed bedrock)	USCS:	SC	AASHTO:	A-6 (3)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 01/16/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

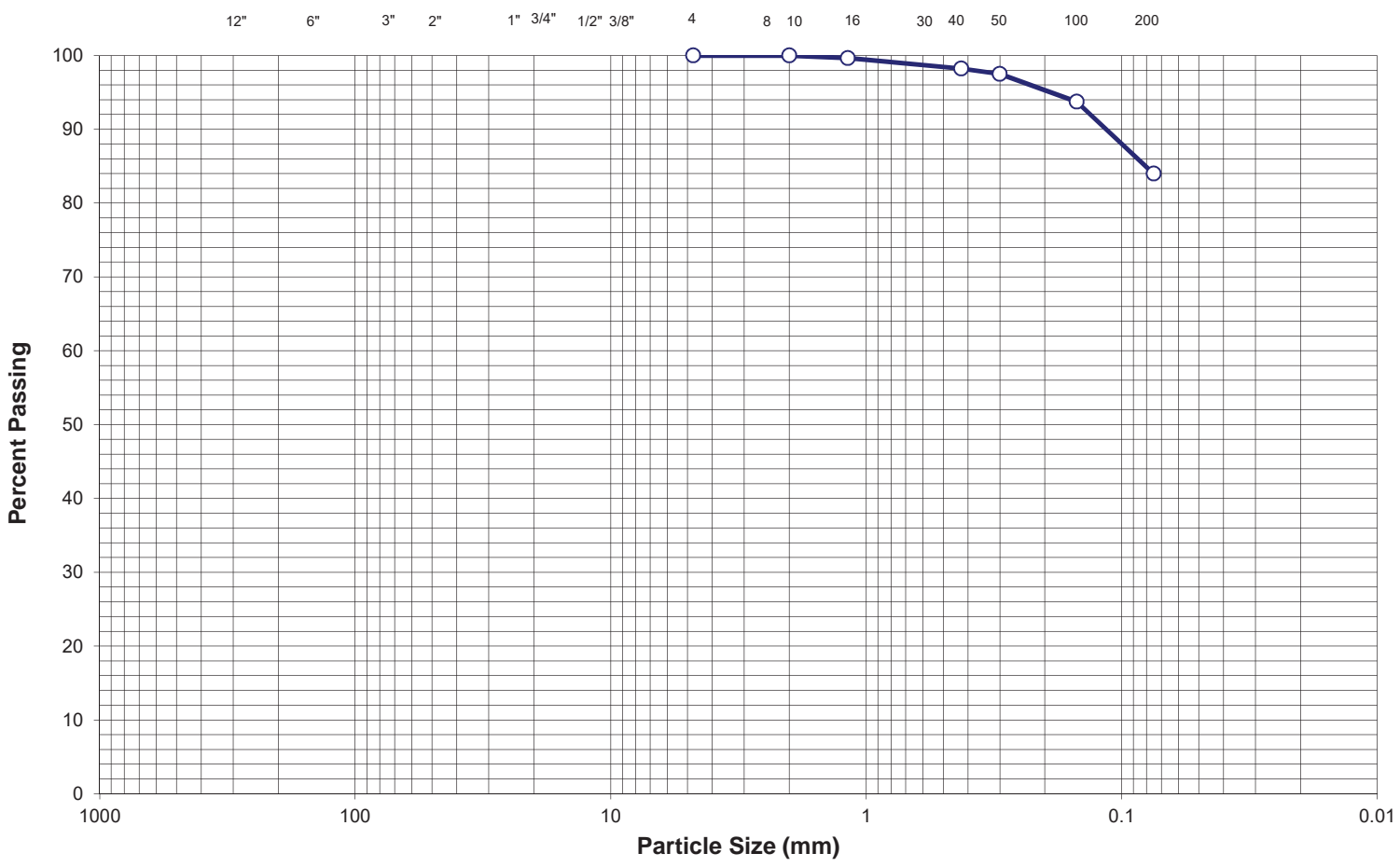
12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200




Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	-
#40	100
#200	72.1

Gravel (%)	0	LL	26	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	28	PL	18	Boring:	WE-01	
Fines (%)	72	PI	8	Sample Depth (ft):	4	
Sample Classification:	Low plasticity CLAY w/ sand, tan	USCS:	CL	AASHTO:	A-4 (4)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 05/03/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

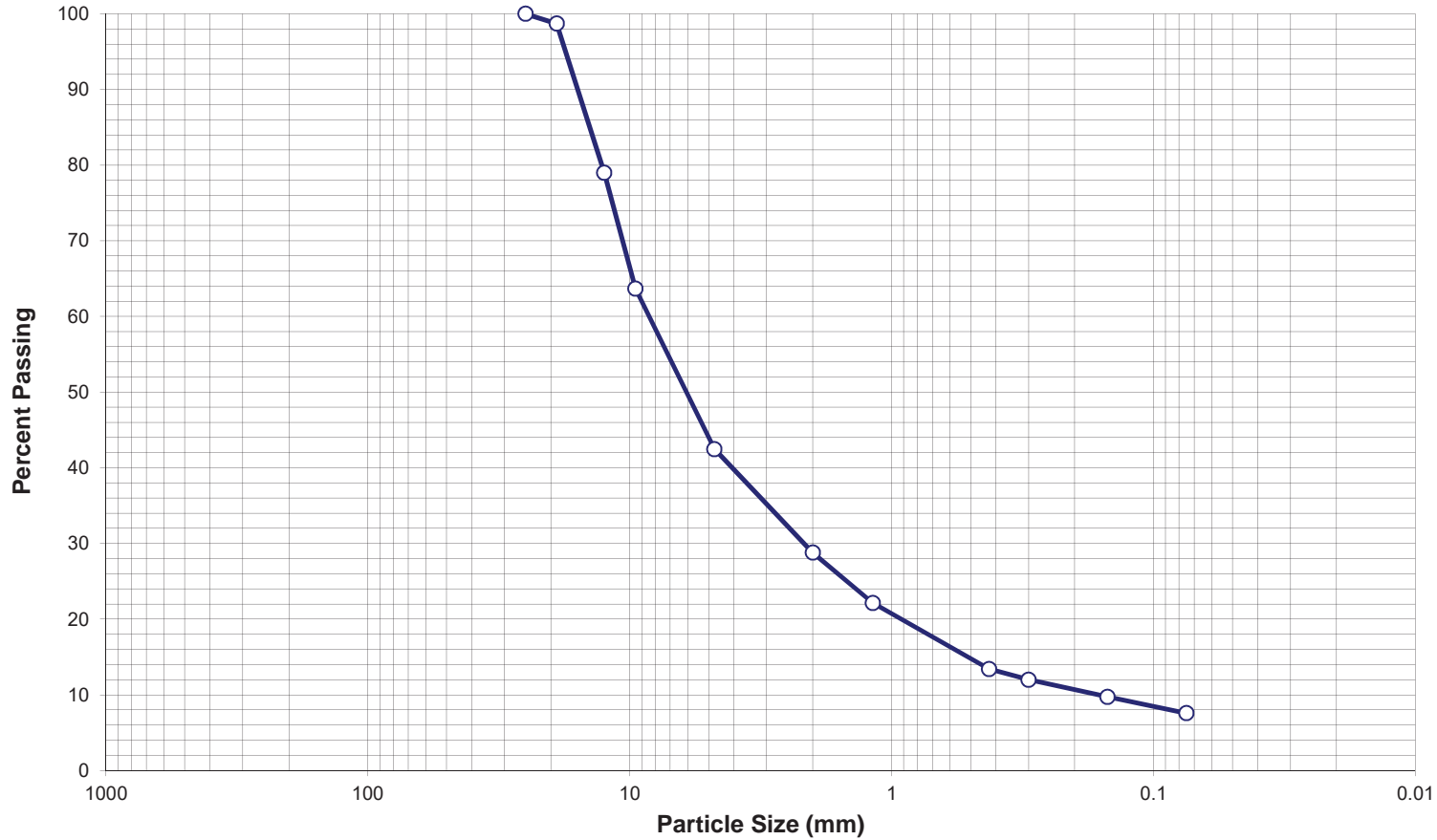


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	98
#200	84.0


Gravel (%)	0	LL	29	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	16	PL	19	Boring:	WE-01	
Fines (%)	84	PI	10	Sample Depth (ft):	4-9	
Sample Classification:	Medium plasticity CLAY w/ sand, brown	USCS:	CL	AASHTO:	A-4 (7)	SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 05/15/18
						Project No.: 217-376 Figure No.: -

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

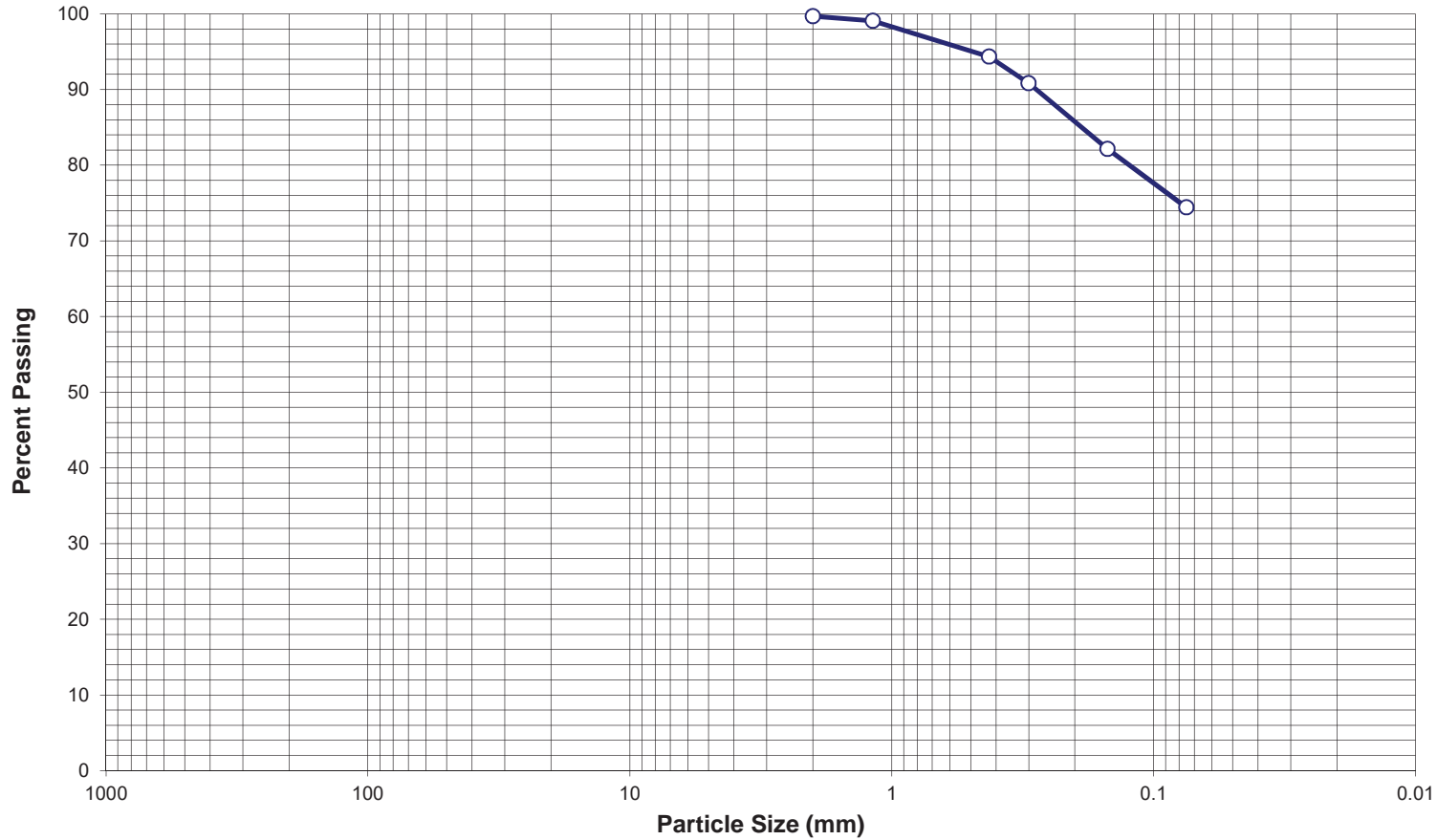


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	100
3/4"	99
1/2"	79
3/8"	64
#4	42
#10	29
#40	13
#200	7.6


Gravel (%)	58	LL	NV	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	34	PL	NP	Boring:	WE-01		
Fines (%)	8	PI	NP	Sample Depth (ft):	19-24		
Sample Classification:	Poorly graded GRAVEL w/ sand	USCS:	GP-GM	AASHTO:	A-1-a (0)	SIEVE ANALYSIS	
				Drawn By:	KM	Project No.:	217-376
				Checked By:	BB	Figure No.:	-
				Date:	05/03/18		

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

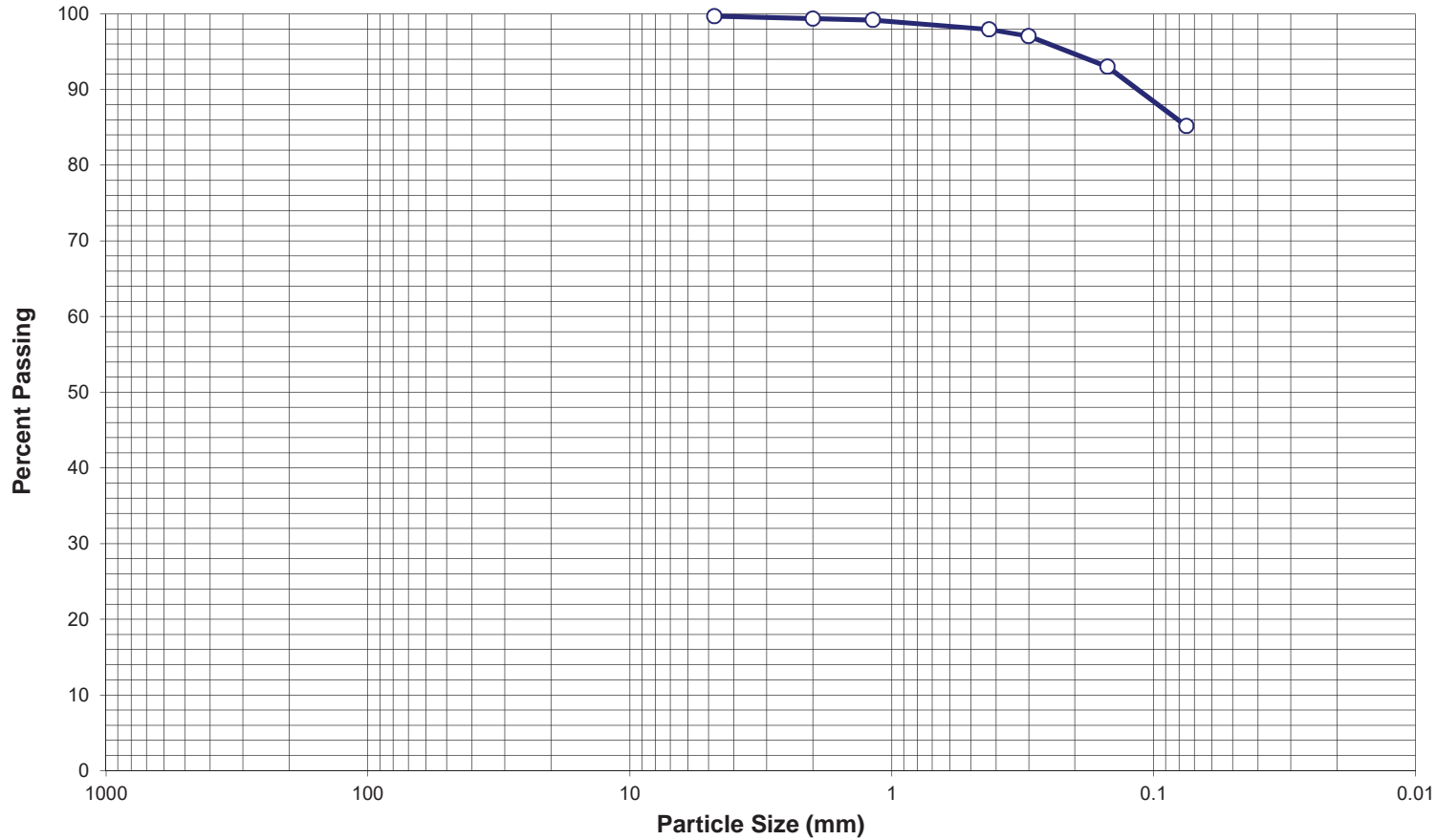


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	100
#40	94
#200	74.4


Gravel (%)	0	LL	33	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	26	PL	15	Boring:	WE-02		
Fines (%)	74	PI	18	Sample Depth (ft):	9-14		
Sample Classification:	Medium plasticity CLAY w/ sand, brown	USCS:	CL	AASHTO:	A-6 (11)	SIEVE ANALYSIS	
				Drawn By:	KM	Project No.:	217-376
				Checked By:	BB	Figure No.:	-
				Date:	05/03/18		

Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

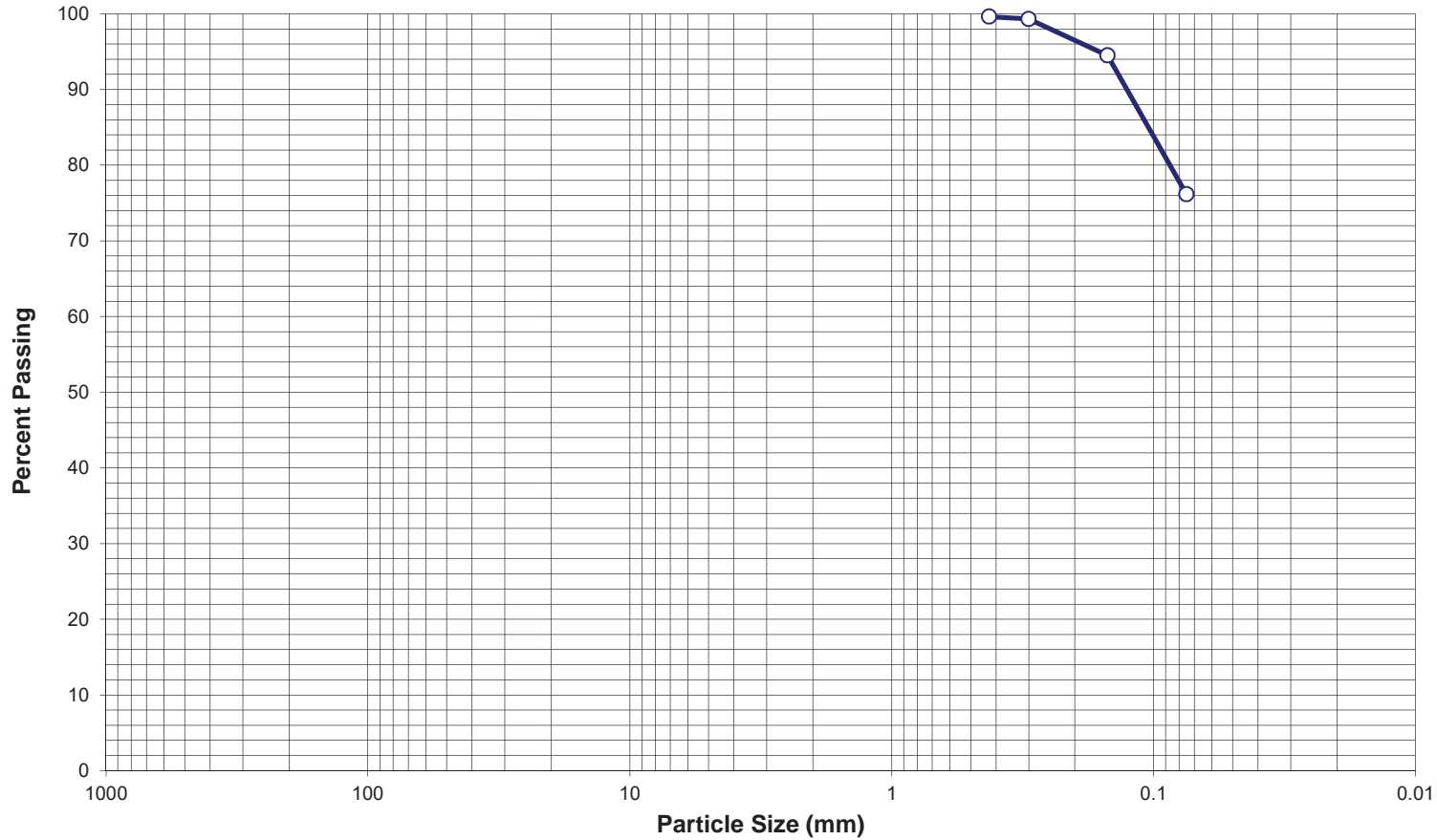


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	99
#40	98
#200	85.2


Gravel (%)	0	LL	50	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	15	PL	12	Boring:	WF-01		
Fines (%)	85	PI	38	Sample Depth (ft):	8-13		
Sample Classification:	High plasticity CLAY, trace sand	USCS:	CH	AASHTO:	A-7-6 (32)	SIEVE ANALYSIS	
		Drawn By:	KM	Project No.:	217-376		
		Checked By:	BB	Figure No.:	-		
		Date:	05/04/18				

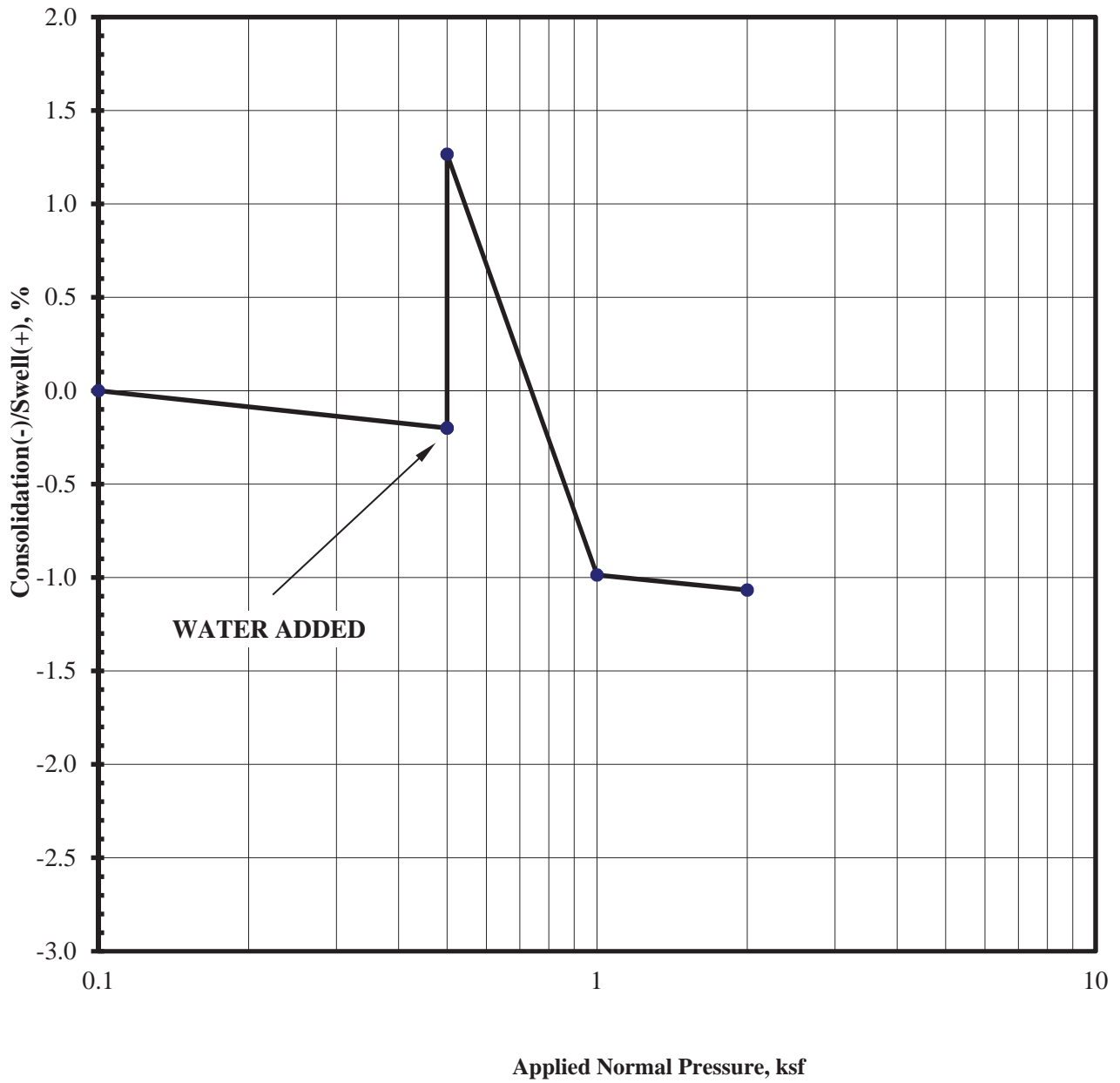
Sieve Analysis		Hydrometer Analysis
Sieve Opening in Inches	U.S. Standard Sieves	Size of Particles in mm

12" 6" 3" 2" 1" 3/4" 1/2" 3/8" 4 8 10 16 30 40 50 100 200

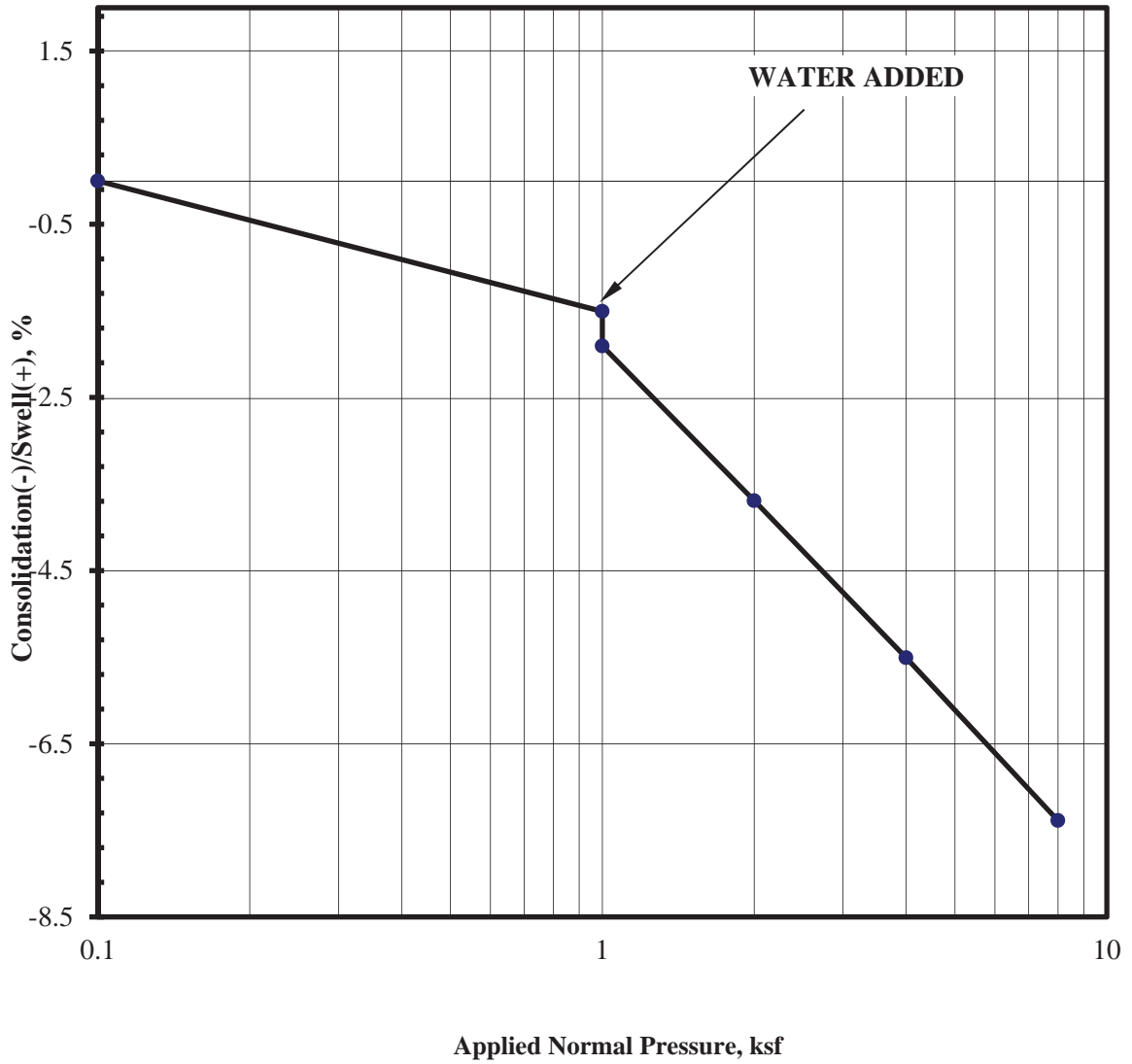


Sieve Size	% Passing
3"	-
2 1/2"	-
2"	-
1 1/2"	-
1"	-
3/4 "	-
1/2"	-
3/8"	-
#4	100
#10	-
#40	100
#200	76.2

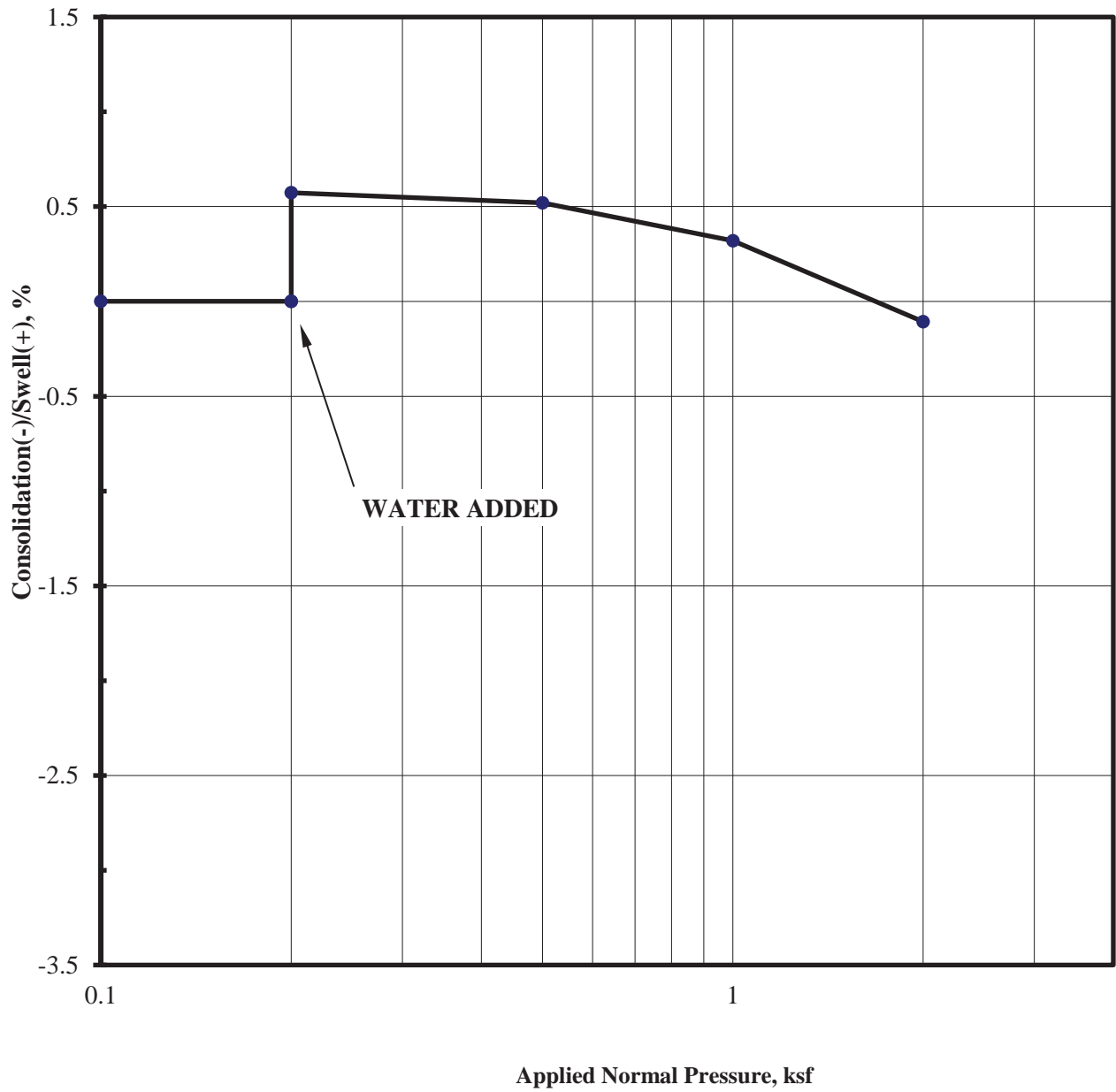
Gravel (%)	0	LL	31	Project Name:	US 550 S / US 160 Connector	 Yeh & Associates, Inc. Geotechnical Engineering Consultants
Sand (%)	24	PL	23	Boring:	WF-02	
Fines (%)	76	PI	8	Sample Depth (ft):	8	
Sample Classification:	SILT with some sand		USCS:	AASHTO:		SIEVE ANALYSIS Drawn By: KM Checked By: BB Date: 05/04/18
		ML	A-4 (5)		Project No.: 217-376 Figure No.: -	



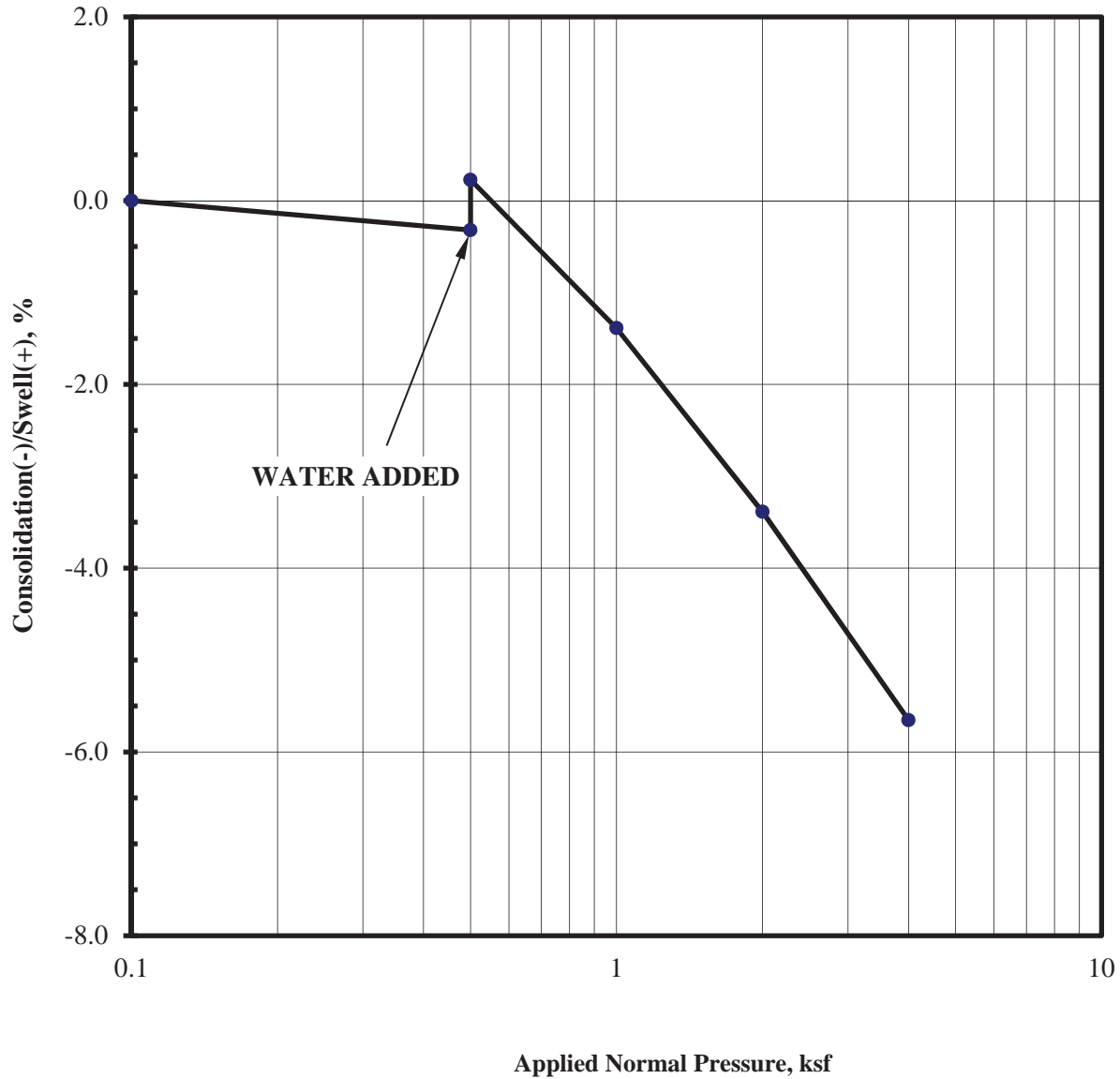
Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) /Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WB-03	9.5	102.9	13.9	1.5	CLAY, with some sand	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	BB
YEH & ASSOCIATES, INC							



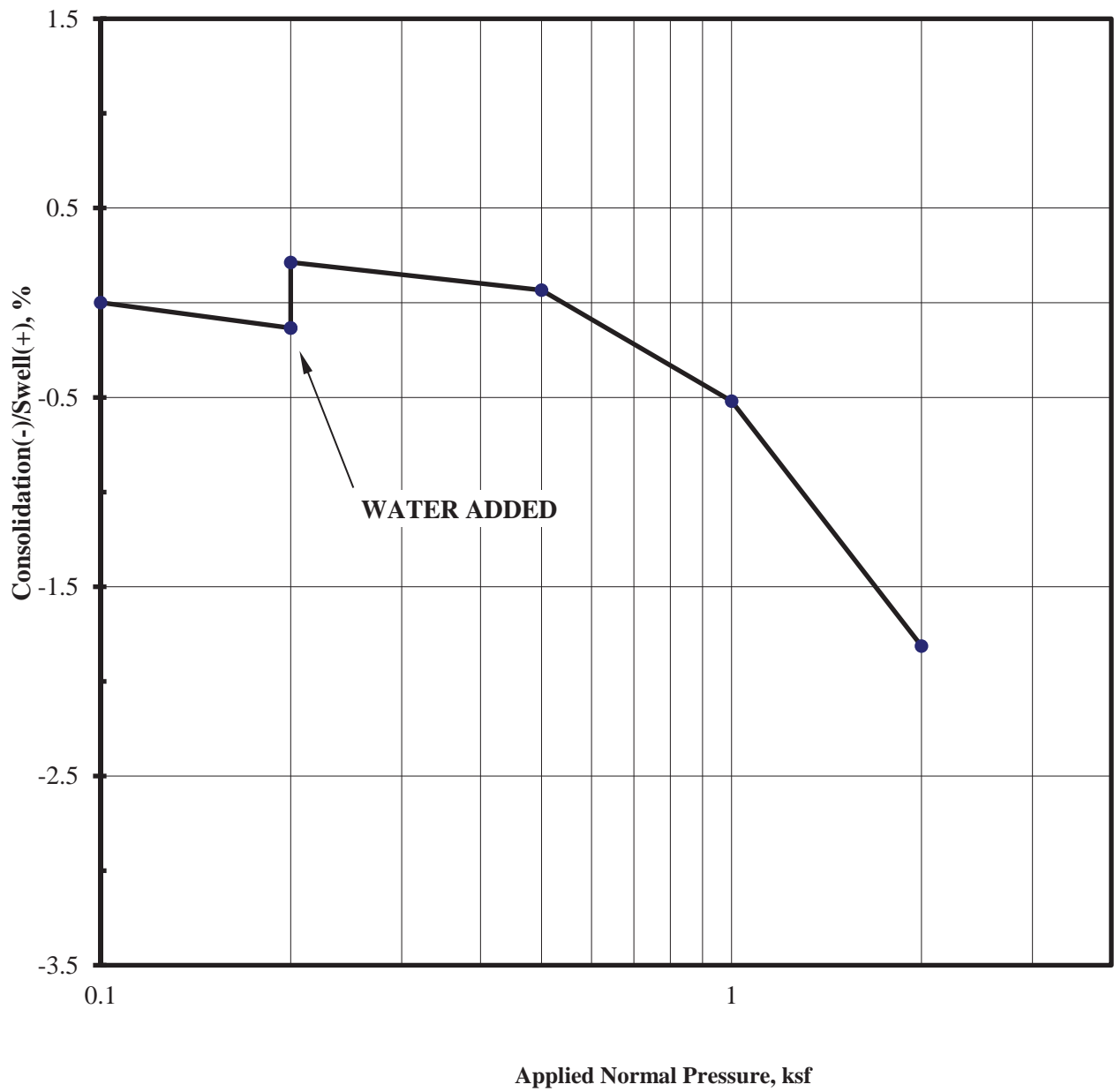
Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Classification	SWELL / CONSOLIDATION GRAPH	
WB-05	14.5	108.0	14.8%	-0.4	Clay, with some sand	Drawn By:	M.A
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	SWR
YEH & ASSOCIATES, INC							



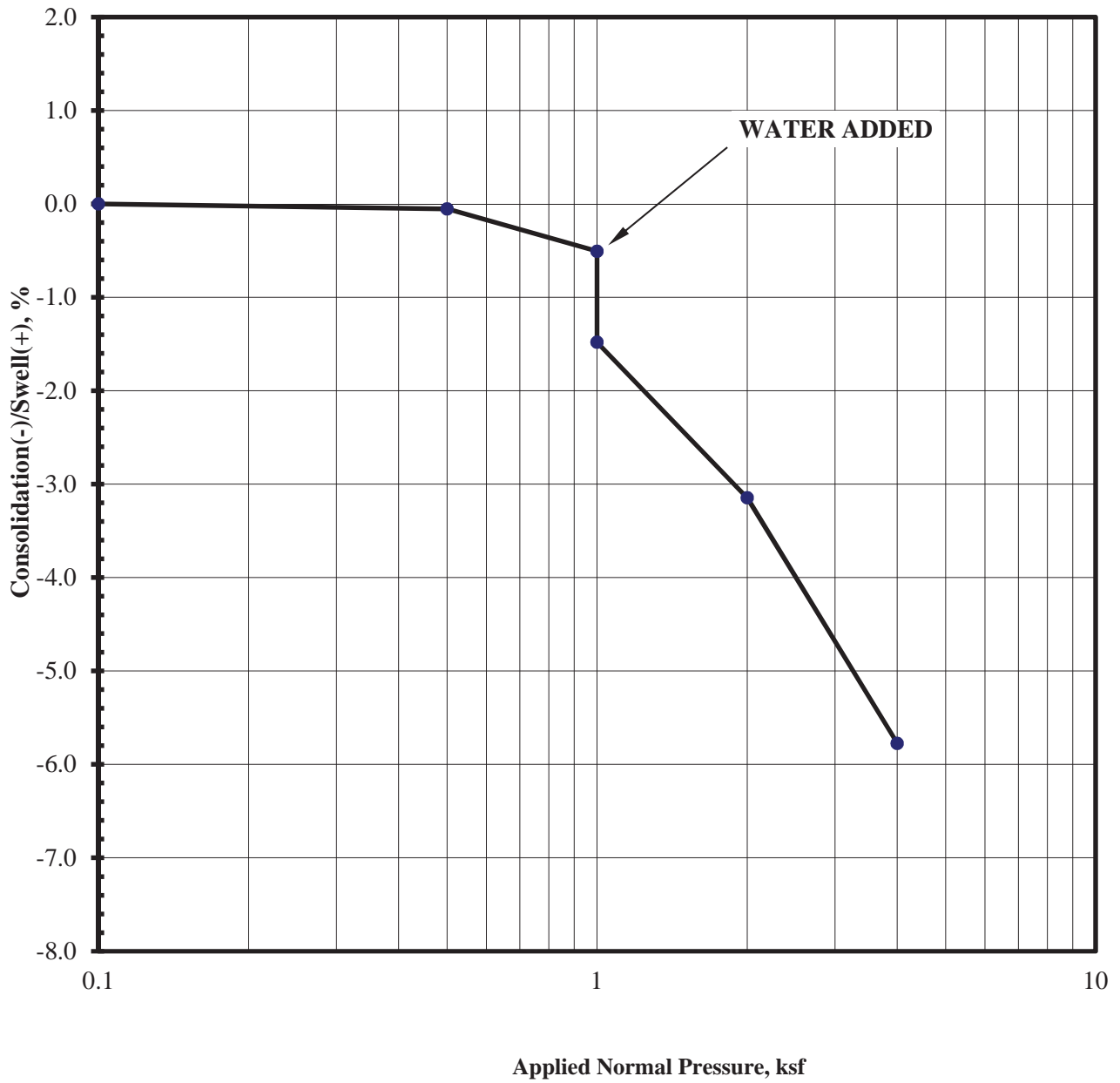
Boring Number	Depth, ft	Remolded Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WB-5	59.5-64.5	110.9	12.7	0.6	BR-shale, gray (remold)	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector		LL: 34 PI: 9		Checked By:	BB	
YEH & ASSOCIATES, INC							



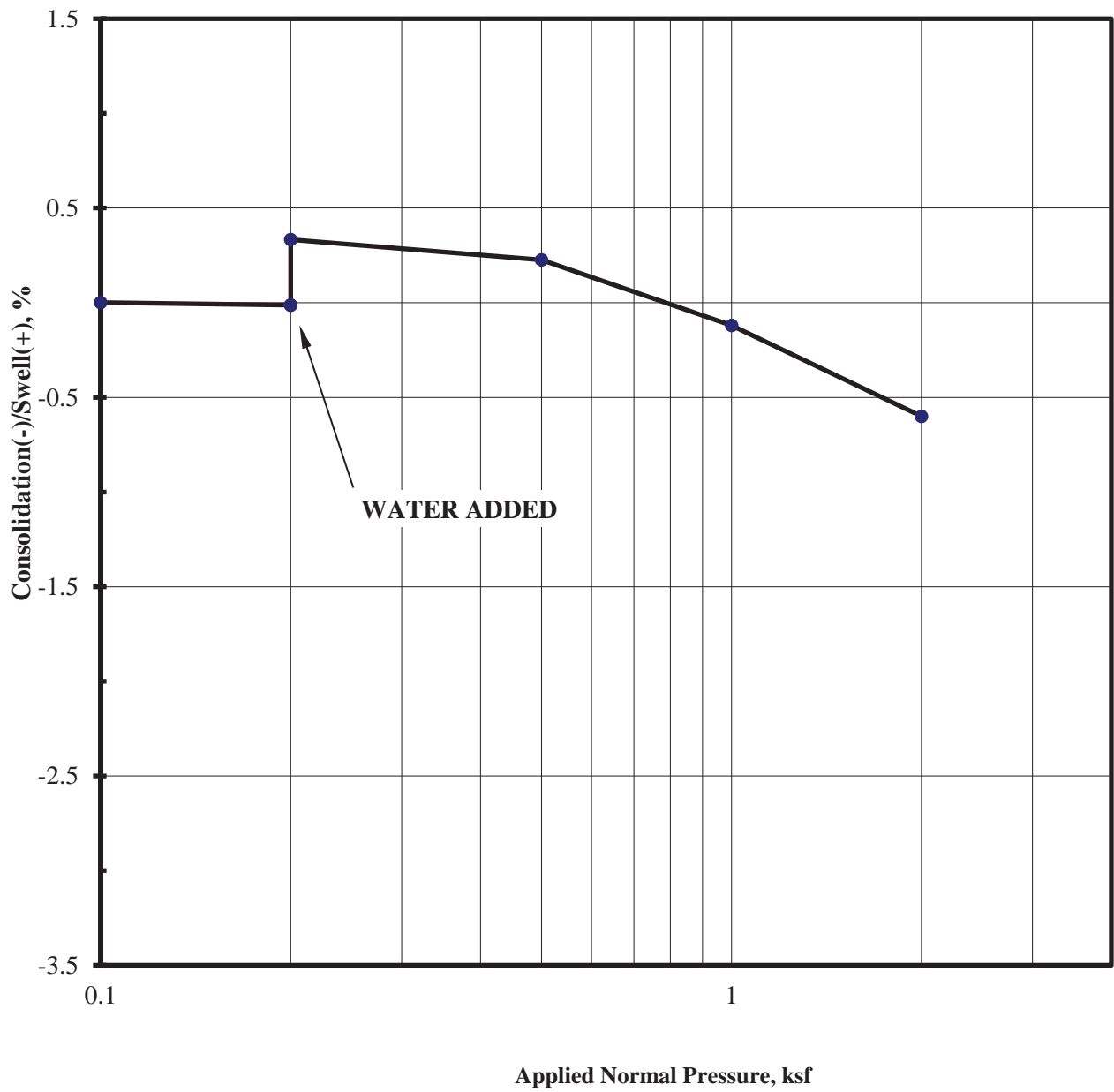
Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) /Swell(+), %	Soil Classification	SWELL / CONSOLIDATION GRAPH	
WB-06	9.5	97.6	9.6%	0.5	Clay, trace sand	Drawn By:	M.A
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	SWR
YEH & ASSOCIATES, INC							



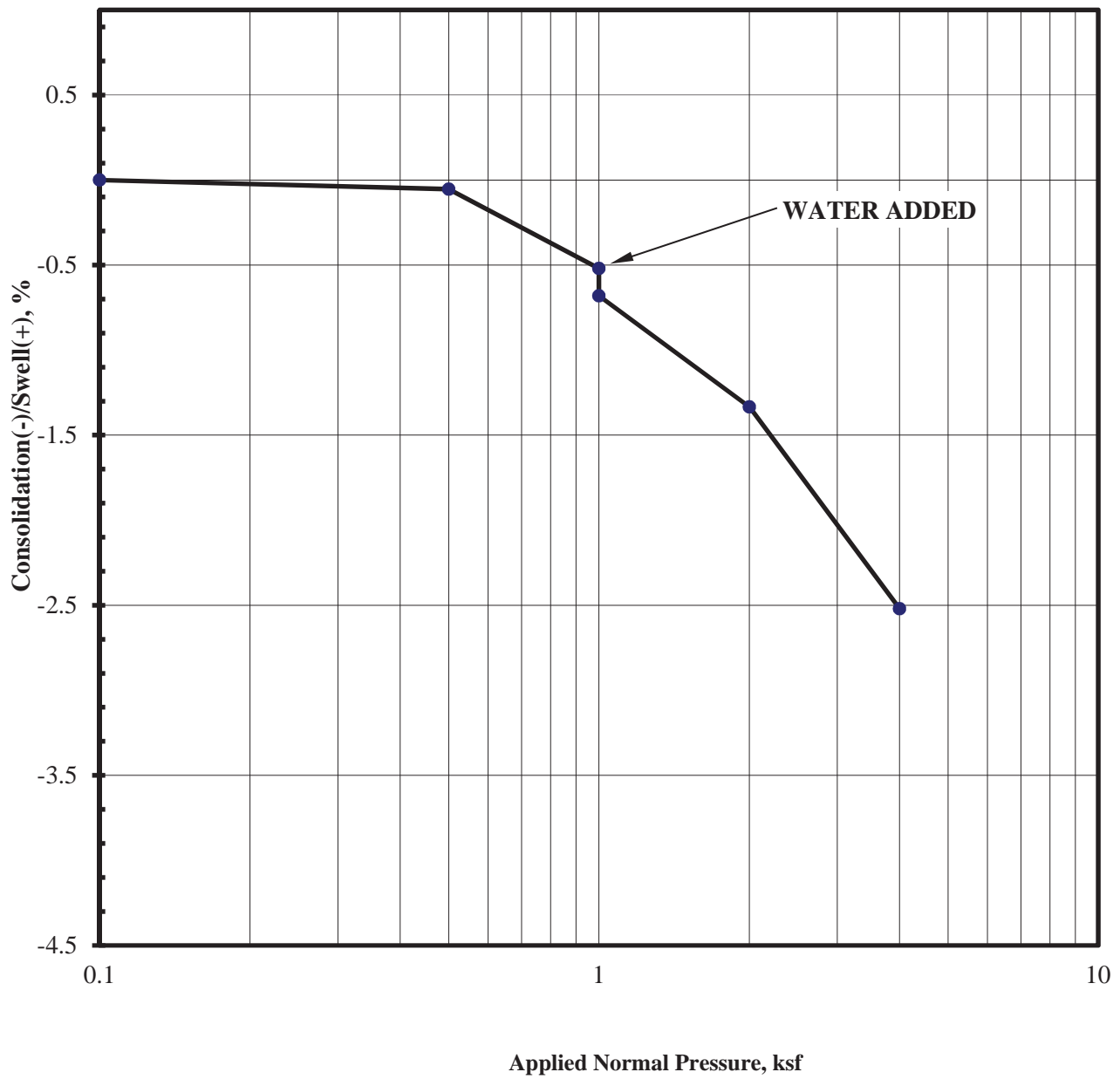
Boring Number	Depth, ft	Remolded Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WB-6	54.5-59.5	104.9	12.4	0.3	Clay/claystone, brown (remold) LL: 33 PI: 16	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	BB
YEH & ASSOCIATES, INC							



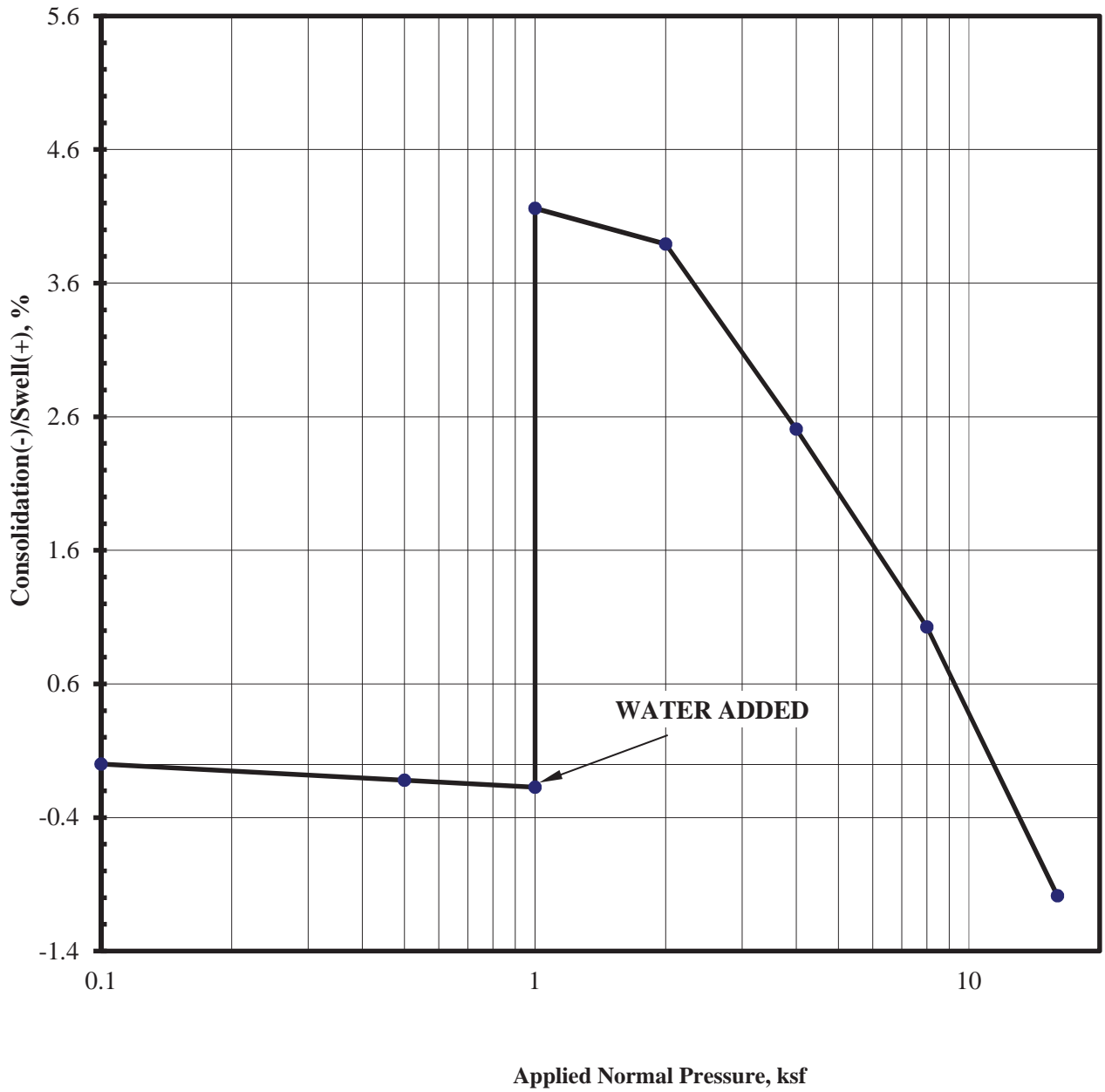
Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) /Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WB-08	9.5	98.6	7.5	-1.0	CLAY, with some sand	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector				Checked By: BB		
YEH & ASSOCIATES, INC							



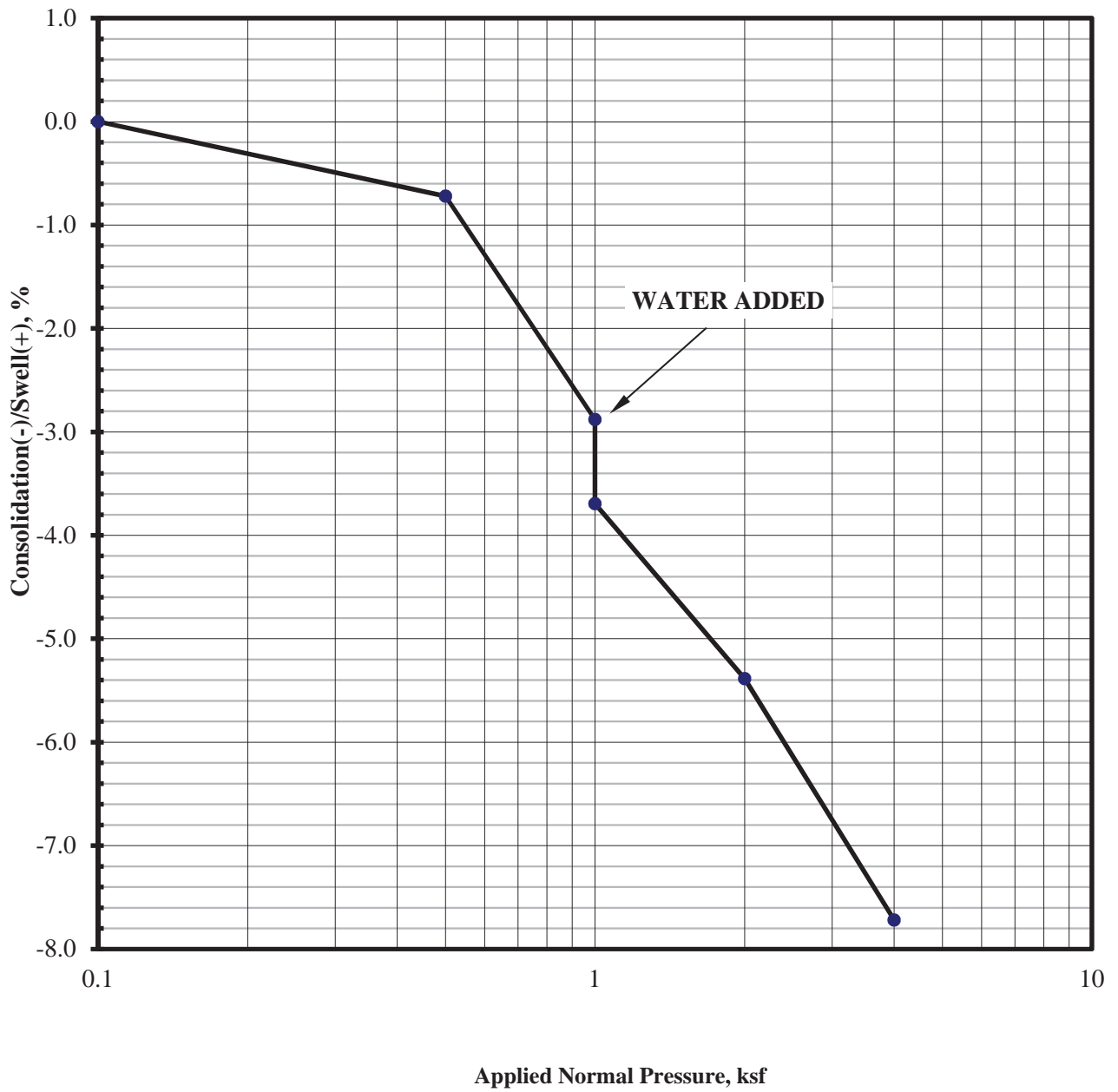
Boring Number	Depth, ft	Remolded Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WC-1	34'	111.8	13.3	0.3	BR-shale, olive (remold)	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector			LL: 28 PI: 12	Checked By: BB		
YEH & ASSOCIATES, INC							



Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WE-01	9	107.4	14.8	-0.2	Sandy CLAY, brown	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector					Checked By:	BB
YEH & ASSOCIATES, INC							

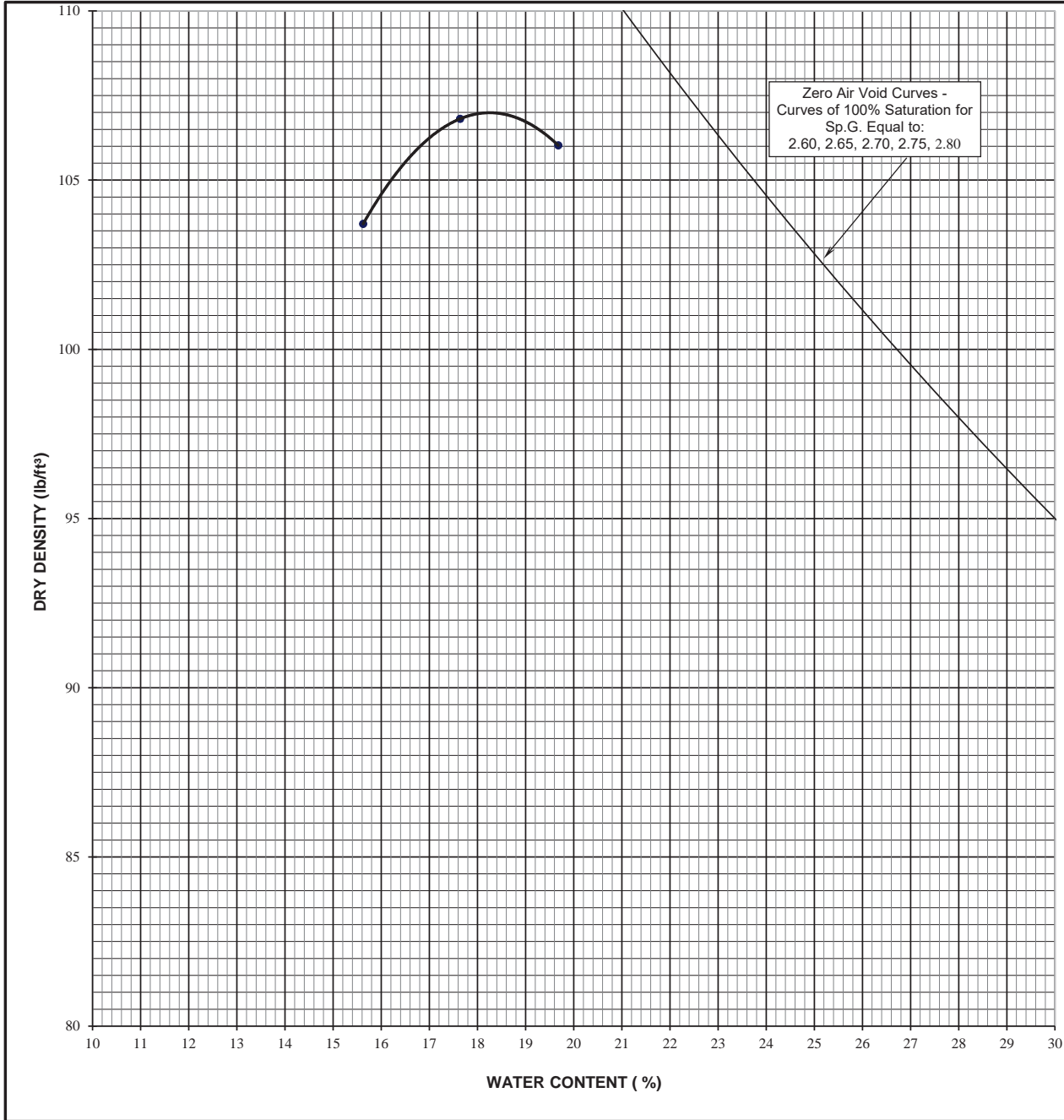


Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) / Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WF-01	8.0	116.6	13.1	4.3	High plasticity CLAY	Drawn By:	BB
Job No: 217-376	Project Name: US 550 S/ 160 Connector				Checked By: KM		
YEH & ASSOCIATES, INC							



Boring Number	Depth, ft	Natural Dry Density, pcf	Moisture Content, %	Consolidation(-) /Swell(+), %	Soil Description	SWELL / CONSOLIDATION GRAPH	
WF-02	3	101.7	13.8	-0.8	Med. plasticity CLAY w/ sand, brown	Drawn By:	KM
Job No: 217-376	Project Name: US 550 S/ 160 Connector				Checked By:	BB	
YEH & ASSOCIATES, INC							

MOISTURE - DENSITY RELATIONSHIP



Yeh & Associates, Inc.
Geotechnical Engineering Consultants

Project No:	217-376	
Job name:	US 550 S/US 160 Connector	
Maximum Dry Density (pcf):	107.0	
Optimum Moisture Content(%):	18.4	
Sampled by:	Eric Pickerill	
Boring #:	WB-09	
Depth :	14.5-24.5	
Soil Description:	Lean CLAY, rust	
USCS Group Name:	CL	
AASHTO Group Symbol:	A-6	
AASHTO Group Index:	11	
Specific Gravity	n/a	
Atterberg (ASTM D - 4318)		
LL:	34	
PL:	20	
PI:	14	
Gradation (ASTM D-422, D-136)		
#4	100	
#10	99	
#40	97	
#200	85.8	
AASHTO Designation:	T99	
Method:	A	
Preparation Method:	Wet	
Mold Size:	4"	
Hammer Type:	Manual	
Sampled By:	E. Pickerill	
Date sampled:	12/19/17	
Tested By:	K. Moran	
Date:	01/26/17	
Reviewed By:	A. Hotchkiss	
Date:	01/26/17	



ADVANCED TERRA TESTING

Image Attachment

CLIENT Yeh & Associates
JOB NO. 2546-97
PROJECT ES US 550 S. / 160 Contractor
PROJECT NO. 217-376
LOCATION --

BORING NO. WB-2
DEPTH 67.2-67.7
SAMPLE NO.
DATE SAMPLED
DESCRIPTION



NOTES

File name: 2546_97_Image_18_03_23_07_57_52



Image Attachment

ADVANCED TERRA TESTING

CLIENT Yeh & Associates
JOB NO. 2546-94
PROJECT ES US 550 South Connection to US 160
PROJECT NO. 217-376
LOCATION --

BORING NO. WB-6
DEPTH 65.25-64.50
SAMPLE NO.
DATE SAMPLED
DESCRIPTION



NOTES

File name: 2546_94_Image_18_01_29_15_30_53



ADVANCED TERRA TESTING

Image Attachment

WB-7

CLIENT Yeh & Associates
JOB NO. 2546-97
PROJECT ES US 550 S. / 160 Contractor
PROJECT NO. 217-376
LOCATION --

BORING NO. WB-2
DEPTH 64.7-65.2
SAMPLE NO.
DATE SAMPLED
DESCRIPTION



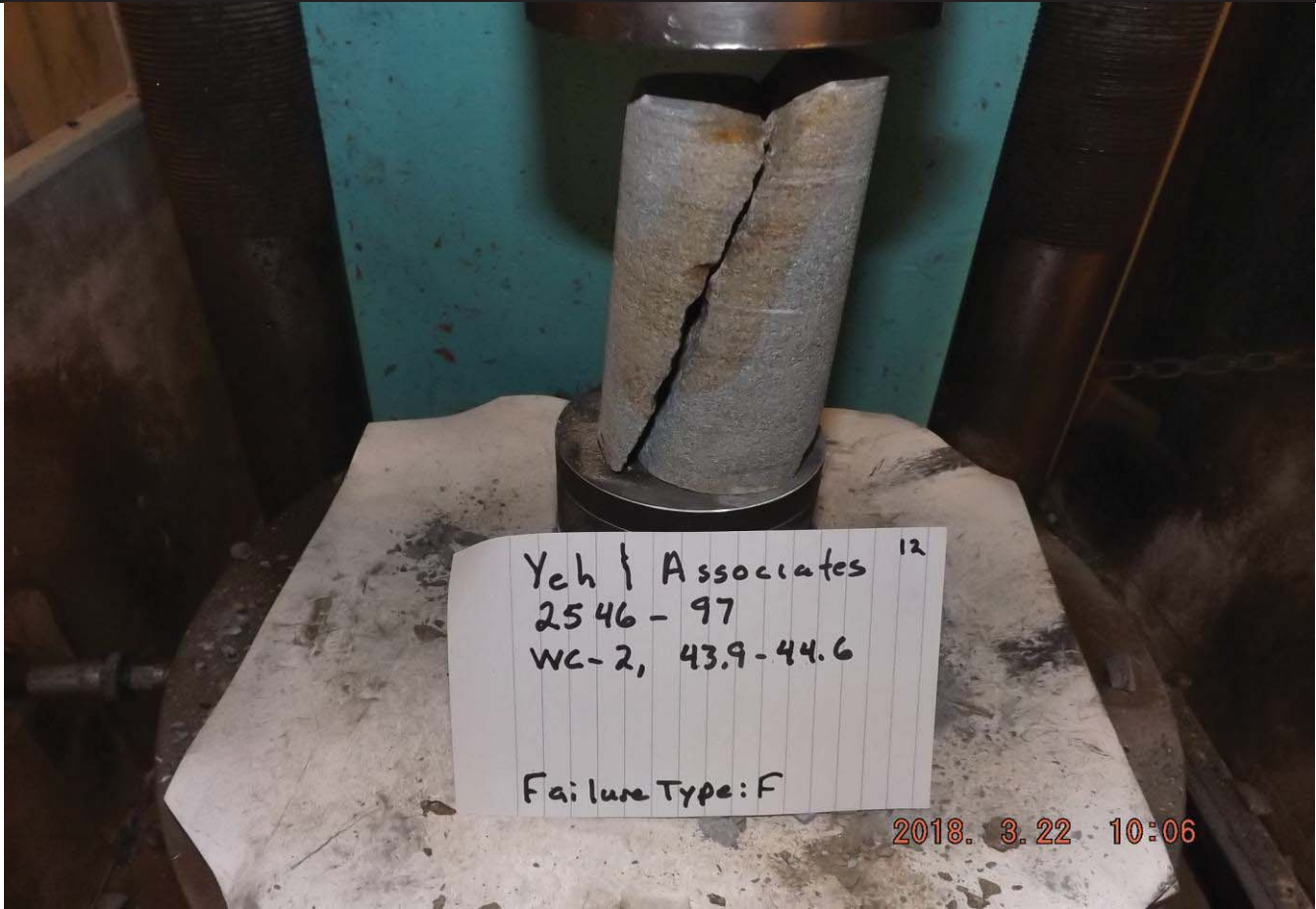
NOTES



Image Attachment

ADVANCED TERRA TESTING

CLIENT	Yeh & Associates	BORING NO.	WC-2
JOB NO.	2546-97	DEPTH	43.9-44.6
PROJECT	ES US 550 S. / 160 Contractor	SAMPLE NO.	
PROJECT NO.	217-376	DATE SAMPLED	
LOCATION	--	DESCRIPTION	



NOTES

File name: 2546_97_Image_18_03_23_08_00_14

Appendix E.5 – Test Pits 1, 2 and 3 - Laboratory Test Results



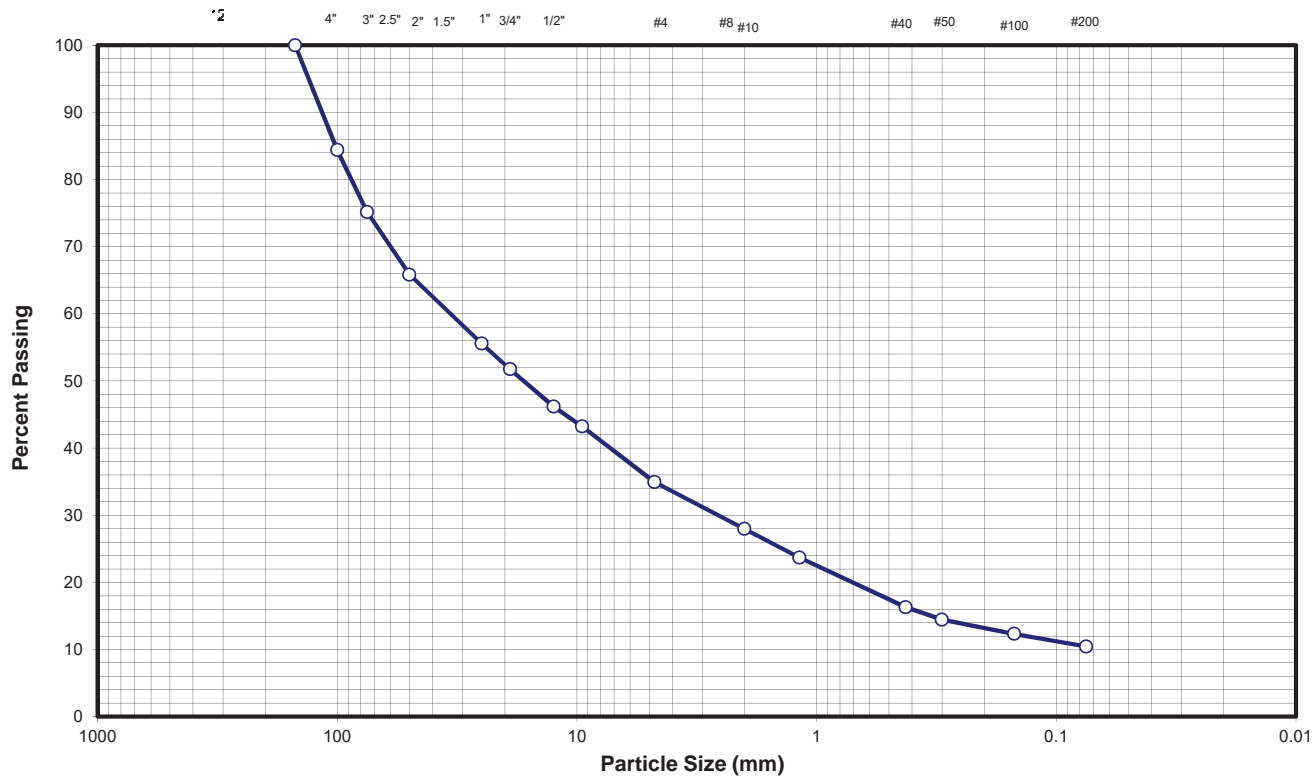
YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 217-376 Project Name: 22420: US 550 S Connection to US 160 Test Pits 1,2 and 3 Laboratory Test Results Date: 7/10/2018

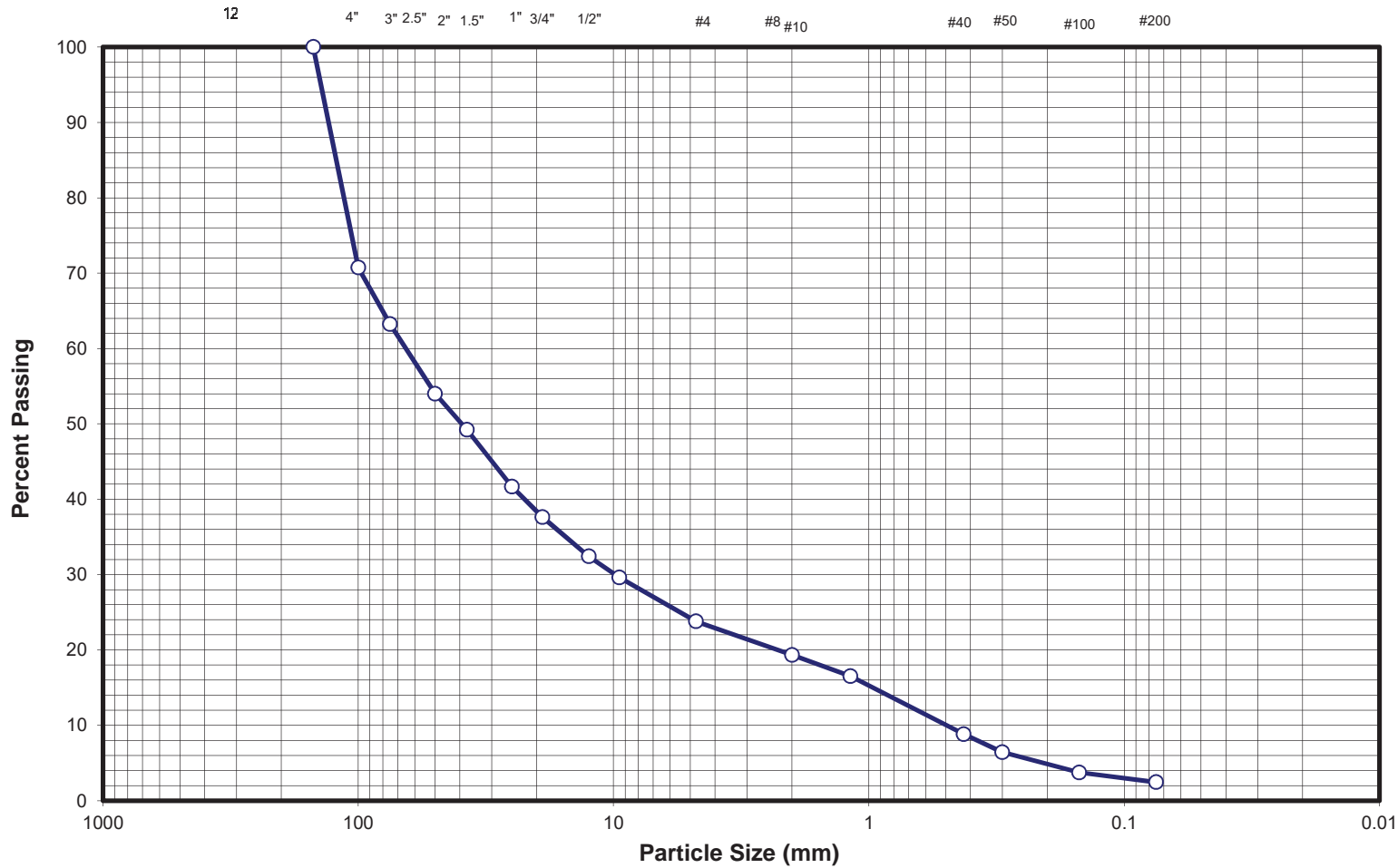
Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	AASHTO T99		Gradation			Atterberg			pH	Water Soluble Sulfate (%)	Chloride (%)	% Swell (+) / Consolidation (-)	Resistivity (Ohm-cm)	Uncon-Comp strength (rock-psi)	Uncon-Comp strength (soil-psf)	CLASSIFICATION	
Boring	Sample Type	Depth (ft)			Max. Dry Density (pcf)	Optimum Moisture (%)	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI								AASHTO	USCS
Pit #1	bulk	0-8	3.6			65	25	10	27	21	6									A-1-a (0)	GP
Pit #2	bulk	0-8	1.3			76	21	2	NV	NP	NP									A-1-a (0)	GP
Pit #3	bulk	0-6	3.3			61	21	18	29	17	12									A-1-b (0)	GM

bulk - indicates drill cuttings sample
 MC - indicates Modified California sample
 CORE - indicates rock core sample
 SS - indicates Split Spoon sample
 NV - indicates no value
 NP - indicates no plasticity



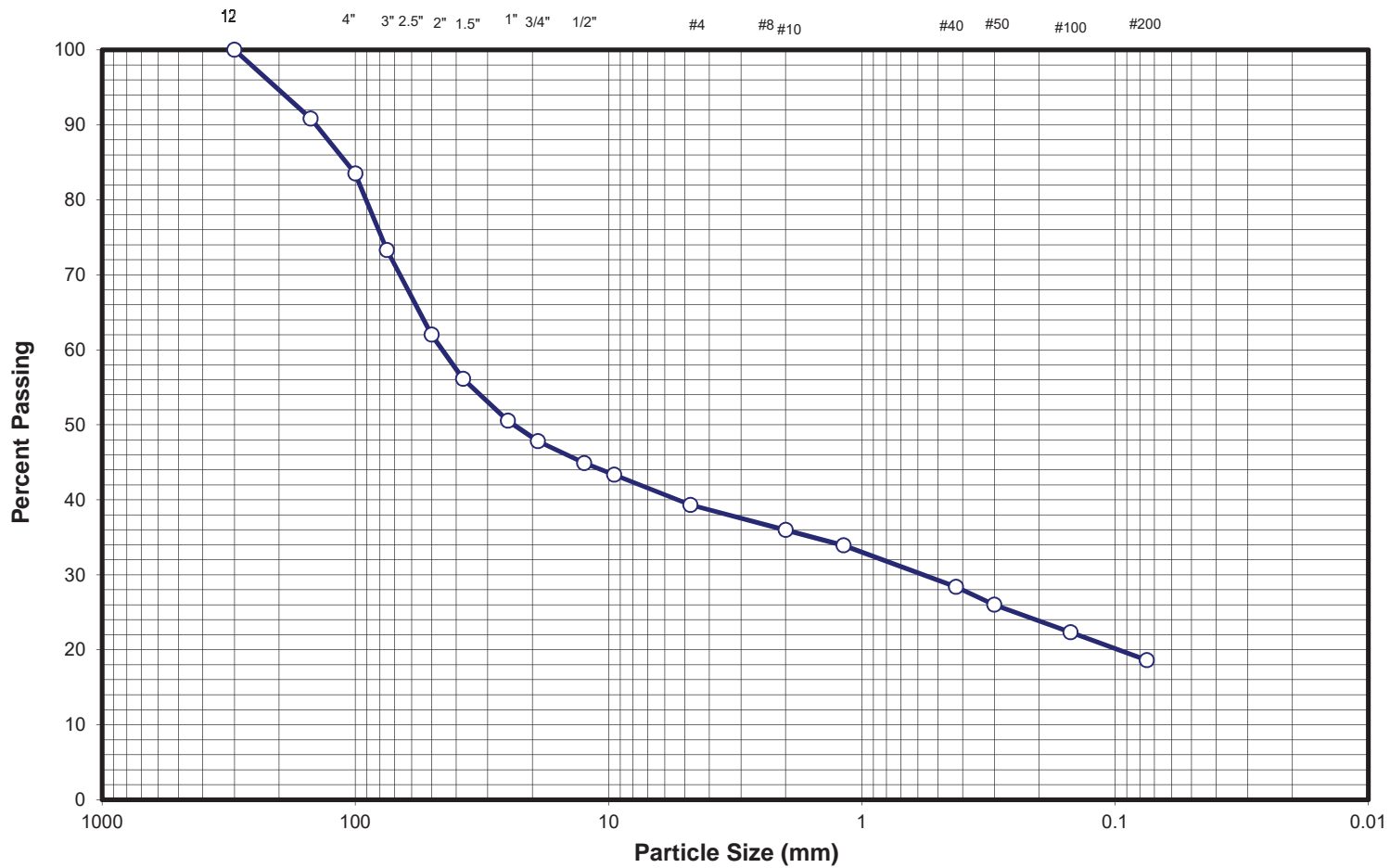
Sieve Size	% Passing
6"	100
4"	84
3"	75
2"	66
1"	56
3/4"	52
1/2"	46
3/8"	43
#4	35
#10	28
#40	16
#200	10

Gravel (%)	65	LL	27	Project Name:	US 550/160 South Connector		
Sand (%)	25	PL	21	Sample ID:	Pit #1		
Fines (%)	10	PI	6	Sample Depth (ft.):			
Sample Description:	Poorly graded GRAVEL w/ sand	USCS:	AASHTO: A-1-a (0)				
		GP					
				Yeh & Associates, Inc. Geotechnical Engineering Consultants			
				SIEVE ANALYSIS			
		Drawn By:	KM	Project No.:	217-376		
		Checked By:	BB	Figure No.:	-		
		Date:	03/07/18				



Sieve Size	% Passing
6"	100
4"	71
3"	63
2"	54
1"	42
3/4"	38
1/2"	32
3/8"	30
#4	24
#10	19
#40	9
#200	2.5

Gravel (%)	76	LL	NV	Project Name:	US 550/160 South Connector	Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	21	PL	NP	Sample ID:	Pit #2		
Fines (%)	3	PI	NP	Sample Depth (ft.):		SIEVE ANALYSIS	
Sample Description:	Poorly graded GRAVEL w/ sand	USCS: GP		AASHTO: A-1-a (0)	Drawn By: KM	Project No.:	217-376
					Checked By: BB	Figure No.:	-
					Date: 03/07/18		



Sieve Size	% Passing
6"	100
4"	83
3"	73
2"	62
1"	51
3/4"	48
1/2"	45
3/8"	43
#4	39
#10	36
#40	28
#200	18.6

Gravel (%)	61	LL	29	Project Name:	US 550/160 South Connector	Yeh & Associates, Inc. Geotechnical Engineering Consultants	
Sand (%)	21	PL	17	Sample ID:	Pit #3		
Fines (%)	19	PI	12	Sample Depth (ft.):	0-8'	SIEVE ANALYSIS	
Sample Description:	Silty GRAVEL w/ sand; some bedrock	USCS: GM	AASHTO: A-1-b (0)	Drawn By:	KM	Project No.:	217-376
				Checked By:	BB	Figure No.:	-
				Date:	03/07/18		

Appendix E.6 – Outside Laboratory Test Results

Core Worksheet

Project: Yeh Misc. 2018, US 550 S./US 160 Connector

Project No. 55166MT

Technician: G. Jadrych

Lab No. 5739- A,B,C

Field Test Results

Core Location:

Sample #A 217 - 376 B24 @ 14.'6 to 15'.0
Sample #B 217 - 376 B21 @ 25.'5 to 26'.0
Sample #3 217 - 376 B21 @ 51.'5 to 52'.3
Sample #4 217 - 376 B24 @ 8.'0 to 8'.5 (Not Tested)

ASTM D7012 - 14

Unit Designation	A	B	C	D
Date tested	6/18/18	6/18/18	6/18/18	
Diameter (in.)	2.39	2.36	2.36	
Area (sq. in.)	4.52	4.36	4.36	
Length (in.)	4.69	4.75	4.82	
Length Capped (in.)	4.84	4.86	4.83	
Weight (lbs.)	1.82	1.79	1.84	
Volume (ft ³)	0.01227	0.01198	0.01216	
Unit Weight (pcf)	148.3	149.4	151.3	
Total Load (lbs.)	25,340	9,730	12,010	
Calculated Strength (psi)	5,400	2,230	2,750	
L/D Ratio	1.96	2.01	2.04	
Correction Factor	N/A	N/A	N/A	
Corrected Strength (psi)				

Note: Core Samples submitted by K. Moran



**UNCONFINED COMPRESSIVE STRENGTH
ASTM D7012, Method C (previously ASTM D2938)**

ADVANCED TERRA TESTING

CLIENT: Yeh & Associates

JOB NO: 2546-97

PROJECT NO.: 217-376

DATE TESTED: 3/20/2018

PROJECT: ES US 550 S. / 160 Connector

TECHNICIAN: BKL

LOCATION:

Specimen ID Boring, Depth (ft), Geologic Unit	Diameter (in)	Length (in)	Mass (gm)	Wet Density (pcf)	Failure Load (lb)	Failure Type *	Compressive Strength (psi)
E-2, 59.5-59.9	2.387	5.023	855.5	145.0	13,871	S/F	3,100
E-2, 70.9-71.4	2.392	5.478	949.6	147.0	6,859	F	1,526
E-2, 91.0-91.5	2.382	5.064	911.2	153.8	14,696	F	3,298
E-2, 106.3-106.7	2.397	5.562	981.3	148.9	15,309	F/S	3,392
E-2, 128.0-128.3	2.397	5.133	894.8	147.2	10,953	F	2,427
E-2, 143.0-143.7	2.392	5.105	936.9	155.6	31,553	F/S	7,021
E-7, 47.0-47.4	2.384	5.107	853.5	142.6	5,790	F	1,297
E-7, 84.5-85.0	2.390	5.374	922.7	145.8	5,034	F	1,122
E-7, 98.7-99.2	2.375	5.567	942.6	145.6	6,815	F	1,538
WB-2, 67.2-67.7	2.374	5.498	872.5	136.6	1,165	F	263
WB-7, 64.7-65.2	2.355	5.086	839.9	144.4	16,240	F	3,728
WC-2, 43.9-44.6	2.389	4.929	927.9	160.0	32,384	F	7,224
B1-8, 27.0	2.367	5.034	885.5	152.3	12,509	F	2,843
B1-8, 56.0	2.387	4.992	894.8	152.6	24,596	F	5,496
B1-1, 92.0	1.752	3.720	377.7	160.4	24,021	S/F	9,964
B1-9, 18.0	2.374	4.988	886.3	152.9	5,221	F	1,180
B1-10, 11.0	2.384	5.018	907.3	154.3	17,440	F	3,907
B1-12, 21.0	2.371	4.667	809.3	149.6	4,740	F	1,072 **
B1-12, 40.0	2.380	5.039	872.0	148.2	6,253	F	1,405

Notes and Comments:

* Failure type = S: Shear Failure, M: Matrix Failure, F: Fracture/Bedding Failure, V: Void Failure, C: Combination

** Regardless of ASTM D7012 method D, any short sample with L/D < 2.0 was tested and a correction factor was applied to the ca

$$C = Ca / [0.88 + 0.24b/h]$$

Ca = Failure Load/surface Area

b = Sample Diameter

h = Sample Length

Data Entered By: BKL

Date: 3/22/2018

Data Checked By: HN

Date: 3/27/2018

Filename: 2546_97_UCS ASTM D7012 Method C-R0_0.xls



**Moisture and Density
ASTM D 2216 and ASTM D 7263**

ADVANCED TERRA TESTING

CLIENT	Yeh & Associates			JOB NO.	2546-97
PROJECT	ES US 550 S. / 160 Connector			PAGE:	1 of 3
PROJECT NO.	217-376				
BORING NO.	E-2	E-2	E-2	E-2	
DEPTH	59.5-59.9	70.9-71.4	91.0-91.5	106.3-106.7	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	03/20/18	03/16/18	03/16/18	03/20/18	
TECHNICIAN	BKL	BKL	BKL	BKL	
DESCRIPTION					
Mass of Wet Pan and Soil (g):	147.16	44.76	141.62	118.63	
Mass of Dry Pan and Soil (g):	141.83	42.24	133.31	114.60	
Mass of Pan (g):	3.12	3.14	3.13	3.14	
Moisture (%):	3.8	6.4	6.4	3.6	
Diameter (in):	2.387	2.392	2.382	2.397	
Height (in):	5.023	5.478	5.064	5.562	
Mass of Wet Soil and Ring (g):	855.5	949.6	911.2	981.3	
Mass of Ring (g):	0.00	0.00	0.00	0.00	
Wet Density (lbs/ft ³):	145.0	147.0	153.8	148.9	
Dry Density (lbs/ft ³):	139.6	138.1	144.6	143.7	
Wet Density (kg/m ³):	2323	2354	2464	2386	
Dry Density (kg/m ³):	2237	2211	2316	2303	
BORING NO.	E-2	E-2	E-7	E-7	
DEPTH	128.0-128.3	143.0-143.7	47.0-47.4	84.5-85.0	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	03/20/18	03/16/18	03/20/18	03/20/18	
TECHNICIAN	BKL	BKL	BKL	BKL	
DESCRIPTION					
Mass of Wet Pan and Soil (g):	128.04	218.58	148.04	112.63	
Mass of Dry Pan and Soil (g):	123.32	209.56	140.34	105.75	
Mass of Pan (g):	3.11	3.11	3.14	3.11	
Moisture (%):	3.9	4.4	5.6	6.7	
Diameter (in):	2.397	2.392	2.384	2.390	
Height (in):	5.133	5.105	5.107	5.374	
Mass of Wet Soil and Ring (g):	894.8	936.9	853.5	922.7	
Mass of Ring (g):	0.00	0.00	0.00	0.00	
Wet Density (lbs/ft ³):	147.2	155.6	142.6	145.8	
Dry Density (lbs/ft ³):	141.6	149.1	135.1	136.6	
Wet Density (kg/m ³):	2357	2492	2285	2335	
Dry Density (kg/m ³):	2268	2388	2163	2189	
NOTES					
Data entry by:	BKL	Date: 3/16-22/2018			
Checked by:	<u>Hu</u>	Date: <u>3/27/2018</u>			
File name:	2546_97_Moisture and Density ASTM D7236_0.xls				



**Moisture and Density
ASTM D 2216 and ASTM D 7263**

ADVANCED TERRA TESTING

CLIENT	Yeh & Associates			JOB NO.	2546-97
PROJECT	ES US 550 S. / 160 Connector			PAGE :	2 of 3
PROJECT NO.	217-376				
BORING NO.	E-7	WB-2	WB-7	WC-2	
DEPTH	98.7-99.2	67.2-67.7	64.7-65.2	43.9-44.6	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	03/19/18	03/19/18	03/19/18	03/16/18	
TECHNICIAN	MLW	MLW	MLW	BKL	
DESCRIPTION					
Mass of Wet Pan and Soil (g):	116.09	104.02	187.10	218.59	
Mass of Dry Pan and Soil (g):	110.74	100.75	180.84	217.59	
Mass of Pan (g):	3.14	3.16	3.15	3.12	
Moisture (%):	5.0	3.4	3.5	0.5	
Diameter (in):	2.375	2.374	2.355	2.389	
Height (in):	5.567	5.498	5.086	4.929	
Mass of Wet Soil and Ring (g):	942.6	872.5	839.9	927.9	
Mass of Ring (g):	0.00	0.00	0.00	0.00	
Wet Density (lbs/ft ³):	145.6	136.6	144.4	160.0	
Dry Density (lbs/ft ³):	138.7	132.2	139.5	159.3	
Wet Density (kg/m ³):	2332	2188	2314	2563	
Dry Density (kg/m ³):	2222	2117	2235	2551	
BORING NO.	B1-8	B1-8	B1-1	B1-9	
DEPTH	27.0	56.0	92.0	18.0	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	03/16/18	03/16/18	03/16/18	03/16/18	
TECHNICIAN	BKL	BKL	BKL	BKL	
DESCRIPTION					
Mass of Wet Pan and Soil (g):	97.94	95.68	105.71	207.55	
Mass of Dry Pan and Soil (g):	90.89	90.07	101.06	191.47	
Mass of Pan (g):	3.15	3.11	3.14	3.14	
Moisture (%):	8.0	6.5	4.7	8.5	
Diameter (in):	2.367	2.387	1.752	2.374	
Height (in):	5.034	4.992	3.720	4.988	
Mass of Wet Soil and Ring (g):	885.5	894.8	377.7	886.3	
Mass of Ring (g):	0.00	0.00	0.00	0.00	
Wet Density (lbs/ft ³):	152.3	152.6	160.4	152.9	
Dry Density (lbs/ft ³):	141.0	143.3	153.2	140.9	
Wet Density (kg/m ³):	2439	2444	2570	2450	
Dry Density (kg/m ³):	2258	2296	2454	2257	
NOTES					
Data entry by:	BKL	Date: 3/16-22/2018			
Checked by:	<u>HN</u>	Date: <u>3/22/2018</u>			
File name:	2546_97_Moisture and Density ASTM D7236_1.xls				



**Moisture and Density
ASTM D 2216 and ASTM D 7263**

ADVANCED TERRA TESTING

CLIENT	Yeh & Associates	JOB NO.	2546-97
PROJECT	ES US 550 S. / 160 Connector	PAGE	3 of 3
PROJECT NO.	217-376		
BORING NO.	B1-10	B1-12	B1-12
DEPTH	11.0	21.0	40.0
SAMPLE NO.			
DATE SAMPLED			
DATE TESTED	03/16/18	03/16/18	03/16/18
TECHNICIAN	BKL	BKL	BKL
DESCRIPTION			
Mass of Wet Pan and Soil (g):	114.03	95.71	115.69
Mass of Dry Pan and Soil (g):	107.82	88.44	107.57
Mass of Pan (g):	3.16	3.12	3.13
Moisture (%):	5.9	8.5	7.8
Diameter (in):	2.384	2.371	2.380
Height (in):	5.018	4.667	5.039
Mass of Wet Soil and Ring (g):	907.3	809.3	872.0
Mass of Ring (g):			
Wet Density (lbs/ft ³):	154.3	149.6	148.2
Dry Density (lbs/ft ³):	145.7	137.9	137.5
Wet Density (kg/m ³):	2472	2397	2374
Dry Density (kg/m ³):	2333	2209	2202
BORING NO.			
DEPTH			
SAMPLE NO.			
DATE SAMPLED			
DATE TESTED			
TECHNICIAN			
DESCRIPTION			
Mass of Wet Pan and Soil (g):			
Mass of Dry Pan and Soil (g):			
Mass of Pan (g):			
Moisture (%):			
Diameter (in):			
Height (in):			
Mass of Wet Soil and Ring (g):			
Mass of Ring (g):			
Wet Density (lbs/ft ³):			
Dry Density (lbs/ft ³):			
Wet Density (kg/m ³):			
Dry Density (kg/m ³):			
NOTES			
Data entry by:	BKL	Date:	3/16/2018
Checked by:	<i>HW</i>	Date:	<i>3/27/2018</i>
File name:	2546_97_Moisture and Density ASTM D7236_2.xls		

IRREGULAR LUMP POINT LOAD TEST
ASTM D 5731

CLIENT: Yeh & Associates
LOCATION: ES US 550 S. / 160 Connector
PROJECT: 217-376

JOB NO.: 2546-97
DATE TESTED: 3/27/18 BL

Specimen ID	Width (in.)	Diameter (in.)	De ² (in ²)	Gauge Failure Load (psig)	P (lb)	Is	F	Is(50)	C	Compressive Strength (psi)	Loading with respect to Fracture/Bedding	Failure Mode
1	2.718	0.928	3.211	1841	3810.9	1186.6	1.0	1129.4	18.0	20,370	Parallel	S
2	3.697	1.361	6.406	4961	10269.3	1603.0	1.1	1782.2	20.1	35,760	Perpendicular	S
3	3.425	1.676	7.309	3816	7899.1	1080.8	1.1	1237.8	21.5	26,670	Perpendicular	C
4	2.561	1.224	3.991	1821	3769.5	944.5	1.0	944.0	19.4	18,340	Perpendicular	C
5	2.072	1.610	4.247	2504	5183.3	1220.3	1.0	1236.9	21.2	26,270	N/A	S
6	2.941	1.711	6.407	1324	2740.7	427.8	1.1	475.6	21.7	10,330	Perpendicular	C
7	2.170	1.347	3.722	793	1641.5	441.1	1.0	434.0	20.0	8,680	Parallel	C
8	3.386	1.664	7.174	4100	8487.0	1183.1	1.1	1349.2	21.5	28,990	N/A	S
9	3.570	1.926	8.755	4575	9470.3	1081.7	1.2	1290.2	22.7	29,310	N/A	S
10	4.161	1.968	10.426	1284	2657.9	254.9	1.2	316.2	22.9	7,250	Perpendicular	C

Notes: W: Shortest distance perpendicular to loading direction
D: Sample Thickness between platens
De²: Equivalent Diameter = $4 \cdot L \cdot D / \pi$
Piston Area (in²): 2.07
P: Gauge Failure Load * Piston area (in²)
Is: Point Load Index Strength = P / De^2
F: Size Correction Factor to 2.0 in = $(De / 2.0)^{0.45}$
Is(50): Size Corrected Index Strength = $F \cdot Is$
C: Factor to Estimate Compressive Strength related to Core Diameter
Compressive Strength in psi = $C \cdot Is(50)$

Failure Modes:
F: Fracture/Bedding Controlled
S: Substance Controlled
C: Combination Substance & Fracture

Data Entered By: BKL Date: 03/27/2018
Data Checked By: HV Date: 3/27/2018
Filename: YHPI97P1



**COLORADO DEPARTMENT OF TRANSPORTATION
PRELIMINARY SOIL SURVEY**

Note 1: If samples are submitted leave sieve analysis section blank.
 Note 3: Sulfate content expressed as percent (dry soil), or ppm in water.
 Note 2: Comments should be placed in the description column of the form.
 Note 4: R-values referenced are noted 'Survey by Group Class' portion of this report.

Form #157 No.	Form #554 No.	Date:
	N/A	02/02/18
Project No.		
Project location	US 160-550 S Connection	
Project code (SA#)	19378	

STATION AND LOG	TEST NO.	DESCRIPTION	SULFATE CONTENT (SO ₄)	R-VAL REF	Per CP 24, Section 4						LIQUID LIMIT	PLASTIC INDEX	CLASSIFICATION AND GROUP INDEX	MOIST. %
					3/4"	3/8"	#4	#10	#40	#200				
Boring location R1														
4-9'	R1	Light Grey/Brown Clay (Sample) (MURPHYP1821135741)		10		100	99	98	94	81	44	27	A-7-6 (21)	3.7
Boring location R2														
4-9'	R2	Dark Tan Clay (Sample) (MURPHYP1821140335)		*		100	99	99	97	82	38	23	A-6 (18)	4.1
		* Sample untestable, to be resampled												
Boring location R3														
4-9'	R3	Dark Grey/Brown Clay (Sample) (MURPHYP1821140554)		*		100	99	99	96	78	43	27	A-7-6 (20)	3.5
		* Sample untestable, to be resampled												
Boring location R4														
14-19'	R4	Similar to R2												
Boring location R5														
4-9'	R5	Light Red Clay (Sample) (MURPHYP1821140717)		22	98	97	97	96	95	88	34	26	A-6 (21)	4.3
Boring location R6														
9-14'	R6	Similar to R5												
Boring location R7														
5-13'	R7	Light Red Sandy Clay (Sample) (MURPHYP17CB075332)		11				100	97	77	41	23	A-7-6 (17)	6.8
		(Resampled, See ensuing 555)												
Boring location R8														
10-15'	R8a	Tan Sandy/Rocky Clay (Sample)(MURPHYP17CB080726)		*			100	99	99	90	40	24	A-6 (22)	2.4
15-20'	R8b	Tan Sandy Clay (Sample)(MURPHYP17CB081624)		18		100	99	99	97	79	32	16	A-4 (0)	2.9
		(Resampled, See ensuing 555) *Sample Untestable												
Boring location R9														
9-19'	R9	Light Tan Fine Clay (Sample - combine 2)(MURPHYP17CB081948)		22	100	99	99	97	91	57	27	11	A-6 (3)	2.8
		(Resampled, See ensuing 555)												
Boring location R12 5-18'	R12	Rocky Cobbles w/Tan Clay (Sample) (MURPHYP1818104045)		18	78	57	41	37	32	25	39	23	A-2-6 (1)	4.7
Boring location A2 10-25'	A2	Reddish Sandy/Rocky Clay (Sample) (MURPHYP1818104454)		28		100	97	91	72	48	24	6	A-4 (0)	3.2

- Materials and Geotechnical
- Region Materials Engineer
- Resident Engineer

Appendix E.7 – Chloride Content - GAL Test Results



75 Suttle Street
Durango, CO 81303
970.247.4220 Phone
970.247.4227 Fax
www.greenanalytical.com

20 December 2017

Barney Bunker
Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango, CO 81303
RE: Soil: Cl

Enclosed are the results of analyses for samples received by the laboratory on 12/05/17 11:50.
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt".

Debbie Zufelt
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

Green Analytical Laboratories is NELAP accredited through the Texas Commission on Environmental Quality. Accreditation applies to drinking water and non-potable water matrices for trace metals and a variety of inorganic parameters. Green Analytical Laboratories is also accredited through the Colorado Department of Public Health and Environment and EPA region 8 for trace metals, Cyanide, Fluoride, Nitrate, and Nitrite in drinking water.

Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550/160, 217-376
Project Manager: Barney Bunker

Reported:
12/20/17 15:56

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
217-376 R10 @ 4'-9'	1712040-01	Solid	11/16/17 13:00	12/05/17 11:50
217-376 R9 @14'-19'	1712040-02	Solid	11/16/17 13:00	12/05/17 11:50
217-376 R7 @ 5'-10'	1712040-03	Solid	11/16/17 13:00	12/05/17 11:50
217-376 E-6 @ 14.5'-19.5'	1712040-04	Solid	11/20/17 13:00	12/05/17 11:50

Green Analytical Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. In no event shall Green Analytical Laboratories be liable for incidental or consequential damages. GALs liability, and clients exclusive remedy for any claim arising, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever, shall be deemed waived unless made in writing and received within thirty days after completion of the applicable service.



Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550/160, 217-376 Project Manager: Barney Bunker	Reported: 12/20/17 15:56
--	---	-----------------------------

217-376 R10 @ 4'-9'

1712040-01 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	94.9			%	1	12/12/17	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.5	10.5	1.51	mg/kg dry	10	12/18/17	EPA300.0		JDA
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217-376 R9 @14'-19'

1712040-02 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	95.7			%	1	12/12/17	EPA160.3/1684	H1	LLG
--------------	------	--	--	---	---	----------	---------------	----	-----

Soluble (DI Water Extraction)

Chloride	64.7	10.4	1.50	mg/kg dry	10	12/18/17	EPA300.0		JDA
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217-376 R7 @ 5'-10'

1712040-03 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	90.0			%	1	12/12/17	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	53.4	11.1	1.59	mg/kg dry	10	12/18/17	EPA300.0		JDA
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217-376 E-6 @ 14.5'-19.5'

1712040-04 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
---------	--------	----	-----	-------	----------	----------	--------	-------	---------

General Chemistry

% Dry Solids	98.5			%	1	12/12/17	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	19.6	10.1	1.45	mg/kg dry	10	12/18/17	EPA300.0		JDA
----------	------	------	------	-----------	----	----------	----------	--	-----

Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550/160, 217-376 Project Manager: Barney Bunker	Reported: 12/20/17 15:56
--	---	-----------------------------

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B712076 - General Prep - Wet Chem

Duplicate (B712076-DUP1)		Source: 1712040-01		Prepared: 12/11/17		Analyzed: 12/12/17				
% Dry Solids	94.8		%		94.9			0.0538	20	

Soluble (DI Water Extraction) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B712123 - General Prep - Wet Chem

Blank (B712123-BLK1)				Prepared: 12/15/17		Analyzed: 12/18/17				
Chloride	ND	1.00	mg/kg wet							
LCS (B712123-BS1)				Prepared: 12/15/17		Analyzed: 12/18/17				
Chloride	244	10.0	mg/kg wet	250		97.7	85-115			
LCS Dup (B712123-BSD1)				Prepared: 12/15/17		Analyzed: 12/18/17				
Chloride	245	10.0	mg/kg wet	250		97.9	85-115	0.184	20	



Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550/160, 217-376
Project Manager: Barney Bunker

Reported:
12/20/17 15:56

Notes and Definitions

HI Sample was received several days after collected and subsequently analyzed past hold time.

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis
*Results reported on as received basis unless designated as dry.

RPD Relative Percent Difference

LCS Laboratory Control Sample (Blank Spike)

RL Report Limit

MDL Method Detection Limit

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CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

(970) 247-4220
 Fax: (970) 247-4227

service@greenanalytical.com or dzufelt@greenanalytical.com
 75 Suttle St Durango, CO 81303

Page 6 of 6

Company Name: Yeh & Associates	Bill to (if different):	ANALYSIS REQUEST			
Project Manager: Barney Bunker	P.O. #:				
Address: 570 Turner Dr. Ste D	Company:				
City: Durango State: CO Zip: 81301	Attn:				
Phone #: 970-382-9590 Email: Bbunker@yeh-eng.com	Address:				
Additional Report To:	City:				
Project Name: US 550/160	State: Zip:				
Project Number: 217-376	Phone #:				
Sampler Name (Print): B. Bunker	Fax or Email:				

FOR LAB USE ONLY		Collected		Matrix (check one)						# of containers						
Lab I.D.	Sample Name or Location	Date	Time	GROUNDWATER	SURFACEWATER	WASTEWATER	PRODUCEDWATER	SOIL	OTHER :	No preservation (general)	HNO ₃	HCl	H ₂ SO ₄	Other:	Other:	Other:
217-376 01	R10 @ 4'-9'	11/16/17	13:00					1		1						
217-376 02	R9 @ 14'-19'	11/16/17	13:00					1		1						
217-376 03	R7 @ 5'-10'	11/16/17	13:00					1		1						
217-376 04	E-6 @ 14.5'-19.5'	11/20/17	13:00					1		1						

chloride

PLEASE NOTE: GAL's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by GAL within 30 days after completion. In no event shall GAL be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by GAL, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: <i>Krishn Moran</i>	Date: 12/5/17	Time: 11:50 am	Received By: <i>Dustin Zufelt</i>	ADDITIONAL REMARKS:	Report to State? (Circle)	
Relinquished By:	Date:	Time:	Received By:		Yes	No
Relinquished By:	Date:	Time:	Received By:			
Delivered By: (Circle One)	Temperature at receipt: 17.4/17.6 °C	CHECKED BY: <i>DJ</i>				

† GAL cannot always accept verbal changes. Please fax or email written change requests.
 * Chain of Custody must be signed in "Relinquished By:" as an acceptance of services and all applicable charges.



75 Suttle Street
Durango, CO 81303
970.247.4220 Phone
970.247.4227 Fax
www.greenanalytical.com

02 January 2018

Barney Bunker
Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango, CO 81303
RE: Soil: Cl

Enclosed are the results of analyses for samples received by the laboratory on 12/15/17 10:35.
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt".

Debbie Zufelt
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

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Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 S./US 160 Connector, 217-376
Project Manager: Barney Bunker

Reported:
01/02/18 13:17

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
217-376 A-2 @ 30'-32'	1712145-01	Solid	11/29/17 13:00	12/15/17 10:35
217-376 WB-3 @ 54.5'-59.5'	1712145-02	Solid	12/04/17 13:00	12/15/17 10:35
217-376 R-12 @ 4.5'-9.5'	1712145-03	Solid	12/01/17 13:00	12/15/17 10:35
217-376 R-12 @ 19.5'-24.5'	1712145-04	Solid	12/01/17 13:00	12/15/17 10:35

Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 S./US 160 Connector, 217-376 Project Manager: Barney Bunker	Reported: 01/02/18 13:17
--	---	-----------------------------

217-376 A-2 @ 30'-32'
1712145-01 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	94.4			%	1	12/20/17	EPA160.3/1684	H1	LLG
--------------	------	--	--	---	---	----------	---------------	----	-----

Soluble (DI Water Extraction)

Chloride	11.4	10.6	1.52	mg/kg dry	10	12/29/17	EPA300.0		JDA
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217-376 WB-3 @ 54.5'-59.5'
1712145-02 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	85.7			%	1	12/20/17	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<11.7	11.7	1.67	mg/kg dry	10	12/29/17	EPA300.0		JDA
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217-376 R-12 @ 4.5'-9.5'
1712145-03 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	92.5			%	1	12/20/17	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	11.8	10.8	1.55	mg/kg dry	10	12/29/17	EPA300.0		JDA
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217-376 R-12 @ 19.5'-24.5'
1712145-04 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
---------	--------	----	-----	-------	----------	----------	--------	-------	---------

General Chemistry

% Dry Solids	95.1			%	1	12/20/17	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	57.6	10.5	1.51	mg/kg dry	10	12/29/17	EPA300.0		JDA
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Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 S./US 160 Connector, 217-376 Project Manager: Barney Bunker	Reported: 01/02/18 13:17
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General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B712148 - General Prep - Wet Chem										
Duplicate (B712148-DUP1) Source: 1712132-01 Prepared: 12/19/17 Analyzed: 12/20/17										
% Dry Solids	95.6		%		95.4			0.205	20	
Duplicate (B712148-DUP2) Source: 1712143-06 Prepared: 12/19/17 Analyzed: 12/20/17										
% Dry Solids	70.7		%		70.3			0.617	20	

Soluble (DI Water Extraction) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B712210 - General Prep - Wet Chem										
Blank (B712210-BLK1) Prepared: 12/27/17 Analyzed: 12/29/18										
Chloride	ND	1.00	mg/kg wet							
LCS (B712210-BS1) Prepared: 12/27/17 Analyzed: 12/29/17										
Chloride	249	10.0	mg/kg wet	250		99.8	85-115			
LCS Dup (B712210-BSD1) Prepared: 12/27/17 Analyzed: 12/29/17										
Chloride	249	10.0	mg/kg wet	250		99.6	85-115	0.169	20	

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Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 S./US 160 Connector, 217-376
Project Manager: Barney Bunker

Reported:
01/02/18 13:17

Notes and Definitions

HI Sample was received several days after collected and subsequently analyzed past hold time.

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis
*Results reported on as received basis unless designated as dry.

RPD Relative Percent Difference

LCS Laboratory Control Sample (Blank Spike)

RL Report Limit

MDL Method Detection Limit

Green Analytical Laboratories

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75 Suttle Street
Durango, CO 81303
970.247.4220 Phone
970.247.4227 Fax
www.greenanalytical.com

18 January 2018

Barney Bunker
Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango, CO 81303
RE: Soil: Cl

Enclosed are the results of analyses for samples received by the laboratory on 01/05/18 16:10.
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt".

Debbie Zufelt
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

Green Analytical Laboratories is NELAP accredited through the Texas Commission on Environmental Quality. Accreditation applies to drinking water and non-potable water matrices for trace metals and a variety of inorganic parameters. Green Analytical Laboratories is also accredited through the Colorado Department of Public Health and Environment and EPA region 8 for trace metals, Cyanide, Fluoride, Nitrate, and Nitrite in drinking water.

Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 S. 160 Connector 217-376
Project Manager: Barney Bunker

Reported:
01/18/18 12:31

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
217-376 WB-1 @ 34.5-44.5	1801045-01	Solid	12/04/17 13:00	01/05/18 16:10
217-376 WB-5 @ 54.5-59.5	1801045-02	Solid	12/04/17 13:00	01/05/18 16:10
217-376 WB-6 @ 14.5-19.5	1801045-03	Solid	12/04/17 13:00	01/05/18 16:10
217-376 WB-7 @ 44.5-49.5	1801045-04	Solid	12/04/17 13:00	01/05/18 16:10
217-376 WB-8 @ 59.5-69.5	1801045-05	Solid	12/04/17 13:00	01/05/18 16:10

Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 S. 160 Connector 217-376 Project Manager: Barney Bunker	Reported: 01/18/18 12:31
--	---	-----------------------------

217-376 WB-1 @ 34.5-44.5
1801045-01 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	99.9			%	1	01/15/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.0	10.0	1.43	mg/kg dry	10	01/17/18	EPA300.0		JDA
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217-376 WB-5 @ 54.5-59.5
1801045-02 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	94.8			%	1	01/15/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.6	10.6	1.51	mg/kg dry	10	01/17/18	EPA300.0		JDA
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217-376 WB-6 @ 14.5-19.5
1801045-03 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	96.7			%	1	01/15/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	62.3	10.3	1.48	mg/kg dry	10	01/17/18	EPA300.0		JDA
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217-376 WB-7 @ 44.5-49.5
1801045-04 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	95.0			%	1	01/15/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.5	10.5	1.51	mg/kg dry	10	01/17/18	EPA300.0		JDA
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Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 S. 160 Connector 217-376 Project Manager: Barney Bunker	Reported: 01/18/18 12:31
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217-376 WB-8 @ 59.5-69.5
1801045-05 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	92.5			%	1	01/15/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.8	10.8	1.55	mg/kg dry	10	01/17/18	EPA300.0		JDA
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General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B801071 - General Prep - Wet Chem

Duplicate (B801071-DUP1)		Source: 1801043-01		Prepared: 01/10/18		Analyzed: 01/15/18				
% Dry Solids	83.2		%		82.8			0.434	20	

Soluble (DI Water Extraction) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B801097 - General Prep - Wet Chem

Blank (B801097-BLK1)				Prepared: 01/15/18		Analyzed: 01/17/18				
Chloride	ND	10.0	mg/kg wet							

LCS (B801097-BS1)				Prepared: 01/15/18		Analyzed: 01/17/18				
Chloride	241	10.0	mg/kg wet	250		96.5	85-115			

LCS Dup (B801097-BSD1)				Prepared: 01/15/18		Analyzed: 01/17/18				
Chloride	241	10.0	mg/kg wet	250		96.3	85-115	0.245	20	

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Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 S. 160 Connector 217-376
Project Manager: Barney Bunker

Reported:
01/18/18 12:31

Notes and Definitions

- H1 Sample was received several days after collected and subsequently analyzed past hold time.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

Green Analytical Laboratories

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(970) 247-4220
Fax: (970) 247-4227

service@greenanalytical.com or dzufelt@greenanalytical.com
75 Suttle St Durango, CO 81303

Company Name: <u>Yeh b Associates</u> Project Manager: <u>Barney Bunker</u> Address: <u>570 Turner Dr Ste D</u> City: <u>Durango</u> State: <u>CO</u> Zip: <u>81301</u> Phone #: <u>970-382-9590</u> Email: <u>bbunker@yeheng.com</u> Additional Report To: <u>-</u> Project Name: <u>US 550 s. 160 connector</u> Project Number: <u>217-376</u> Sampler Name (Print): <u>E. Pickerill</u>	Bill to (if different): P.O. #: Company: Attn: Address: City: State: Zip: Phone #: Fax or Email:	ANALYSIS REQUEST
--	--	-------------------------

Lab I.D.	Sample Name or Location	Collected		Matrix (check one)							# of containers					
		Date	Time	GROUNDWATER	SURFACEWATER	WASTEWATER	PRODUCEDWATER	SOIL	OTHER:	No preservation (general)	HNO ₃	HCl	H ₂ SO ₄	Other:	Other:	Other:
<u>217-376</u>	<u>WB-1 @ 34.5-44.5-01</u>	<u>12-4-17</u>	<u>13:00</u>					<input checked="" type="checkbox"/>								
<u>217-376</u>	<u>WB-5 @ 54.5-59.5-02</u>	<u>12-4-17</u>	<u>13:00</u>					<input checked="" type="checkbox"/>								
<u>217-376</u>	<u>WB-6 @ 14.5-19.5-03</u>	<u>12-4-17</u>	<u>13:00</u>					<input checked="" type="checkbox"/>								
<u>217-376</u>	<u>WB-7 @ 44.5-49.5-04</u>	<u>12-4-17</u>	<u>13:00</u>					<input checked="" type="checkbox"/>								
<u>217-376</u>	<u>WB-8 @ 59.5-69.5-05</u>	<u>12-4-17</u>	<u>13:00</u>					<input checked="" type="checkbox"/>								

Chloride
5

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Relinquished By:	Date:	Received By:	ADDITIONAL REMARKS:
	Time:		Report to State? (Circle)
Relinquished By: <u>Kristin Moran</u>	Date: <u>1/5/18</u>	Received By: <u>Deline Zufelt</u>	Yes No
Relinquished By:	Time: <u>4:10 pm</u>	Received By:	
	Date:		
	Time:	<u>#1</u>	
Delivered By: (Circle One)	Temperature at receipt:	CHECKED BY:	
Sampler - UPS - FedEx - Kangaroo - Other:	<u>20.1/20.3°C</u>	<u>Dz</u>	

↑ GAL cannot always accept verbal changes. Please fax or email written change requests.
* Chain of Custody must be signed in "Relinquished By:" as an acceptance of services and all applicable charges.



75 Suttle Street
Durango, CO 81303
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27 February 2018

Barney Bunker
Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango, CO 81303
RE: Soil: Cl

Enclosed are the results of analyses for samples received by the laboratory on 02/13/18 16:30.
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt".

Debbie Zufelt
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

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Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 South / US 160 Connector
Project Manager: Barney Bunker

Reported:
02/27/18 12:15

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WA-3 @ 54.5 - 59.5	1802113-01	Solid	01/12/18 13:00	02/13/18 16:30
WC-3 @ 29.5 - 34.5	1802113-02	Solid	01/12/18 13:00	02/13/18 16:30
R-1 @ 9'-14'	1802113-03	Solid	01/16/18 09:00	02/13/18 16:30
R-2 @ 1' - 2'	1802113-04	Solid	01/16/18 10:00	02/13/18 16:30
R-3 @ 9' - 14'	1802113-05	Solid	01/16/18 10:00	02/13/18 16:30
R-4 @ 9' - 14'	1802113-06	Solid	01/16/18 12:00	02/13/18 16:30
R-5 @ 9' - 14'	1802113-07	Solid	01/17/18 09:00	02/13/18 16:30
R-6 @ 4' - 9'	1802113-08	Solid	01/17/18 10:00	02/13/18 16:30

Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 South / US 160 Connector Project Manager: Barney Bunker	Reported: 02/27/18 12:15
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WA-3 @ 54.5 - 59.5

1802113-01 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	94.5			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.6	10.6	1.52	mg/kg dry	10	02/26/18	EPA300.0		JDA
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WC-3 @ 29.5 - 34.5

1802113-02 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	93.0			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.8	10.8	1.54	mg/kg dry	10	02/26/18	EPA300.0		JDA
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R-1 @ 9'-14'

1802113-03 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	87.6			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	78.8	11.4	1.64	mg/kg dry	10	02/26/18	EPA300.0		JDA
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R-2 @ 1' - 2'

1802113-04 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	96.4			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	43.3	10.4	1.49	mg/kg dry	10	02/26/18	EPA300.0		JDA
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Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 South / US 160 Connector Project Manager: Barney Bunker	Reported: 02/27/18 12:15
--	---	-----------------------------

R-3 @ 9' - 14'
1802113-05 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	84.2			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	16.4	11.9	1.70	mg/kg dry	10	02/26/18	EPA300.0		JDA
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R-4 @ 9' - 14'
1802113-06 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	85.8			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	29.2	11.7	1.67	mg/kg dry	10	02/26/18	EPA300.0		JDA
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R-5 @ 9' - 14'
1802113-07 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	89.5			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	29.0	11.2	1.60	mg/kg dry	10	02/26/18	EPA300.0		JDA
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R-6 @ 4' - 9'
1802113-08 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	86.5			%	1	02/22/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	1060	57.8	8.28	mg/kg dry	50	02/26/18	EPA300.0		JDA
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Green Analytical Laboratories
Debbie Zufelt

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 South / US 160 Connector Project Manager: Barney Bunker	Reported: 02/27/18 12:15
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General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B802143 - General Prep - Wet Chem

Duplicate (B802143-DUP1) Source: 1802113-01 Prepared: 02/20/18 Analyzed: 02/26/18

% Dry Solids	94.5		%		94.5			0.00741	20	
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Soluble (DI Water Extraction) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B802165 - General Prep - Wet Chem

Blank (B802165-BLK1) Prepared: 02/22/18 Analyzed: 02/23/18

Chloride	ND	1.00	mg/kg wet							
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LCS (B802165-BS1) Prepared: 02/22/18 Analyzed: 02/23/18

Chloride	243	10.0	mg/kg wet	250		97.4	85-115			
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LCS Dup (B802165-BSD1) Prepared: 02/22/18 Analyzed: 02/23/18

Chloride	245	10.0	mg/kg wet	250		98.2	85-115	0.839	20	
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Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 South / US 160 Connector
Project Manager: Barney Bunker

Reported:
02/27/18 12:15

Notes and Definitions

- HI Sample was received several days after collected and subsequently analyzed past hold time.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

Green Analytical Laboratories

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75 Suttle Street
Durango, CO 81303
970.247.4220 Phone
970.247.4227 Fax
www.greenanalytical.com

09 March 2018

Barney Bunker
Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango, CO 81303
RE: Soil: Cl

Enclosed are the results of analyses for samples received by the laboratory on 02/28/18 15:52.
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt".

Debbie Zufelt
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

Green Analytical Laboratories is NELAP accredited through the Texas Commission on Environmental Quality. Accreditation applies to drinking water and non-potable water matrices for trace metals and a variety of inorganic parameters. Green Analytical Laboratories is also accredited through the Colorado Department of Public Health and Environment and EPA region 8 for trace metals, Cyanide, Fluoride, Nitrate, and Nitrite in drinking water.

Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 South/US 160 Connector, 217-376
Project Manager: Barney Bunker

Reported:
03/09/18 17:09

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
217-376 E-8 @ 44.5-49.5	1803003-01	Solid	01/20/18 14:00	02/28/18 15:52
217-376 E-8 @ 9.5-14.5	1803003-02	Solid	01/20/18 12:00	02/28/18 15:52
217-376 E-4 @ 59.5-64.5	1803003-03	Solid	01/20/18 14:00	02/28/18 15:52
217-376 E-1 @ 114'-119'	1803003-04	Solid	01/22/18 14:00	02/28/18 15:52
217-376 E-1 @ 79'-84'	1803003-05	Solid	01/22/18 14:00	02/28/18 15:52

Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 South/US 160 Connector, 217-376 Project Manager: Barney Bunker	Reported: 03/09/18 17:09
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217-376 E-8 @ 44.5-49.5

1803003-01 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	91.0			%	1	03/08/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<11.0	11.0	1.57	mg/kg dry	10	03/06/18	EPA300.0		JDA
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217-376 E-8 @ 9.5-14.5

1803003-02 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	88.6			%	1	03/08/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<11.3	11.3	1.62	mg/kg dry	10	03/06/18	EPA300.0		JDA
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217-376 E-4 @ 59.5-64.5

1803003-03 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	92.0			%	1	03/08/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<10.9	10.9	1.56	mg/kg dry	10	03/06/18	EPA300.0		JDA
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217-376 E-1 @ 114'-119'

1803003-04 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	91.3			%	1	03/08/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<11.0	11.0	1.57	mg/kg dry	10	03/06/18	EPA300.0		JDA
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Green Analytical Laboratories

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 South/US 160 Connector, 217-376 Project Manager: Barney Bunker	Reported: 03/09/18 17:09
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217-376 E-1 @ 79'-84'
1803003-05 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	91.3			%	1	03/08/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	<11.0	11.0	1.57	mg/kg dry	10	03/06/18	EPA300.0		JDA
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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 South/US 160 Connector, 217-376 Project Manager: Barney Bunker	Reported: 03/09/18 17:09
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General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B803012 - General Prep - Wet Chem

Duplicate (B803012-DUP1) Source: 1802159-01 Prepared: 03/02/18 Analyzed: 03/08/18

% Dry Solids	80.1		%		80.7			0.796	20	
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Soluble (DI Water Extraction) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B803021 - General Prep - Wet Chem

Blank (B803021-BLK1) Prepared: 03/05/18 Analyzed: 03/06/18

Chloride	ND	10.0	mg/kg wet							
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LCS (B803021-BS1) Prepared: 03/05/18 Analyzed: 03/06/18

Chloride	236	10.0	mg/kg wet	250		94.3	85-115			
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LCS Dup (B803021-BSD1) Prepared: 03/05/18 Analyzed: 03/06/18

Chloride	238	10.0	mg/kg wet	250		95.2	85-115	0.963	20	
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Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 South/US 160 Connector, 217-376
Project Manager: Barney Bunker

Reported:
03/09/18 17:09

Notes and Definitions

- HI Sample was received several days after collected and subsequently analyzed past hold time.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

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75 Suttle Street
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970.247.4227 Fax
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21 May 2018

Barney Bunker
Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango, CO 81303
RE: Soil: Cl

Enclosed are the results of analyses for samples received by the laboratory on 05/07/18 14:35.
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Debbie Zufelt".

Debbie Zufelt
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 S/160 Connector 217-376 Project Manager: Barney Bunker	Reported: 05/21/18 09:08
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ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
217-376 WE-01 @ 4'-9'	1805064-01	Solid	04/19/18 00:00	05/07/18 14:35
217-376 WX2-01 @ 8'-13'	1805064-02	Solid	04/19/18 00:00	05/07/18 14:35

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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 S/160 Connector 217-376 Project Manager: Barney Bunker	Reported: 05/21/18 09:08
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217-376 WE-01 @ 4'-9'

1805064-01 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	97.0			%	1	05/11/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	78.4	10.3	1.48	mg/kg dry	10	05/17/18	EPA300.0		JDA
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217-376 WX2-01 @ 8'-13'

1805064-02 (Solid)

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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General Chemistry

% Dry Solids	94.8			%	1	05/11/18	EPA160.3/1684	H1	LLG
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Soluble (DI Water Extraction)

Chloride	54.3	10.5	1.51	mg/kg dry	10	05/17/18	EPA300.0		JDA
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Yeh and Associates, Inc 570 Turner Dr. Suite D Durango CO, 81303	Project: Soil: Cl Project Name / Number: US 550 S/160 Connector 217-376 Project Manager: Barney Bunker	Reported: 05/21/18 09:08
--	--	-----------------------------

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B805062 - General Prep - Wet Chem

Duplicate (B805062-DUP1) Source: 1805055-01 Prepared: 05/08/18 Analyzed: 05/11/18

% Dry Solids	98.3		%		98.3			0.0448	20	
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Soluble (DI Water Extraction) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B805121 - General Prep - Wet Chem

Blank (B805121-BLK1) Prepared: 05/16/18 Analyzed: 05/17/18

Chloride	ND	10.0	mg/kg wet							
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LCS (B805121-BS1) Prepared: 05/16/18 Analyzed: 05/17/18

Chloride	232	10.0	mg/kg wet	250		92.8	85-115			
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LCS Dup (B805121-BSD1) Prepared: 05/16/18 Analyzed: 05/17/18

Chloride	235	10.0	mg/kg wet	250		93.9	85-115	1.23	20	
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Yeh and Associates, Inc
570 Turner Dr. Suite D
Durango CO, 81303

Project: Soil: Cl
Project Name / Number: US 550 S/160 Connector 217-376
Project Manager: Barney Bunker

Reported:
05/21/18 09:08

Notes and Definitions

- H1 Sample was received several days after collected and subsequently analyzed past hold time.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

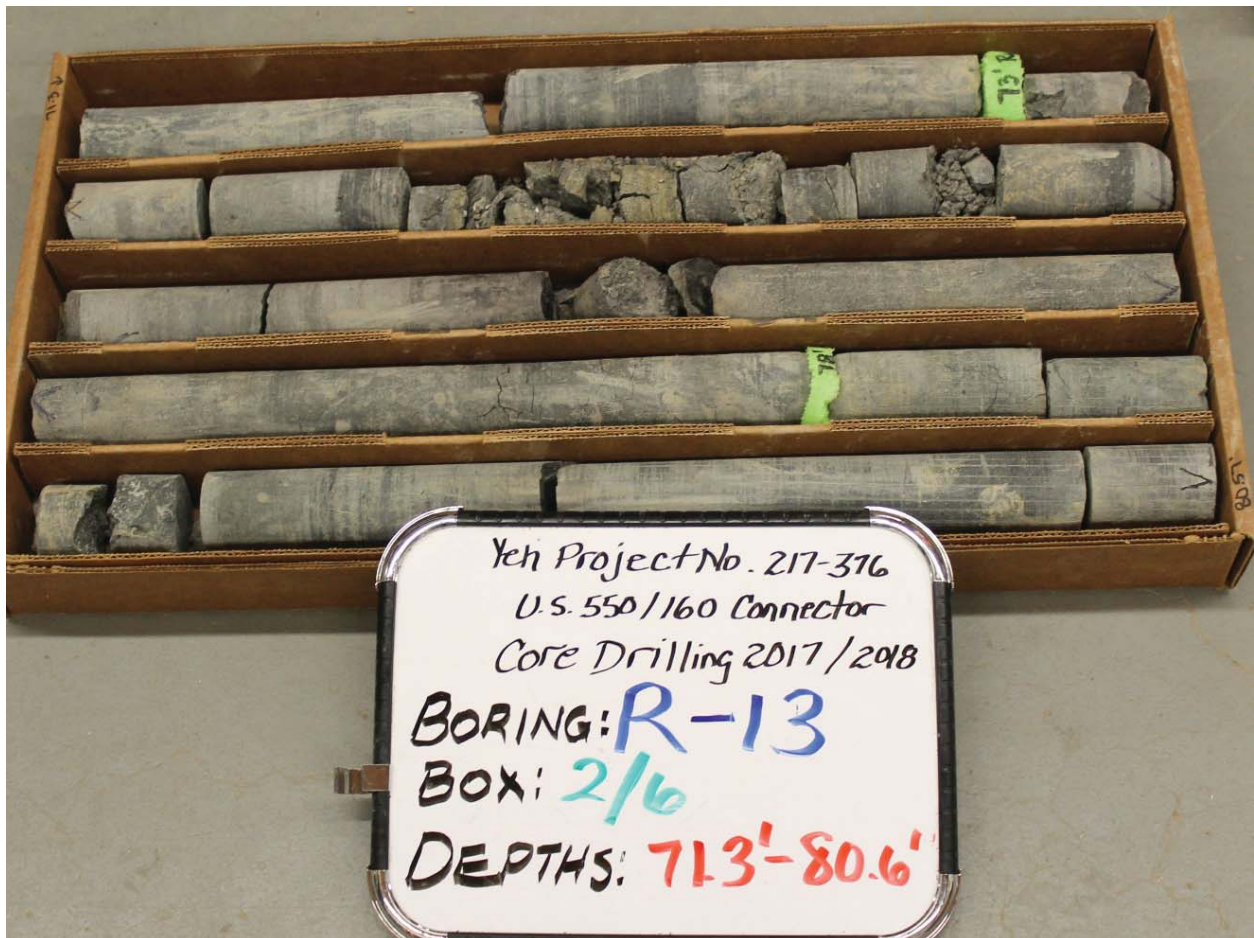
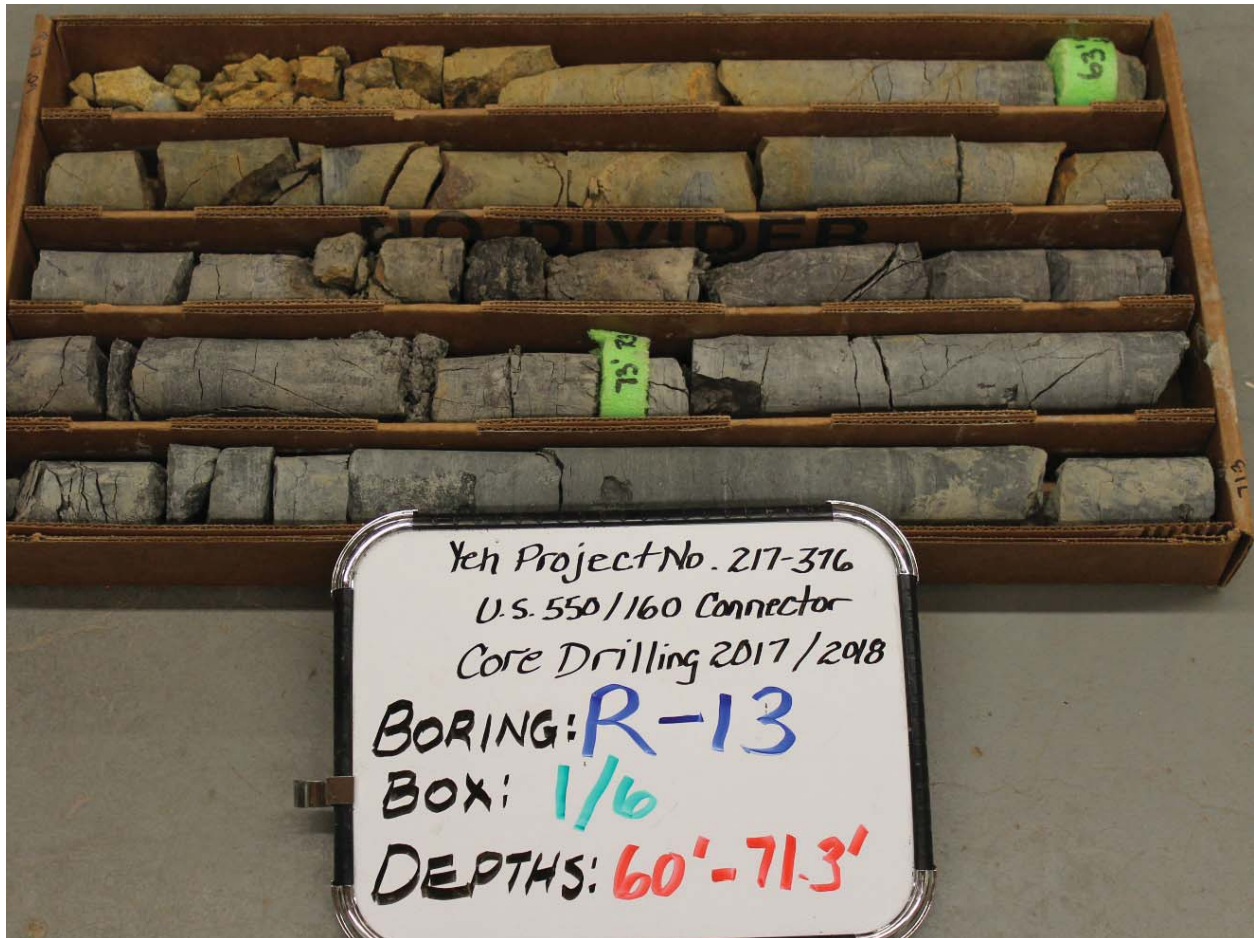
Green Analytical Laboratories

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Appendix F – Core Photos

- F.1 Roadway and Excavation Borings – Core Photos
- F.2 Bridge 1 (P-05-AZ) Borings – Core Photos
- F.3 Bridge 2 (P-05-BA) Borings – Core Photos
- F.4 Retaining Walls Borings – Core Photos

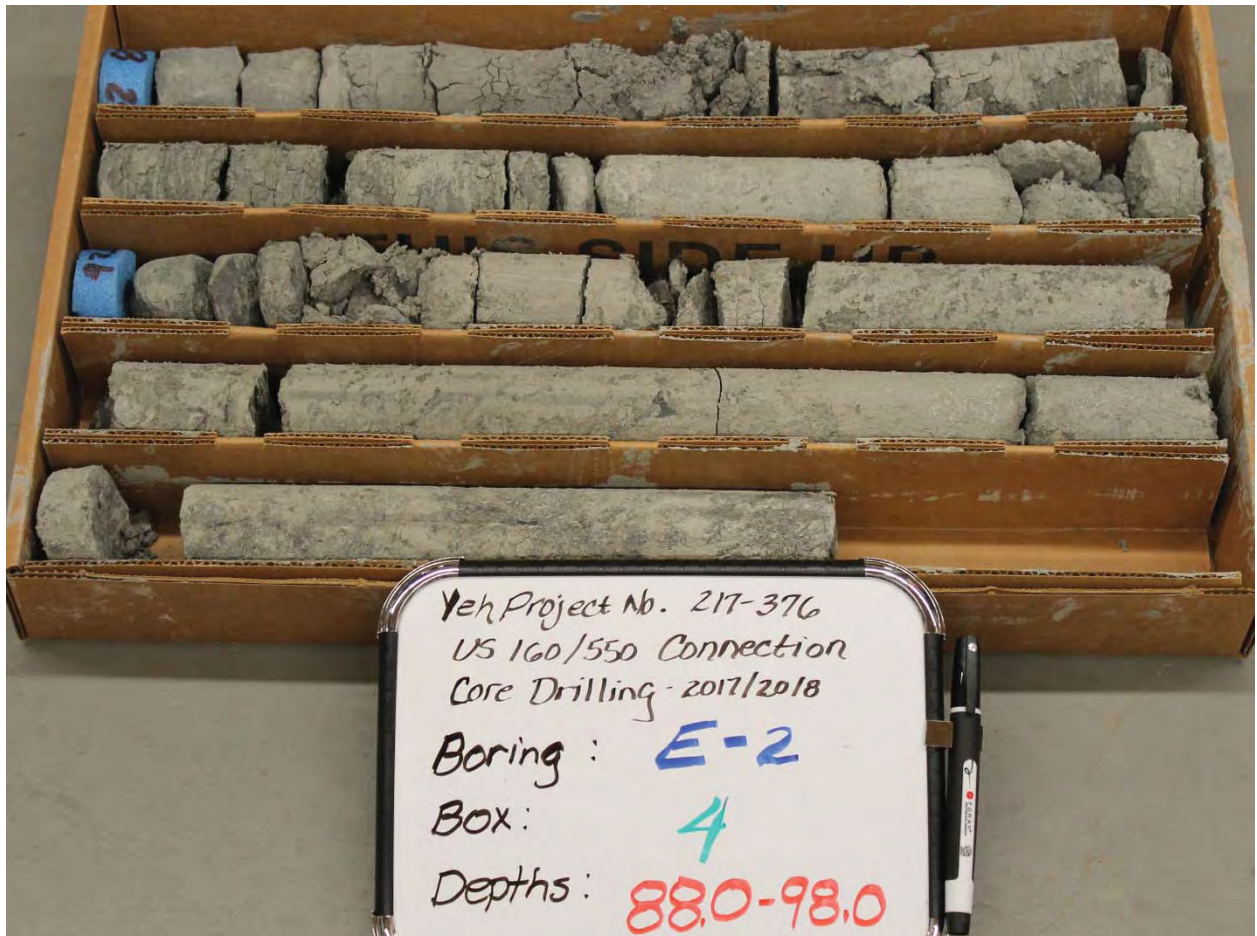
Appendix F.1 – Roadway and Excavation Borings – Core Photos









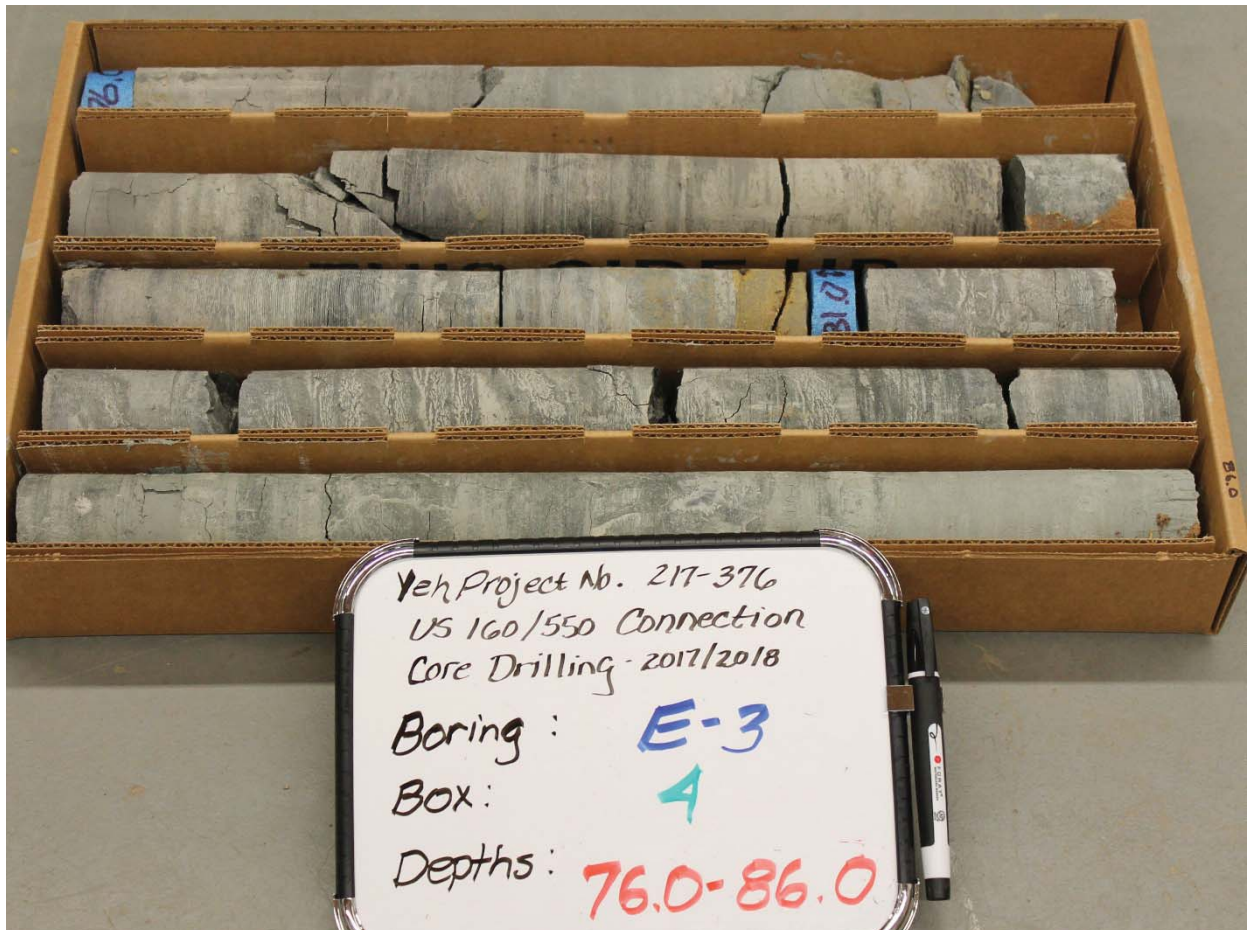












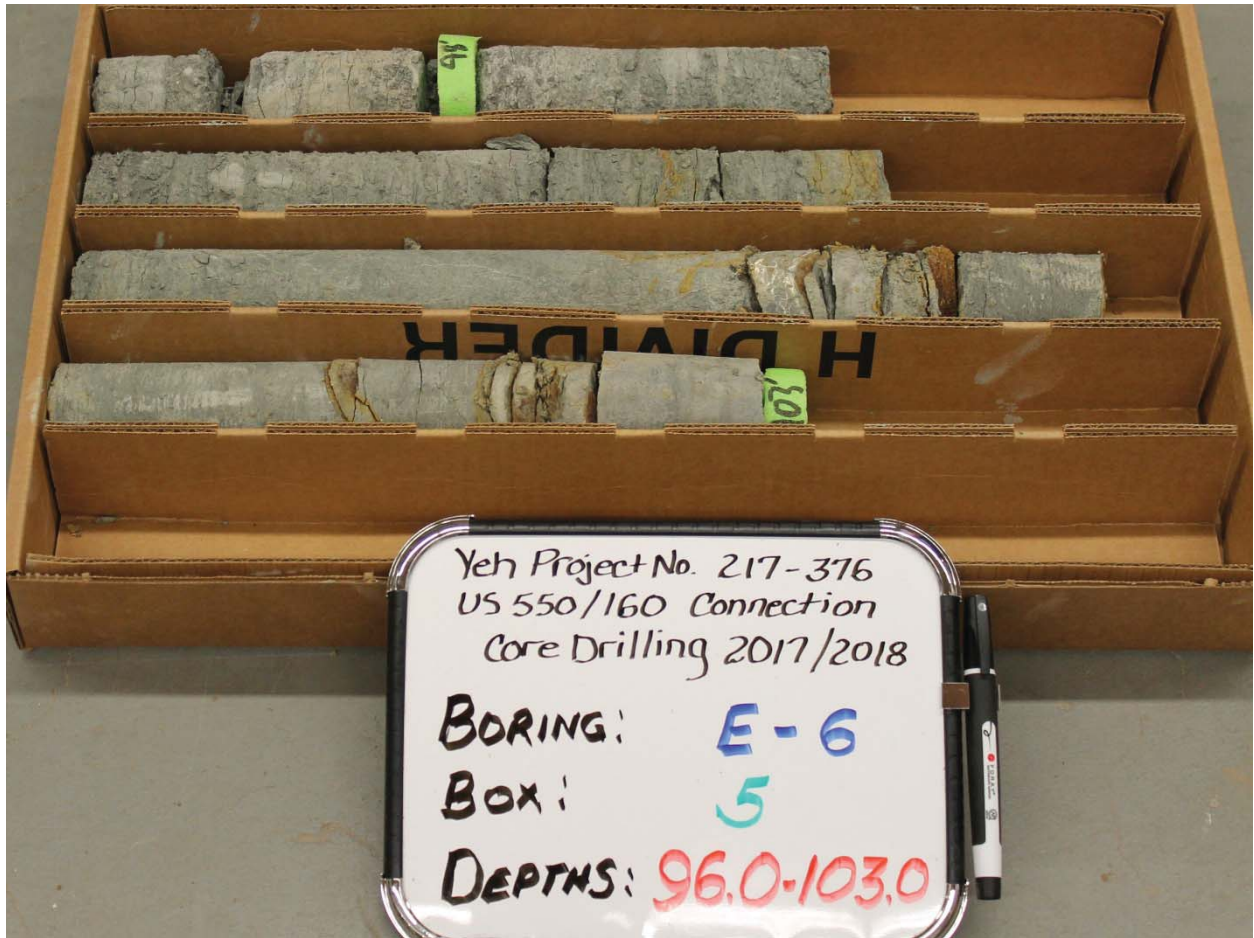


Yeh Project No. 217-376
US 160/550 Connection
Core Drilling - 2017/2018

Boring : E-3
Box : 5
Depths : 86.0-91.0







Yeh Project No. 217-316
US 550/160 Connection
Core Drilling 2017/2018

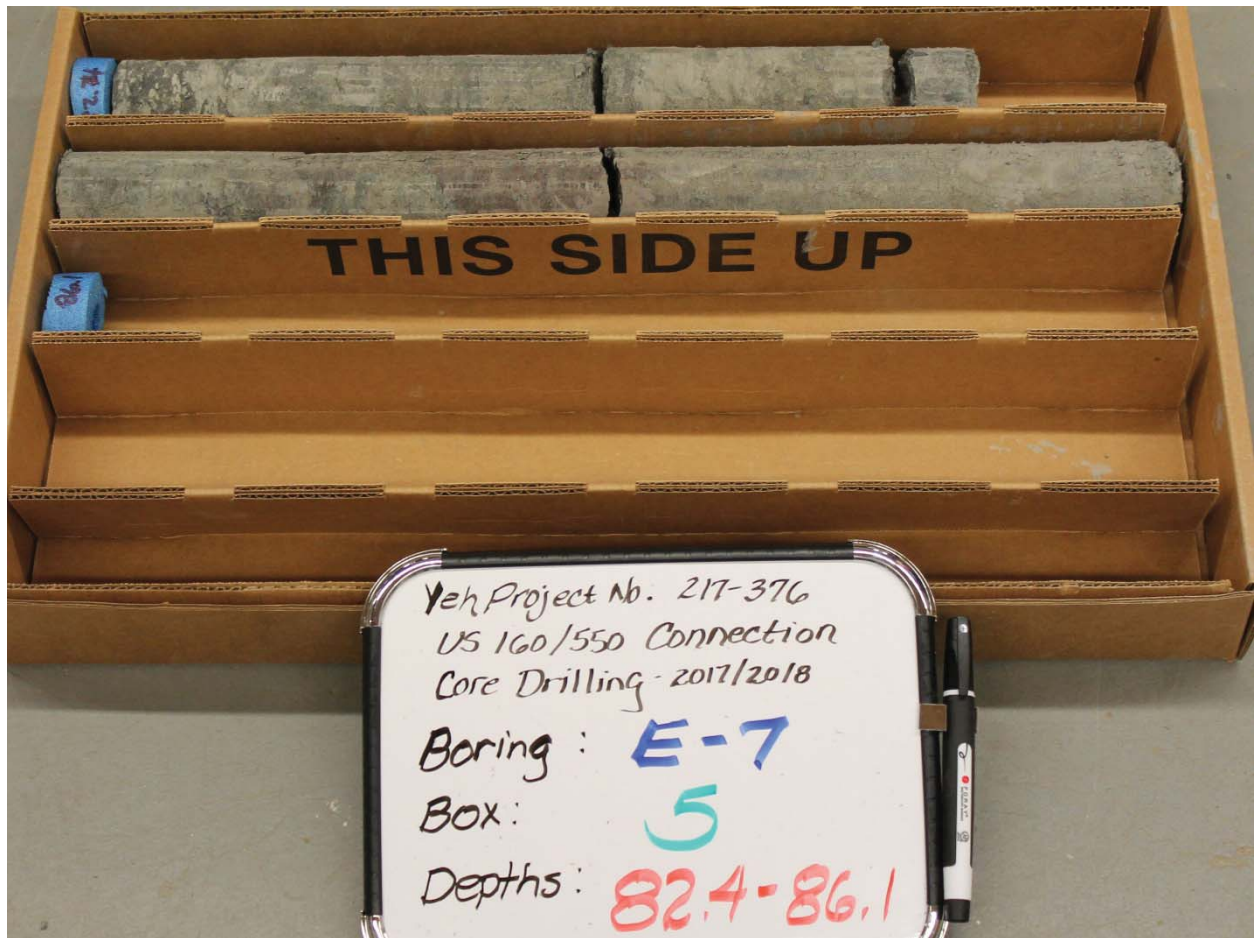
BORING: E-6

BOX: 5

DEPTHS: 96.0-103.0









Yeh Project No. 217-376
US 160/550 Connection
Core Drilling - 2017/2018

Boring : E-7

Box : 7

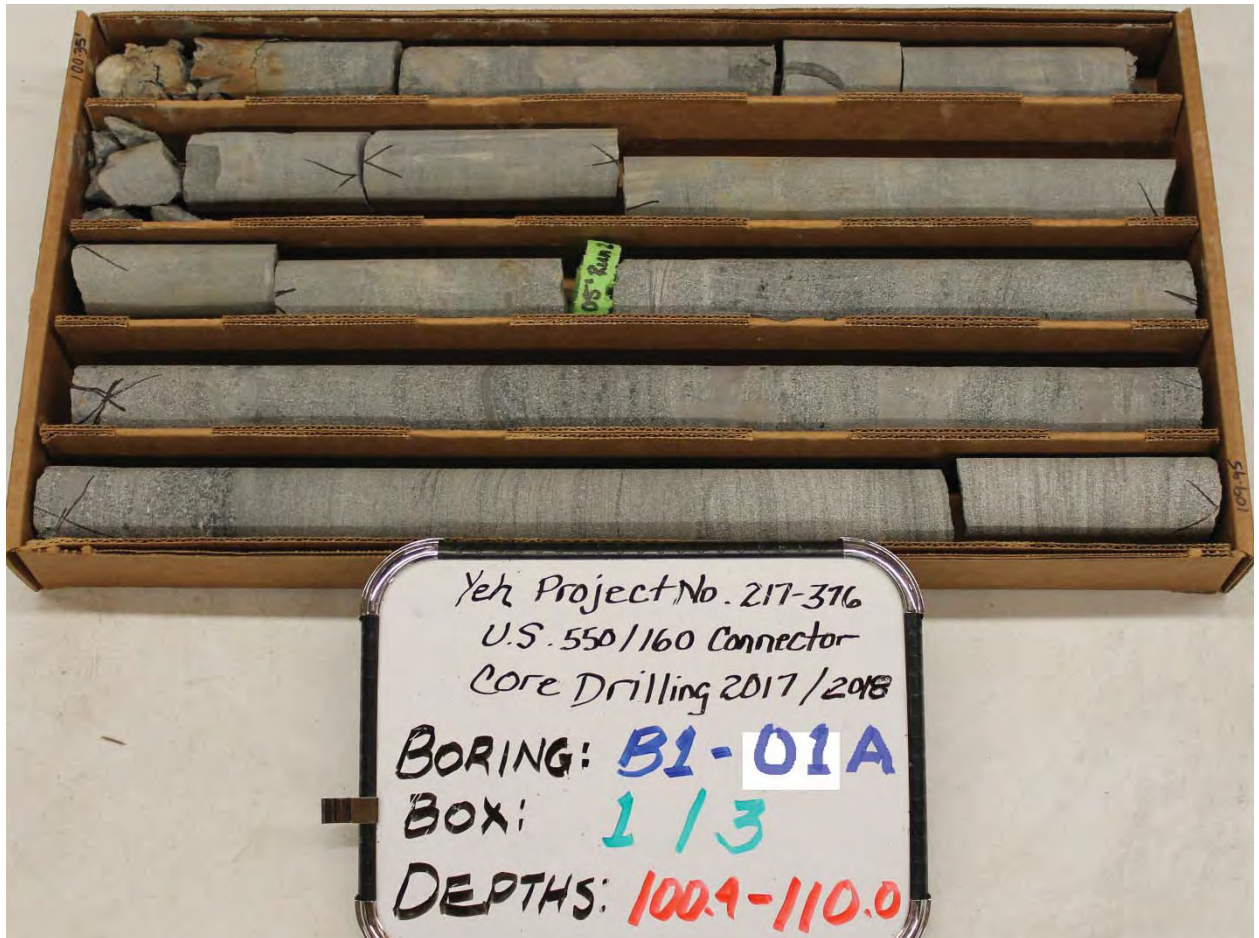
Depths : 92.4-100.0

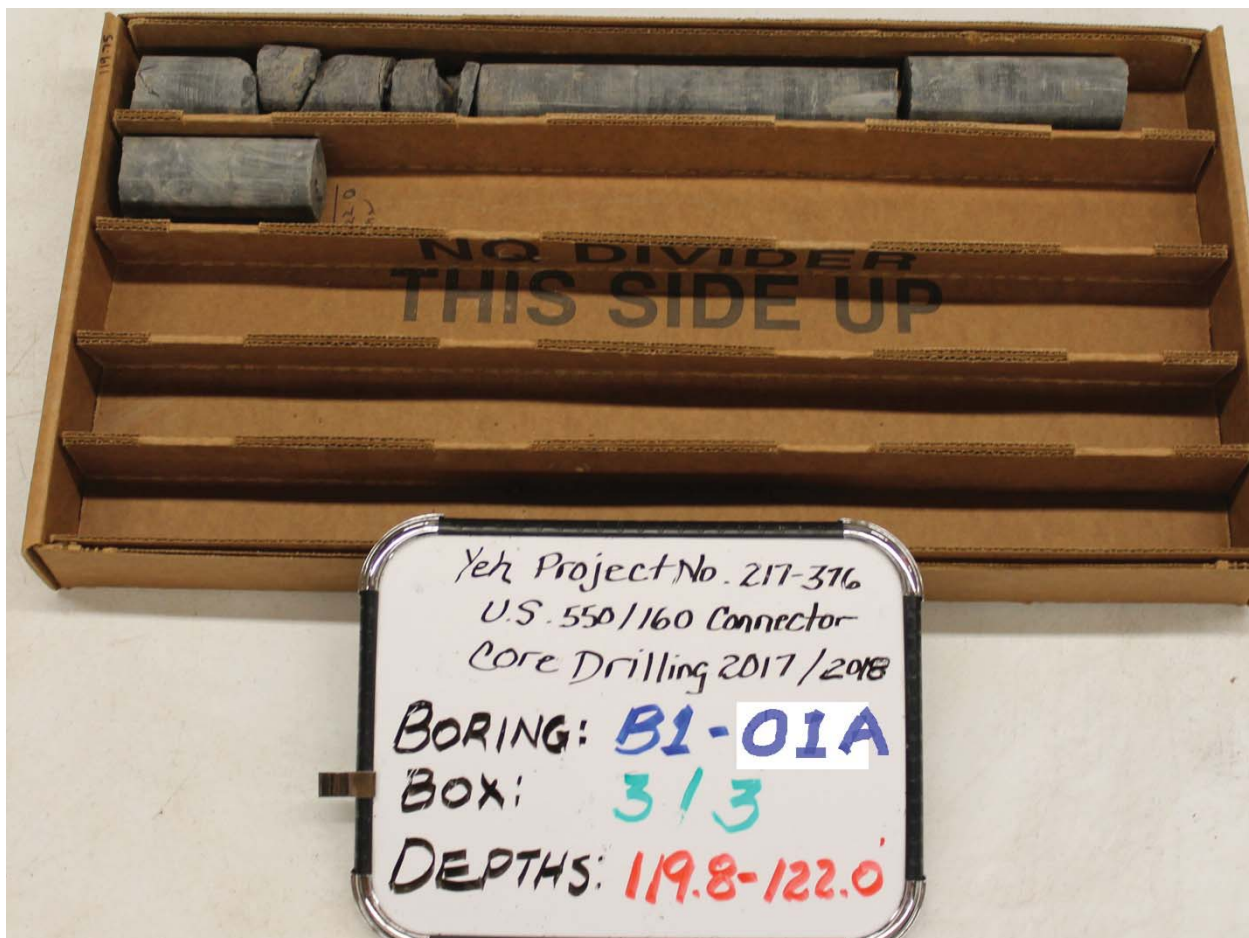
Appendix F.2 – Bridge 1 (P-05-AZ) Borings – Core Photos





Yeh Project No. 217-316
U.S. 550/160 Connector
Core Drilling 2017/2018
BORING: B1-01
BOX: 3/3
DEPTHS: 96.0-106.0'





Yeh Project No. 217-316

U.S. 550/160 Connector

Core Drilling 2017/2018

BORING: B1-01A

BOX: 3/3

DEPTHS: 119.8-122.0'

