

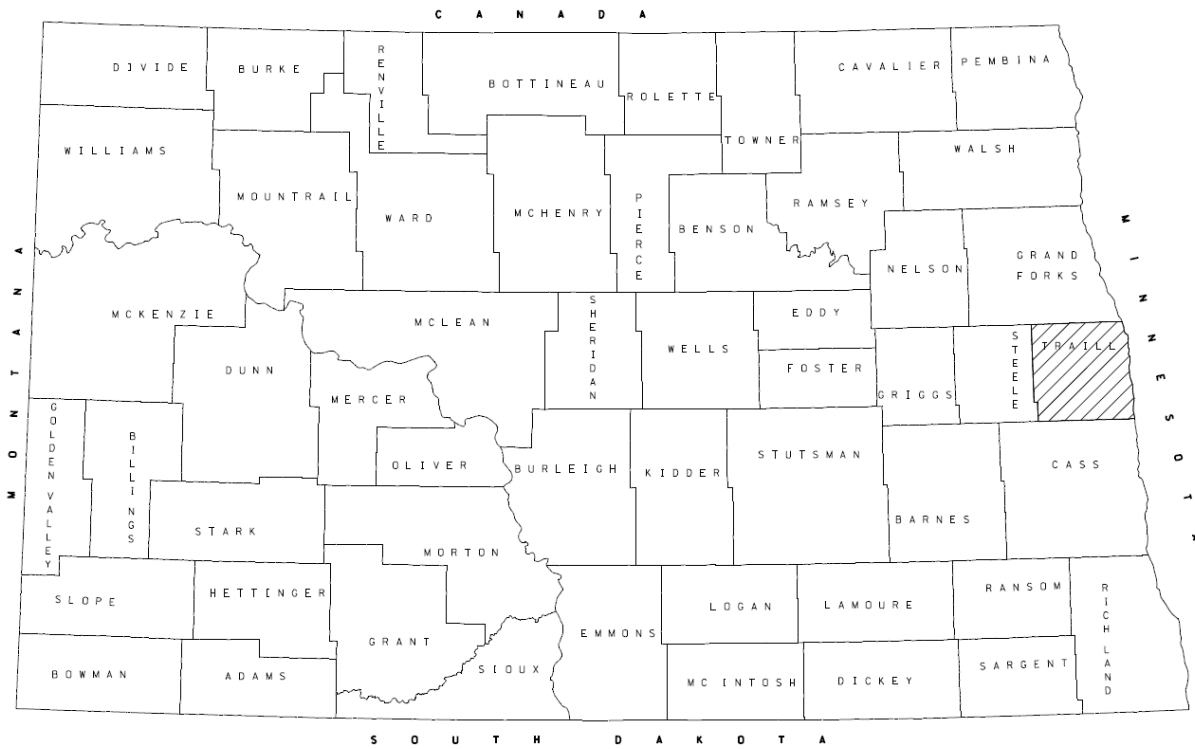
Deep Foundation Report and Analysis

PROJECT NO. IM-8-029(203)101

PCN 23102

COUNTY Traill

Bridge #: 0029-104.169 B



PREPARED BY: Riley McAdoo-Roesler

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

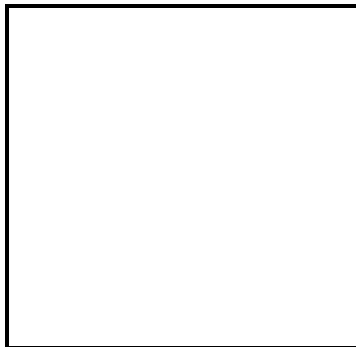
November 2022

IM-8-029(203)101

N of Kelso N to N of N Jct 200 – Hillsboro Int.
Bridge #: 0029-104.169 B

CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of North Dakota. This document was originally issued and sealed by Colter Schwagler, Registration number PE-27747 on 11/03/2022 and the original document is stored at the North Dakota Department of Transportation.



Hillsboro Pedestrian Bridge Deep Foundation Borings

Project: IM-8-029(203)101
PCN: 23102
Bridges: 0029-104.169 B
Scope: New Structure
Location: Hillsboro Int.

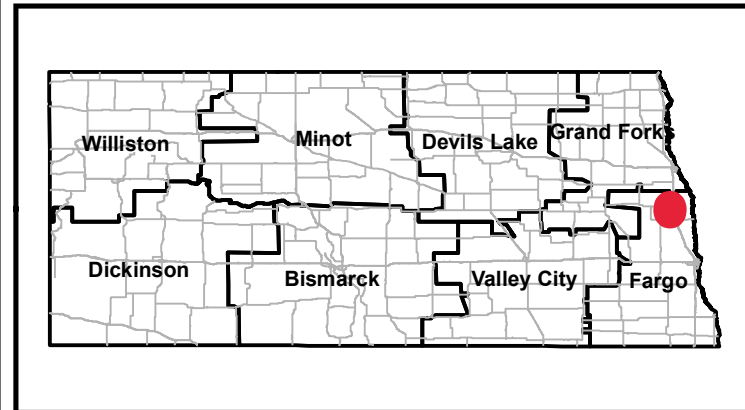


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Introduction

The purpose of the project is to add a pedestrian bridge adjacent to the current structure by extending the existing embankment and installing the pedestrian bridge on the same alignment along the I-29 corridor.

This report will provide foundation, settlement and bridge end slope recommendations for the construction of the new structure.

Existing Structure Information

There are existing bridges on I-29 that will stay in place as part of the project. The information for these structures is below.

Bridge #0029-104.155

Main Structure Type: Steel Stringer

Length: 265'

Foundation Type: H-Pile

Year Constructed: 1970

Soil Borings

A total of 2 borings were completed near the proposed structure. See the project location map for the boring locations.

Boring #1

Boring #1 has an elevation of approximately 909 feet at the top of boring and is located near the proposed east abutment. This boring extends to a depth of 136 feet.

Boring #2

Boring #2 has an elevation of approximately 912 feet at the top of boring and is located near the proposed west abutment. This boring extends to a depth of 111 feet.

Sampling and Testing Procedures:

Shelby tube sampling and split spoon sampling were used to extract the samples from a hollow stem auger.

Shelby tube sampling provides an "undisturbed" sample of fine-grained soils for laboratory testing via a thin wall tube that is slowly pushed into the soils to be sampled. Densities were calculated according to AASHTO test method T-296.

Split spoon samplers are utilized during advancement of the boring to perform the Standard Penetration Test (SPT). The samples are considered "disturbed", due to the

driving nature in which they are obtained. The SPT results in an N-value, or number of blows required to drive the split spoon sampler 1 foot. This N-value is used to estimate the friction angle of non-cohesive soils and define the consistency of cohesive soils.

For cohesive soils, the shear strength values were determined from the Unconsolidated Undrained and Consolidated Undrained tests utilizing Shelby tubes samples.

The samples from the split spoon and Shelby tubes are submitted to the laboratory for determination of AASHTO classification, moisture content, dry density, sieve analysis, and Atterberg limits.

Test Results

A summary of the lab analysis has been included in the Appendix B.

Proposed Structures

Main Structure Type: 2 Span
Foundation Type: Steel H-Piles

Foundation Recommendation

Steel Piling

Pile recommendations are given as termination elevations. The pile sizes that have been analyzed are HP10x42, HP14x73, and HP14x102. See table 3 below for the recommended termination elevations.

The software "APile" was used in conjunction with engineering judgment and past experience in pile driving in these types of soils to estimate the pile lengths. The output from this analysis is available upon request from the NDDOT Geotechnical Section.

Below are simplified soil profiles for each boring that was used to predict the unfactored nominal geotechnical resistance in APile. A graphical representation of the unfactored nominal geotechnical resistance is also shown below in figures 1-3. The nominal geotechnical resistance is used to help predict the pile termination elevations which can be found in table 3 below.

Table 1 - Boring #1 Simplified Soil Profile – East Approach Slab, Abutments & Piers

Layer	Depth (feet)	Elevation (feet)	Cohesion (lb/ft ²)	Friction Angle	Effective Unit Weight (lb/ft ³)
Medium Stiff Moist Brown Fat Clay	0.0-10.0	909.0-899.0	c=1245 psf	-	108.9
Medium Stiff Moist Brown Fat Clay	10.0-36.0	899.0-873.0	c=1245 psf	-	46.5
Stiff Moist Gray Lean Clay	36.0-44.0	873.0-865.0	c=756 psf		61.1
Stiff Moist Gray Silt	44.0-64.0	865.0-845.0	c=3951 psf	-	58.3
Stiff to Hard Moist Gray Sandy Lean Clay/Silt	64.0-94.0	845.0-815.0	c=4000 psf	-	60.7
Medium Stiff Moist Gray Lean Clay	94.0-104.0	815.0-805.0	c=4000 psf	-	60.7
Hard Moist Gray Lean Clay with Sand	104.0-136.0	805.0-773.0	c=5563 psf	-	60.7

Table 2 - Boring #2 Simplified Soil Profile – West Approach Slab, Abutments & Piers

Layer	Depth (feet)	Elevation (feet)	Cohesion (lb/ft ²)	Friction Angle	Effective Unit Weight (lb/ft ³)
Medium Stiff to Stiff Moist Brown Fat Clay	0.0-6.0	912.0-906.0	c=1205 psf	-	106.9
Medium Stiff to Stiff Moist Brown Fat Clay	6.0-54.0	906.0-858.0	c=1205 psf	-	46.7
Stiff Wet Gray Silt	54.0-64.0	858.0-848.0	c=1457 psf	-	60.7
Hard Moist Gray Clay	64.0-111.0	848.0-801.0	c=5563 psf	-	73.6

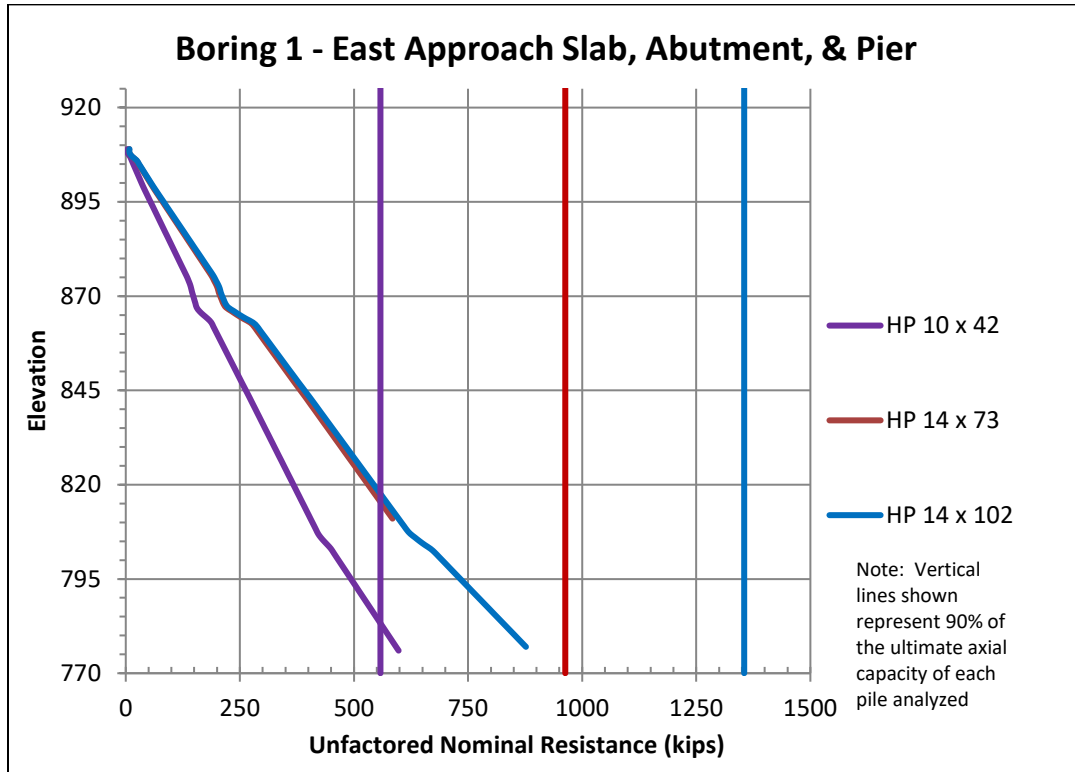


Figure 1: Nominal Resistance for Pile at East Approach Slabs, Abutments, & Pier

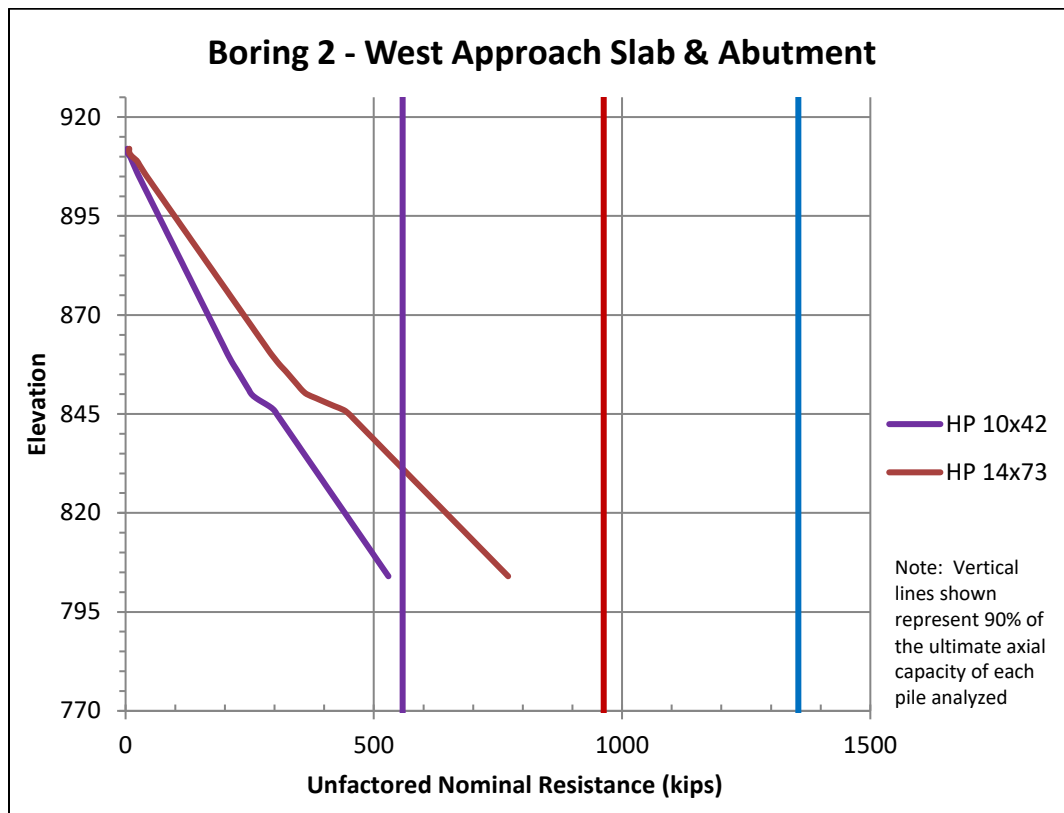


Figure 2: Nominal Resistance for West Approach Slab & Abutment

Based on the Apile information, past experience and engineering judgement the pile termination elevations were selected as shown in the table below.

Table 3 - Pile Length Information

Pile Type	90% Ultimate Axial Capacity	East Approach Slab	East Abutment	Pier	West Abutment	West Approach Slab
	kips	Termination Elevation	Termination Elevation	Termination Elevation	Termination Elevation	Termination Elevation
HP10x42	558	*805'	-	-	-	*840'
HP14x73	963	-	*805'	-	*840'	-
HP14x102	1355	-	-	*805'	-	-

*Based on engineering judgement/past experience.

Pile Tips

It is not anticipated that pile tips will be required for this bridge.

Downdrag

Due to the minimal amount of fill being placed at the structures downdrag is not applicable.

Scour

This bridge is not over a water crossing therefore there is no scour.

Compaction Recommendation

Compact roadway embankment material to at least 95 percent of the maximum dry density with moisture content no less than 4.0 percentage points and no more than 5.0 percentage points above the optimum moisture. The Engineer will determine the maximum dry density and optimum moisture content as specified in ND T 99.

Compact the aggregate transitions at the bridge ends according to section 714.04 A.10.

Slope Recommendation

The proposed bridge will partially utilize the existing embankment and bridge endslope of the existing structure. The existing bridge endslope and embankment appear to be stable and do not currently have any slope stability issues. The proposed bridge endslopes are flatter than existing and based on the historical information the proposed slopes will meet an acceptable factor of safety and no slope stability analysis is needed.

Drainage Recommendation

The drainage off the bridge should be controlled so that water does not drain directly off the bridge ends and cause erosion around the wing-wall. A combination of inlets, downdrains, and/or deckdrains should be used to control water runoff. Water should not be allowed to drain off the bridge as to allow the in slopes and end slopes to become saturated, which is a common cause of slope failure.

Settlement Analysis/Recommendation

Based on the minimal amount of fill being placed settlement is not a concern at the structures.

Pre-Boring

Pre-Boring will be necessary for the piling at the east and west abutments. It is recommended to pre-bore through the existing and proposed embankment to the original existing ground at the elevations shown in the table below:

Table 4 – Pre-boring Elevations

Location	Pre-bore Elevation
West Approach Slabs	906
West Abutments	906
East Approach Slabs	909
East Abutments	909

APPENDIX A

Boring Logs



PROJECT NUMBER IM-8-029(203)101 DATE STARTED 6/20/22 COMPLETED 6/22/22
 PCN 23102 ELEVATION 912 ft
 LOCATION Trail County RP+Feet ft Offset
 DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD
 ENGINEER
 NOTES West

NDDOT LOG - NDDOT_DATATEMP_20180208.GDT - 10/27/22 14:09 - F:\LAB\PROJECTS\GINT\8-029(203)101.GPJ

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	AASHTO	USCS	SAMPLE TYPE & NUMBER	RECOVERY (%)	SPT N VALUE	CLAY FRACTION (%)		TESTS & REMARKS
									PL	LL	
910	0	Medium Stiff to Stiff Moist Brn Fat Clay		A-7-6	CH	203	50	6	22	63	$\gamma_d = 92.0$ pcf $\gamma = 106.9$ pcf UU= 1067 psf
				A-7-6	CH	204	75	8	26	69	
				A-7-6	CH	205	50	10	27	68	
				A-7-6	CH	206	85	10	27	77	
				A-7-6	CH	207	85	7	29	69	
				A-7-6	CH	208	90	10	29	75	
				A-7-6	CH	209	85	10	29	78	
				A-7-5	CH	210	90	10	30	85	
				A-7-5	CH	211	85	5	30	86	
				A-7-5	CH	212	90	10	30	80	
				A-7-6	CH	213	85	7	28	68	
				A-7-6	CH	214	90	10	25	69	
				A-7-6	CH	215	75	6	25	66	
				A-7-6	CH	216	100	10	26	64	
				A-7-6	CH	217	100	10	27	77	
				A-7-6	CH	218	100	5	25	72	
				A-7-6	CH	219	75	10	22	61	
				A-7-6	CH	220	100	4	21	50	
860	50	858.0 ft	54.0 ft	A-7-6	CH	220	100	10	21	50	$\gamma_d = 67.8$ pcf $\gamma = 111.4$ pcf UU= 1342 psf
				A-7-6	CH	219	75	10	22	61	
				A-4	ML	221	50	11	23	31	$\gamma_d = 93.1$ pcf $\gamma = 123.1$ pcf UU= 1457 psf
				A-4	ML	222	75	11	23	31	
850	60	848.0 ft	64.0 ft	A-4	CL	223	67	11	23	31	$\gamma_d = 115.0$ pcf $\gamma = 136.0$ pcf UU= 5563 psf
				A-6	CL	224	75	11	23	31	
840	70	Hard Moist Gry Sand Lean Clay/Silt		A-6	CL	224	75	76	17	28	$\gamma_d = 115.0$ pcf $\gamma = 136.0$ pcf UU= 5563 psf
				A-4	ML	225	75	56	24	36	
830	80			A-4	ML	225	75	56	24	36	$\gamma_d = 115.0$ pcf $\gamma = 136.0$ pcf UU= 5563 psf
				A-6	CL	226	25	50	16	36	
820	90			A-6	CL	226	25	50	16	36	$\gamma_d = 115.0$ pcf $\gamma = 136.0$ pcf UU= 5563 psf
				A-4	SM	227	75	66	16	36	
810	100			A-4	SM	227	75	66	16	36	$\gamma_d = 115.0$ pcf $\gamma = 136.0$ pcf UU= 5563 psf
				A-4	SM	227	75	66	16	36	
801.0 ft	110	801.0 ft	111.0 ft			228	100	100	100	100	Bottom of borehole at 111.0 ft

APPENDIX B

Lab Results

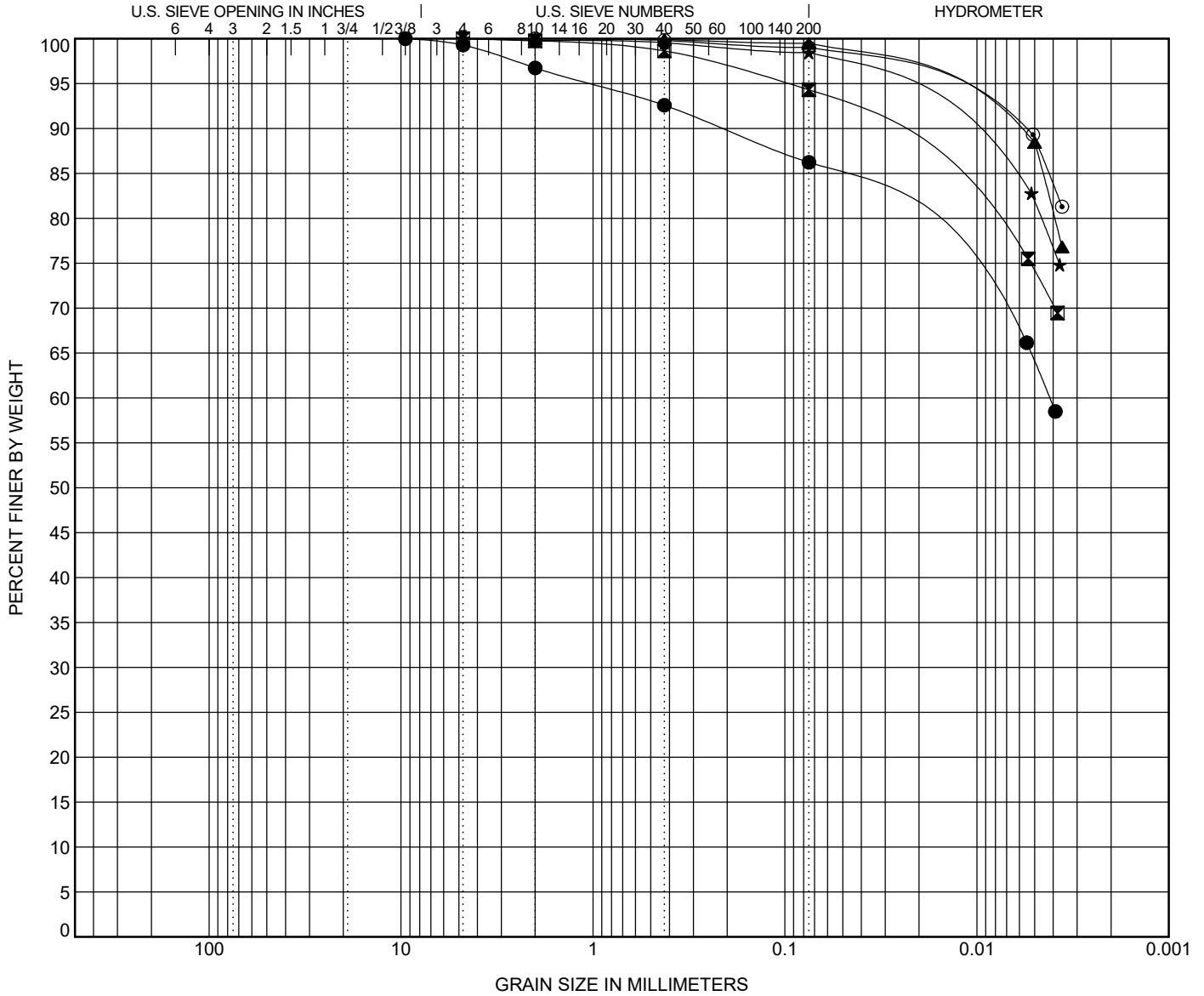


GRAIN SIZE DISTRIBUTION

PROJECT NUMBER IM-8-029(203)101

LOCATION Trail County

PCN 23102



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
● SB - 1	0.0	A-7-6 (39)	CH	67	26	41		
☒ SB - 1	2.0	A-7-5 (50)	CH	77	32	45		
▲ SB - 1	4.0	A-7-6 (62)	CH	82	29	53		
★ SB - 1	6.0	A-7-6 (57)	CH	78	29	49		
◎ SB - 1	9.0	A-7-6 (74)	CH	92	29	63		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 1	0.0	9.5				0.7	13.1	86.2	
☒ SB - 1	2.0	4.75				0.0	5.7	94.3	
▲ SB - 1	4.0	2				0.0	0.5	99.5	
★ SB - 1	6.0	4.75				0.0	1.5	98.5	
◎ SB - 1	9.0	2				0.0	1.0	99.0	

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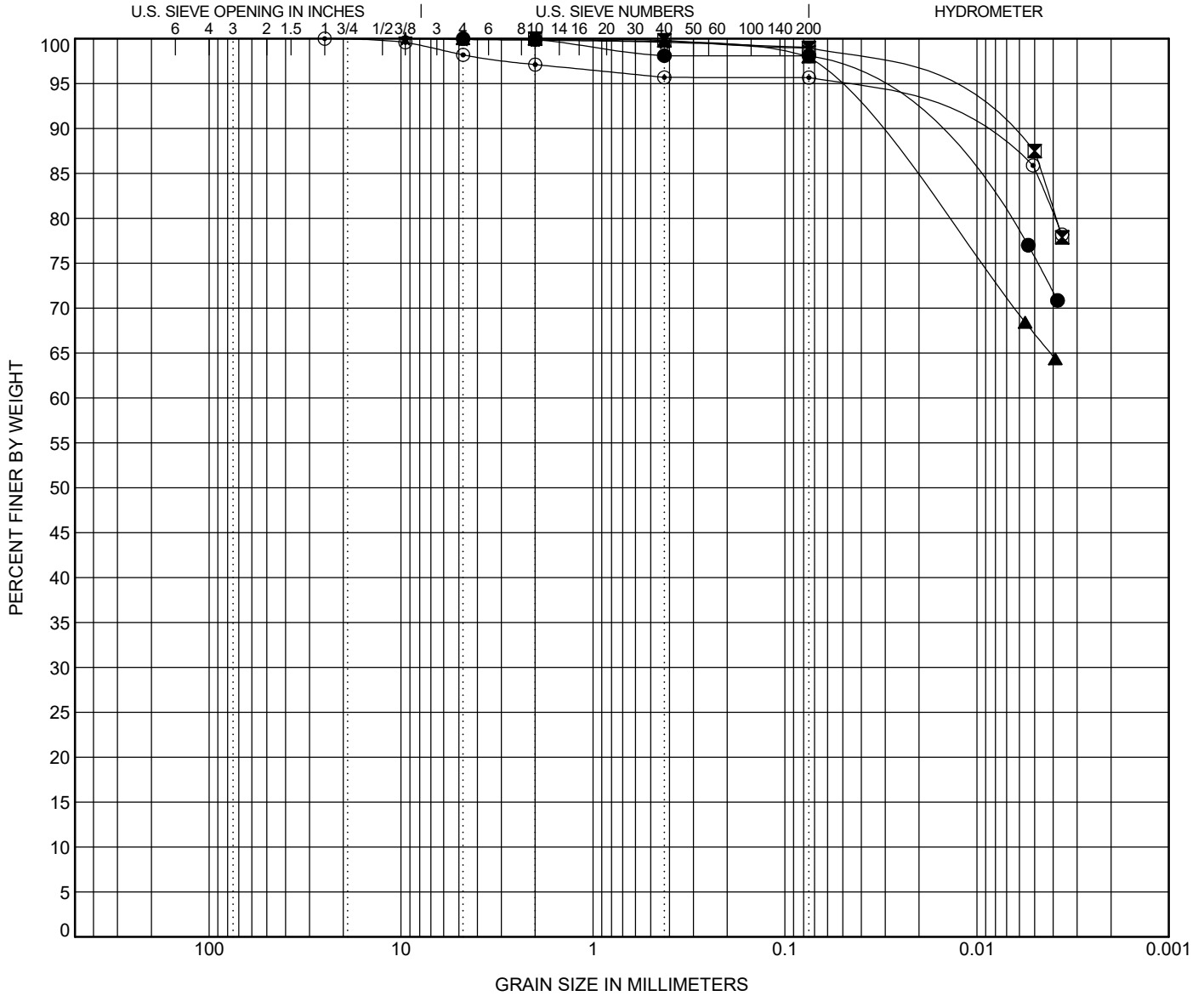


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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
● SB - 1	11.0	A-7-6 (61)	CH	81	28	53		
☒ SB - 1	14.0	A-7-5 (58)	CH	80	31	49		
▲ SB - 1	19.0	A-7-5 (46)	CH	69	30	39		
★ SB - 1	24.0	A-7-5 (57)	CH	78	30	48		
◎ SB - 1	29.0	A-7-6 (51)	CH	72	26	46		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 1	11.0	4.75				0.0	1.9	98.1	
☒ SB - 1	14.0	2				0.0	1.0	99.0	
▲ SB - 1	19.0	4.75				0.0	2.0	98.0	
★ SB - 1	24.0	9.5				0.1	0.9	99.0	
◎ SB - 1	29.0	25				1.8	2.5	95.7	

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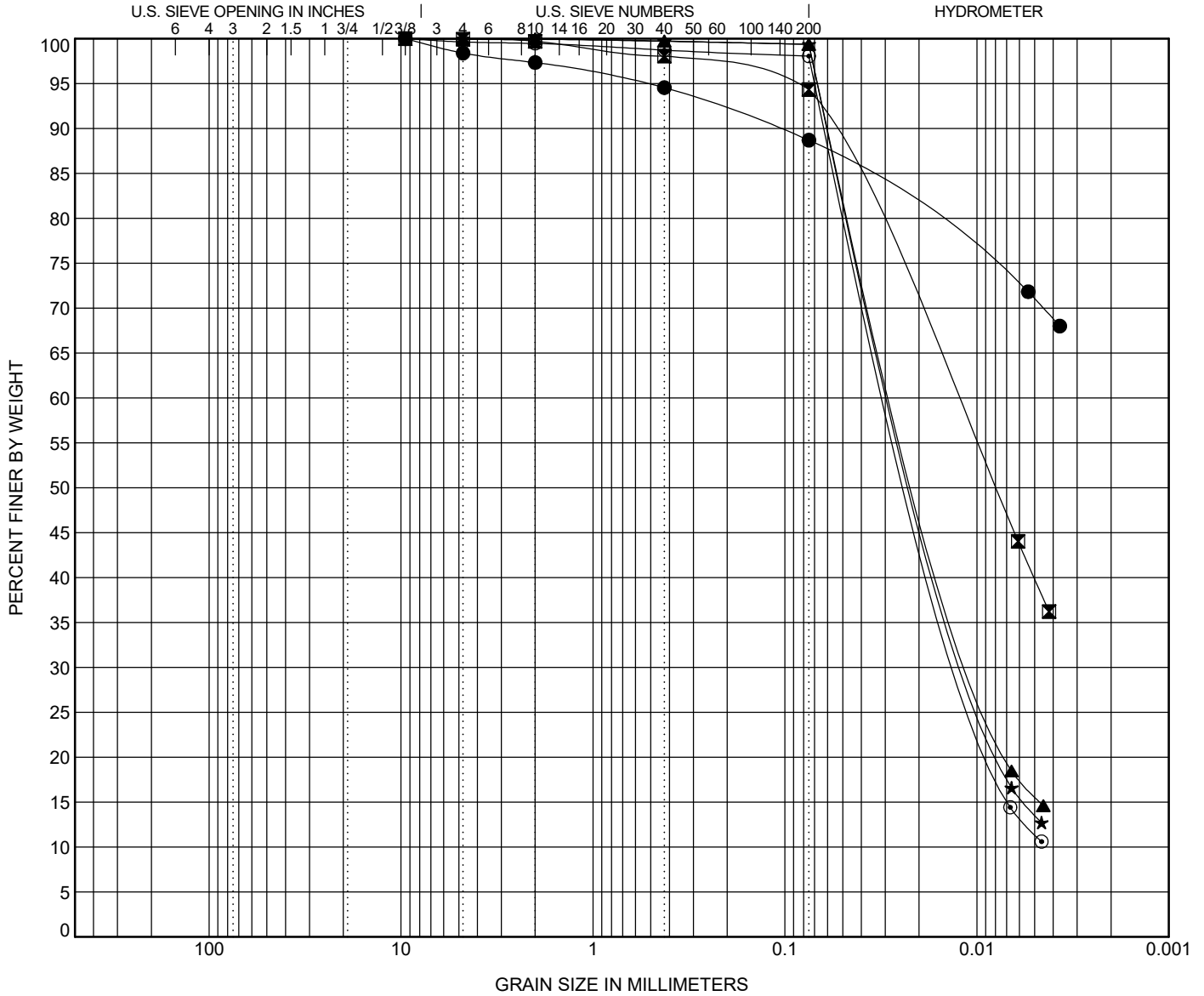


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	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification		LL	PL	PI	Cc	Cu
● SB-1	34.0	A-7-6 (50)	CH		74	23	51		
☒ SB-1	39.0	A-6 (18)	CL		40	22	18		
▲ SB-1	44.0	A-4 (12)	ML		36	26	10		
★ SB-1	49.0	A-4 (0)	ML		NP	NP	NP		
◎ SB-1	54.0	A-4 (0)	ML		NP	NP	NP		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB-1	34.0	9.5				1.6	9.7		88.7
☒ SB-1	39.0	9.5	0.008			0.1	5.6		94.3
▲ SB-1	44.0	4.75	0.017	0.009	0.005	0.0	0.6		99.4
★ SB-1	49.0	9.5	0.018	0.01	0.006	0.0	0.6		99.4
◎ SB-1	54.0	9.5	0.019	0.011	0.007	0.4	1.6		98.1

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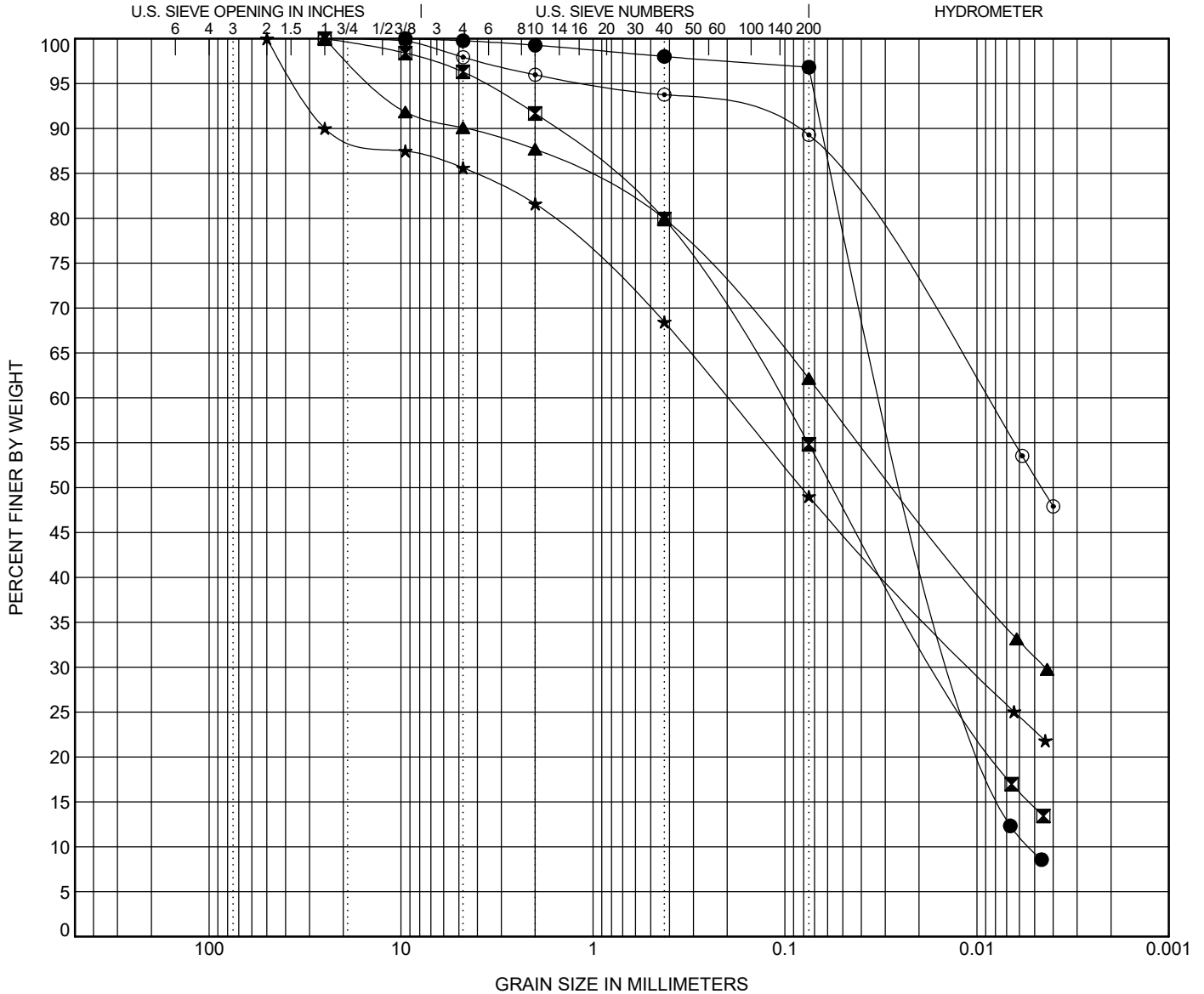


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	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification			LL	PL	PI	Cc	Cu
● SB - 1	59.0	A-4 (0)	ML			NP	NP	NP	0.89	4.93
▣ SB - 1	64.0	A-4 (2)	CL			25	17	8		
▲ SB - 1	74.0	A-5 (6)	ML			41	31	10		
★ SB - 1	84.0	A-6 (5)	SC			37	21	16		
⊙ SB - 1	94.0	A-6 (17)	CL			38	19	19		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 1	59.0	9.5	0.02	0.011	0.007	0.2	2.9	96.8	
▣ SB - 1	64.0	25	0.055	0.015	0.005	3.7	41.5	54.8	
▲ SB - 1	74.0	25	0.026	0.004		9.9	27.9	62.1	
★ SB - 1	84.0	50	0.082	0.011		14.4	36.6	49.0	
⊙ SB - 1	94.0	25	0.005			2.1	8.6	89.3	

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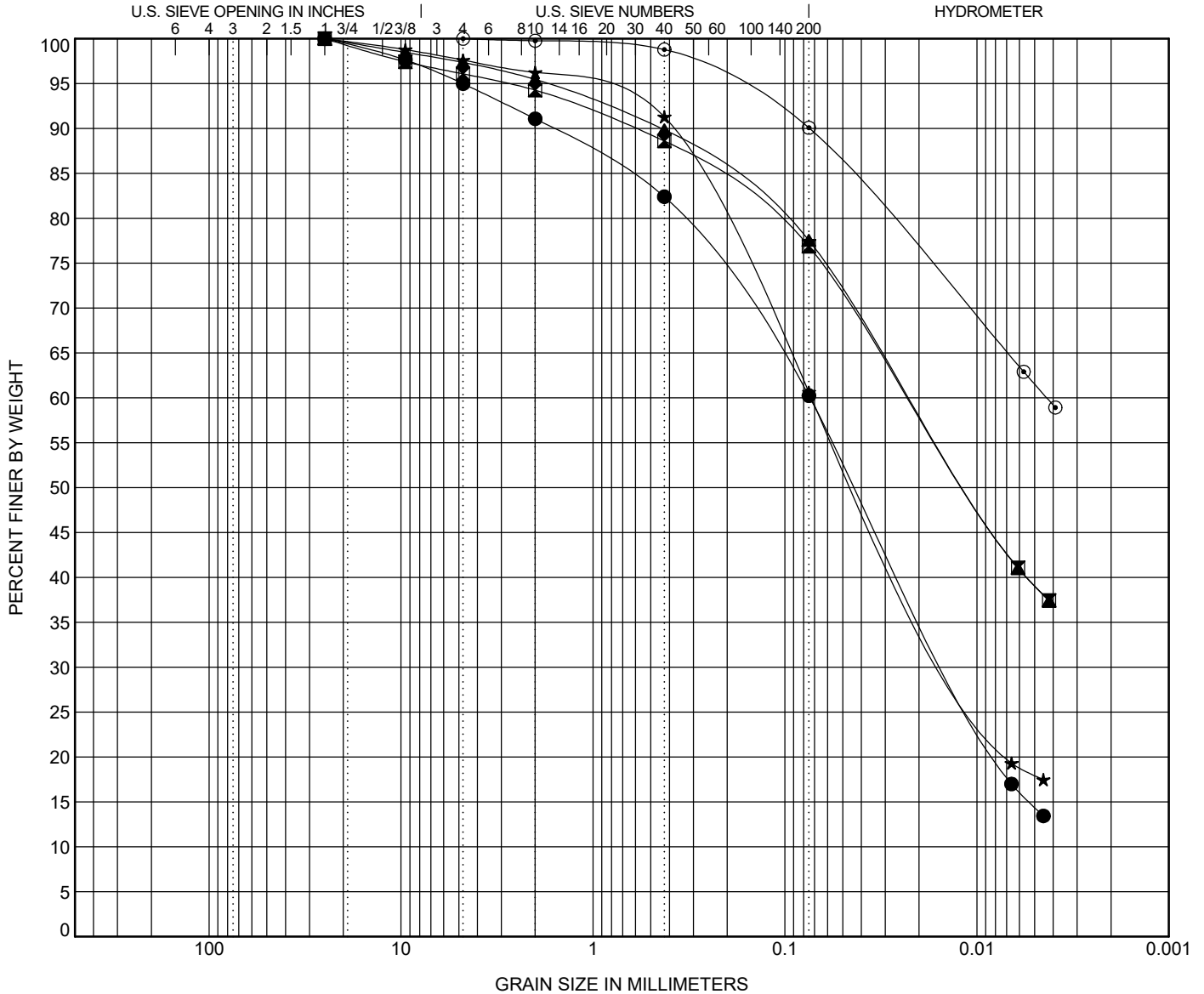


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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
● SB - 1	104.0	A-4 (2)	CL-ML	24	17	7		
▣ SB - 1	114.0	A-6 (15)	CL	36	14	22		
▲ SB - 1	124.0	A-6 (14)	CL	34	14	20		
★ SB - 1	134.0	A-4 (2)	CL	22	13	9		
◎ SB - 2	0.0	A-7-6 (41)	CH	63	22	41		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 1	104.0	25	0.042	0.014	0.005	5.0	34.7	60.2	
▣ SB - 1	114.0	25	0.011			3.9	19.2	76.9	
▲ SB - 1	124.0	25	0.011			2.6	19.8	77.5	
★ SB - 1	134.0	25	0.04	0.012		2.4	37.0	60.6	
◎ SB - 2	0.0	4.75				0.0	9.9	90.1	

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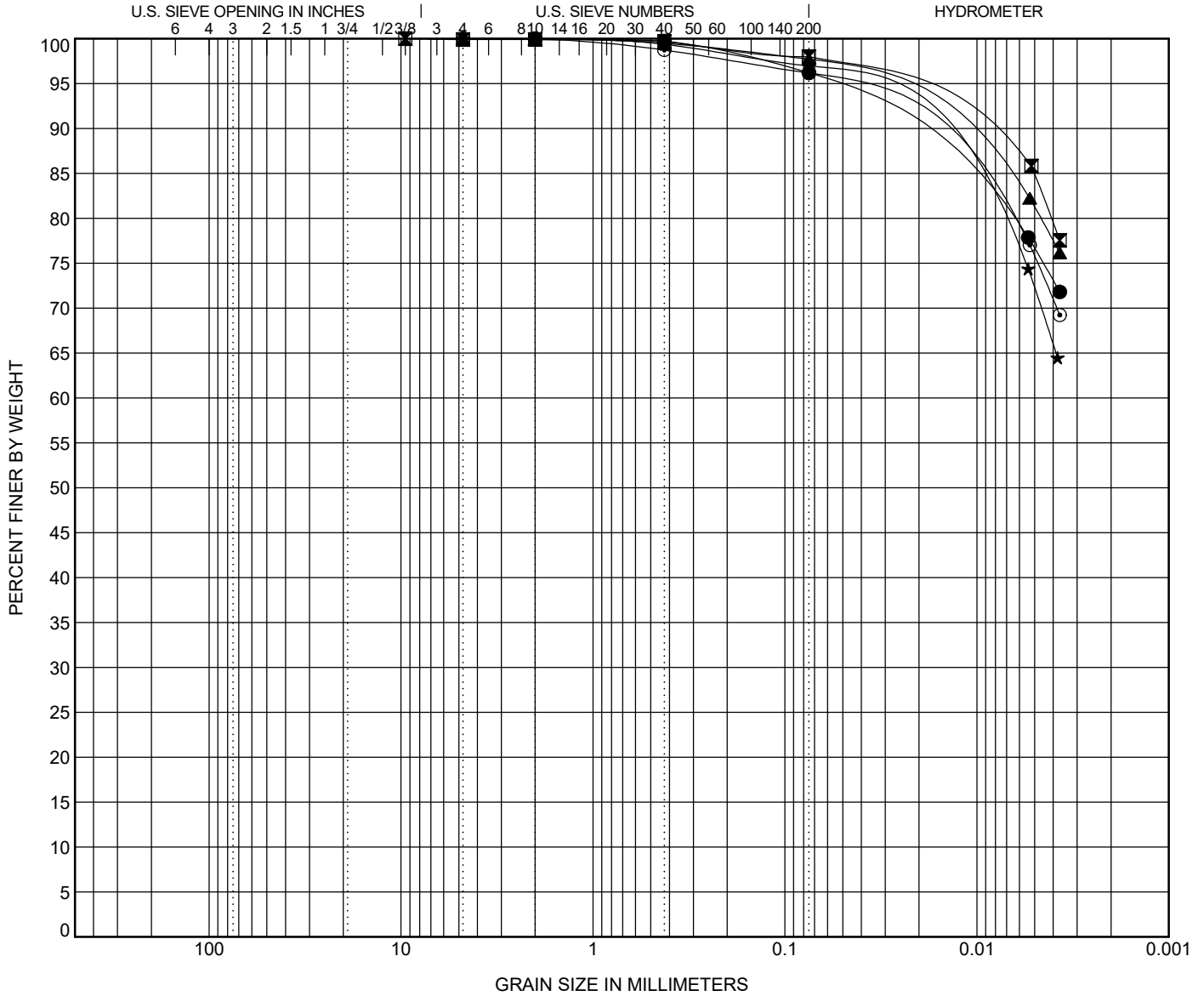


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BOREHOLE	DEPTH	AASHTO Classification	USCS Classification			LL	PL	PI	Cc	Cu
● SB - 2	2.0	A-7-6 (48)	CH			69	26	43		
☒ SB - 2	4.0	A-7-6 (47)	CH			68	27	41		
▲ SB - 2	6.0	A-7-6 (57)	CH			77	27	50		
★ SB - 2	9.0	A-7-6 (46)	CH			69	29	40		
◎ SB - 2	11.0	A-7-6 (52)	CH			75	29	46		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 2	2.0	2				0.0	3.8	96.2	
☒ SB - 2	4.0	9.5				0.1	1.9	98.0	
▲ SB - 2	6.0	4.75				0.0	2.3	97.7	
★ SB - 2	9.0	4.75				0.0	3.0	97.0	
◎ SB - 2	11.0	4.75				0.0	3.8	96.2	

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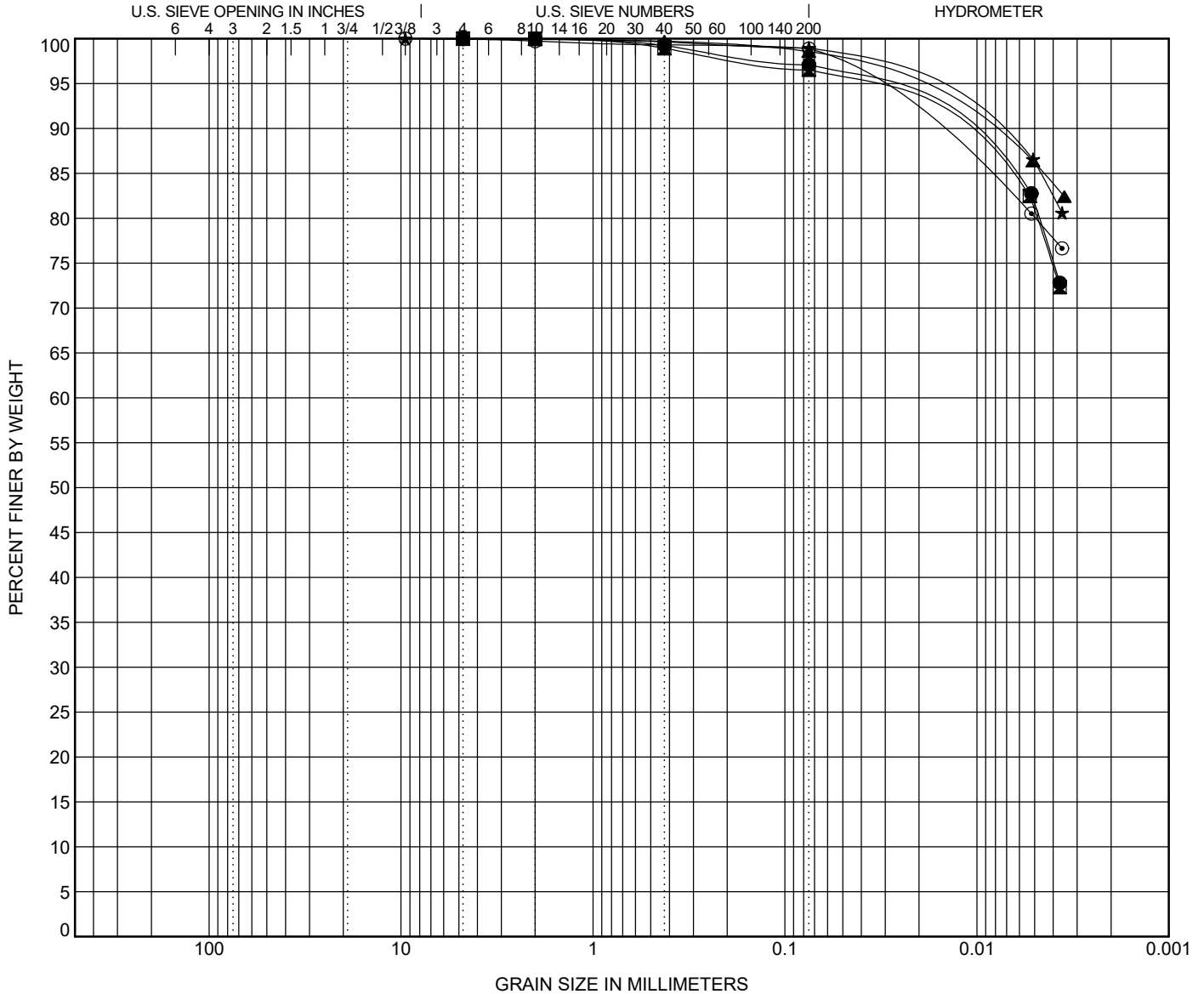


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	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
● SB - 2	14.0	A-7-6 (56)	CH	78	29	49		
☒ SB - 2	16.0	A-7-5 (62)	CH	85	32	53		
▲ SB - 2	19.0	A-7-5 (66)	CH	86	30	56		
★ SB - 2	21.0	A-7-5 (59)	CH	80	30	50		
◎ SB - 2	24.0	A-7-6 (47)	CH	68	28	40		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 2	14.0	4.75				0.0	2.9	97.1	
☒ SB - 2	16.0	4.75				0.0	3.5	96.5	
▲ SB - 2	19.0	4.75				0.0	1.4	98.6	
★ SB - 2	21.0	9.5				0.0	1.0	99.0	
◎ SB - 2	24.0	9.5				0.0	1.1	98.9	

GRAIN SIZE D ADJUSTED - 20171219.GDT - 10/27/22 11:41 - F:\LAB\PROJECTS\GINT18-029(203)101.GPJ



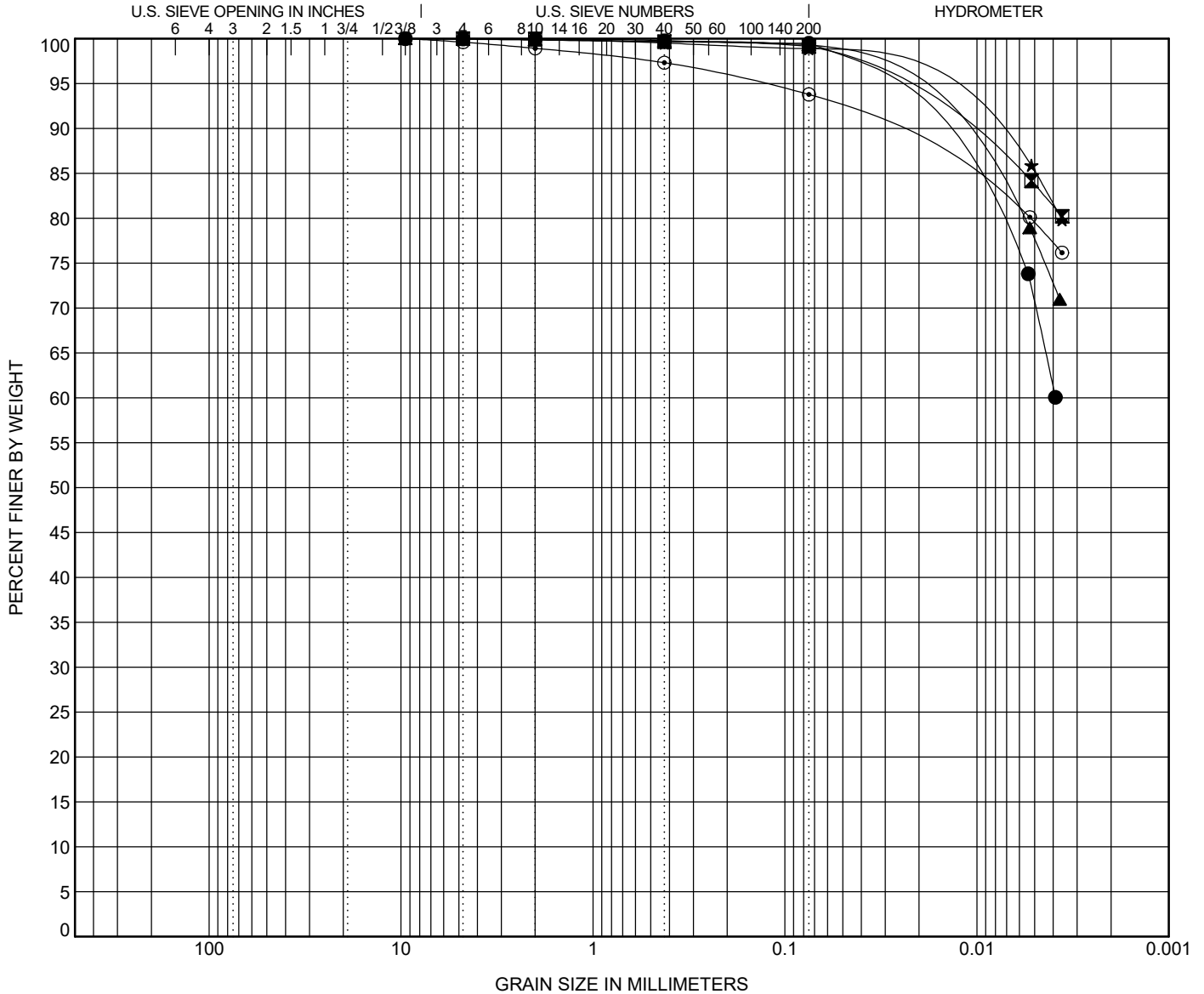
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER IM-8-029(203)101

LOCATION Trail County

PCN 23102



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
● SB - 2	26.0	A-7-6 (51)	CH	69	25	44		
☒ SB - 2	29.0	A-7-6 (47)	CH	66	25	41		
▲ SB - 2	31.0	A-7-6 (44)	CH	64	26	38		
★ SB - 2	34.0	A-7-6 (58)	CH	77	27	50		
◎ SB - 2	39.0	A-7-6 (50)	CH	72	25	47		

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 2	26.0	9.5				0.0	0.5	99.5	
☒ SB - 2	29.0	4.75				0.0	0.9	99.1	
▲ SB - 2	31.0	9.5				0.1	0.7	99.3	
★ SB - 2	34.0	4.75				0.0	1.1	98.9	
◎ SB - 2	39.0	9.5				0.4	5.8	93.8	

GRAIN SIZE D ADJUSTED - 20171219.GDT - 10/27/22 11:41 - F:\LAB\PROJECTS\GINT18-029(203)101.GPJ



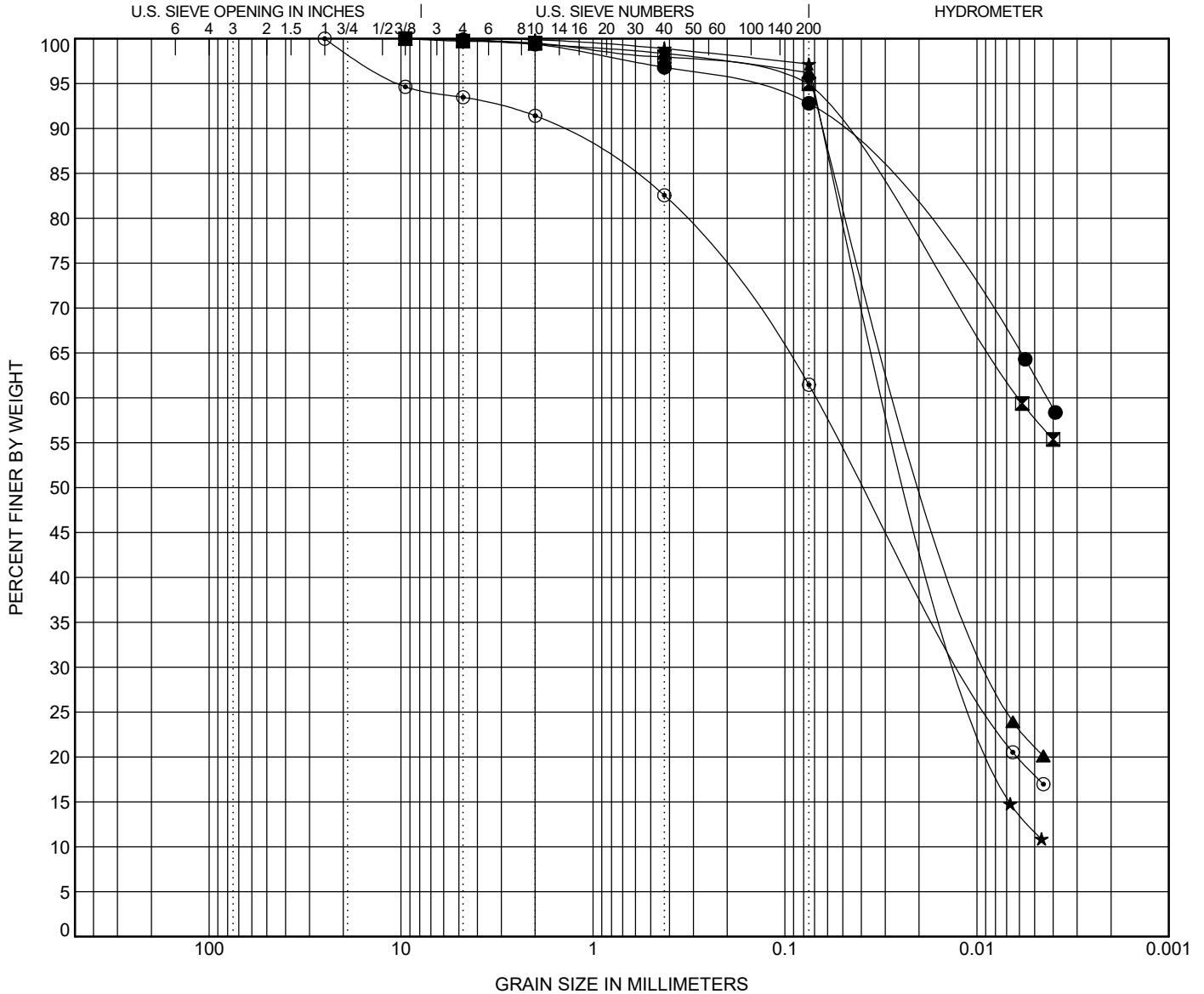
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER IM-8-029(203)101

LOCATION Trail County

PCN 23102



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification			LL	PL	PI	Cc	Cu
● SB - 2	44.0	A-7-6 (40)		CH			61	22	39		
☒ SB - 2	49.0	A-7-6 (30)		CH			50	21	29		
▲ SB - 2	54.0	A-4 (6)		ML			31	25	6		
★ SB - 2	59.0	A-4 (0)		ML			NP	NP	NP		
◎ SB - 2	64.0	A-4 (3)		CL			29	20	9		
BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay		
● SB - 2	44.0	9.5				0.1	7.1	92.8			
☒ SB - 2	49.0	9.5				0.3	4.7	95.0			
▲ SB - 2	54.0	9.5	0.016	0.008		0.2	3.6	96.2			
★ SB - 2	59.0	9.5	0.019	0.01	0.007	0.0	2.8	97.2			
◎ SB - 2	64.0	25	0.038	0.011		6.5	32.0	61.5			

GRAIN SIZE D ADJUSTED - 20171219.GDT - 10/27/22 11:41 - F:\LAB\PROJECTS\GINT18-029(203)101.GPJ

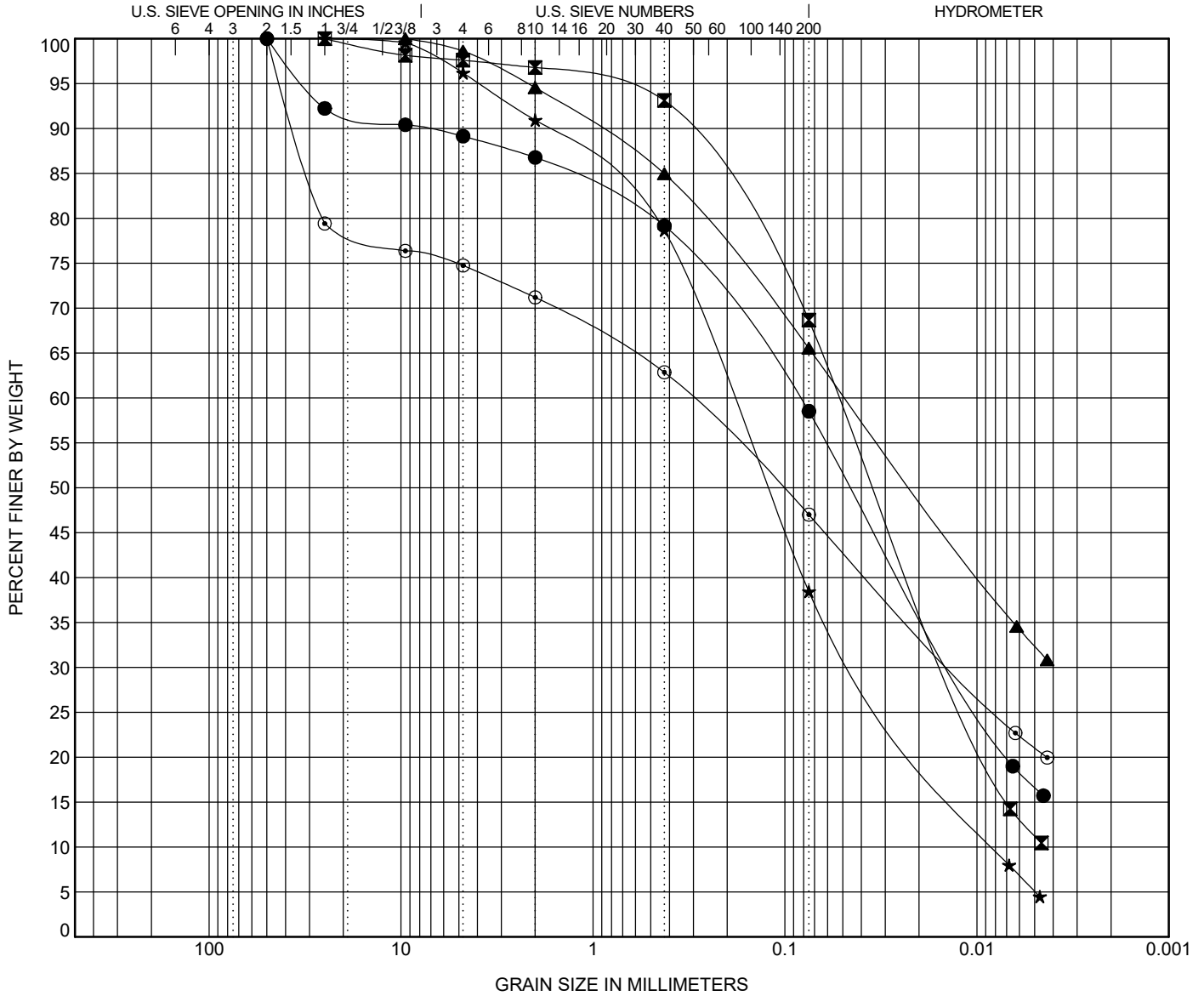


GRAIN SIZE DISTRIBUTION

PROJECT NUMBER IM-8-029(203)101

LOCATION Trail County

PCN 23102



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification			LL	PL	PI	Cc	Cu
● SB - 2	69.0	A-6 (4)	CL			28	17	11		
■ SB - 2	79.0	A-4 (0)	ML			24	21	3		
▲ SB - 2	91.5	A-6 (11)	CL			36	16	20		
★ SB - 2	99.0	A-4 (0)	SM			NP	NP	NP	0.98	23.85
◎ SB - 2	109.0									

BOREHOLE	DEPTH	D100	D50	D30	D15	%Gravel	%Sand	%Silt	%Clay
● SB - 2	69.0	50	0.044	0.013		10.9	30.6	58.5	
■ SB - 2	79.0	25	0.033	0.013	0.007	2.4	28.9	68.7	
▲ SB - 2	91.5	9.5	0.021			1.4	33.1	65.5	
★ SB - 2	99.0	25	0.123	0.039	0.012	3.8	57.7	38.4	
◎ SB - 2	109.0	50	0.104	0.013		25.3	27.7	47.0	

GRAIN SIZE D ADJUSTED - 20171219.GDT - 10/27/22 11:41 - F:\LAB\PROJECTS\GINT18-029(203)101.GPJ



SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER IM-8-029(203)101

LOCATION Traill County

PCN 23102

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
SB - 1	0.0	67	26	41	9.5	86	A-7-6 (39)	CH	35.0	35.0			
SB - 1	2.0	77	32	45	4.75	94	A-7-5 (50)	CH	31.3	31.3			
SB - 1	4.0	82	29	53	2	99	A-7-6 (62)	CH	37.4	37.4			
SB - 1	6.0	78	29	49	4.75	98	A-7-6 (57)	CH	37.3	37.3			
SB - 1	9.0	92	29	63	2	99	A-7-6 (74)	CH	49.0	49.0	73.1		
SB - 1	11.0	81	28	53	4.75	98	A-7-6 (61)	CH	39.8	39.8			
SB - 1	14.0	80	31	49	2	99	A-7-5 (58)	CH	54.0	54.0			
SB - 1	19.0	69	30	39	4.75	98	A-7-5 (46)	CH	43.0	43.0			
SB - 1	24.0	78	30	48	9.5	99	A-7-5 (57)	CH	48.0	48.0			
SB - 1	29.0	72	26	46	25	96	A-7-6 (51)	CH	58.6	58.6			
SB - 1	34.0	74	23	51	9.5	89	A-7-6 (50)	CH	47.7	47.7			
SB - 1	39.0	40	22	18	9.5	94	A-6 (18)	CL	48.7	48.7	83.1		
SB - 1	44.0	36	26	10	4.75	99	A-4 (12)	ML	34.3	34.3			
SB - 1	49.0	NP	NP	NP	9.5	99	A-4 (0)	ML	31.0	31.0			
SB - 1	54.0	NP	NP	NP	9.5	98	A-4 (0)	ML	29.8	29.8			
SB - 1	59.0	NP	NP	NP	9.5	97	A-4 (0)	ML	31.2	31.2	92.0		
SB - 1	64.0	25	17	8	25	55	A-4 (2)	CL	16.0	16.0			
SB - 1	74.0	41	31	10	25	62	A-5 (6)	ML	21.8	21.8			
SB - 1	84.0	37	21	16	50	49	A-6 (5)	SC	23.2	23.2			
SB - 1	94.0	38	19	19	25	89	A-6 (17)	CL	39.9	39.9			
SB - 1	104.0	24	17	7	25	60	A-4 (2)	CL-ML	15.8	15.8			
SB - 1	114.0	36	14	22	25	77	A-6 (15)	CL	12.6	12.6			
SB - 1	124.0	34	14	20	25	78	A-6 (14)	CL	9.7	9.7			
SB - 1	134.0	22	13	9	25	61	A-4 (2)	CL	8.0	8.0			
SB - 2	0.0	63	22	41	4.75	90	A-7-6 (41)	CH	29.2	29.2			
SB - 2	2.0	69	26	43	2	96	A-7-6 (48)	CH	31.1	31.1			
SB - 2	4.0	68	27	41	9.5	98	A-7-6 (47)	CH	33.1	33.1			
SB - 2	6.0	77	27	50	4.75	98	A-7-6 (57)	CH	38.5	38.5			
SB - 2	9.0	69	29	40	4.75	97	A-7-6 (46)	CH	41.8	41.8			
SB - 2	11.0	75	29	46	4.75	96	A-7-6 (52)	CH	42.5	42.5			
SB - 2	14.0	78	29	49	4.75	97	A-7-6 (56)	CH	16.2	16.2	92.0		
SB - 2	16.0	85	32	53	4.75	97	A-7-5 (62)	CH	50.0	50.0			
SB - 2	19.0	86	30	56	4.75	99	A-7-5 (66)	CH	49.6	49.6			
SB - 2	21.0	80	30	50	9.5	99	A-7-5 (59)	CH	53.9	53.9			
SB - 2	24.0	68	28	40	9.5	99	A-7-6 (47)	CH	49.4	49.4			
SB - 2	26.0	69	25	44	9.5	99	A-7-6 (51)	CH	42.7	42.7			
SB - 2	29.0	66	25	41	4.75	99	A-7-6 (47)	CH	46.3	46.3			
SB - 2	31.0	64	26	38	9.5	99	A-7-6 (44)	CH	43.6	43.6			
SB - 2	34.0	77	27	50	4.75	99	A-7-6 (58)	CH	64.3	64.3	67.8		
SB - 2	39.0	72	25	47	9.5	94	A-7-6 (50)	CH	55.1	55.1			
SB - 2	44.0	61	22	39	9.5	93	A-7-6 (40)	CH	44.2	44.2			
SB - 2	49.0	50	21	29	9.5	95	A-7-6 (30)	CH	41.4	41.4			
SB - 2	54.0	31	25	6	9.5	96	A-4 (6)	ML	32.3	32.3	93.1		

LAB SUMMARY - 20171219.GDT - 10/27/22 11:42 - F:\LAB\PROJECTS\GINT18-029(203)101.GPJ



SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER IM-8-029(203)101

LOCATION Trail County

PCN 23102

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
SB - 2	59.0	NP	NP	NP	9.5	97	A-4 (0)	ML	30.0	30.0			
SB - 2	64.0	29	20	9	25	61	A-4 (3)	CL	18.2	18.2	115.0		
SB - 2	69.0	28	17	11	50	59	A-6 (4)	CL	16.8	16.8			
SB - 2	79.0	24	21	3	25	69	A-4 (0)	ML	17.5	17.5			
SB - 2	91.5	36	16	20	9.5	66	A-6 (11)	CL	24.8	24.8			
SB - 2	99.0	NP	NP	NP	25	38	A-4 (0)	SM	15.4	15.4			
SB - 2	109.0				50	47			16.2	16.2			