

SOIL INFORMATION MEMO

TO:	File
FROM:	Geotechnical Section
DATE:	09/24/2026
HIGHWAY:	I-94
PROJECT NUMBER:	CVD-IM-1-094(238)172
PCN:	23810
LOCATION:	I-94, RP 172 to 183
SUBJECT:	Soil Information for Culvert Replacements

Project Background

This project includes culvert replacements on I-94 at the following reference points (RP): single culverts at 174.152 and 174.909, a double culvert at 180.021 & 180.023, and a single culvert at 182.865. As part of the culvert replacements, it is anticipated that shoring will be necessary for installation and constructability. A soil investigation was performed at each culvert location.

Soil Information

A 46-foot soil boring was completed near each existing culvert location with split spoon samples and thin-walled tube samples collected at approximately 2'-3' intervals. Standard soil laboratory index testing was performed on each soil sample, and UU triaxial testing was completed on some thin-walled tube samples. The boring locations map, boring log, and lab testing results are attached to this memo. The soil boring surface elevations were obtained from Google Earth Pro.

Boring 1 Location, RP 174 + 0800 ft (Single Culvert)

Boring 1 had a surface elevation of approximately 1709 feet and was located at approximately RP 174+0800, in the center of the median. There were five soil layers encountered. The first layer consisted of approximately 19 feet of brown/gray moist/wet medium stiff/stiff silty lean/fat clay with sand. The second layer consisted of approximately 5 feet of gray wet loose sandy silt. The third layer consisted of approximately 7 feet of brown/gray wet medium stiff silty lean/fat clay. The fourth layer consisted of approximately 6 feet of gray wet medium stiff silty lean clay with sand. The fifth layer consisted of approximately 7 feet of brown/gray wet medium stiff silty lean clay with sand. Water bearing soils were encountered at a depth of approximately 17.5 feet from the top surface of the boring (approximate elevation of 1691.5 feet).

Boring 2 Location, RP 174 + 4800 ft (Single Culvert)

Boring 2 had a surface elevation of approximately 1709 feet and was located at approximately RP 174+4800, in the center of the median. There were six soil layers encountered. The first layer consisted of approximately 6 feet of brown/gray moist medium stiff silty fat clay with some sand. The second layer consisted of approximately 13 feet of gray/brown moist medium stiff/stiff silty lean/fat clay with sand. The third layer consisted of approximately 7 feet of brown moist medium stiff fat clay. The fourth layer consisted of approximately 7 feet of gray/brown moist/wet medium stiff sandy silt/silty lean clay with sand. The fifth layer consisted of approximately 11 feet of gray wet medium stiff silty lean/fat clay with some sand. The sixth layer consisted of approximately 2 feet of gray wet very loose sandy silt. Water bearing soils were encountered at a depth of approximately 29 feet from the top surface of the boring (approximate elevation of 1680 feet).

Boring 3 Location, RP 180 + 0120 ft (Double Culvert)

Boring 3 had a surface elevation of approximately 1843 feet and was located at approximately RP 180+0120, in the center of the median. There were three soil layers encountered. The first layer consisted of approximately 38 feet of brown/gray moist/wet medium stiff to very stiff sandy silty lean clay. The second layer consisted of approximately 3 feet of gray wet medium dense silty sand. The third layer consisted of approximately 3 feet of gray wet stiff sandy silty lean clay. Water bearing soils were encountered at a depth of approximately 16 feet from the top surface of the boring (approximate elevation of 1827 feet).

Boring 4 Location, RP 182 + 4570 ft (Single Culvert)

Boring 3 had a surface elevation of approximately 1880 feet and was located at approximately RP 182+4570, in the center of the median. There was essentially one soil layer encountered, which consisted of approximately 46 feet of brown/gray/black moist/wet medium stiff to very stiff sandy silty lean clay. Water bearing soils were encountered at a depth of approximately 21 feet from the top surface of the boring (approximate elevation of 1859 feet).

The boring logs are only representative of the exact location and time period from which the samples were taken. Fluctuations in the soil conditions may occur due to rainfall, spring thaw, drainage, and other seasonal factors not evident at the time the samples were taken. Construction planning should recognize the possibility of fluctuations. The NDDOT assumes no responsibility if the soil conditions encountered during construction differ from those shown. The boring locations were determined based on preliminary layouts of the proposed box culvert locations.

Limitations

This memo should be made available to prospective designers and contractors for information on factual data only and not as a warranty of subsurface conditions. This memo should not be used without approval if any of the following occurs:

- Conditions change due to natural forces or human activity under, at, or adjacent to the site.
- Assumptions stated in this memo have changed.
- Project details change or new information becomes available such that the analyses, conclusions, and recommendations may be affected.
- The site ownership or land use has changed.
- More than 5 years has passed since the date of this memo.

Unanticipated soil and water table conditions are commonly encountered.

Within the limitations of scope and schedule, the analyses, conclusions, and recommendations presented in this memo were prepared in accordance with generally accepted professional geotechnical and geological principles and practice in this area at the time this memo was prepared. We make no other warranty, either express or implied.

If there are any questions or concerns, please contact Aaron Lehman alehman@nd.gov or Colter Schwagler cschwagler@nd.gov of the NDDOT Geotechnical Section.



Legend

Boring Locations

Reference Points



Project Number: CVD-IM-1-094(238)172



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

LOG OF BORING SB - 1

PAGE 1 OF 1

PROJECT NUMBER CVD-1-094(238)172

DATE STARTED 7/20/26

COMPLETED 7/20/26

PCN 23810

ELEVATION 1709 ft

LOCATION Burleigh County

Northing 5188052.52 m

Easting 388332.06 m

DRILLED BY Dallan

LOGGED BY Matt

RP+Feet 174+0800 ft

Offset 0 ft Median CL

ENGINEER

DRILLING METHOD Hollow Stem Auger

NOTES Coordinate System: NAD 1983 UTM Zone 14N. Surface elevations based off of Google Earth Pro.

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	AASHTO	USCS	SAMPLE TYPE & NUMBER	RECOVERY (%)	© SPT N VALUE	PL MC LL 20 40 60 80 CLAY FRACTION (%)	TESTS & REMARKS
	0	Topsoil 1707.2 ft	1.8 ft	A-7-6	CL	SS 519	50	7	18 42	
		Medium Stiff/Stiff Moist/Wet Brown/Gray Silty Lean/Fat Clay with Sand Water bearing at 17.5'		A-7-6	CH	SS 520	50	9	19 55	
	5			A-6	CL	3TW 521	40		17 39	$\gamma_d = 100.0$ pcf $\gamma = 126.5$ pcf $S_u = 1062$ psf
				A-7-6	CH	SS 522	100	6	23 72	
	10			A-7-6	CH	3TW 523	50		21 65	$\gamma_d = 100.5$ pcf $\gamma = 129.9$ pcf $S_u = 1359$ psf
				A-7-6	CH	SS 524	65	11	18 62	
	15			A-7-6	CL	3TW 525	100		14 44	
				A-7-6	CH	SS 526	100	10	20 78	
	20	1688.0 ft	21.0 ft	A-7-6	CL	3TW 527	100		21 45	$\gamma_d = 88.5$ pcf $\gamma = 118.7$ pcf $S_u = 1112$ psf
		Loose Wet Gray Sandy Silt		A-4	ML	SS 528	100	5	0	
	25	1683.0 ft	26.0 ft	A-4	ML	3TW 529	100		30	
		Medium Stiff Wet Brown/Gray Silty Lean/Fat Clay		A-7-6	CH	SS 530	85	6	19 50	
	30			A-7-6	CH	3TW 531	100		21 55	$\gamma_d = 88.2$ pcf $\gamma = 117.9$ pcf $S_u = 1389$ psf
		1676.0 ft	33.0 ft	A-7-6	CL	SS 532	100	7	20 46	
	35	Medium Stiff Wet Gray Silty Lean Clay with Sand		A-4	CL	3TW 533	0		2 32	
				A-4	CL	SS 534	100	5		
	40	1670.0 ft	39.0 ft	A-7-6	CH	3TW 535	100		22 55	$\gamma_d = 88.7$ pcf $\gamma = 118.5$ pcf $S_u = 1389$ psf
		Medium Stiff Wet Brown/Gray Silty Fat Clay		A-7-6	CH	SS 536	100	7	21 58	
	45	1663.0 ft	46.0 ft	A-7-6	CH	SS 537	100	7	18 57	
Bottom of borehole at 46.0 ft										

NDDOT LOG LAT/LONG - 20171219.GDT - 9/21/26 10:56 - F:\LAB\PROJECTS\GINT1-094(238)172 SHORING DEEP BORINGS.GPJ

PROJECT NUMBER CVD-1-094(238)172 **DATE STARTED** 7/20/26 **COMPLETED** 7/20/26
PCN 23810 **ELEVATION** 1709 ft
LOCATION Burleigh County **Northing** 5188026.03 m **Easting** 389582.71 m
DRILLED BY Dallan **LOGGED BY** Matt **RP+Feet** 174+4800 ft **Offset** 0 ft Median CL
ENGINEER **DRILLING METHOD** Hollow Stem Auger
NOTES Coordinate System: NAD 1983 UTM Zone 14N. Surface elevations based off of Google Earth Pro.

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	AASHTO	USCS	SAMPLE TYPE & NUMBER	RECOVERY (%)	© SPT N VALUE	PL MC LL 30 60 90 120 CLAY FRACTION (%)	TESTS & REMARKS
	0	Topsoil 1708.7 ft	0.3 ft	A-7-6	CH	SS 538	45	6	23 72	
		Medium Stiff Moist Brown/Gray Silty Fat Clay with Some Sand with Some Organics & I.O. Deposits		A-7-6	CH	SS 539	70	8	19 62	
	5	1703.0 ft	6.0 ft	A-7-6	CH	3TW 540	75		22 65	$\gamma_d = 96.9$ pcf $\gamma = 123.1$ pcf $S_u = 1655$ psf
		Medium Stiff/Stiff Moist Gray/Brown Silty Lean/Fat Clay with Sand with Some I.O. Deposits		A-7-6	CH	SS 541	75	9	17 55	
	10			A-7-6	CL	3TW 542	95		15 42	
				A-7-6	CL	3TW 542.1	95		16 45	
				A-7-6	CL	SS 543	100	5	15 45	
	15			A-7-6	CH	3TW 544	85		18 58	
				A-7-6	CH	SS 545	100	7	17 60	
	20	1690.0 ft	19.0 ft	A-7-6	CH	3TW 546	100		24 87	$\gamma_d = 82.7$ pcf $\gamma = 113.7$ pcf $S_u = 954$ psf
		Medium Stiff Moist Brown Fat Clay with Some I.O. Deposits		A-7-6	CH	SS 547	100	7	24 104	
	25	1683.0 ft	26.0 ft	A-7-6	CH	3TW 548	100		24 83	
		Medium Stiff Moist/Wet Gray/Brown Sandy Silt/Silty Lean Clay with Sand Water bearing at 29' with Some I.O. Deposits		A-7-6	CL	SS 549	90	6	20 43	
	30	1676.0 ft	33.0 ft	A-4	ML	3TW 550	100		0	
		Medium Stiff Wet Gray Silty Lean/Fat Clay with Some Sand		A-6	CL	SS 551	100	7	2 35	
	35			A-7-6	CH	3TW 552	100		21 50	$\gamma_d = 85.6$ pcf $\gamma = 118.0$ pcf $S_u = 1032$ psf
				A-6	CL	SS 553	100	6	19 35	
				A-7-6	CH	SS 554	100		23 72	
	40			A-7-6	CL	3TW 555	100		21 48	$\gamma_d = 83.5$ pcf $\gamma = 113.2$ pcf $S_u = 1397$ psf
				A-6	CL	SS 556	100	6	22 40	
	45	1665.0 ft Very Loose Wet Gray Sandy Silt 1663.0 ft	44.0 ft 46.0 ft	A-4	ML	SS 557	100	3	0	
Bottom of borehole at 46.0 ft										



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

LOG OF BORING SB - 4

PAGE 1 OF 1

PROJECT NUMBER CVD-1-094(238)172 DATE STARTED 7/22/26 COMPLETED 7/22/26
PCN 23810 ELEVATION 1880 ft
LOCATION Burleigh County Northing 5187764.85 m Easting 402349.74 m
DRILLED BY Dallan LOGGED BY Colter RP+Feet 182+4570 ft Offset 0 ft Median CL
ENGINEER _____ DRILLING METHOD Hollow Stem Auger
NOTES Coordinate System: NAD 1983 UTM Zone 14N. Surface elevations based off of Google Earth Pro.

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	AASHTO	USCS	SAMPLE TYPE & NUMBER	RECOVERY (%)	© SPT N VALUE	● MC PL LL		TESTS & REMARKS
									20 40 60 80	20 40 60 80	
□ CLAY FRACTION (%)											
1880	0							20 40 60 80	20 40 60 80		
		Topsoil 1879.7 ft	0.3 ft	A-6	CL	SS 576	40	7	19 38	$\gamma_d = 103.4$ pcf $\gamma = 129.2$ pcf Su=1521 psf	
		Medium Stiff to Very Stiff Moist/Wet Brown/Gray/Black Sandy Silty Lean Clay Water bearing at 21'		A-7-6	CL	SS 577	45	8	18 42		
1875	5		A-6	CL	3TW 578	60		18 39			
			A-6	CL	SS 579	45	15	18 38			
1870	10		A-6	CL	3TW 580	55		18 33	$\gamma_d = 100.5$ pcf $\gamma = 122.3$ pcf Su=3121 psf		
				A-6	CL	SS 581	100	9	20 34		
1865	15			A-6	CL	3TW 582	90		18 32		
				A-6	CL	SS 583	100	17	19 35		
1860	20			A-6	CL	3TW 584	90		19 35	$\gamma_d = 105.3$ pcf $\gamma = 128.7$ pcf Su=2425 psf	
				A-6	CL	SS 585	100	19	18 33		
1855	25			A-6	CL	3TW 586	90		19 37		
				A-6	CL	SS 587	100	14	18 37		
1850	30			A-6	CL	3TW 588	100		19 37		
				A-7-6	CL	SS 589	100	11	18 41		
1845	35			A-7-6	CL	3TW 590	90		20 46		
				A-7-6	CL	SS 591	100	19	19 44	$\gamma_d = 101.3$ pcf $\gamma = 126.2$ pcf Su=3040 psf	
1840	40			A-6	CL	3TW 592	100		18 40		
				A-7-6	CL	SS 593	20	21	18 43		
1835	45			A-7-6	CL	SS 594	100	17	18 44		
Bottom of borehole at 46.0 ft											

NDDOT LOG LAT/LONG - 20171219.GDT - 9/21/26 10:57 - F:\LAB\PROJECTS\GINT1-094(238)172 SHORING DEEP BORINGS.GPJ

SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810

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	42	18	24	4.75	68	A-7-6 (14)	CL	19.0	19.0			
SB - 1	2.0	55	19	36	4.75	83	A-7-6 (31)	CH	26.2	26.2			
SB - 1	4.0	39	17	22	4.75	65	A-6 (12)	CL	26.5	26.5	100.0		
SB - 1	6.0	72	23	49	4.75	94	A-7-6 (52)	CH	36.7	36.7			
SB - 1	9.0	65	21	44	4.75	88	A-7-6 (42)	CH	29.2	29.2	100.5		
SB - 1	11.0	62	18	44	4.75	84	A-7-6 (39)	CH	28.7	28.7			
SB - 1	14.0	44	14	30	4.75	58	A-7-6 (14)	CL	22.2	22.2			
SB - 1	16.0	78	20	58	4.75	92	A-7-6 (59)	CH	40.2	40.2			
SB - 1	19.0	45	21	24	2	98	A-7-6 (26)	CL	34.1	34.1	88.5		
SB - 1	21.0	NP	NP	NP	9.5	54	A-4 (0)	ML	25.0	25.0			
SB - 1	24.0	30	30	NP	2	76	A-4 (0)	ML	31.4	31.4			
SB - 1	26.0	50	19	31	2	96	A-7-6 (32)	CH	32.3	32.3			
SB - 1	29.0	55	21	34	2	100	A-7-6 (38)	CH	33.8	33.8	88.2		
SB - 1	31.0	46	20	26	2	96	A-7-6 (27)	CL	35.8	35.8			
SB - 1	36.0	32	23	9	2	79	A-4 (6)	CL	30.4	30.4			
SB - 1	39.0	55	22	33	2	100	A-7-6 (37)	CH	33.6	33.6	88.7		
SB - 1	41.0	58	21	37	2	96	A-7-6 (40)	CH	35.6	35.6			
SB - 1	44.0	57	18	39	2	98	A-7-6 (42)	CH	34.6	34.6			
SB - 2	0.0	72	23	49	2	94	A-7-6 (52)	CH	25.4	25.4			
SB - 2	2.0	62	19	43	4.75	86	A-7-6 (39)	CH	23.6	23.6			
SB - 2	4.0	65	22	43	4.75	90	A-7-6 (43)	CH	27.0	27.0	96.9		
SB - 2	6.0	55	17	38	4.75	79	A-7-6 (30)	CH	26.3	26.3			
SB - 2	9.0	42	15	27	9.5	68	A-7-6 (16)	CL	26.1	26.1			
SB - 2	10.0	45	16	29	4.75	82	A-7-6 (23)	CL	29.5	29.5			
SB - 2	11.0	45	15	30	9.5	75	A-7-6 (21)	CL	27.0	27.0			
SB - 2	14.0	58	18	40	2	89	A-7-6 (38)	CH	32.0	32.0			
SB - 2	16.0	60	17	43	4.75	85	A-7-6 (38)	CH	32.6	32.6			
SB - 2	19.0	87	24	63	2	100	A-7-6 (73)	CH	37.5	37.5	82.7		
SB - 2	21.0	104	24	80	2	100	A-7-6 (93)	CH	40.2	40.2			
SB - 2	24.0	83	24	59	4.75	100	A-7-6 (69)	CH	43.6	43.6			
SB - 2	26.0	43	20	23	2	85	A-7-6 (20)	CL	38.3	38.3			
SB - 2	29.0	NP	NP	NP	2	70	A-4 (0)	ML	33.0	33.0			
SB - 2	31.0	35	23	12	2	85	A-6 (10)	CL	33.0	33.0			
SB - 2	34.0	50	21	29	2	100	A-7-6 (32)	CH	37.9	37.9	85.6		
SB - 2	36.0	35	19	16	2	75	A-6 (11)	CL	37.0	37.0			
SB - 2	37.4	72	23	49	2	99	A-7-6 (56)	CH	36.9	36.9			
SB - 2	39.0	48	21	27	2	98	A-7-6 (29)	CL	35.6	35.6	83.5		
SB - 2	41.0	40	22	18	2	91	A-6 (17)	CL	32.4	32.4			
SB - 2	44.0	NP	NP	NP	2	63	A-4 (0)	ML	28.4	28.4			
SB - 3	0.0	NP	NP	NP	25	60	A-4 (0)	ML	10.3	10.3			
SB - 3	2.0	41	20	21	9.5	59	A-7-6 (10)	CL	17.0	17.0			
SB - 3	4.0	42	17	25	25	62	A-7-6 (13)	CL	21.6	21.6	105.0		
SB - 3	6.0	43	18	25	25	62	A-7-6 (13)	CL	21.8	21.8			

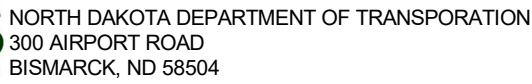
SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810

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 - 3	9.0	44	19	25	25	64	A-7-6 (14)	CL	23.0	23.0			
SB - 3	11.0	40	16	24	25	57	A-6 (10)	CL	19.4	19.4			
SB - 3	14.0	41	17	24	9.5	60	A-7-6 (11)	CL	22.9	22.9			
SB - 3	16.0	47	19	28	25	64	A-7-6 (16)	CL	23.3	23.3			
SB - 3	19.0	49	19	30	25	65	A-7-6 (17)	CL	23.2	23.2	103.5		
SB - 3	21.0	37	17	20	25	65	A-6 (11)	CL	23.1	23.1			
SB - 3	24.0	43	18	25	9.5	63	A-7-6 (13)	CL	28.8	28.8			
SB - 3	26.0	44	18	26	25	62	A-7-6 (13)	CL	26.7	26.7			
SB - 3	31.0	40	17	23	9.5	63	A-6 (12)	CL	26.6	26.6			
SB - 3	34.0	41	16	25	25	58	A-7-6 (11)	CL	26.0	26.0	101.0		
SB - 3	36.0	40	18	22	9.5	61	A-6 (11)	CL	25.4	25.4			
SB - 3	39.0	38	19	19	9.5	60	A-6 (9)	CL	23.8	23.8			
SB - 3	40.0	NP	NP	NP	4.75	31	A-2-4 (0)	SM	21.3	21.3			
SB - 3	41.0	NP	NP	NP	9.5	12	A-2-4 (0)	SP-SM	26.0	26.0			
SB - 3	44.0	32	18	14	9.5	54	A-6 (5)	CL	29.4	29.4			
SB - 4	0.0	38	19	19	25	59	A-6 (9)	CL	18.7	18.7			
SB - 4	2.0	42	18	24	9.5	61	A-7-6 (12)	CL	26.0	26.0			
SB - 4	4.0	39	18	21	25	58	A-6 (9)	CL	25.0	25.0	103.4		
SB - 4	6.0	38	18	20	25	57	A-6 (8)	CL	17.8	17.8			
SB - 4	9.0	33	18	15	25	67	A-6 (8)	CL	21.7	21.7	100.5		
SB - 4	11.0	34	20	14	9.5	60	A-6 (6)	CL	24.1	24.1			
SB - 4	14.0	32	18	14	50	52	A-6 (4)	CL	22.8	22.8			
SB - 4	16.0	35	19	16	25	57	A-6 (6)	CL	22.5	22.5			
SB - 4	19.0	35	19	16	25	55	A-6 (6)	CL	22.2	22.2	105.3		
SB - 4	21.0	33	18	15	25	54	A-6 (5)	CL	24.3	24.3			
SB - 4	24.0	37	19	18	25	57	A-6 (7)	CL	23.4	23.4			
SB - 4	26.0	37	18	19	25	60	A-6 (9)	CL	24.7	24.7			
SB - 4	29.0	37	19	18	25	58	A-6 (8)	CL	24.6	24.6			
SB - 4	31.0	41	18	23	9.5	61	A-7-6 (11)	CL	25.8	25.8			
SB - 4	34.0	46	20	26	50	53	A-7-6 (10)	CL	24.5	24.5	101.3		
SB - 4	36.0	44	19	25	25	60	A-7-6 (12)	CL	28.2	28.2			
SB - 4	39.0	40	18	22	50	56	A-6 (9)	CL	22.2	22.2			
SB - 4	41.0	43	18	25	25	61	A-7-6 (12)	CL	24.8	24.8			
SB - 4	44.0	44	18	26	9.5	63	A-7-6 (14)	CL	22.3	22.3			

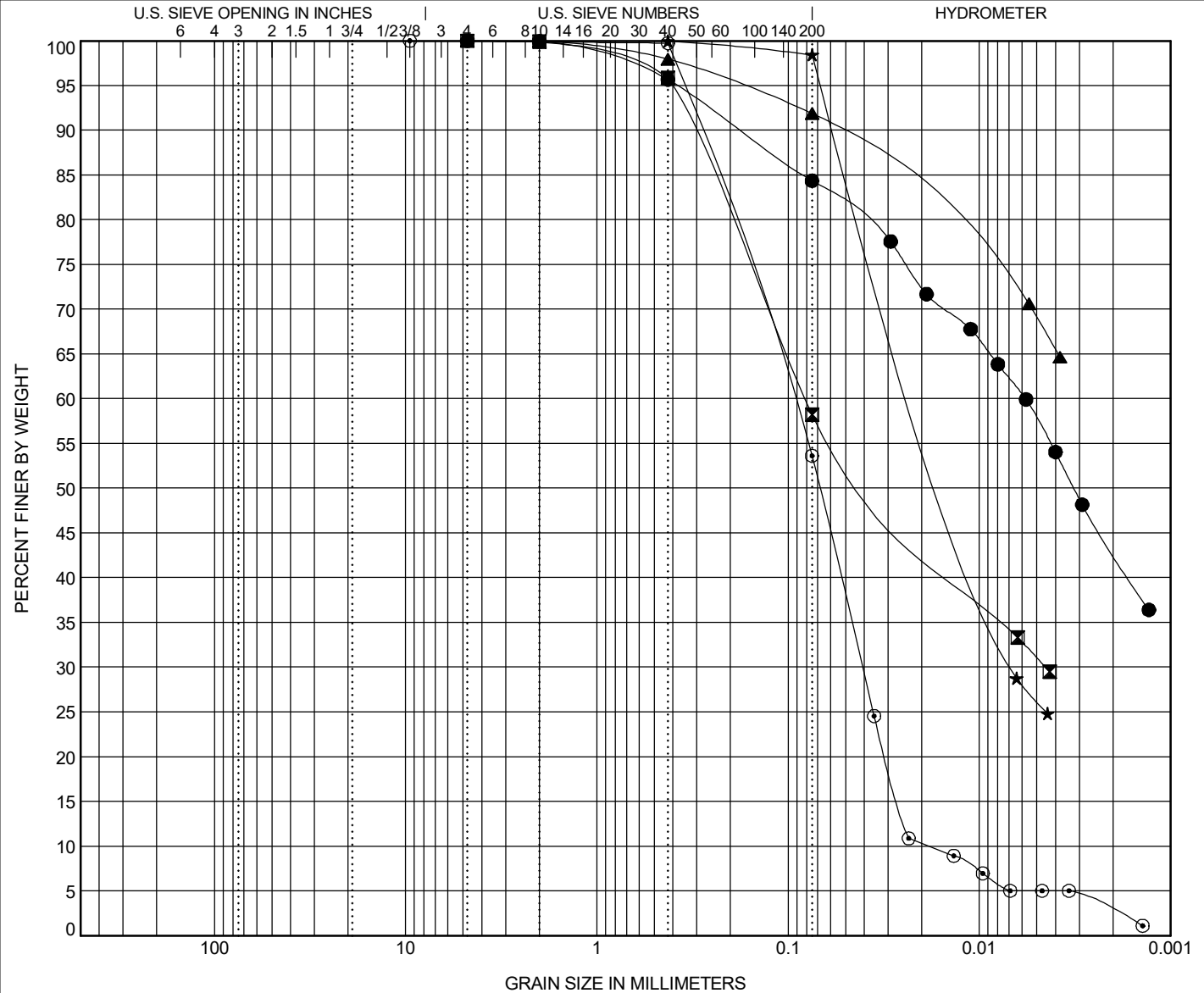


BOREHOLE		DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
●	SB - 1	0.0	A-7-6 (14)			CL		42	18	24		
⊠	SB - 1	2.0	A-7-6 (31)			CH		55	19	36		
▲	SB - 1	4.0	A-6 (12)			CL		39	17	22		
★	SB - 1	6.0	A-7-6 (52)			CH		72	23	49		
◎	SB - 1	9.0	A-7-6 (42)			CH		65	21	44		
BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
●	SB - 1	0.0	4.75	0.044	0.005		0.0	32.4	67.6			
⊠	SB - 1	2.0	4.75	0.008			0.0	16.9	42.6	40.5		
▲	SB - 1	4.0	4.75	0.048			0.0	34.6	65.4			
★	SB - 1	6.0	4.75				0.0	5.9	94.1			
◎	SB - 1	9.0	4.75				0.0	12.2	87.8			

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810

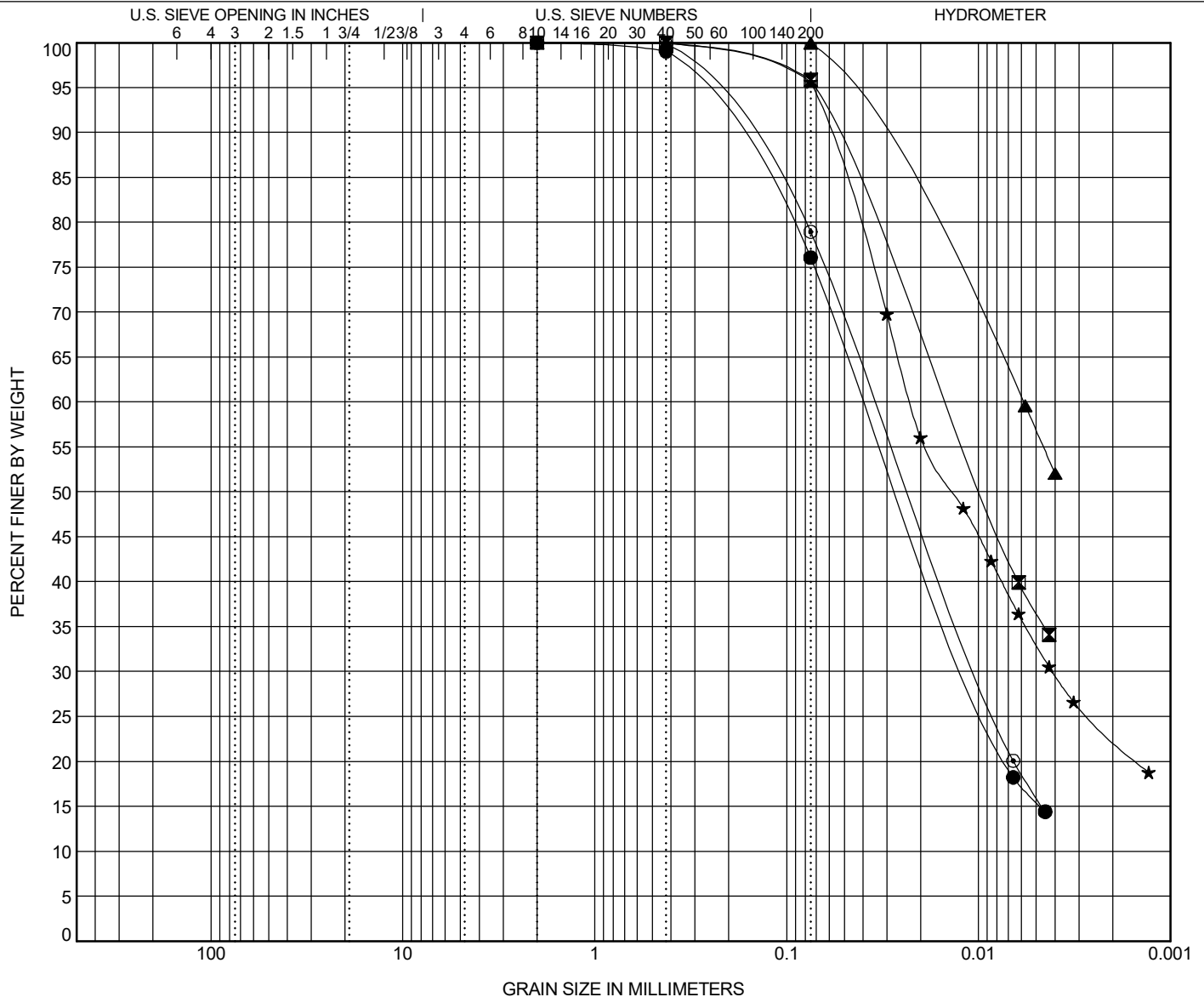


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification			LL	PL	PI	Cc	Cu
● SB - 1	11.0	A-7-6 (39)		CH			62	18	44		
▣ SB - 1	14.0	A-7-6 (14)		CL			44	14	30		
▲ SB - 1	16.0	A-7-6 (59)		CH			78	20	58		
★ SB - 1	19.0	A-7-6 (26)		CL			45	21	24		
◎ SB - 1	21.0	A-4 (0)		ML			NP	NP	NP	0.95	5.17
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● SB - 1	11.0	4.75	0.006			0.0	15.6	41.7		42.7	
▣ SB - 1	14.0	4.75	0.082	0.005		0.0	41.8	58.2			
▲ SB - 1	16.0	4.75				0.0	8.1	91.9			
★ SB - 1	19.0	2	0.019	0.007		0.0	1.6	98.4			
◎ SB - 1	21.0	9.5	0.095	0.041	0.018	0.0	46.4	51.0		2.7	

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810

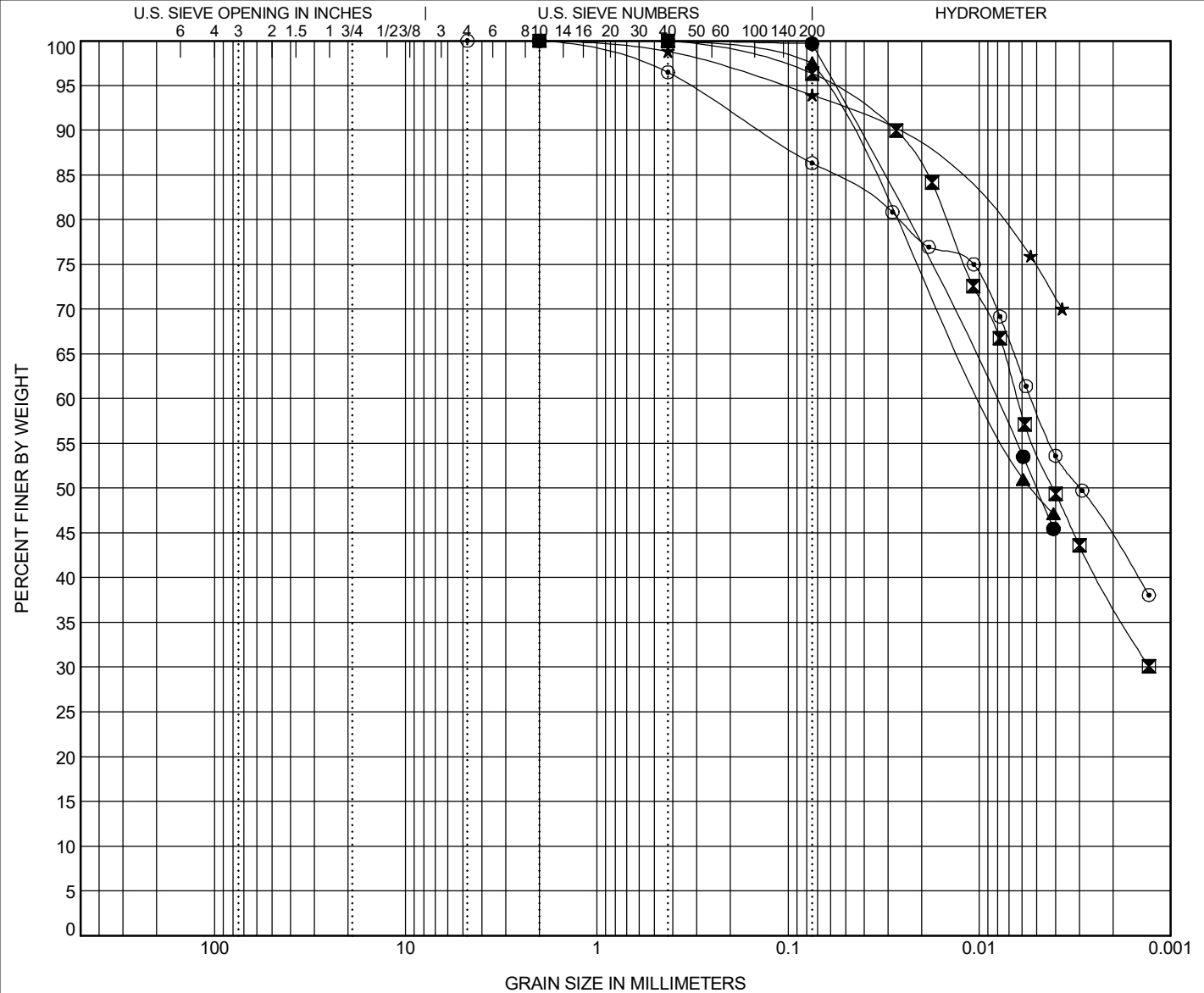
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE		DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
●	SB - 1	24.0	A-4 (0)			ML		30	30	NP		
▣	SB - 1	26.0	A-7-6 (32)			CH		50	19	31		
▲	SB - 1	29.0	A-7-6 (38)			CH		55	21	34		
★	SB - 1	31.0	A-7-6 (27)			CL		46	20	26		
◎	SB - 1	36.0	A-4 (6)			CL		32	23	9		
BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
●	SB - 1	24.0	2	0.038	0.011		0.0	23.9	76.1			
▣	SB - 1	26.0	2	0.015			0.0	4.2	95.8			
▲	SB - 1	29.0	2	0.006			0.0	0.1	99.9			
★	SB - 1	31.0	2	0.023	0.004		0.0	4.4	73.1		22.5	
◎	SB - 1	36.0	2	0.034	0.01		0.0	21.0	79.0			

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810

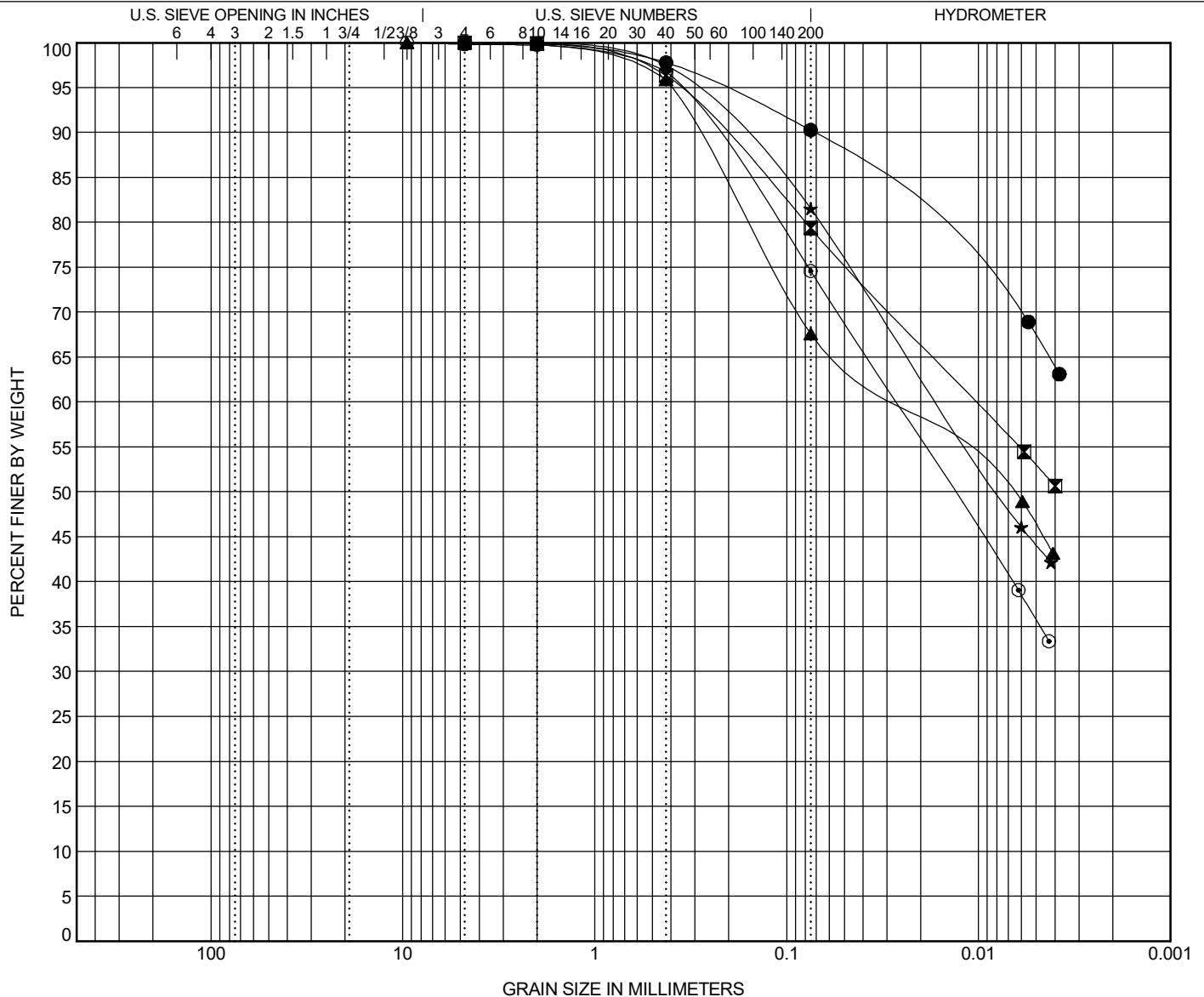


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
● SB - 1	39.0	A-7-6 (37)			CH		55	22	33		
☒ SB - 1	41.0	A-7-6 (40)			CH		58	21	37		
▲ SB - 1	44.0	A-7-6 (42)			CH		57	18	39		
★ SB - 2	0.0	A-7-6 (52)			CH		72	23	49		
◎ SB - 2	2.0	A-7-6 (39)			CH		62	19	43		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● SB - 1	39.0	2	0.008			0.0	0.3	99.7			
☒ SB - 1	41.0	2	0.006			0.0	3.7	59.3	37.0		
▲ SB - 1	44.0	2	0.01			0.0	2.5	97.5			
★ SB - 2	0.0	2				0.0	6.1	93.9			
◎ SB - 2	2.0	4.75	0.005			0.0	13.7	42.0	44.3		

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810

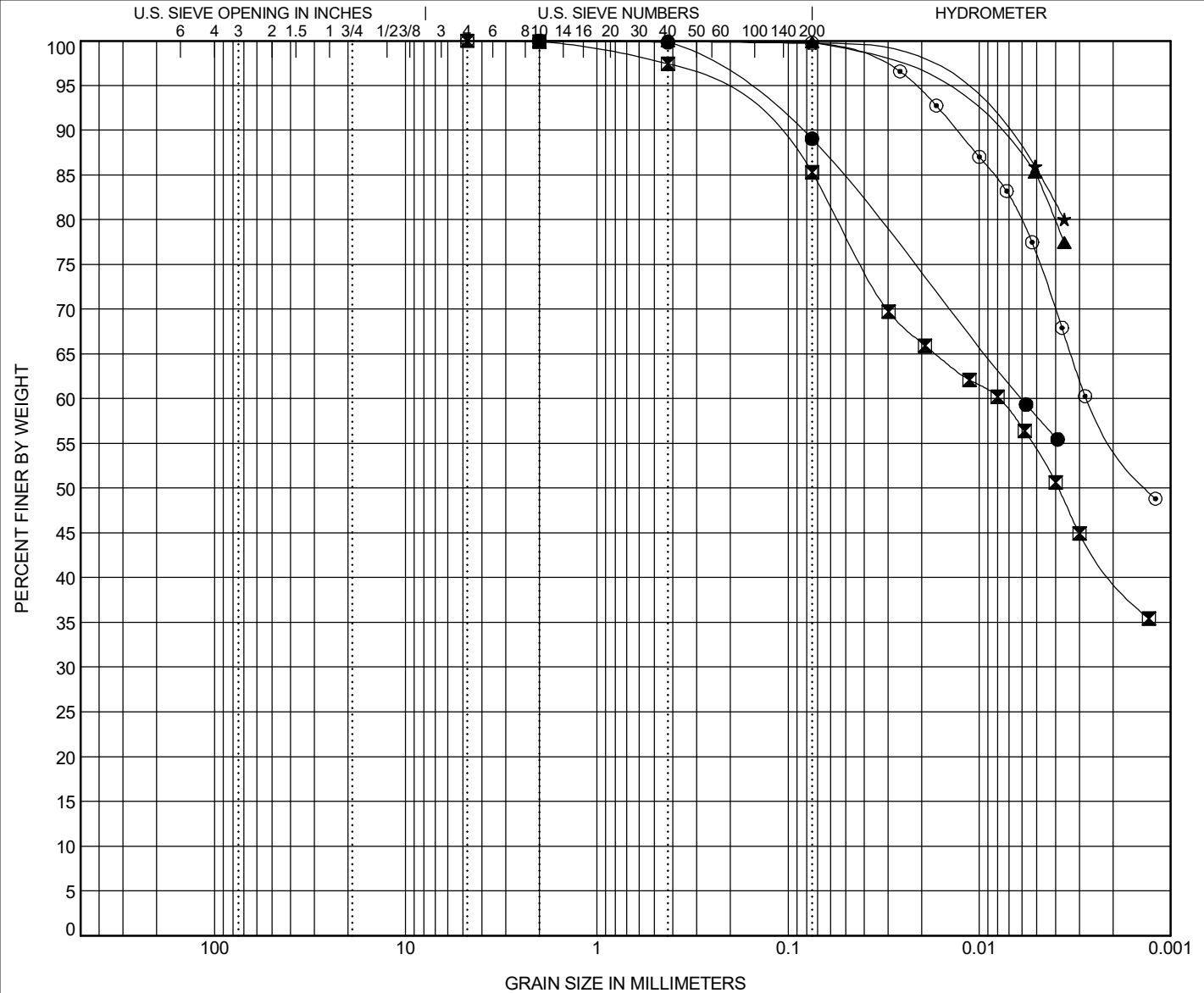
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE		DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
●	SB - 2	4.0	A-7-6 (43)			CH		65	22	43		
☒	SB - 2	6.0	A-7-6 (30)			CH		55	17	38		
▲	SB - 2	9.0	A-7-6 (16)			CL		42	15	27		
★	SB - 2	10.0	A-7-6 (23)			CL		45	16	29		
◎	SB - 2	11.0	A-7-6 (21)			CL		45	15	30		
BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	SB - 2	4.0	4.75				0.0	9.7	90.3			
☒	SB - 2	6.0	4.75	0.01			0.0	20.6	79.4			
▲	SB - 2	9.0	9.5	0.027			0.0	32.4	67.6			
★	SB - 2	10.0	4.75	0.016			0.0	18.5	81.5			
◎	SB - 2	11.0	9.5	0.027			0.2	25.2	74.6			

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



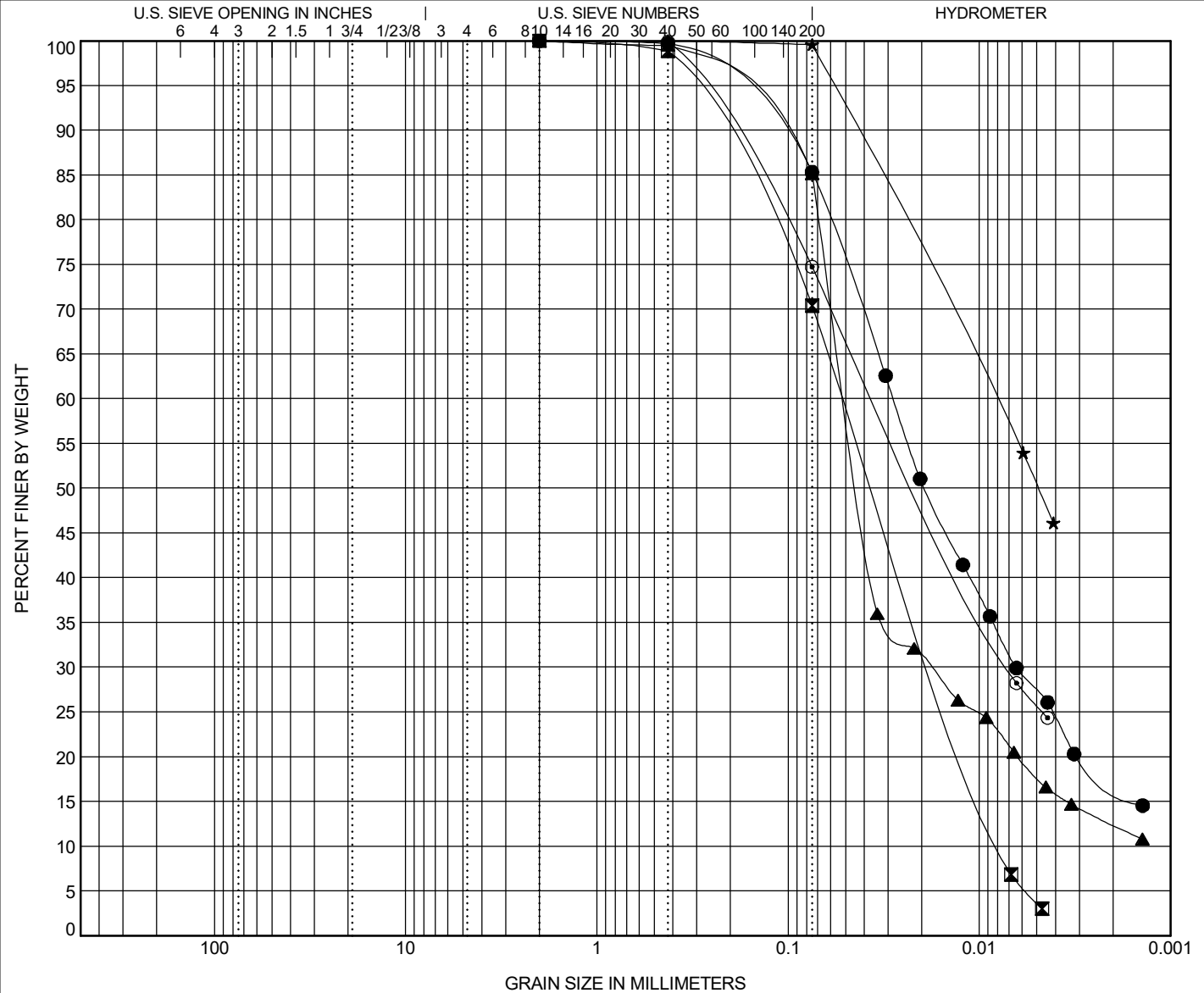
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● SB - 2	14.0	A-7-6 (38)		CH		58	18	40		
☒ SB - 2	16.0	A-7-6 (38)		CH		60	17	43		
▲ SB - 2	19.0	A-7-6 (73)		CH		87	24	63		
★ SB - 2	21.0	A-7-6 (93)		CH		104	24	80		
◎ SB - 2	24.0	A-7-6 (69)		CH		83	24	59		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● SB - 2	14.0	2	0.006			0.0	11.0	89.0		
☒ SB - 2	16.0	4.75	0.008			0.0	14.7	45.0	40.3	
▲ SB - 2	19.0	2				0.0	0.2	99.8		
★ SB - 2	21.0	2				0.0	0.3	99.7		
◎ SB - 2	24.0	4.75	0.003			0.0	0.2	44.0	55.7	

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



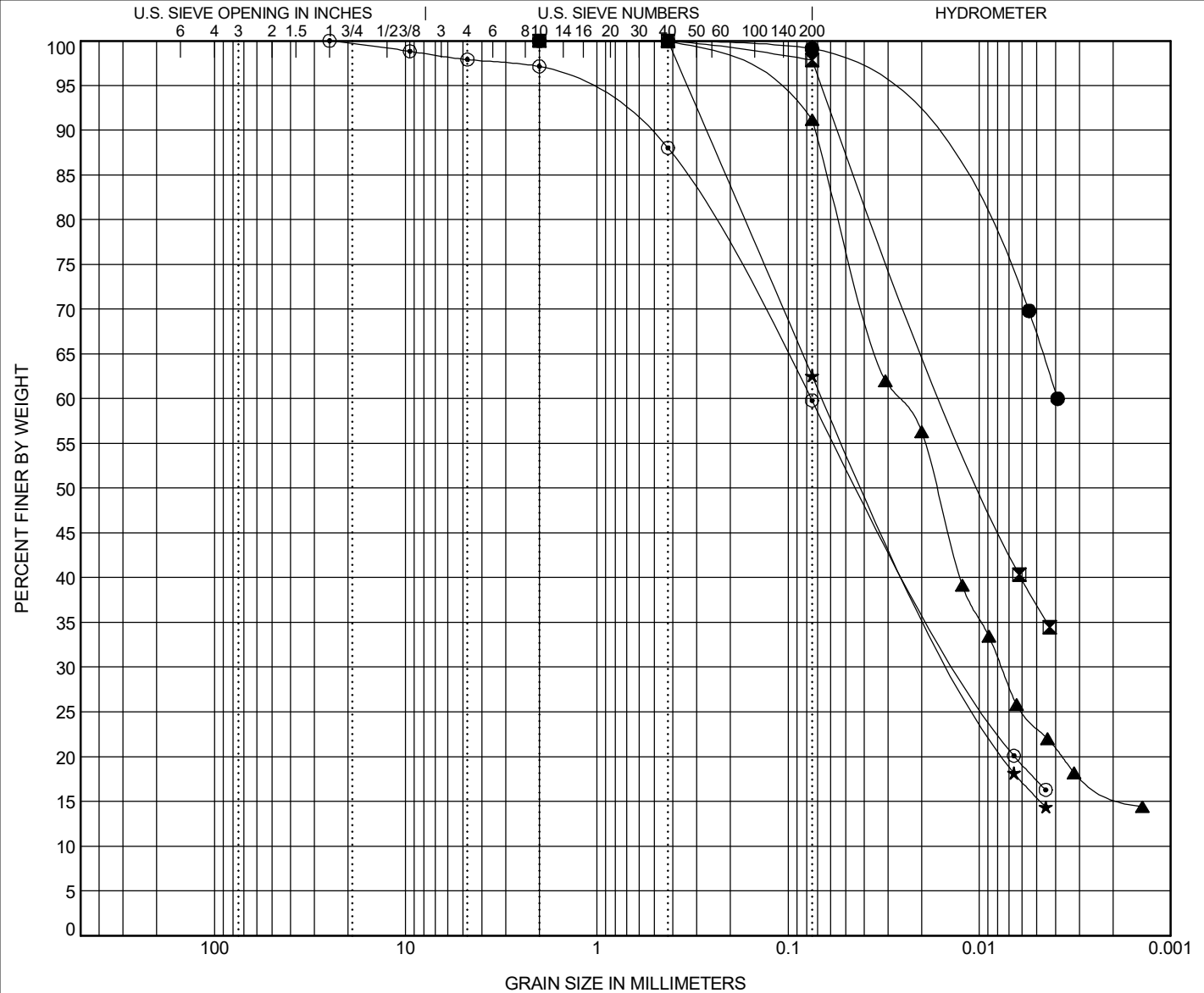
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
● SB - 2	26.0	A-7-6 (20)			CL		43	20	23		
☒ SB - 2	29.0	A-4 (0)			ML		NP	NP	NP	0.69	6.60
▲ SB - 2	31.0	A-6 (10)			CL		35	23	12		
★ SB - 2	34.0	A-7-6 (32)			CH		50	21	29		
⊙ SB - 2	36.0	A-6 (11)			CL		35	19	16		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● SB - 2	26.0	2	0.028	0.006		0.0	14.7	68.3		17.0	
☒ SB - 2	29.0	2	0.051	0.016	0.008	0.0	29.6	70.4			
▲ SB - 2	31.0	2	0.05	0.018		0.0	14.8	72.8		12.4	
★ SB - 2	34.0	2	0.008			0.0	0.4	99.6			
⊙ SB - 2	36.0	2	0.034	0.007		0.0	25.3	74.7			

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



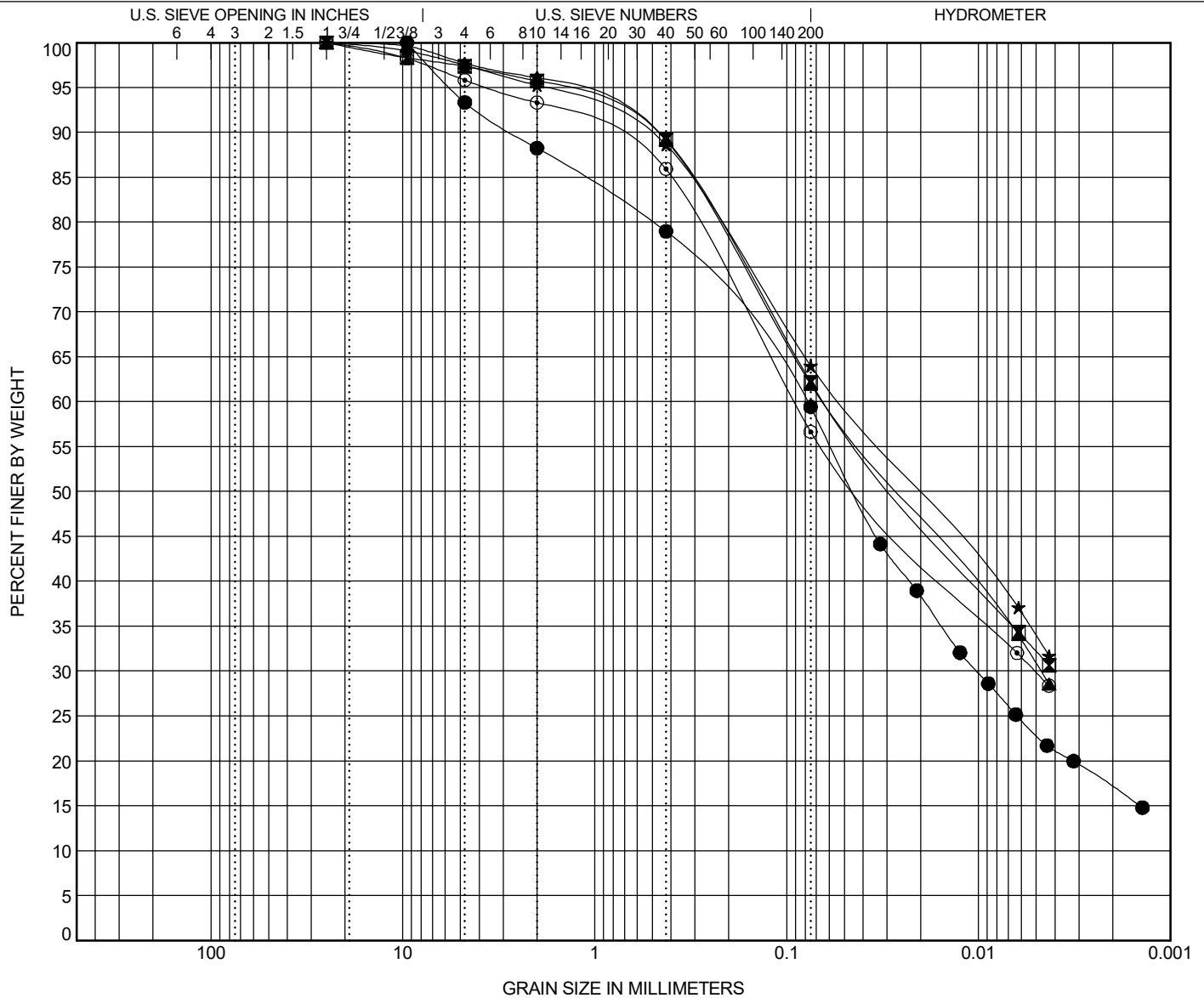
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● SB - 2	37.4	A-7-6 (56)		CH		72	23	49		
☒ SB - 2	39.0	A-7-6 (29)		CL		48	21	27		
▲ SB - 2	41.0	A-6 (17)		CL		40	22	18		
★ SB - 2	44.0	A-4 (0)		ML		NP	NP	NP		
◎ SB - 3	0.0	A-4 (0)		ML		NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● SB - 2	37.4	2	0.004			0.0	0.9	99.1		
☒ SB - 2	39.0	2	0.015			0.0	2.2	97.8		
▲ SB - 2	41.0	2	0.027	0.008		0.0	8.8	75.1	16.0	
★ SB - 2	44.0	2	0.065	0.013		0.0	37.5	62.5		
◎ SB - 3	0.0	25	0.076	0.012		2.1	38.1	59.8		

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

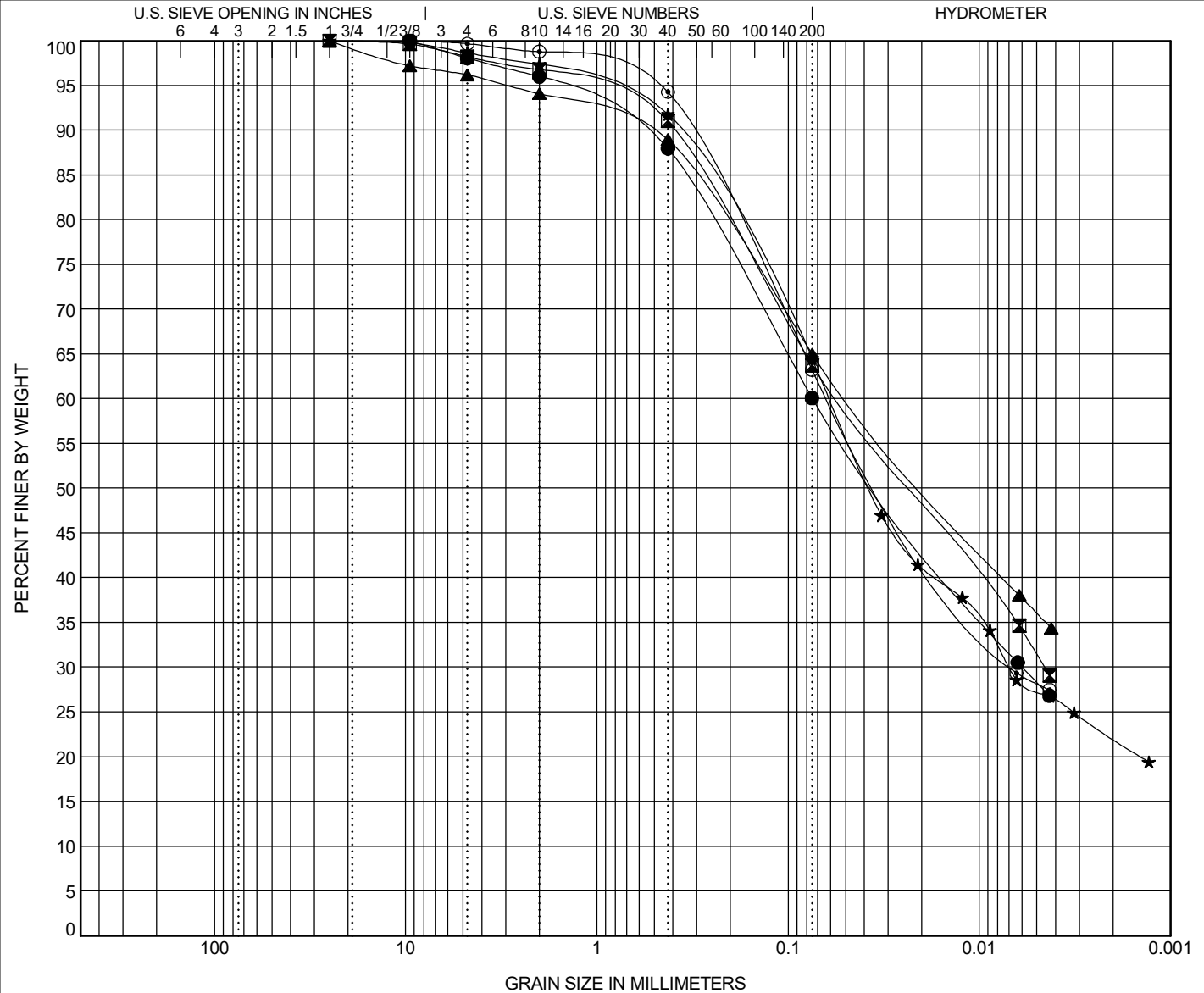
BOREHOLE		DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
●	SB - 3	2.0	A-7-6 (10)			CL		41	20	21		
☒	SB - 3	4.0	A-7-6 (13)			CL		42	17	25		
▲	SB - 3	6.0	A-7-6 (13)			CL		43	18	25		
★	SB - 3	9.0	A-7-6 (14)			CL		44	19	25		
◎	SB - 3	11.0	A-6 (10)			CL		40	16	24		
BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	SB - 3	2.0	9.5	0.079	0.01		6.7	33.9	42.4	17.0		
☒	SB - 3	4.0	25	0.062			2.6	35.2	62.1			
▲	SB - 3	6.0	25	0.063	0.005		2.3	35.8	61.9			
★	SB - 3	9.0	25	0.052			2.5	33.5	64.0			
◎	SB - 3	11.0	25	0.092	0.005		4.2	39.2	56.6			

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



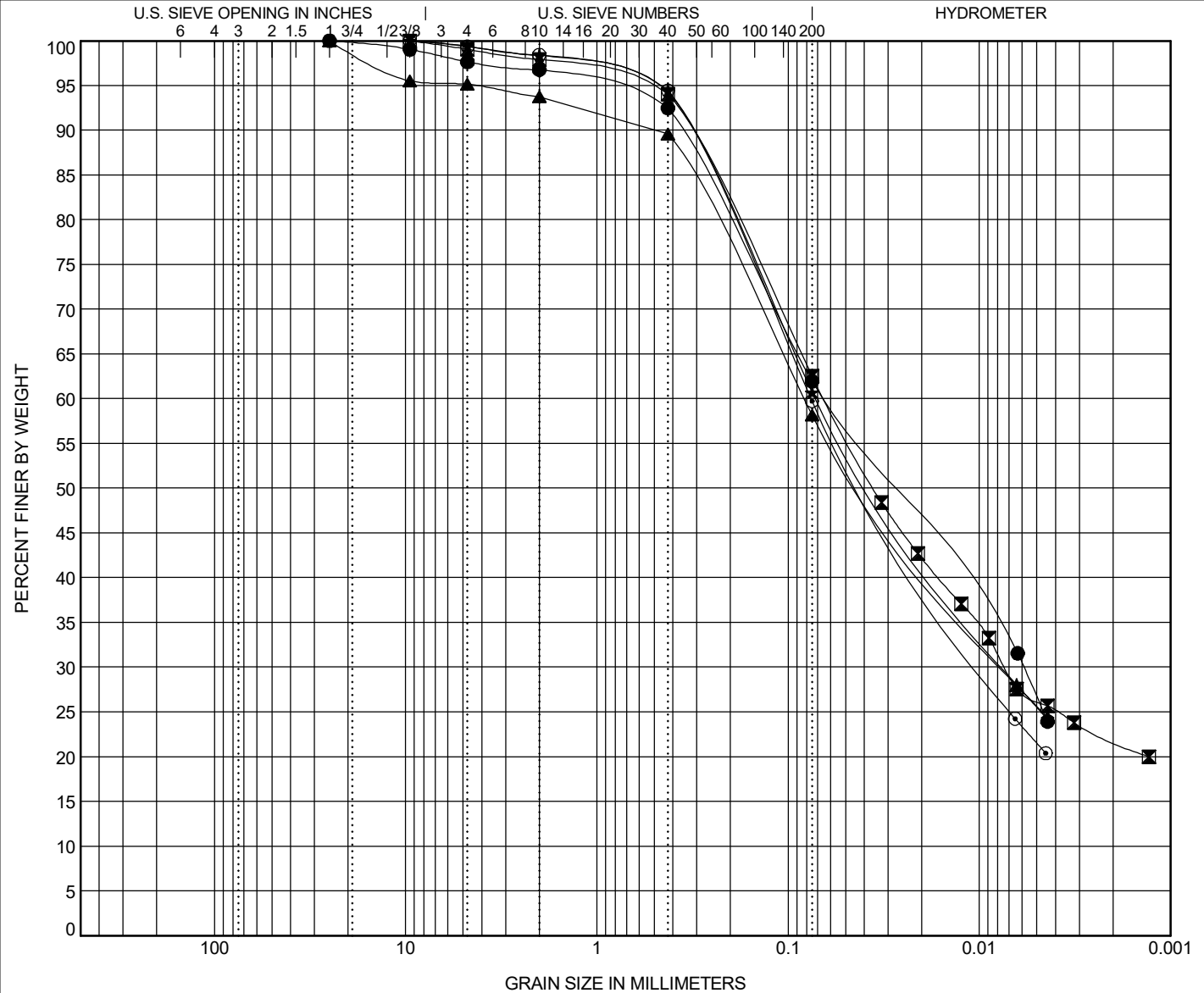
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● SB - 3	14.0	A-7-6 (11)		CL		41	17	24		
▣ SB - 3	16.0	A-7-6 (16)		CL		47	19	28		
▲ SB - 3	19.0	A-7-6 (17)		CL		49	19	30		
★ SB - 3	21.0	A-6 (11)		CL		37	17	20		
◎ SB - 3	24.0	A-7-6 (13)		CL		43	18	25		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● SB - 3	14.0	9.5	0.075	0.006		1.9	38.0	60.1		
▣ SB - 3	16.0	25	0.054	0.005		1.8	34.5	63.8		
▲ SB - 3	19.0	25	0.047			3.8	31.2	65.0		
★ SB - 3	21.0	25	0.06	0.007		1.4	34.1	42.5	22.0	
◎ SB - 3	24.0	9.5	0.059	0.007		0.3	36.5	63.2		

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

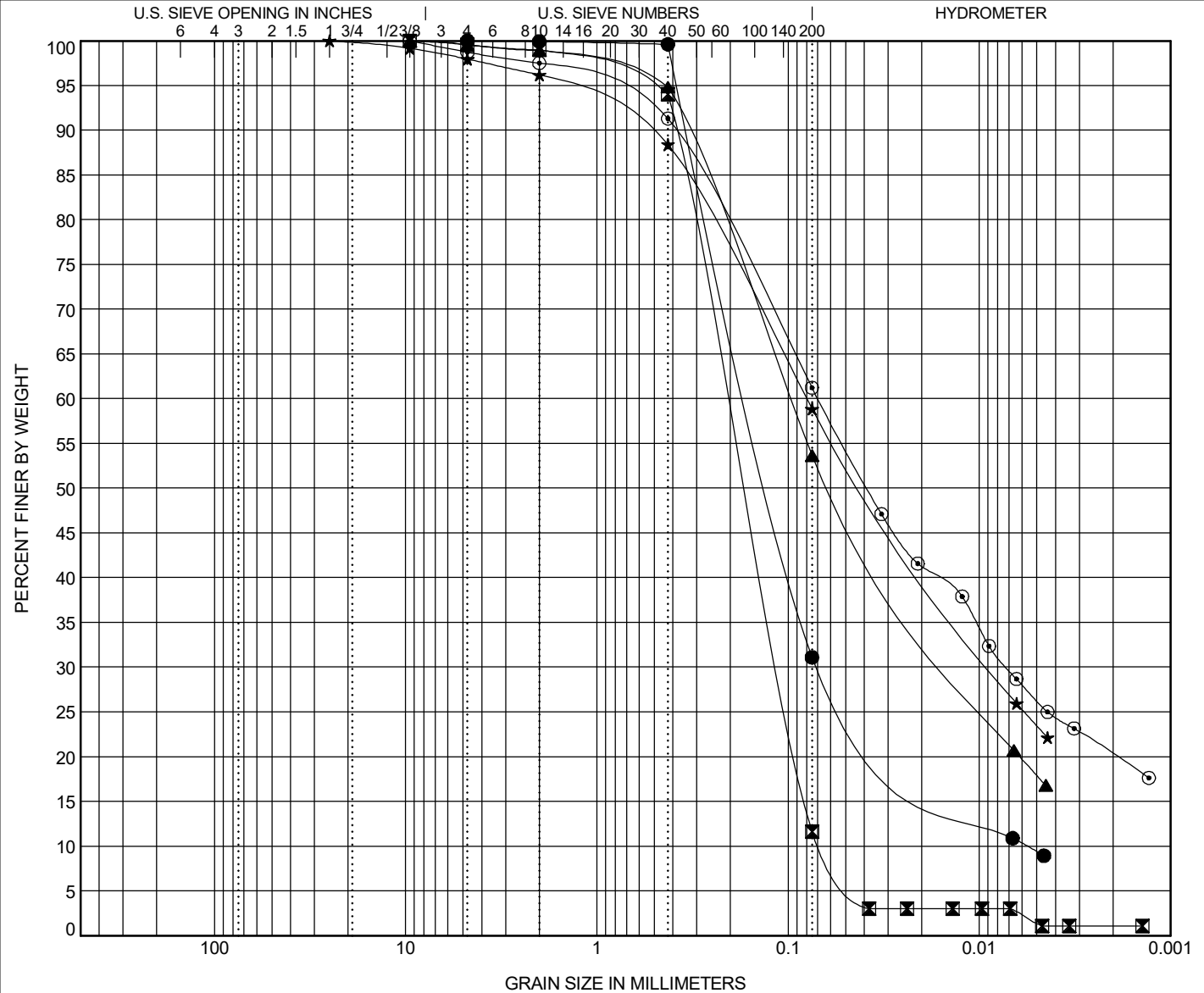
BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● SB - 3	26.0	A-7-6 (13)		CL		44	18	26		
■ SB - 3	31.0	A-6 (12)		CL		40	17	23		
▲ SB - 3	34.0	A-7-6 (11)		CL		41	16	25		
★ SB - 3	36.0	A-6 (11)		CL		40	18	22		
◎ SB - 3	39.0	A-6 (9)		CL		38	19	19		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● SB - 3	26.0	25	0.064	0.006		2.4	35.7	62.0		
■ SB - 3	31.0	9.5	0.065	0.007		1.0	36.5	40.7	21.8	
▲ SB - 3	34.0	25	0.083	0.008		4.9	37.0	58.1		
★ SB - 3	36.0	9.5	0.071	0.007		0.6	38.7	60.7		
◎ SB - 3	39.0	9.5	0.076	0.01		0.6	39.6	59.7		

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



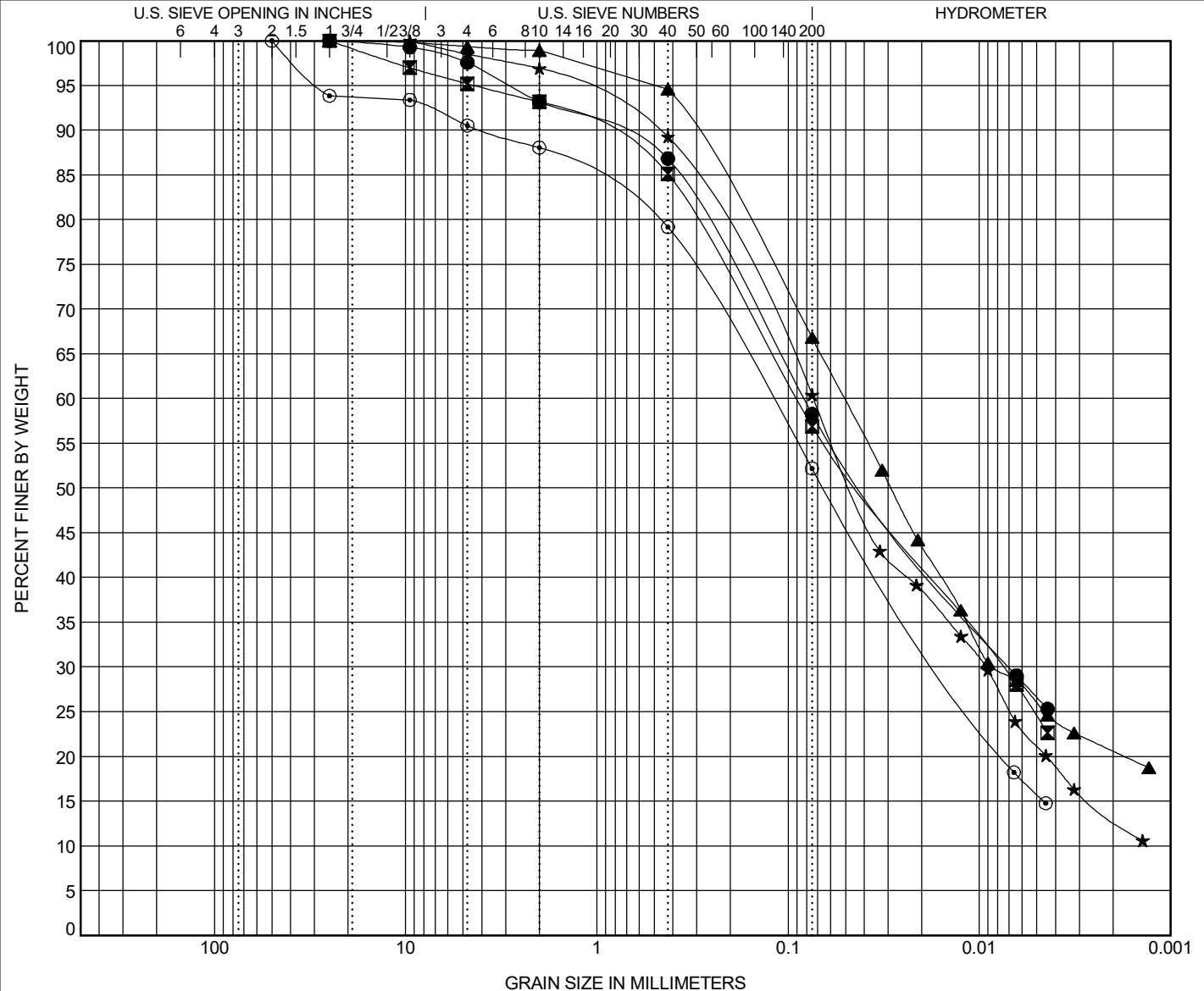
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
● SB - 3	40.0	A-2-4 (0)			SM		NP	NP	NP	4.91	27.49
☒ SB - 3	41.0	A-2-4 (0)			SP-SM		NP	NP	NP	0.89	3.14
▲ SB - 3	44.0	A-6 (5)			CL		32	18	14		
★ SB - 4	0.0	A-6 (9)			CL		38	19	19		
◎ SB - 4	2.0	A-7-6 (12)			CL		42	18	24		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● SB - 3	40.0	4.75	0.156	0.066	0.006	0.0	68.9	31.1			
☒ SB - 3	41.0	9.5	0.208	0.11	0.066	0.5	87.9	10.5		1.1	
▲ SB - 3	44.0	9.5	0.098	0.013		0.5	45.9	53.7			
★ SB - 4	0.0	25	0.08	0.009		2.0	39.1	58.9			
◎ SB - 4	2.0	9.5	0.07	0.007		1.3	37.5	41.0		20.3	

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



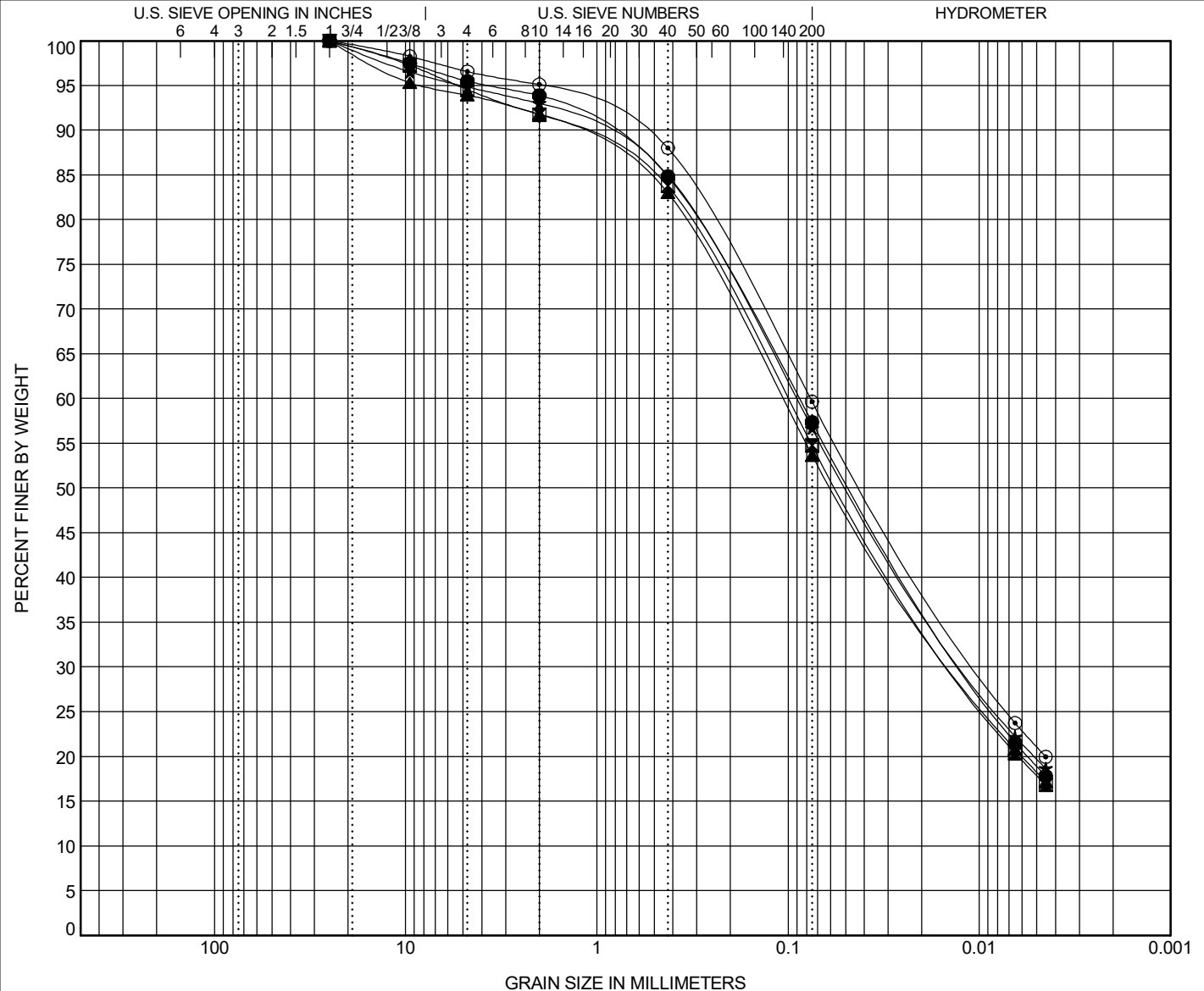
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● SB - 4	4.0	A-6 (9)		CL		39	18	21		
■ SB - 4	6.0	A-6 (8)		CL		38	18	20		
▲ SB - 4	9.0	A-6 (8)		CL		33	18	15		
★ SB - 4	11.0	A-6 (6)		CL		34	20	14		
◎ SB - 4	14.0	A-6 (4)		CL		32	18	14		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● SB - 4	4.0	25	0.083	0.007		2.4	39.3	58.3		
■ SB - 4	6.0	25	0.091	0.008		4.8	38.3	56.9		
▲ SB - 4	9.0	25	0.051	0.008		0.6	32.5	46.2	20.6	
★ SB - 4	11.0	9.5	0.074	0.009		1.5	38.1	47.4	13.0	
◎ SB - 4	14.0	50	0.124	0.015		9.5	38.3	52.2		

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

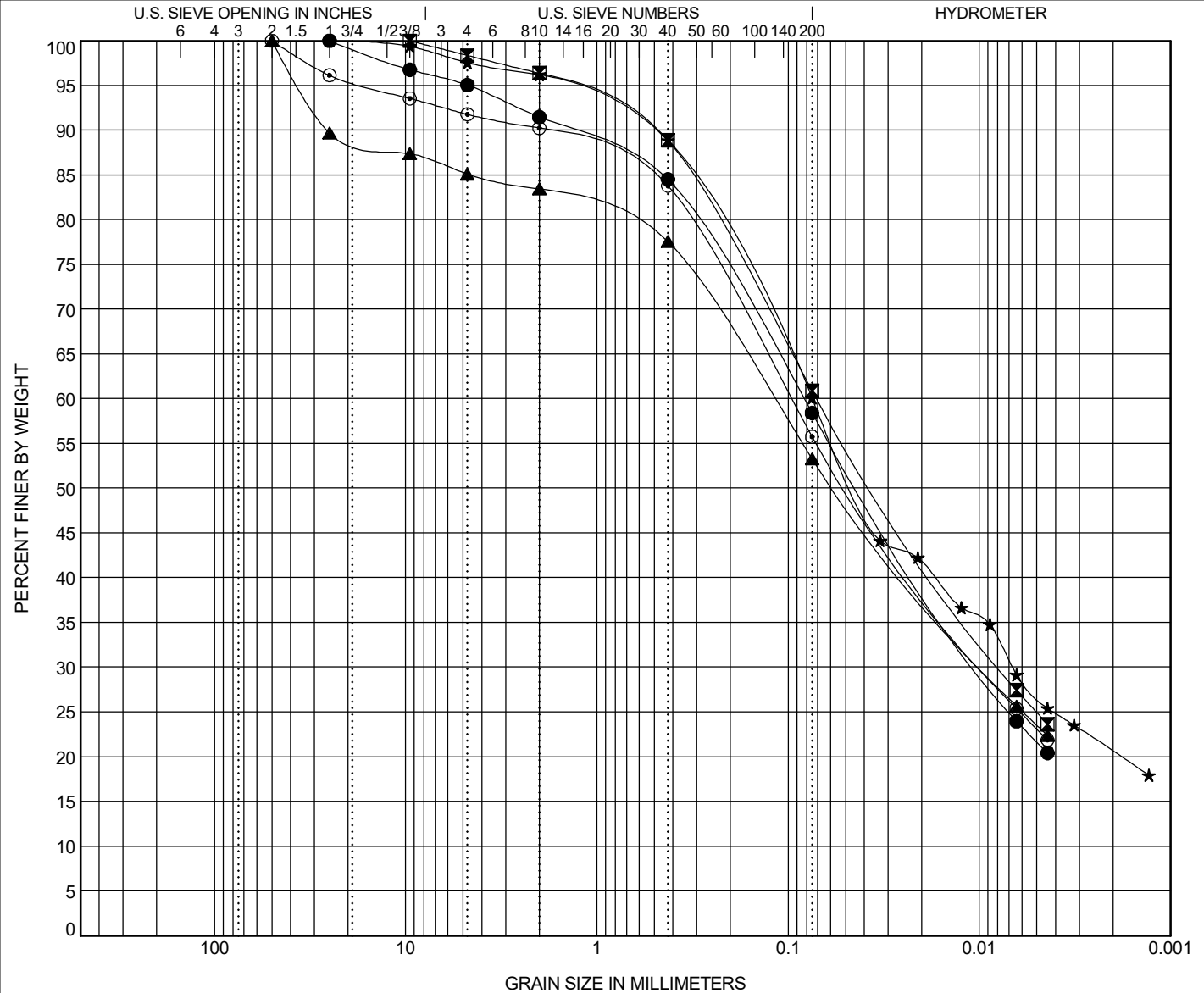
PCN 23810



PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

PCN 23810



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● SB - 4	29.0	A-6 (8)		CL		37	19	18		
☒ SB - 4	31.0	A-7-6 (11)		CL		41	18	23		
▲ SB - 4	34.0	A-7-6 (10)		CL		46	20	26		
★ SB - 4	36.0	A-7-6 (12)		CL		44	19	25		
◎ SB - 4	39.0	A-6 (9)		CL		40	18	22		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay
● SB - 4	29.0	25	0.083	0.01		5.0	36.6	58.4		
☒ SB - 4	31.0	9.5	0.07	0.008		1.6	37.5	60.9		
▲ SB - 4	34.0	50	0.121	0.009		14.9	31.8	53.3		
★ SB - 4	36.0	25	0.075	0.007		2.5	37.4	39.5		20.6
◎ SB - 4	39.0	50	0.098	0.009		8.2	36.0	55.7		



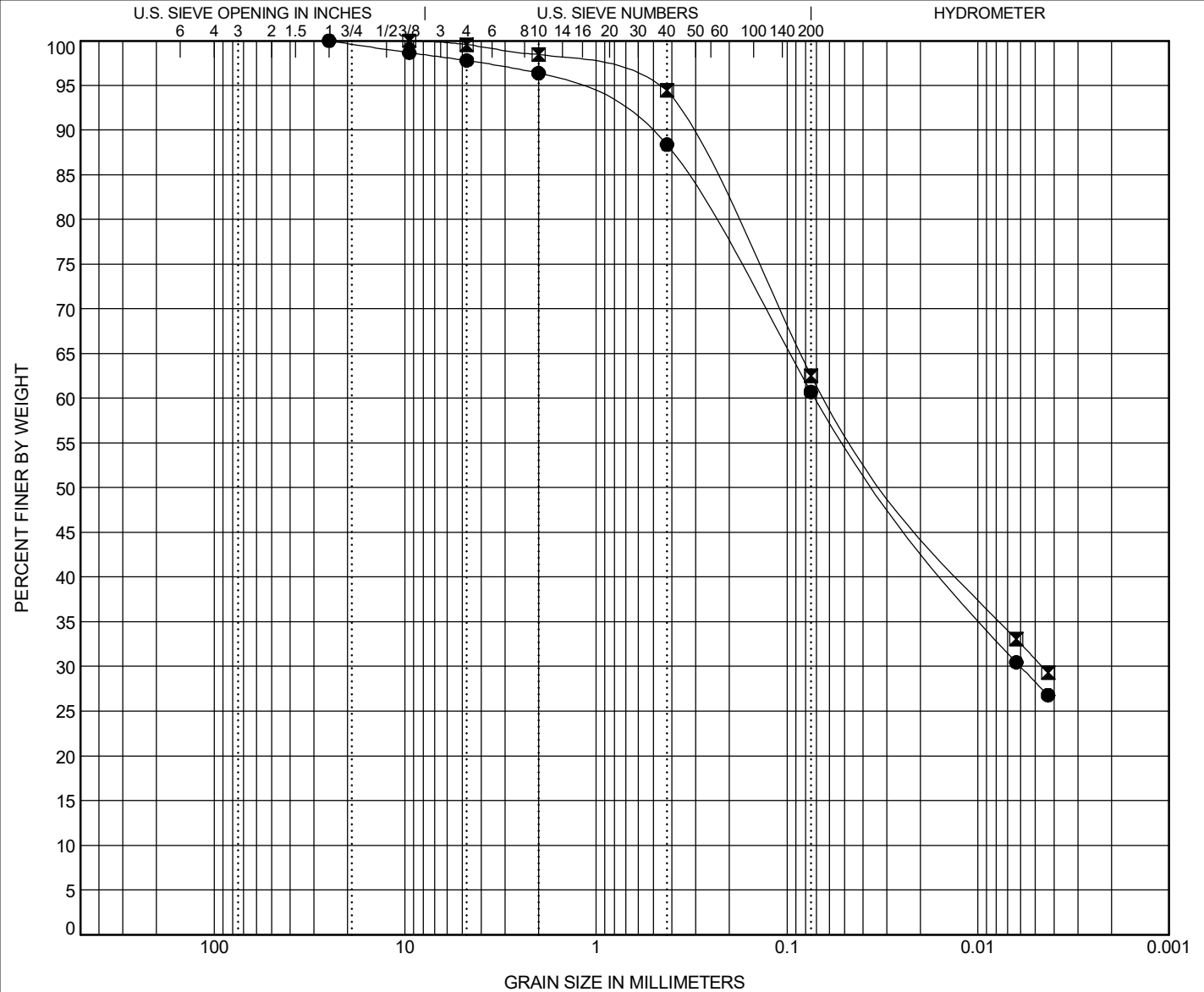
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER CVD-1-094(238)172

LOCATION Burleigh County

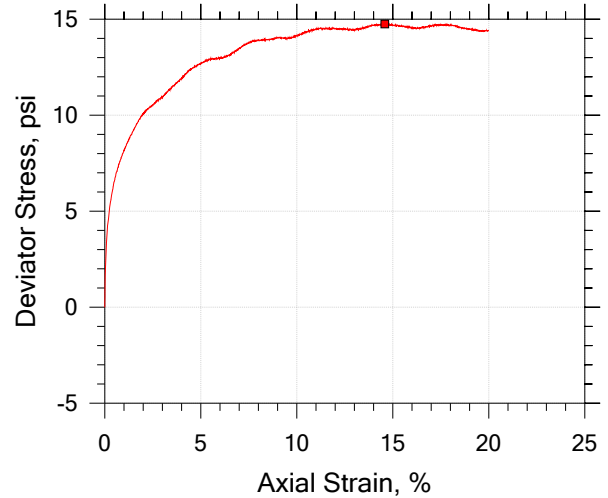
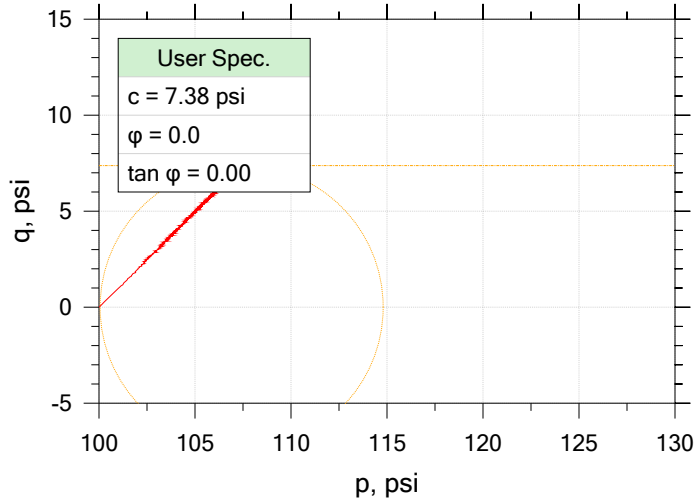
PCN 23810



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● SB - 4	41.0	A-7-6 (12)		CL		43	18	25		
☒ SB - 4	44.0	A-7-6 (14)		CL		44	18	26		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● SB - 4	41.0	25	0.071	0.006		2.2	37.1	60.7		
☒ SB - 4	44.0	9.5	0.061	0.005		0.4	37.0	62.5		

Unconsolidated Undrained by ASTM D4767



Symbol	■			
Sample ID	SS-523 -26			
Depth	4.0 - 6.0			
Test Number	UU -47- 26			
Initial				
Height, in	5.749			
Diameter, in	2.797			
Moisture Content (from Cuttings), %	26.5			
Dry Density, pcf	100.			
Saturation (Wet Method), %	106.2			
Void Ratio	0.668			
Final				
Moisture Content, %	23.5			
Dry Density, pcf	103.			
Cross-Sectional Area (Method A), in ²	6.052			
Saturation, %	100.0			
Void Ratio	0.631			
Back Pressure, psi	0.0000			
Vertical Effective Consolidation Stress, psi	100.0			
Horizontal Effective Consolidation Stress, psi	100.0			
Vertical Strain after Consolidation, %	0.0000			
Volumetric Strain after Consolidation, %	0.0000			
Time to 50% Consolidation, min	0.0000			
Shear Strength, psi	7.375			
Strain at Failure, %	14.6			
Strain Rate, %/min	1.000			
Deviator Stress at Failure, psi	14.75			
Effective Minor Principal Stress at Failure, psi	100.0			
Effective Major Principal Stress at Failure, psi	114.8			
B-Value	---			

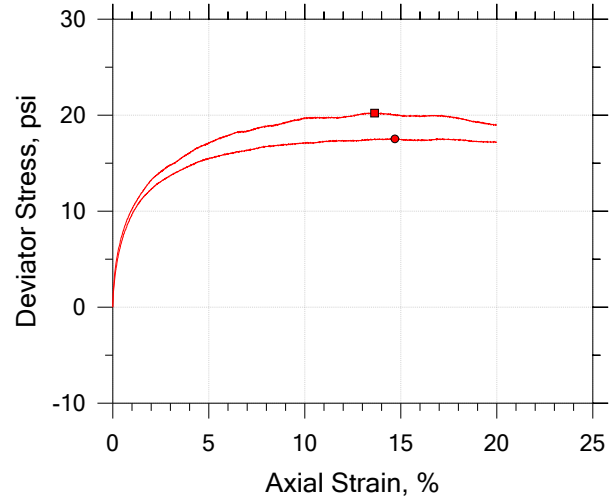
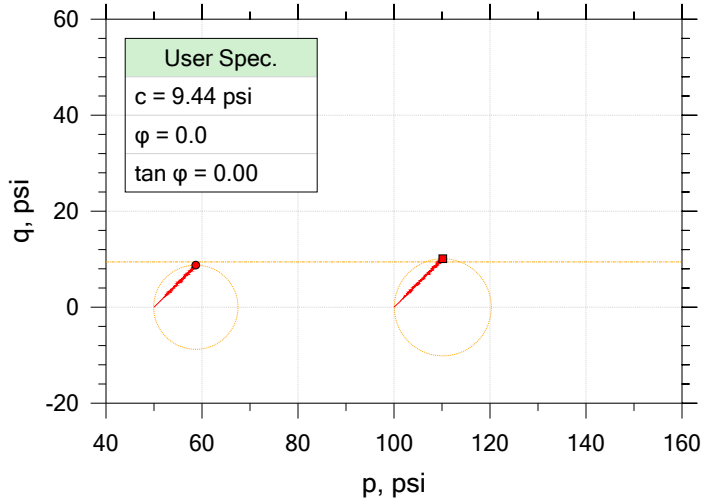
Notes:

- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and ϕ determined from best-fit straight line for the specific test conditions.

Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 1	Tester: MD	Checker: DT
Sample Number: SS-523 -26	Test Date: 8/4/2026	Depth: 4.0 - 6.0
Test Number: UU -47- 26	Preparation:	Elevation:
Description: 13" Dark Brn Silty Cly I.O.Deposits & Organics		
Remarks: Test Depth 4.3 - 4.8		

Unconsolidated Undrained by ASTM D4767

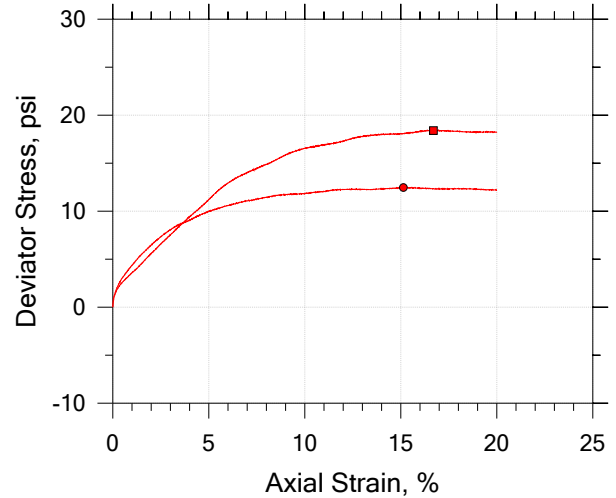
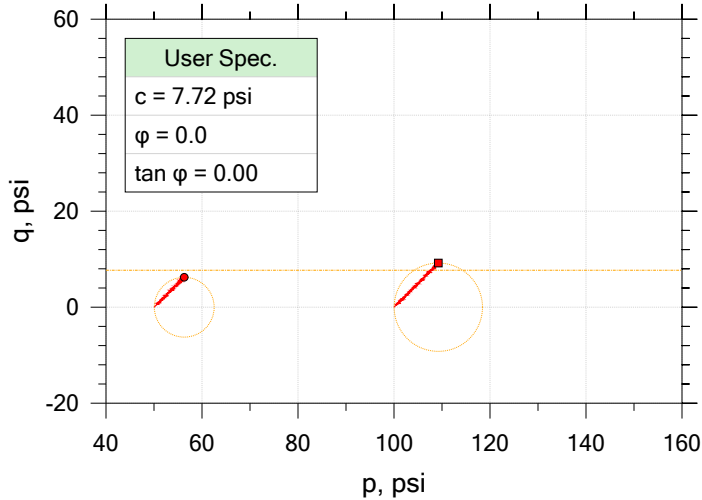


Symbol	■	●		
Sample ID	SS-523 -26	SS-523 -26		
Depth	9.0 - 11.0	9.0 - 11.0		
Test Number	UU -45- 26	UU -46- 26		
Initial				
Height, in	5.750	5.747		
Diameter, in	2.813	2.830		
Moisture Content (from Cuttings), %	29.2	19.0		
Dry Density, pcf	96.1	105.		
Saturation (Wet Method), %	105.6	86.1		
Void Ratio	0.742	0.592		
Final				
Moisture Content, %	26.4	21.3		
Dry Density, pcf	98.0	107.		
Cross-Sectional Area (Method A), in ²	6.133	6.232		
Saturation, %	100.0	100.0		
Void Ratio	0.708	0.570		
Back Pressure, psi	0.0000	0.0000		
Vertical Effective Consolidation Stress, psi	99.98	50.00		
Horizontal Effective Consolidation Stress, psi	99.99	50.00		
Vertical Strain after Consolidation, %	0.0000	0.0000		
Volumetric Strain after Consolidation, %	0.0000	0.0000		
Time to 50% Consolidation, min	0.0000	0.0000		
Shear Strength, psi	10.11	8.769		
Strain at Failure, %	13.6	14.7		
Strain Rate, %/min	1.000	1.000		
Deviator Stress at Failure, psi	20.23	17.54		
Effective Minor Principal Stress at Failure, psi	100.1	49.94		
Effective Major Principal Stress at Failure, psi	120.3	67.48		
B-Value	---	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 1	Tester: MD	Checker: DT
Sample Number: SS-523 -26	Test Date: 8/4/2026	Depth: 9.0 - 11.0
Test Number: UU -45- 26	Preparation:	Elevation:
Description: 17" Brn Cly with Sand, I.O. & Silt Deposits		
Remarks: Test Depth 9.2 - 9.7		

Unconsolidated Undrained by ASTM D4767

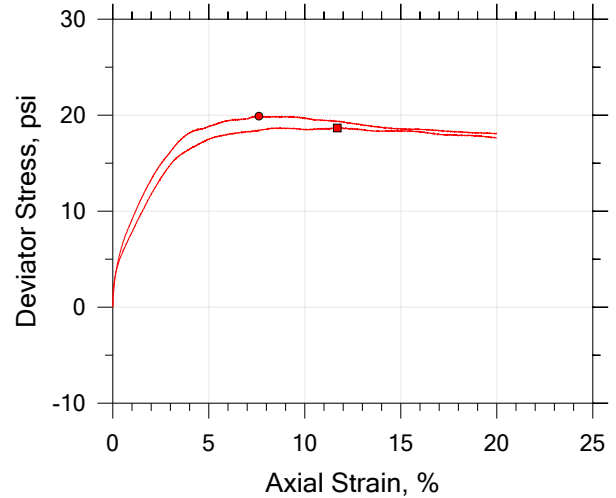
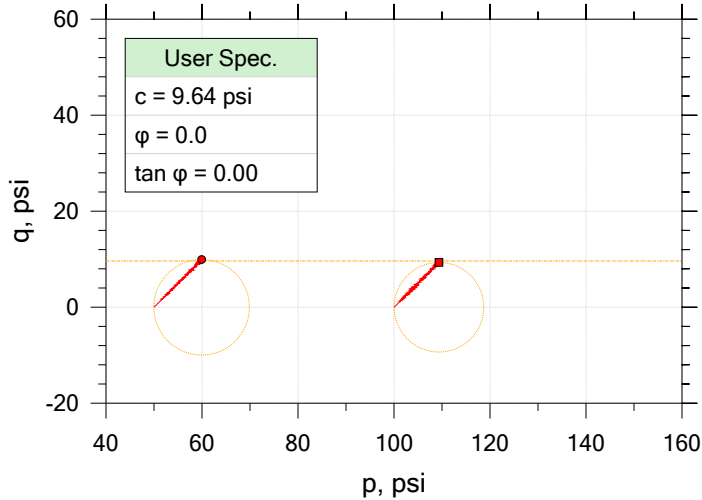


Symbol	■	●		
Sample ID	SS-527 -26	SS-527 -26		
Depth	19.0 - 21.0	19.0 - 21.0		
Test Number	UU -43- 26	UU -44- 26		
Initial				
Height, in	5.727	5.738		
Diameter, in	2.797	2.833		
Moisture Content (from Cuttings), %	34.1	35.2		
Dry Density, pcf	88.3	88.7		
Saturation (Wet Method), %	102.2	106.6		
Void Ratio	0.894	0.886		
Final				
Moisture Content, %	32.6	33.0		
Dry Density, pcf	89.3	88.8		
Cross-Sectional Area (Method A), in ²	6.099	6.300		
Saturation, %	100.0	100.0		
Void Ratio	0.873	0.884		
Back Pressure, psi	0.0000	0.0000		
Vertical Effective Consolidation Stress, psi	99.98	50.00		
Horizontal Effective Consolidation Stress, psi	99.98	50.00		
Vertical Strain after Consolidation, %	0.0000	0.0000		
Volumetric Strain after Consolidation, %	0.0000	0.0000		
Time to 50% Consolidation, min	0.0000	0.0000		
Shear Strength, psi	9.206	6.235		
Strain at Failure, %	16.7	15.1		
Strain Rate, %/min	1.000	1.000		
Deviator Stress at Failure, psi	18.41	12.47		
Effective Minor Principal Stress at Failure, psi	100.1	50.07		
Effective Major Principal Stress at Failure, psi	118.5	62.54		
B-Value	---	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 1	Tester: MD	Checker: DT
Sample Number: SS-527 -26	Test Date: 8/4/2026	Depth: 19.0 - 21.0
Test Number: UU -43- 26	Preparation:	Elevation:
Description: 25" Gry Silty Cly with Silt Lamination		
Remarks: Test Depth 19.2 - 19.7		

Unconsolidated Undrained by ASTM D4767

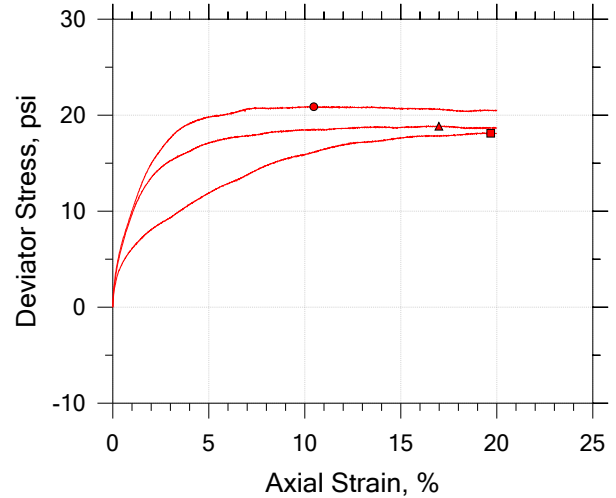
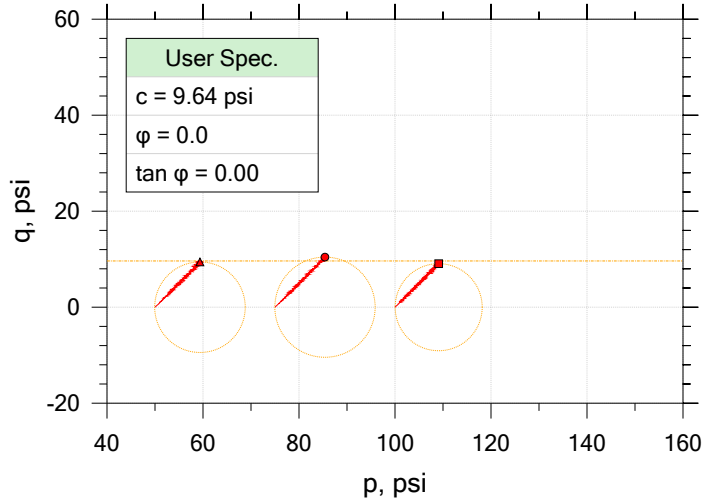


Symbol	■	●		
Sample ID	SS -531- 26	SS -531- 26		
Depth	29.0 - 31.0	29.0 - 31.0		
Test Number	UU -73-26	UU -74-26		
Initial				
Height, in	5.745	5.746		
Diameter, in	2.824	2.827		
Moisture Content (from Cuttings), %	33.8	34.9		
Dry Density, pcf	88.9	87.4		
Saturation (Wet Method), %	102.5	102.3		
Void Ratio	0.883	0.914		
Final				
Moisture Content, %	32.1	33.4		
Dry Density, pcf	89.9	88.3		
Cross-Sectional Area (Method A), in ²	6.216	6.232		
Saturation, %	100.0	100.0		
Void Ratio	0.861	0.894		
Back Pressure, psi	0.0000	0.0000		
Vertical Effective Consolidation Stress, psi	99.98	49.99		
Horizontal Effective Consolidation Stress, psi	99.99	49.99		
Vertical Strain after Consolidation, %	0.0000	0.0000		
Volumetric Strain after Consolidation, %	0.0000	0.0000		
Time to 50% Consolidation, min	0.0000	0.0000		
Shear Strength, psi	9.335	9.953		
Strain at Failure, %	11.7	7.61		
Strain Rate, %/min	1.000	1.000		
Deviator Stress at Failure, psi	18.67	19.91		
Effective Minor Principal Stress at Failure, psi	100.0	49.96		
Effective Major Principal Stress at Failure, psi	118.7	69.86		
B-Value	---	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 1	Tester: MD	Checker: DT
Sample Number: SS -531- 26	Test Date: 8/27/2026	Depth: 29.0 - 31.0
Test Number: UU -73-26	Preparation:	Elevation:
Description: 26" Gry Cly with Silt Laminations		
Remarks: Test Depth 29.6 - 30.1		

Unconsolidated Undrained by ASTM D4767

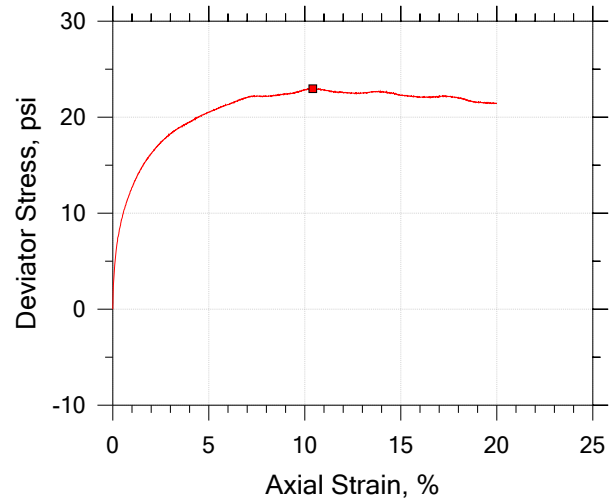
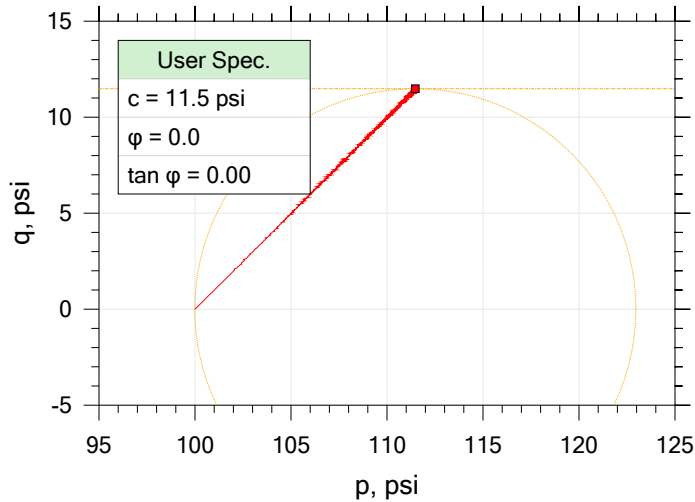


Symbol	■	●	▲	
Sample ID	SS-535 -26	SS-535 -26	SS-535 -26	
Depth	39.0 - 41.0	39.0 - 41.0	39.0 - 41.0	
Test Number	UU -40- 26	UU -41- 26	UU -42- 26	
Initial				
Height, in	5.749	5.751	5.762	
Diameter, in	2.835	2.834	2.847	
Moisture Content (from Cuttings), %	33.6	34.1	34.4	
Dry Density, pcf	89.1	88.8	88.3	
Saturation (Wet Method), %	102.6	103.2	103.2	
Void Ratio	0.877	0.884	0.895	
Final				
Moisture Content, %	32.3	32.6	33.1	
Dry Density, pcf	89.7	89.4	88.6	
Cross-Sectional Area (Method A), in²	6.285	6.282	6.351	
Saturation, %	100.0	100.0	100.0	
Void Ratio	0.865	0.872	0.888	
Back Pressure, psi	0.0000	0.0000	0.0000	
Vertical Effective Consolidation Stress, psi	99.98	74.98	50.00	
Horizontal Effective Consolidation Stress, psi	99.99	74.99	50.00	
Vertical Strain after Consolidation, %	0.0000	0.0000	0.0000	
Volumetric Strain after Consolidation, %	0.0000	0.0000	0.0000	
Time to 50% Consolidation, min	0.0000	0.0000	0.0000	
Shear Strength, psi	9.064	10.44	9.429	
Strain at Failure, %	19.7	10.5	17.0	
Strain Rate, %/min	1.000	1.000	1.000	
Deviator Stress at Failure, psi	18.13	20.88	18.86	
Effective Minor Principal Stress at Failure, psi	99.96	74.95	49.93	
Effective Major Principal Stress at Failure, psi	118.1	95.83	68.79	
B-Value	---	---	---	

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and φ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 1	Tester: MD	Checker: DT
Sample Number: SS-535 -26	Test Date: 8/3/2026	Depth: 39.0 - 41.0
Test Number: UU -40- 26	Preparation:	Elevation:
Description: 24" Gry Cly with Silt Deposit		
Remarks: Test Depth 39.2 - 39.7		

Unconsolidated Undrained by ASTM D4767

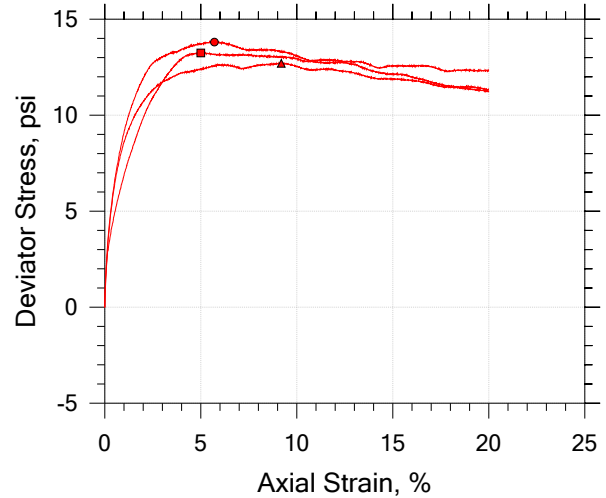
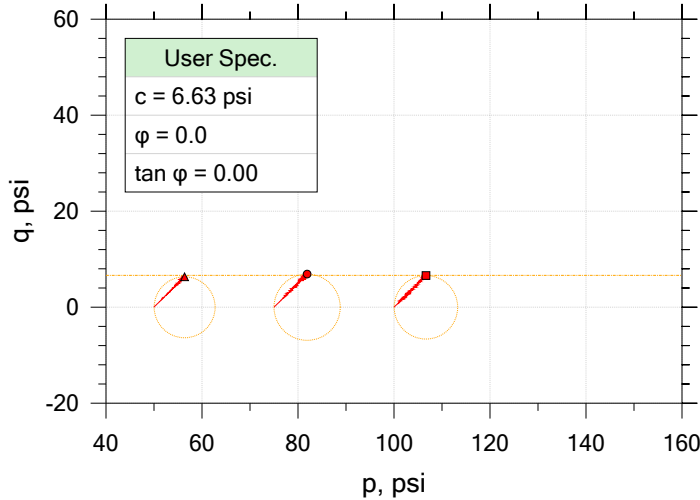


Symbol	■			
Sample ID	SS-540-26			
Depth	4.0 - 6.0			
Test Number	UU -56- 26			
Initial	Height, in	5.750		
	Diameter, in	2.830		
	Moisture Content (from Cuttings), %	27.0		
	Dry Density, pcf	96.9		
	Saturation (Wet Method), %	99.7		
Final	Void Ratio	0.727		
	Moisture Content, %	25.9		
	Dry Density, pcf	98.7		
	Cross-Sectional Area (Method A), in ²	6.211		
	Saturation, %	100.0		
	Void Ratio	0.695		
	Back Pressure, psi	0.0000		
	Vertical Effective Consolidation Stress, psi	99.99		
	Horizontal Effective Consolidation Stress, psi	100.0		
	Vertical Strain after Consolidation, %	0.0000		
	Volumetric Strain after Consolidation, %	0.0000		
	Time to 50% Consolidation, min	0.0000		
	Shear Strength, psi	11.49		
	Strain at Failure, %	10.4		
	Strain Rate, %/min	1.000		
	Deviator Stress at Failure, psi	22.97		
	Effective Minor Principal Stress at Failure, psi	100.0		
	Effective Major Principal Stress at Failure, psi	123.0		
	B-Value	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

	Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
	Boring Number: 2	Tester: MD	Checker: DT
	Sample Number: SS-540-26	Test Date: 8/10/2026	Depth: 4.0 - 6.0
	Test Number: UU -56- 26	Preparation:	Elevation:
	Description: 13"DarkBrn & Brn Cly with I.O. and Silt Deposits		
	Remarks: Test Depth 4.2 - 4.7		

Unconsolidated Undrained by ASTM D4767

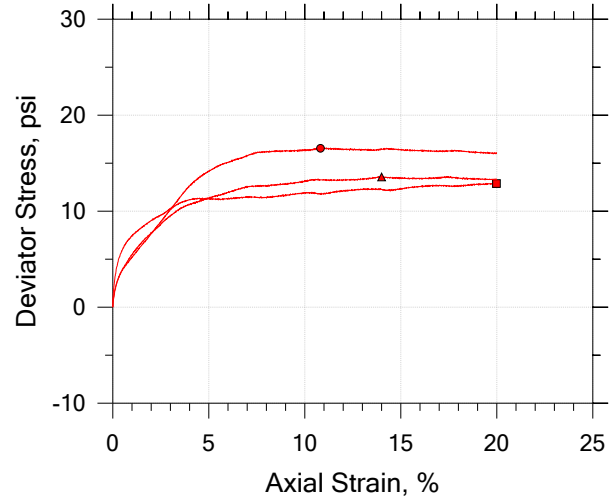
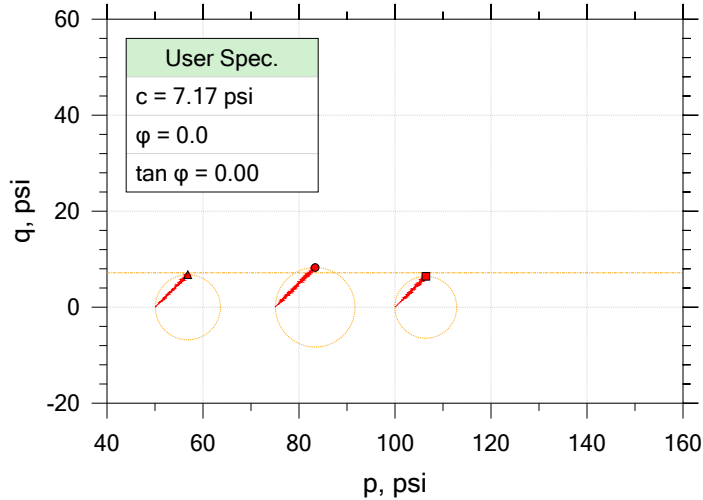


Symbol	■	●	▲	
Sample ID	SS-546 -26	SS-546 -26	SS-546 -26	
Depth	19.0 - 21.0	19.0 - 21.0	19.0 - 21.0	
Test Number	UU -53- 26	UU -54- 26	UU -55- 26	
Initial				
Height, in	5.730	5.743	5.735	
Diameter, in	2.817	2.828	2.838	
Moisture Content (from Cuttings), %	37.5	39.5	41.9	
Dry Density, pcf	85.2	82.1	80.8	
Saturation (Wet Method), %	104.3	102.0	104.8	
Void Ratio	0.964	1.04	1.07	
Final				
Moisture Content, %	35.1	37.9	39.4	
Dry Density, pcf	86.2	83.0	81.4	
Cross-Sectional Area (Method A), in ²	6.186	6.233	6.293	
Saturation, %	100.0	100.0	100.0	
Void Ratio	0.942	1.01	1.05	
Back Pressure, psi	0.0000	0.0000	0.0000	
Vertical Effective Consolidation Stress, psi	99.99	74.98	49.95	
Horizontal Effective Consolidation Stress, psi	100.0	74.98	49.97	
Vertical Strain after Consolidation, %	0.0000	0.0000	0.0000	
Volumetric Strain after Consolidation, %	0.0000	0.0000	0.0000	
Time to 50% Consolidation, min	0.0000	0.0000	0.0000	
Shear Strength, psi	6.621	6.905	6.352	
Strain at Failure, %	5.01	5.71	9.20	
Strain Rate, %/min	1.000	1.000	1.000	
Deviator Stress at Failure, psi	13.24	13.81	12.70	
Effective Minor Principal Stress at Failure, psi	100.1	75.03	50.06	
Effective Major Principal Stress at Failure, psi	113.3	88.83	62.77	
B-Value	---	---	---	

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 2	Tester: MD	Checker: DT
Sample Number: SS-546 -26	Test Date: 8/6/2026	Depth: 19.0 - 21.0
Test Number: UU -53- 26	Preparation:	Elevation:
Description: 25"Brn Gry Cly with I.O. Deposits		
Remarks: Test Depth 19.3 - 19.8		

Unconsolidated Undrained by ASTM D4767

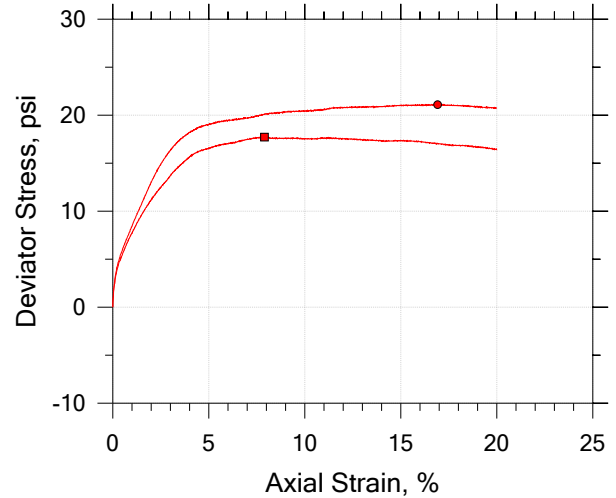
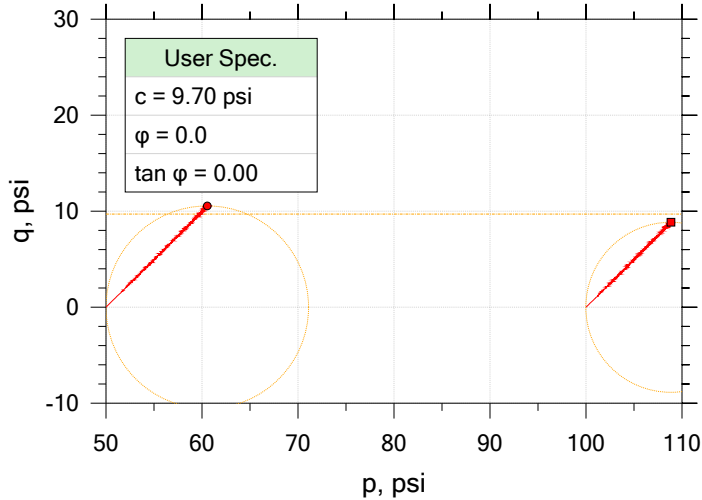


Symbol	■	●	▲	
Sample ID	SS-552 -26	SS-552 -26	SS-552 -26	
Depth	34.0 - 36.0	34.0 - 36.0	34.0 - 36.0	
Test Number	UU -50- 26	UU -51- 26	UU -52- 26	
Initial				
Height, in	5.746	5.750	5.749	
Diameter, in	2.830	2.815	2.812	
Moisture Content (from Cuttings), %	37.9	34.0	33.9	
Dry Density, pcf	84.7	86.2	85.8	
Saturation (Wet Method), %	104.0	96.8	95.7	
Void Ratio	0.976	0.941	0.950	
Final				
Moisture Content, %	35.9	34.4	34.7	
Dry Density, pcf	85.3	87.0	86.7	
Cross-Sectional Area (Method A), in ²	6.261	6.186	6.169	
Saturation, %	100.0	100.0	100.0	
Void Ratio	0.962	0.923	0.930	
Back Pressure, psi	0.0000	0.0000	0.0000	
Vertical Effective Consolidation Stress, psi	99.99	75.00	50.00	
Horizontal Effective Consolidation Stress, psi	100.0	74.99	50.00	
Vertical Strain after Consolidation, %	0.0000	0.0000	0.0000	
Volumetric Strain after Consolidation, %	0.0000	0.0000	0.0000	
Time to 50% Consolidation, min	0.0000	0.0000	0.0000	
Shear Strength, psi	6.445	8.280	6.782	
Strain at Failure, %	20.0	10.8	14.0	
Strain Rate, %/min	1.000	1.000	1.000	
Deviator Stress at Failure, psi	12.89	16.56	13.56	
Effective Minor Principal Stress at Failure, psi	99.96	75.11	49.98	
Effective Major Principal Stress at Failure, psi	112.9	91.67	63.55	
B-Value	---	---	---	

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 2	Tester: MD	Checker: DT
Sample Number: SS-552 -26	Test Date: 8/5/2026	Depth: 34.0 - 36.0
Test Number: UU -50- 26	Preparation:	Elevation:
Description: 25"Gry Silty Cly with Silt Layers		
Remarks: Test Depth 34.2 - 34.7		

Unconsolidated Undrained by ASTM D4767

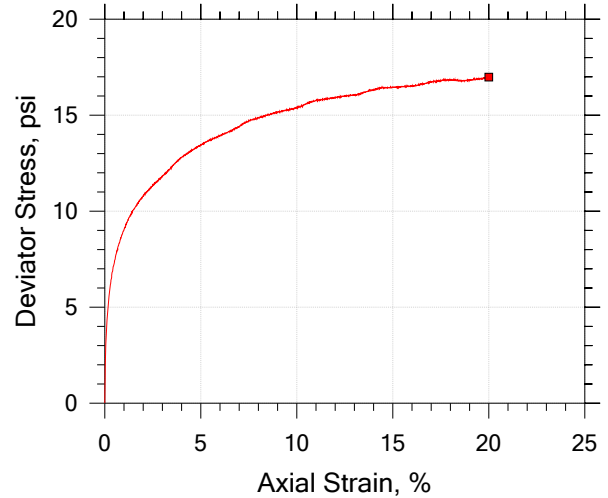
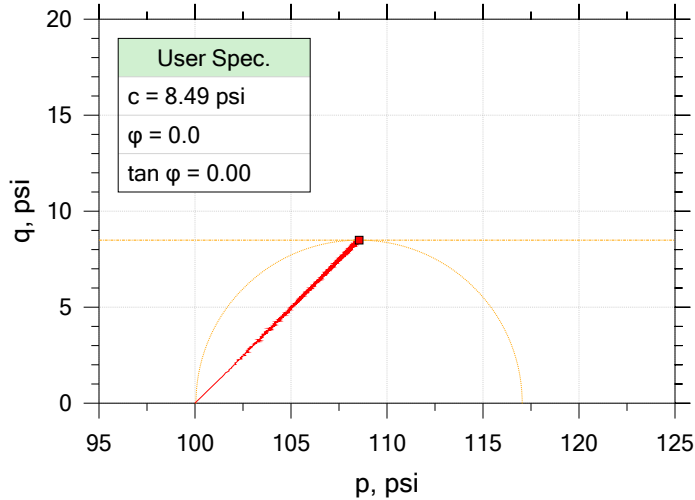


Symbol	■	●		
Sample ID	SS-555 -26	SS-555 -26		
Depth	39.0 - 41.0	39.0 - 41.0		
Test Number	UU -48- 26	UU -49- 26		
Initial				
Height, in	5.746	5.744		
Diameter, in	2.840	2.830		
Moisture Content (from Cuttings), %	35.6	40.2		
Dry Density, pcf	85.3	81.6		
Saturation (Wet Method), %	99.3	102.4		
Void Ratio	0.962	1.05		
Final				
Moisture Content, %	35.5	38.2		
Dry Density, pcf	85.7	82.7		
Cross-Sectional Area (Method A), in ²	6.312	6.232		
Saturation, %	100.0	100.0		
Void Ratio	0.951	1.02		
Back Pressure, psi	0.0000	0.0000		
Vertical Effective Consolidation Stress, psi	99.99	50.01		
Horizontal Effective Consolidation Stress, psi	100.0	50.00		
Vertical Strain after Consolidation, %	0.0000	0.0000		
Volumetric Strain after Consolidation, %	0.0000	0.0000		
Time to 50% Consolidation, min	0.0000	0.0000		
Shear Strength, psi	8.857	10.55		
Strain at Failure, %	7.90	16.9		
Strain Rate, %/min	1.000	1.000		
Deviator Stress at Failure, psi	17.71	21.10		
Effective Minor Principal Stress at Failure, psi	100.0	50.01		
Effective Major Principal Stress at Failure, psi	117.7	71.11		
B-Value	---	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 2	Tester: MD	Checker: DT
Sample Number: SS-555 -26	Test Date: 8/5/2026	Depth: 39.0 - 41.0
Test Number: UU -48- 26	Preparation:	Elevation:
Description: 26"Gry Silty Cly with Silt Laminations		
Remarks: Test Depth 39.2 - 39.7		

Unconsolidated Undrained by ASTM D4767

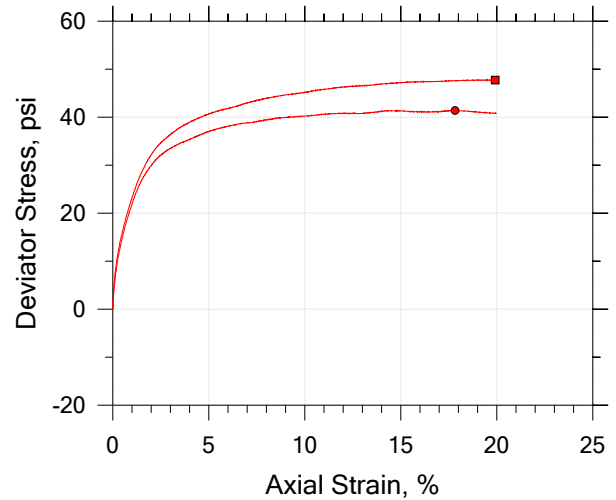
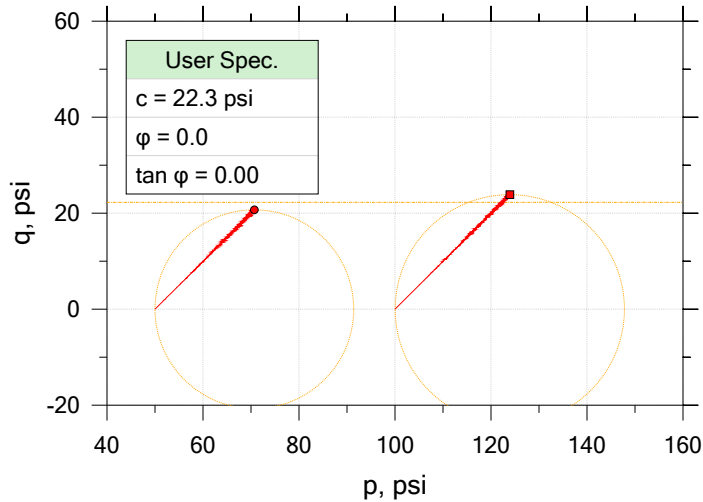


Symbol	■			
Sample ID	SS -560- 26			
Depth	4.0 - 6.0			
Test Number	UU -62- 26			
Initial	Height, in	5.746		
	Diameter, in	2.835		
	Moisture Content (from Cuttings), %	21.6		
	Dry Density, pcf	105.		
	Saturation (Wet Method), %	98.0		
	Void Ratio	0.590		
Final	Moisture Content, %	20.8		
	Dry Density, pcf	107.		
	Cross-Sectional Area (Method A), in ²	6.228		
	Saturation, %	100.0		
	Void Ratio	0.558		
	Back Pressure, psi	0.0000		
	Vertical Effective Consolidation Stress, psi	100.0		
	Horizontal Effective Consolidation Stress, psi	99.99		
	Vertical Strain after Consolidation, %	0.0000		
	Volumetric Strain after Consolidation, %	0.0000		
	Time to 50% Consolidation, min	0.0000		
	Shear Strength, psi	8.493		
	Strain at Failure, %	20.0		
	Strain Rate, %/min	1.000		
	Deviator Stress at Failure, psi	16.99		
	Effective Minor Principal Stress at Failure, psi	100.1		
	Effective Major Principal Stress at Failure, psi	117.1		
	B-Value	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

	Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
	Boring Number: 3	Tester: MD	Checker: DT
	Sample Number: SS -560- 26	Test Date: 8/13/2026	Depth: 4.0 - 6.0
	Test Number: UU -62- 26	Preparation:	Elevation:
	Description: 13" Brn Cly with I.O & Silt Deposits		
	Remarks: Test Depth 4.5 - 5.0		

Unconsolidated Undrained by ASTM D4767

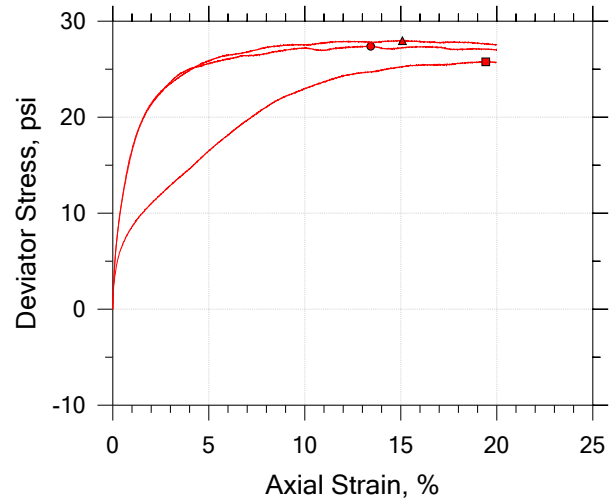
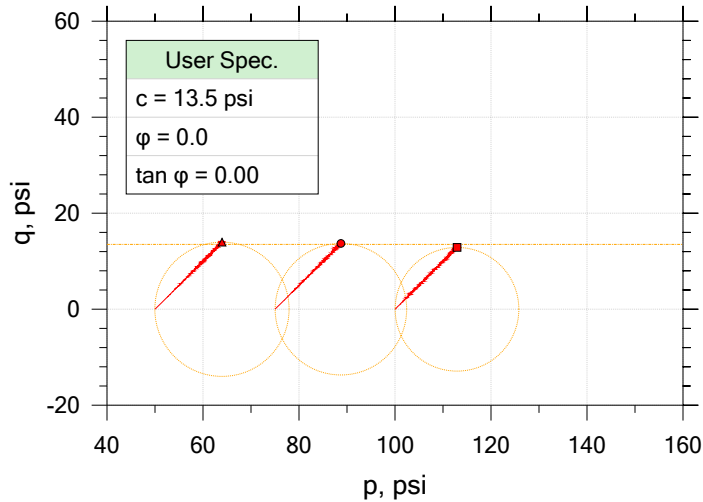


Symbol	■	●		
Sample ID	SS-566-26	SS-566-26		
Depth	19.0 - 21.0	19.0 - 21.0		
Test Number	UU-60-26	UU-61-26		
Initial				
Height, in	5.737	5.750		
Diameter, in	2.852	2.848		
Moisture Content (from Cuttings), %	23.2	22.8		
Dry Density, pcf	103.	104.		
Saturation (Wet Method), %	100.2	99.5		
Void Ratio	0.620	0.613		
Final				
Moisture Content, %	21.8	22.8		
Dry Density, pcf	106.	104.		
Cross-Sectional Area (Method A), in ²	6.296	6.364		
Saturation, %	100.0	100.0		
Void Ratio	0.585	0.611		
Back Pressure, psi	0.0000	0.0000		
Vertical Effective Consolidation Stress, psi	99.99	50.01		
Horizontal Effective Consolidation Stress, psi	100.0	50.00		
Vertical Strain after Consolidation, %	0.0000	0.0000		
Volumetric Strain after Consolidation, %	0.0000	0.0000		
Time to 50% Consolidation, min	0.0000	0.0000		
Shear Strength, psi	23.88	20.70		
Strain at Failure, %	19.9	17.8		
Strain Rate, %/min	1.000	1.000		
Deviator Stress at Failure, psi	47.76	41.41		
Effective Minor Principal Stress at Failure, psi	100.1	50.03		
Effective Major Principal Stress at Failure, psi	147.9	91.44		
B-Value	---	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 3	Tester: MD	Checker: DT
Sample Number: SS-566-26	Test Date: 8/13/2026	Depth: 19.0 - 21.0
Test Number: UU-60-26	Preparation:	Elevation:
Description: 20" Brn Gry Cly with I.O., Silt, & Coal Deposits		
Remarks: Test Depth 19.2 - 19.7		

Unconsolidated Undrained by ASTM D4767

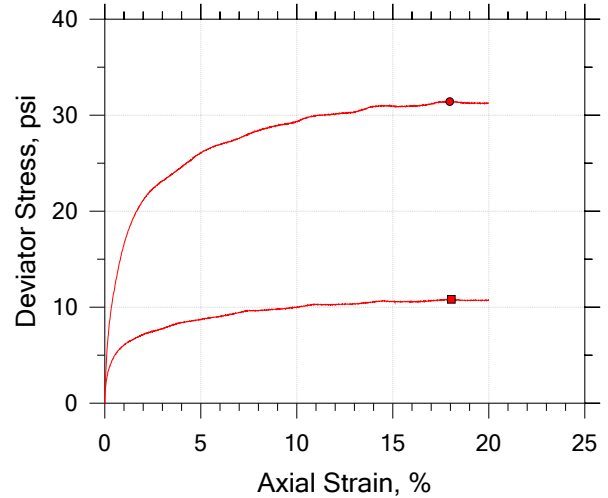
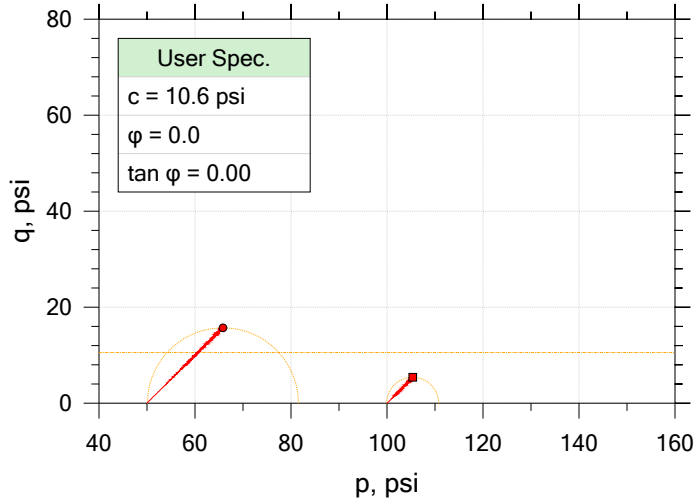


Symbol	■	●	▲	
Sample ID	SS-571-26	SS-571-26	SS-571-26	
Depth	34.0 - 36.0	34.0 - 36.0	34.0 - 36.0	
Test Number	UU -57- 26	UU -58- 26	UU -59- 26	
Initial				
Height, in	5.737	5.746	5.745	
Diameter, in	2.852	2.858	2.853	
Moisture Content (from Cuttings), %	26.0	26.0	26.0	
Dry Density, pcf	101.	101.	101.	
Saturation (Wet Method), %	106.1	105.6	106.3	
Void Ratio	0.657	0.660	0.655	
Final				
Moisture Content, %	23.9	24.4	24.1	
Dry Density, pcf	102.	101.	102.	
Cross-Sectional Area (Method A), in ²	6.347	6.400	6.369	
Saturation, %	100.0	100.0	100.0	
Void Ratio	0.641	0.654	0.646	
Back Pressure, psi	0.0000	0.0000	0.0000	
Vertical Effective Consolidation Stress, psi	99.99	75.00	49.99	
Horizontal Effective Consolidation Stress, psi	99.98	74.99	49.99	
Vertical Strain after Consolidation, %	0.0000	0.0000	0.0000	
Volumetric Strain after Consolidation, %	0.0000	0.0000	0.0000	
Time to 50% Consolidation, min	0.0000	0.0000	0.0000	
Shear Strength, psi	12.89	13.69	13.99	
Strain at Failure, %	19.4	13.4	15.1	
Strain Rate, %/min	1.000	1.000	1.000	
Deviator Stress at Failure, psi	25.78	27.39	27.98	
Effective Minor Principal Stress at Failure, psi	100.2	75.07	50.04	
Effective Major Principal Stress at Failure, psi	125.9	102.5	78.02	
B-Value	---	---	---	

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 3	Tester: MD	Checker: DT
Sample Number: SS-571-26	Test Date: 8/11/2026	Depth: 34.0 - 36.0
Test Number: UU -57- 26	Preparation:	Elevation:
Description: 25" Gry Silty Cly with Silt Deposits, Rocks up to 1"		
Remarks: Test Depth 34.2 -34.7		

Unconsolidated Undrained by ASTM D4767

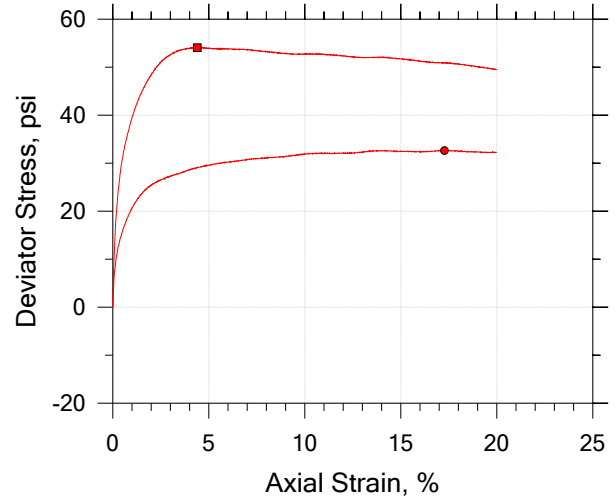
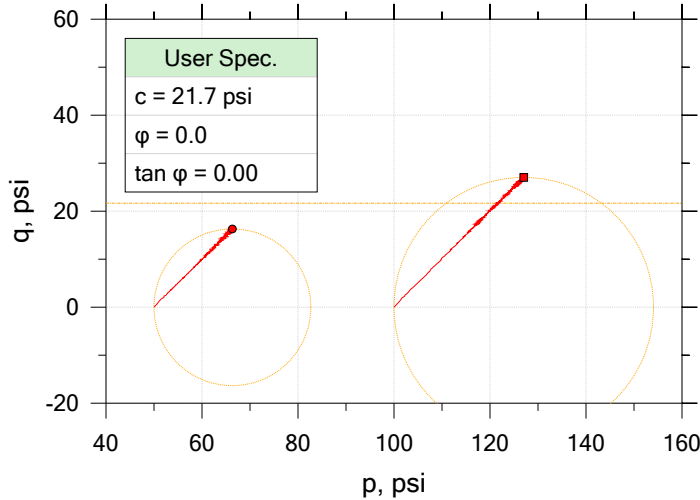


Symbol	■	●		
Sample ID	SS -578- 26	SS -578- 26		
Depth	4.0 - 6.0	4.0 - 6.0		
Test Number	UU -71-26	UU -72-26		
Initial				
Height, in	5.733	5.745		
Diameter, in	2.840	2.859		
Moisture Content (from Cuttings), %	25.0	22.1		
Dry Density, pcf	99.7	107.		
Saturation (Wet Method), %	98.7	104.3		
Void Ratio	0.679	0.567		
Final				
Moisture Content, %	24.0	20.6		
Dry Density, pcf	102.	108.		
Cross-Sectional Area (Method A), in ²	6.242	6.381		
Saturation, %	100.0	100.0		
Void Ratio	0.643	0.553		
Back Pressure, psi	0.0000	0.008095		
Vertical Effective Consolidation Stress, psi	100.0	50.00		
Horizontal Effective Consolidation Stress, psi	100.0	49.99		
Vertical Strain after Consolidation, %	0.0000	0.0000		
Volumetric Strain after Consolidation, %	0.0000	0.0000		
Time to 50% Consolidation, min	0.0000	0.0000		
Shear Strength, psi	5.414	15.71		
Strain at Failure, %	18.1	18.0		
Strain Rate, %/min	1.000	1.000		
Deviator Stress at Failure, psi	10.83	31.42		
Effective Minor Principal Stress at Failure, psi	99.83	50.05		
Effective Major Principal Stress at Failure, psi	110.7	81.47		
B-Value	---	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 4	Tester: MD	Checker: DT
Sample Number: SS -578- 26	Test Date: 8/20/2026	Depth: 4.0 - 6.0
Test Number: UU -71-26	Preparation:	Elevation:
Description: 20" Brn Cly with I.O. & Silt Deposit		
Remarks: Test Depth 4.3 -4.8		

Unconsolidated Undrained by ASTM D4767

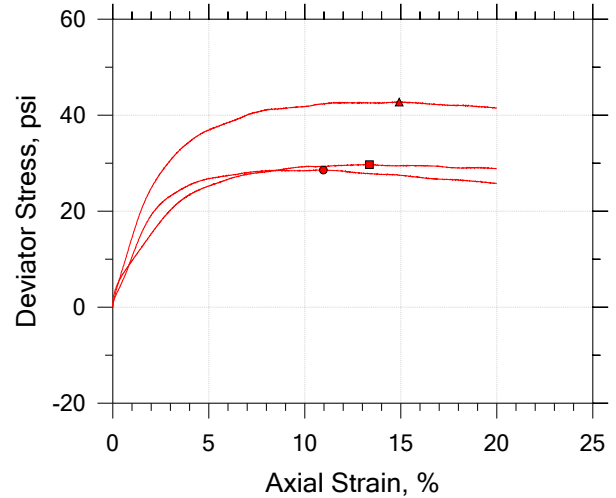
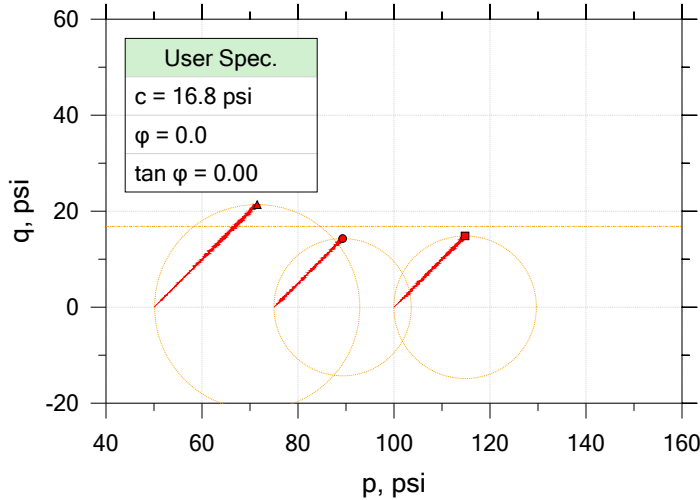


Symbol	■	●		
Sample ID	SS -580- 26	SS -580- 26		
Depth	9.0 - 11.0	9.0 - 11.0		
Test Number	UU -69-26	UU -70-26		
Initial				
Height, in	5.753	5.749		
Diameter, in	2.832	2.856		
Moisture Content (from Cuttings), %	21.7	22.8		
Dry Density, pcf	99.9	101.		
Saturation (Wet Method), %	86.3	94.1		
Void Ratio	0.675	0.650		
Final				
Moisture Content, %	22.1	23.0		
Dry Density, pcf	105.	104.		
Cross-Sectional Area (Method A), in ²	6.087	6.318		
Saturation, %	100.0	100.0		
Void Ratio	0.592	0.616		
Back Pressure, psi	0.0000	0.0000		
Vertical Effective Consolidation Stress, psi	100.0	49.99		
Horizontal Effective Consolidation Stress, psi	99.99	49.99		
Vertical Strain after Consolidation, %	0.0000	0.0000		
Volumetric Strain after Consolidation, %	0.0000	0.0000		
Time to 50% Consolidation, min	0.0000	0.0000		
Shear Strength, psi	27.03	16.32		
Strain at Failure, %	4.40	17.3		
Strain Rate, %/min	1.000	1.000		
Deviator Stress at Failure, psi	54.07	32.65		
Effective Minor Principal Stress at Failure, psi	100.0	49.98		
Effective Major Principal Stress at Failure, psi	154.1	82.63		
B-Value	---	---		

Notes:
 - Before Shear Saturation set to 100% for phase calculation.
 - Moisture Content determined by ASTM D2216.
 - Deviator Stress includes membrane correction.
 - Values for c and ϕ determined from best-fit straight line for the specific test conditions.
 Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 4	Tester: MD	Checker: DT
Sample Number: SS -580- 26	Test Date: 8/19/2026	Depth: 9.0 - 11.0
Test Number: UU -69-26	Preparation:	Elevation:
Description: 15" Blk Gry Cly with I.O. Deposits, Organics		
Remarks: Test Depth 9.2 - 9.7		

Unconsolidated Undrained by ASTM D4767

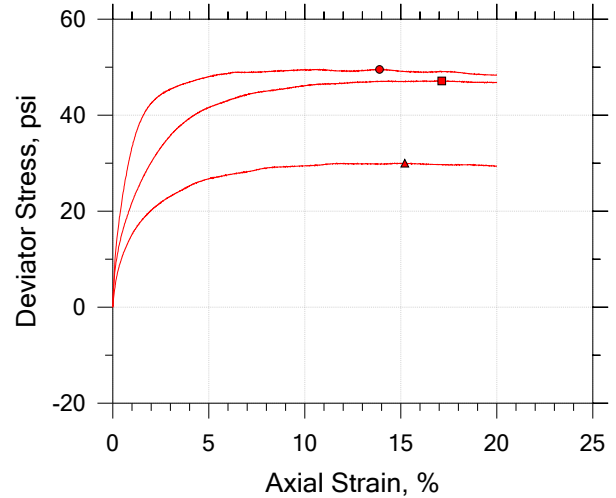
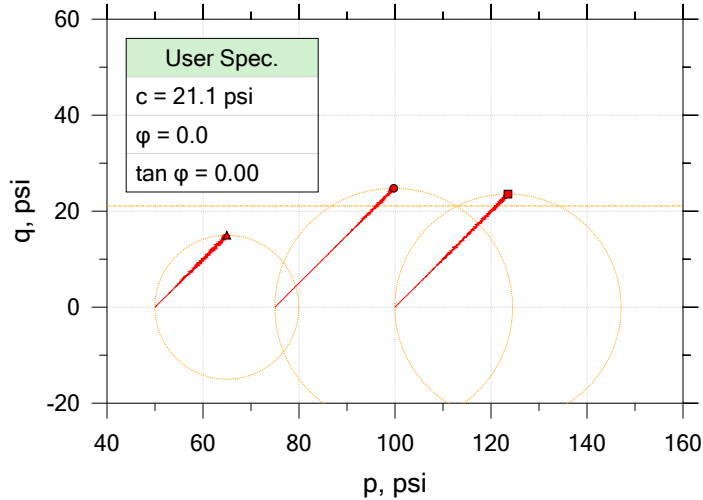


Symbol	■	●	▲	
Sample ID	SS -584- 26	SS -584- 26	SS -584- 26	
Depth	19.0 - 21.0	19.0 - 21.0	19.0 - 21.0	
Test Number	UU -66- 26	UU -67- 26	UU -68-26	
Initial				
Height, in	5.746	5.749	5.748	
Diameter, in	2.850	2.851	2.842	
Moisture Content (from Cuttings), %	22.2	22.1	22.0	
Dry Density, pcf	105.	105.	106.	
Saturation (Wet Method), %	100.6	98.8	101.6	
Void Ratio	0.590	0.599	0.579	
Final				
Moisture Content, %	21.7	22.3	21.4	
Dry Density, pcf	106.	105.	106.	
Cross-Sectional Area (Method A), in ²	6.352	6.378	6.330	
Saturation, %	100.0	100.0	100.0	
Void Ratio	0.580	0.597	0.574	
Back Pressure, psi	0.0000	0.0000	0.0000	
Vertical Effective Consolidation Stress, psi	99.98	75.01	50.01	
Horizontal Effective Consolidation Stress, psi	99.99	75.01	49.99	
Vertical Strain after Consolidation, %	0.0000	0.0000	0.0000	
Volumetric Strain after Consolidation, %	0.0000	0.0000	0.0000	
Time to 50% Consolidation, min	0.0000	0.0000	0.0000	
Shear Strength, psi	14.86	14.29	21.37	
Strain at Failure, %	13.4	11.0	14.9	
Strain Rate, %/min	1.000	1.000	1.000	
Deviator Stress at Failure, psi	29.72	28.59	42.74	
Effective Minor Principal Stress at Failure, psi	100.0	75.02	50.13	
Effective Major Principal Stress at Failure, psi	129.7	103.6	92.87	
B-Value	---	---	---	

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and ϕ determined from best-fit straight line for the specific test conditions.
Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 4	Tester: MD	Checker: DT
Sample Number: SS -584- 26	Test Date: 8/18/2026	Depth: 19.0 - 21.0
Test Number: UU -66- 26	Preparation:	Elevation:
Description: 25" Brn Cly with I.O,Sand, Coal & Silt Deposits, Rock up to 3/4"		
Remarks: Test Depth 19.3 -19.8		

Unconsolidated Undrained by ASTM D4767



Symbol	■	●	▲	
Sample ID	SS -590- 26	SS -590- 26	SS -590- 26	
Depth	34.0 - 36.0	34.0 - 36.0	34.0 - 36.0	
Test Number	UU -63- 26	UU -64- 26	UU -65- 26	
Initial				
Height, in	5.742	5.767	5.755	
Diameter, in	2.862	2.863	2.859	
Moisture Content (from Cuttings), %	24.5	23.5	24.3	
Dry Density, pcf	103.	101.	99.9	
Saturation (Wet Method), %	104.8	95.9	96.7	
Void Ratio	0.627	0.658	0.675	
Final				
Moisture Content, %	22.3	23.9	25.0	
Dry Density, pcf	105.	102.	100.	
Cross-Sectional Area (Method A), in ²	6.358	6.393	6.405	
Saturation, %	100.0	100.0	100.0	
Void Ratio	0.599	0.641	0.669	
Back Pressure, psi	0.0000	0.0000	0.0000	
Vertical Effective Consolidation Stress, psi	99.97	75.00	49.99	
Horizontal Effective Consolidation Stress, psi	99.99	74.99	49.99	
Vertical Strain after Consolidation, %	0.0000	0.0000	0.0000	
Volumetric Strain after Consolidation, %	0.0000	0.0000	0.0000	
Time to 50% Consolidation, min	0.0000	0.0000	0.0000	
Shear Strength, psi	23.57	24.77	15.00	
Strain at Failure, %	17.1	13.9	15.2	
Strain Rate, %/min	1.000	1.000	1.000	
Deviator Stress at Failure, psi	47.14	49.54	29.99	
Effective Minor Principal Stress at Failure, psi	99.91	74.96	50.00	
Effective Major Principal Stress at Failure, psi	147.0	124.5	79.99	
B-Value	---	---	---	

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and ϕ determined from best-fit straight line for the specific test conditions.
Actual strength parameters may vary and should be determined by an engineer for site conditions.

Project Name: Culverts	Location: Bismarck, ND	Project Number: 1-094(238)172
Boring Number: 4	Tester: MD	Checker: DT
Sample Number: SS -590- 26	Test Date: 8/17/2026	Depth: 34.0 - 36.0
Test Number: UU -63- 26	Preparation:	Elevation:
Description: 23" Brn Cly with I.O & Silt Deposits, Rock up to 3/8"		
Remarks: Test Depth 34.2 - 34.7		