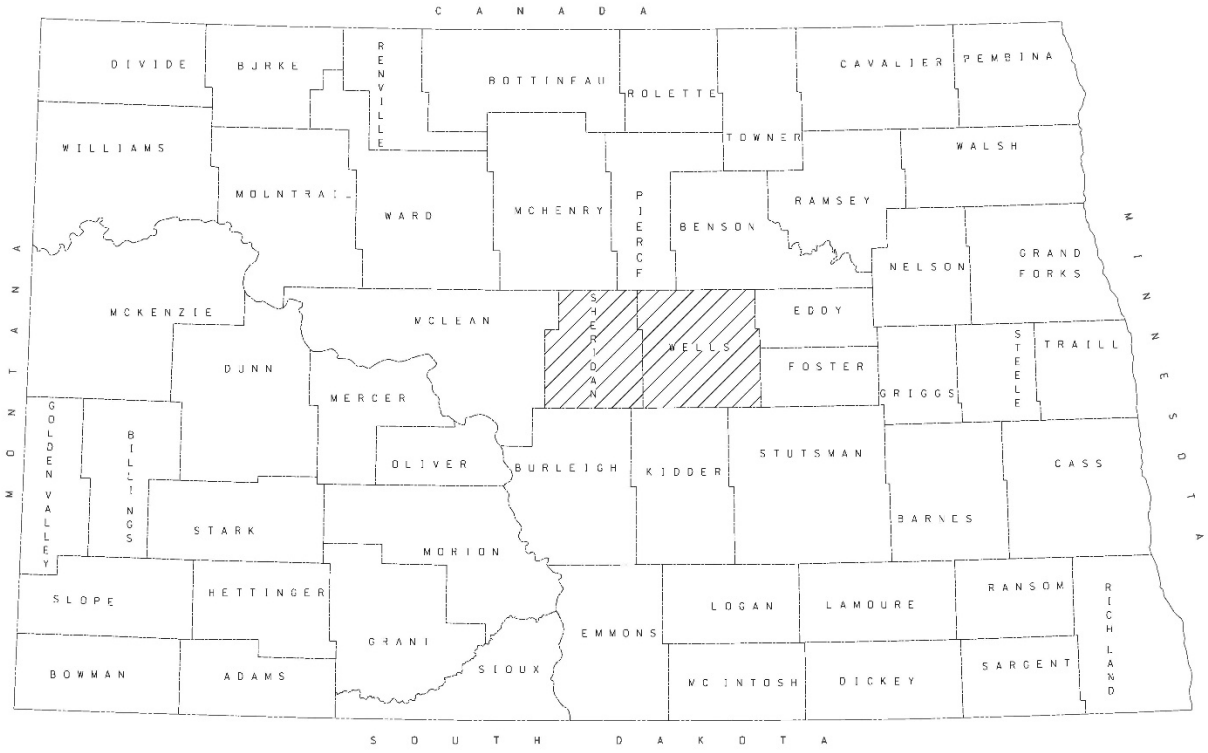
Borrow Site Report #1

PROJECT NO. NH-1-200(073)236

PCN 21508

COUNTY Sheridan & Wells

ND Highway 200 From RP 236.269 to RP 252.062



PREPARED BY: Jordan M. Nehls, P.E.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

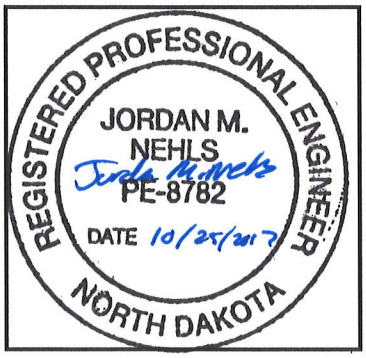
October 2017

NH-1-200(073)236

Highway 200 from Junction Highway 14 East to West Junction of Highway 3

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 Jordan M. Nehls, Registration number PE-8782 on 10/25/2017 and the original document is stored at the North Dakota Department of Transportation.



Jordan M. Nehls
Jordan M. Nehls, P.E.

10/25/2017
Date

Borrow Site Investigation

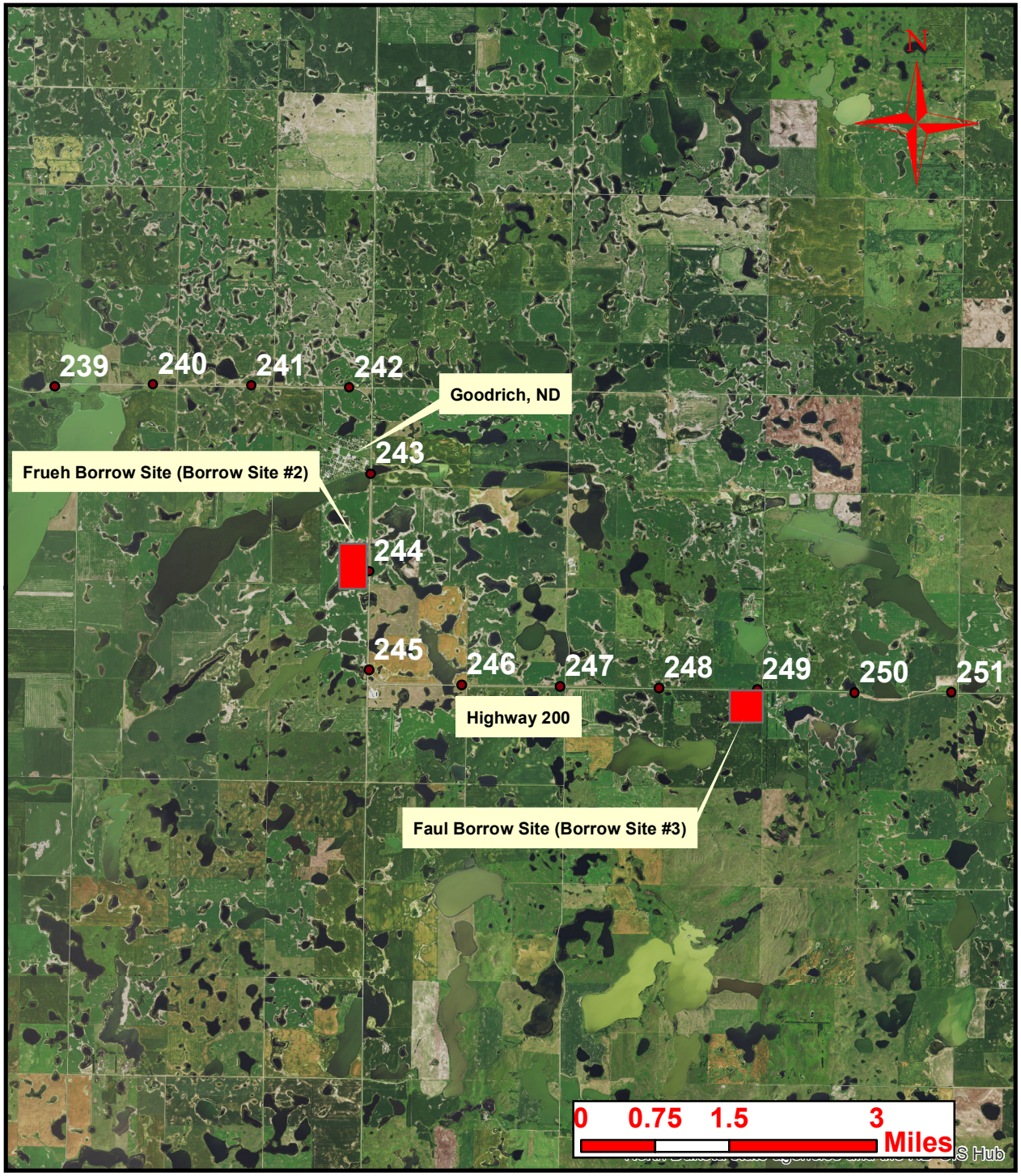
Project: NH-1-200(073)236

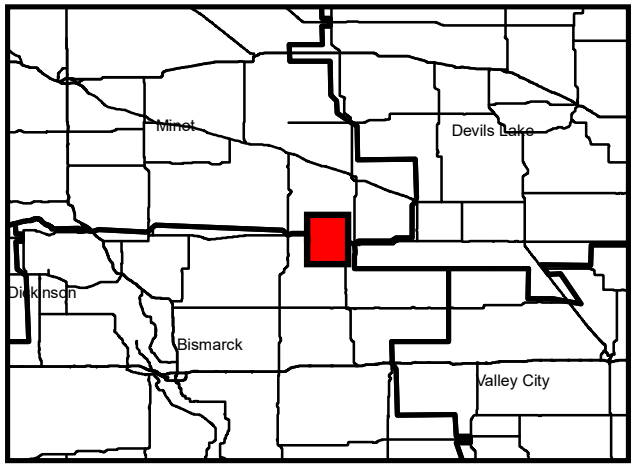
PCN: 21508

Scope: Sliver Grading, Milling, RAP Overlay, Intersections, Pipe Extensions

Length:15.84 Miles

Location: Highway 200 From Junction Highway 14 East to West Junction Highway 3





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Introduction

This report includes the investigation of two of the borrow sites on project NH-1-200(073)236. The borrow sites included in this report are the Frueh and Faul borrow sites. The field and subsurface investigation was conducted on 9/6/2017 in order to develop this report.

Sampling and Testing Procedures:

Borings were conducted with a six inch solid flight auger. Soil samples were taken at each boring location. Borings that had significant changes in soil type were split into separate samples. Moisture content samples were taken at 1 foot intervals.

The samples were submitted to the laboratory for determination of AASHTO classification, moisture content, dry density, sieve analysis, and Atterberg limits.

Frueh Borrow Site (Borrow Site #2)

This borrow site was drilled on 9/6/2017. A total of 9 borings were conducted at this location. A summary of the boring data is shown in Table 1. Detailed data is in Appendix B.

Table 1 - Summary of Frueh Borrow (Borrow Site #2)

Boring Number	Lab Number	Depth of Sample	AASHTO Class	USCS Class	Average In Place Moisture Content	Optimum Moisture Content T-180	Max Dry Density
		feet			%	%	lb/ft^3
1	788	0.6–5.0	A-7-6(17)	CL	13.9	12.0	123.3
2	789	1.0-10.0	A-7-6(16)	CL	17.2	13.1	121.1
3	790	1.0-5.0	A-1-b(0)	SM	8.1	7.8	136.0
4	791	0.6–5.0	A-7-6(19)	CL	14.7	12.6	121.3
5	792	0.5-10.0	A-7-6(18)	CL	23.9	13.1	121.0
6	793	0.4-5.0	A-7-6(18)	CL	14.0	11.3	126.0
7	794	0.4-5.0	A-7-6(21)	CL	16.5	12.6	121.3
8	795	0.5-5.0	A-7-6(20)	CL	17.5	11.6	121.8
9	796	1.5-5.0	A-7-6(19)	CL	18.7	11.9	122.2

Faul Borrow Site (Borrow Site #3)

This borrow site was drilled on 9/6/2017. A total of 10 borings were conducted at this location. A summary of the boring data is shown in Table 2. Detailed data is in Appendix C.

Table 2 - Summary of Faul Borrow (Borrow Site #3)

Boring Number	Lab Number	Depth of Sample	AASHTO Class	USCS Class	Average In Place Moisture Content	Optimum Moisture Content T-180	Max Dry Density
		feet			%	%	lb/ft^3
1	797	0.6–5.0	A-7-6(16)	CL	14.4	11.5	124.3
2	798	0.6-15.0	A-6(12)	CL	16.8	11.6	124.3
3	799	0.6-10.0	A-7-6(13)	CL	16.8	12.1	123.3
4	800	0.6-10.0	A-7-6(16)	CL	17.2	12.1	123.4
5	801	0.6-10.0	A-6(16)	CL	17.9	11.9	123.2
6	802	0.6-10.0	A-6(13)	CL	15.4	10.9	124.2
7	803	0.6-5.0	A-6(12)	CL	13.2	11.0	124.9
8	804	0.5-10.0	A-6(12)	CL	15.6	11.7	124.2
9	805	0.4-10.0	A-6(13)	CL	17.2	11.3	124.9
10	806	1.2-5.0	A-6(10)	CL	15.3	11.3	124.0

Summary and Recommendations

Frueh Borrow Site (Borrow Site #2) Recommendation

A majority of the soils encountered in the Frueh Borrow Site were sandy lean clays that classified as A-7-6 soils with marginal swell potential and low group index on average with the exception of one sample. That sample was a silty sand with gravel and classified as an A-1-b. The soils generally have a moisture content 0-6% over optimum. The soils appear to be fairly uniform throughout the borrow pit.

The material in this borrow site will perform adequately as subgrade material.

Faul Borrow Site (Borrow Site #3) Recommendation

A majority of the soils encountered in Faul Borrow Site were sandy lean clay classified as A-6 or A-7-6 soils with marginal swell potential and low group index on average. The soils generally have a moisture content 0-6% over optimum. The soils appear to be fairly uniform throughout the borrow pit.

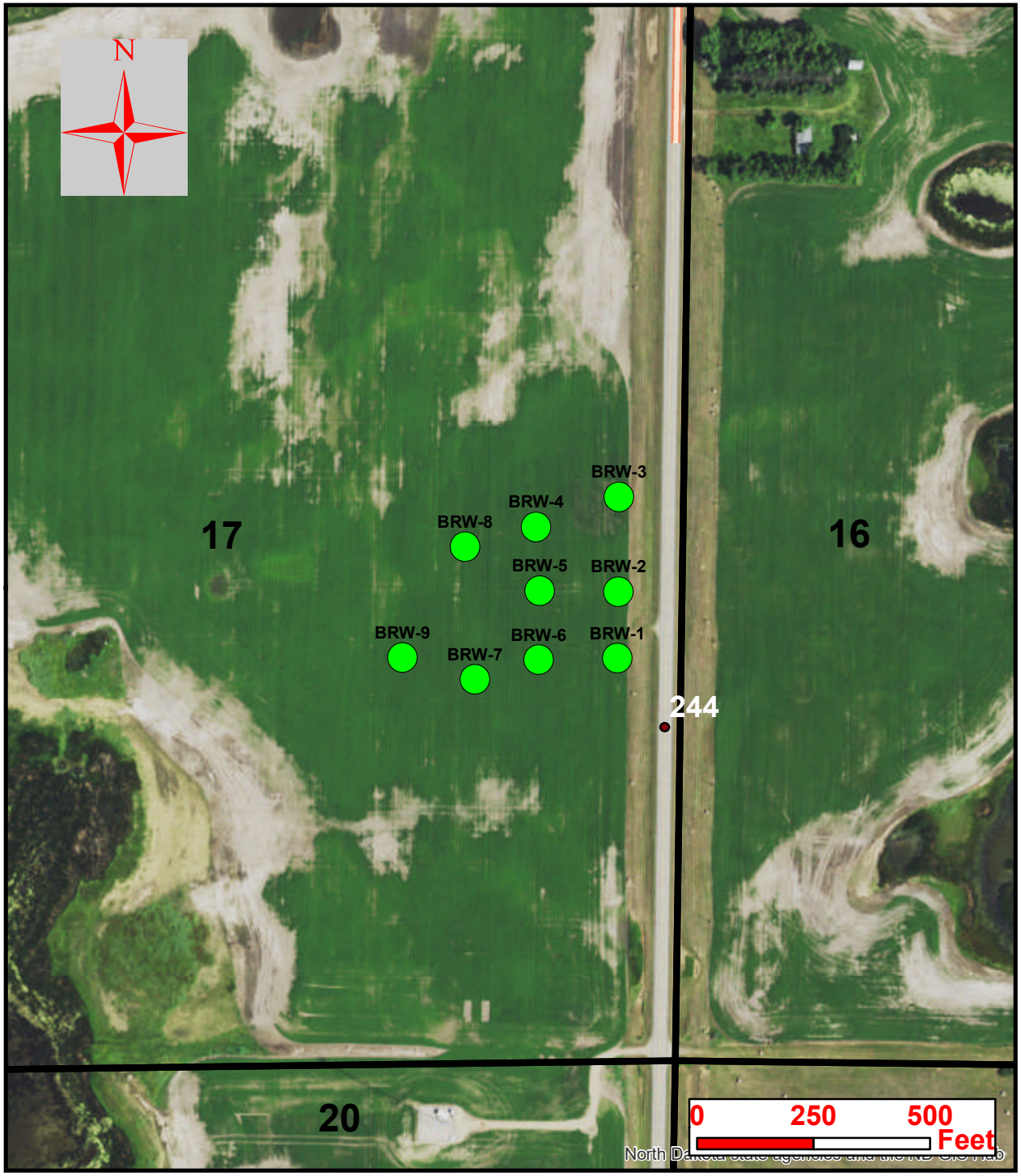
The material in this borrow site will perform adequately as subgrade material.

Moisture and Density Controls

Moisture and Density for all borrow material shall be in accordance with AASHTO T-180.

APPENDIX A

Map of Boring Locations



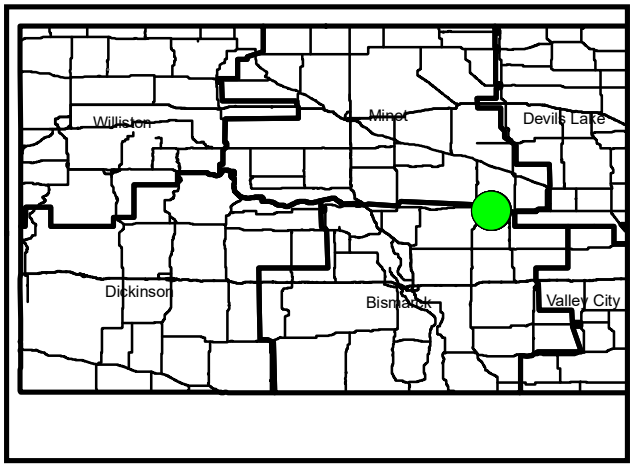
Frueh Borrow Site

Project: NH-1-200(073)36
PCN: 21508

Location: SE 1/4
Sec17, T.146N, R.74W

Legend

- Boring Locations
- Reference Points



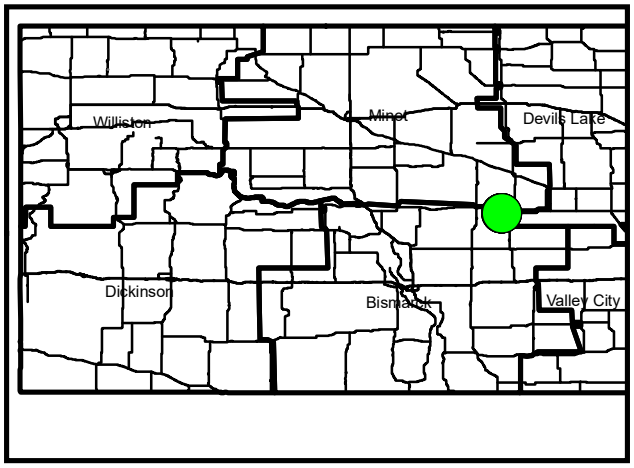
Faul Borrow Site

Project: NH-1-200(073)36
PCN: 21508

Location: NE 1/4
Sec25, T.146N, R.74W

Legend

- Boring Locations
- Reference Points



APPENDIX B

Summary and Lab Results For Frueh Borrow Site (Borrow Site #2)

SUMMARY OF LABORATORY RESULTS

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

PROJECT NUMBER NH-1-200(073)236 #1 **LOCATION** Sheridan County

PCN 21508

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BRW - 1	1.0	43	17	26	25	68	A-7-6 (16)	CL	18.8			
BRW - 1	2.0								10.5			
BRW - 1	3.0								10.8			
BRW - 1	4.0								12.3			
BRW - 1	5.0								17.0			
BRW - 2	1.0	44	17	27	9.5	68	A-7-6 (16)	CL	13.4			
BRW - 2	2.0								13.8			
BRW - 2	3.0								12.3			
BRW - 2	4.0								16.6			
BRW - 2	5.0								18.0			
BRW - 2	6.0								17.9			
BRW - 2	7.0								17.5			
BRW - 2	8.0								22.1			
BRW - 2	9.0								20.5			
BRW - 2	10.0								20.4			
BRW - 3	1.0	NP	NP	NP	25	13	A-1-b (0)	SM	17.4			
BRW - 3	2.0								5.4			
BRW - 3	3.0								4.0			
BRW - 3	4.0								6.1			
BRW - 3	5.0								7.6			
BRW - 4	1.0	48	17	31	9.5	68	A-7-6 (19)	CL	16.8			
BRW - 4	2.0								11.0			
BRW - 4	3.0								12.5			
BRW - 4	4.0								15.2			
BRW - 4	5.0								17.8			
BRW - 5	1.0	45	17	28	25	70	A-7-6 (18)	CL	20.4			
BRW - 5	2.0								11.5			
BRW - 5	3.0								59.2			
BRW - 5	4.0								20.2			
BRW - 5	5.0								17.8			
BRW - 5	6.0								19.7			
BRW - 5	7.0								20.5			
BRW - 5	8.0								22.6			
BRW - 5	9.0								23.9			
BRW - 5	10.0								23.6			
BRW - 6	1.0	44	14	30	9.5	68	A-7-6 (18)	CL	18.5			
BRW - 6	2.0								9.3			
BRW - 6	3.0								10.4			
BRW - 6	4.0								15.7			
BRW - 6	5.0								15.9			
BRW - 7	1.0	49	16	33	25	69	A-7-6 (21)	CL	17.3			
BRW - 7	2.0								12.7			
BRW - 7	3.0								16.0			

SUMMARY OF LABORATORY RESULTS

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

PROJECT NUMBER NH-1-200(073)236 #1 **LOCATION** Sheridan County

PCN 21508

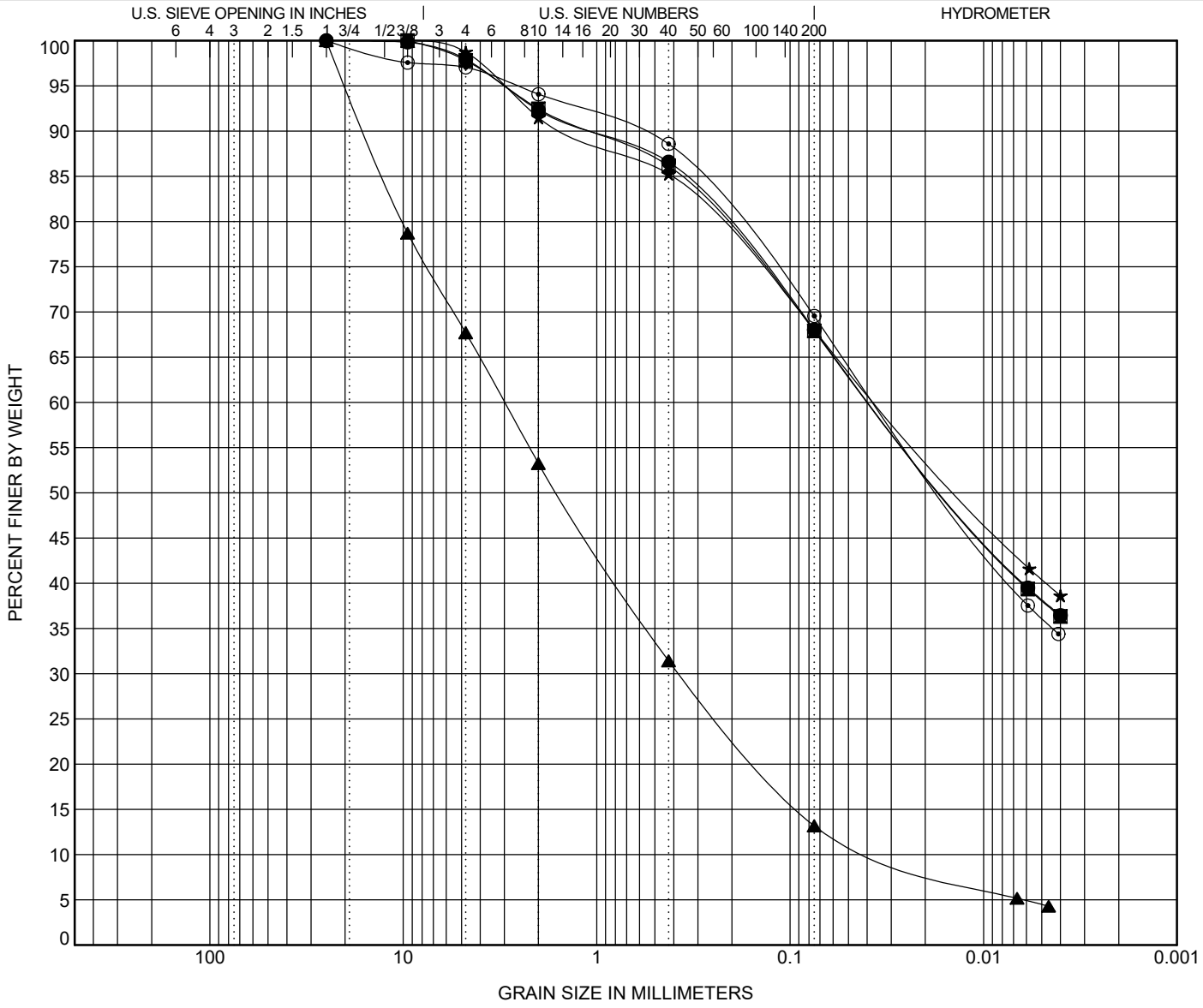
Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BRW - 7	4.0								19.0			
BRW - 7	5.0								17.4			
BRW - 8	1.0	46	16	30	25	72	A-7-6 (20)	CL	21.5			
BRW - 8	2.0								10.0			
BRW - 8	3.0								18.2			
BRW - 8	4.0								18.7			
BRW - 8	5.0								19.3			
BRW - 9	1.0	45	16	29	25	71	A-7-6 (19)	CL	22.4			
BRW - 9	2.0								17.0			
BRW - 9	3.0								17.8			
BRW - 9	4.0								17.8			
BRW - 9	5.0								18.3			

GRAIN SIZE DISTRIBUTION

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

PROJECT NUMBER NH-1-200(073)236 #1 **LOCATION** Sheridan County

PCN 21508



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
●	**BRW - 1**	**1.0**	**A-7-6 (16)**	**CL**	**43**	**17**	**26**		
⊠	**BRW - 2**	**1.0**	**A-7-6 (16)**	**CL**	**44**	**17**	**27**		
▲	**BRW - 3**	**1.0**	**A-1-b (0)**	**SM**	**NP**	**NP**	**NP**	**1.60**	**104.24**
★	**BRW - 4**	**1.0**	**A-7-6 (19)**	**CL**	**48**	**17**	**31**		
⊙	**BRW - 5**	**1.0**	**A-7-6 (18)**	**CL**	**45**	**17**	**28**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BRW - 1**	**1.0**	**25**	**0.037**			**2.1**	**29.9**	**29.8**	**38.2**
⊠	**BRW - 2**	**1.0**	**9.5**	**0.037**			**2.2**	**29.9**	**29.8**	**38.1**
▲	**BRW - 3**	**1.0**	**25**	**2.997**	**0.371**	**0.029**	**32.3**	**54.5**	**8.7**	**4.5**
★	**BRW - 4**	**1.0**	**9.5**	**0.035**			**1.3**	**30.7**	**27.6**	**40.4**
⊙	**BRW - 5**	**1.0**	**25**	**0.035**			**3.0**	**27.5**	**33.4**	**36.1**

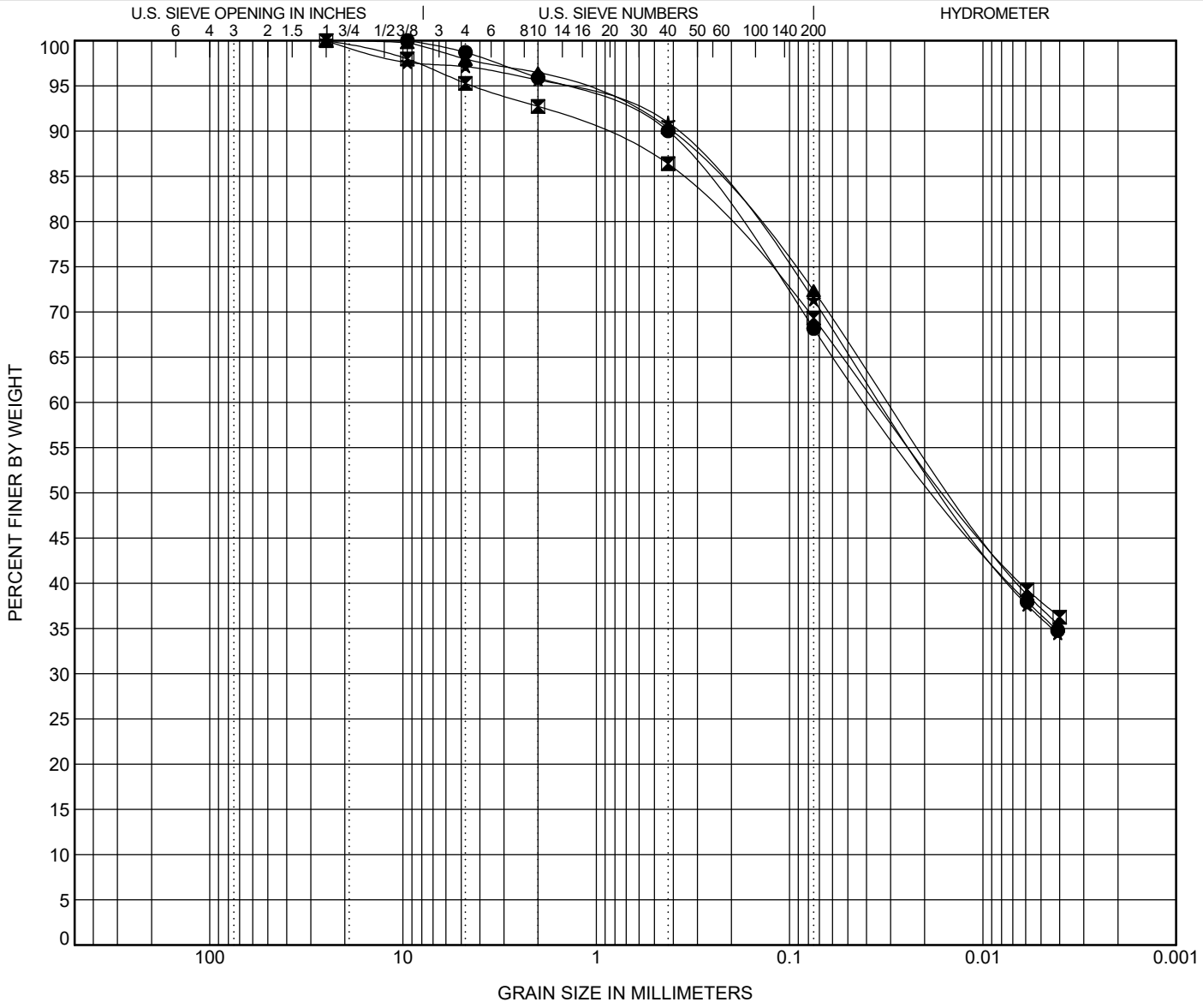
GRAIN SIZE - ND DOT.GDT - 10/16/17 16:23 - F:\LAB\PROJECTS\GINT\NH-1-200(073)236 #1.GPJ

GRAIN SIZE DISTRIBUTION

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

PROJECT NUMBER NH-1-200(073)236 #1 **LOCATION** Sheridan County

PCN 21508



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
●	**BRW - 6**	**1.0**	**A-7-6 (18)**	**CL**	**44**	**14**	**30**		
⊠	**BRW - 7**	**1.0**	**A-7-6 (21)**	**CL**	**49**	**16**	**33**		
▲	**BRW - 8**	**1.0**	**A-7-6 (20)**	**CL**	**46**	**16**	**30**		
★	**BRW - 9**	**1.0**	**A-7-6 (19)**	**CL**	**45**	**16**	**29**		

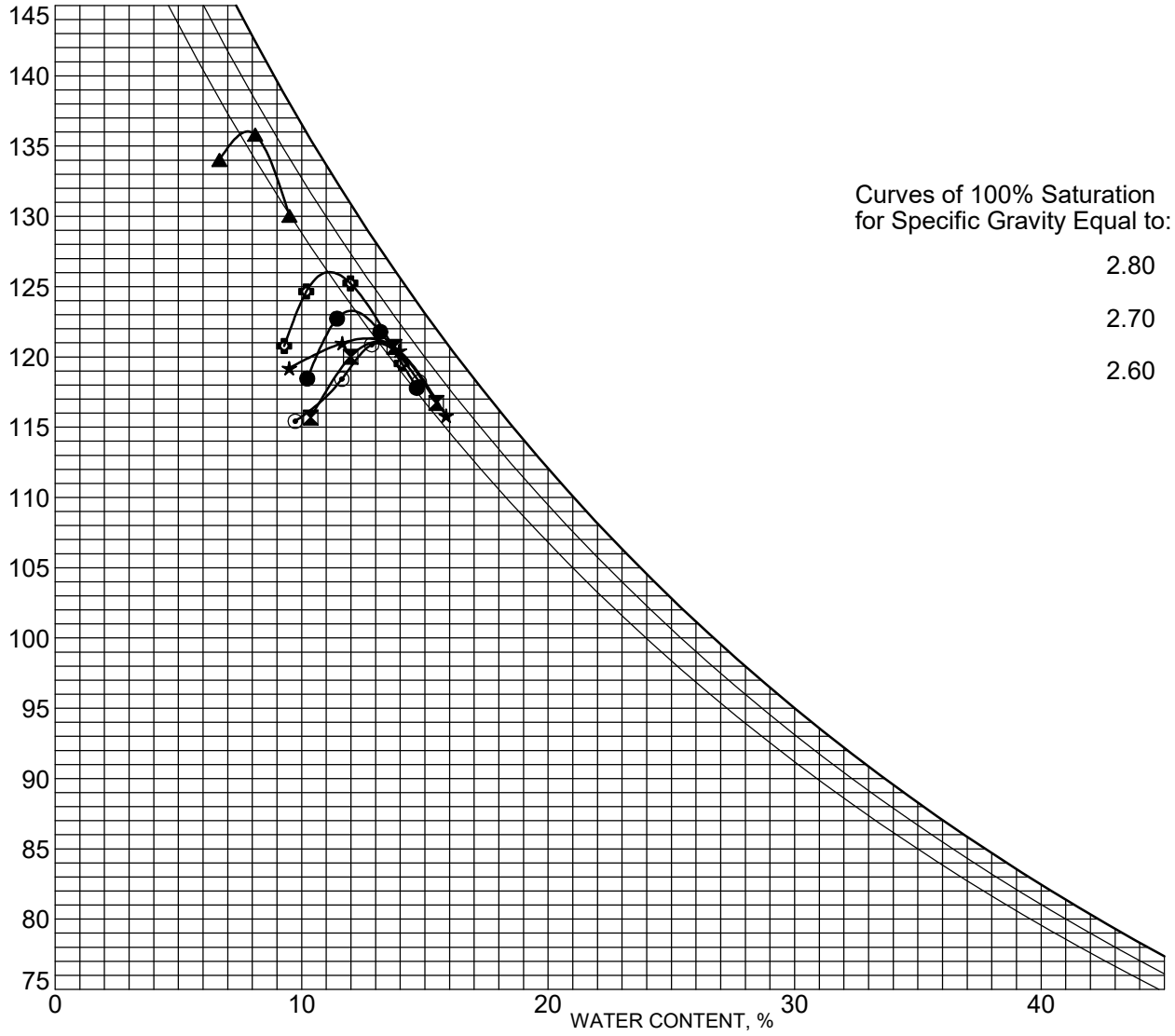
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BRW - 6**	**1.0**	**9.5**	**0.038**			**1.3**	**30.5**	**31.7**	**36.5**
⊠	**BRW - 7**	**1.0**	**25**	**0.034**			**4.7**	**26.0**	**31.3**	**38.0**
▲	**BRW - 8**	**1.0**	**25**	**0.029**			**2.0**	**25.6**	**35.1**	**37.3**
★	**BRW - 9**	**1.0**	**25**	**0.032**			**2.9**	**25.8**	**35.2**	**36.2**

MOISTURE-DENSITY RELATIONSHIP

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

PROJECT NUMBER NH-1-200(073)236 #1 **LOCATION** Sheridan County

PCN 21508



BOREHOLE		DEPTH	AASHTO Classification	USCS Description
●	**BRW - 1**	**1.0**	**A-7-6 (16)**	**SANDY LEAN CLAY(CL)**
⊠	**BRW - 2**	**1.0**	**A-7-6 (16)**	**SANDY LEAN CLAY(CL)**
▲	**BRW - 3**	**1.0**	**A-1-b (0)**	**SILTY SAND with GRAVEL(SM)**
★	**BRW - 4**	**1.0**	**A-7-6 (19)**	**SANDY LEAN CLAY(CL)**
⊙	**BRW - 5**	**1.0**	**A-7-6 (18)**	**SANDY LEAN CLAY(CL)**
✿	**BRW - 6**	**1.0**	**A-7-6 (18)**	**SANDY LEAN CLAY(CL)**

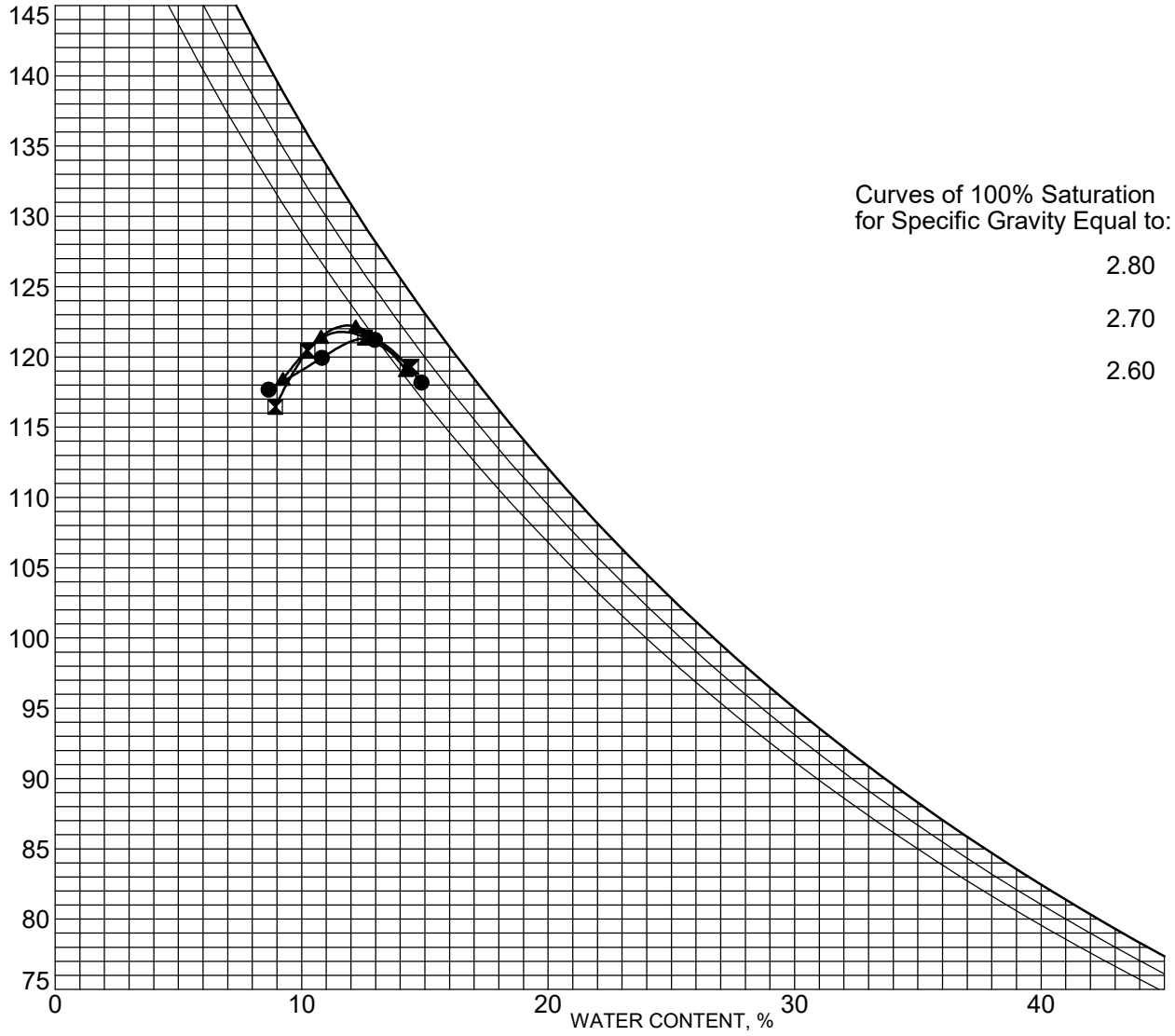
BOREHOLE		DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
●	**BRW - 1**	**1.0**	**AASHTO T-180 Method A**	**43**	**17**	**26**	**123.3 PCF**	**12.0 %**
⊠	**BRW - 2**	**1.0**	**AASHTO T-180 Method A**	**44**	**17**	**27**	**121.1 PCF**	**13.1 %**
▲	**BRW - 3**	**1.0**	**AASHTO T-180 Method A**	**NP**	**NP**	**NP**	**136.0 PCF**	**7.8 %**
★	**BRW - 4**	**1.0**	**AASHTO T-180 Method A**	**48**	**17**	**31**	**121.3 PCF**	**12.6 %**
⊙	**BRW - 5**	**1.0**	**AASHTO T-180 Method A**	**45**	**17**	**28**	**121.0 PCF**	**13.1 %**
✿	**BRW - 6**	**1.0**	**AASHTO T-180 Method A**	**44**	**14**	**30**	**126.0 PCF**	**11.1 %**

MOISTURE-DENSITY RELATIONSHIP

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

PROJECT NUMBER NH-1-200(073)236 #1 **LOCATION** Sheridan County

PCN 21508



	BOREHOLE	DEPTH	AASHTO Classification	USCS Description
●	**BRW - 7**	**1.0**	**A-7-6 (21)**	**SANDY LEAN CLAY(CL)**
⊠	**BRW - 8**	**1.0**	**A-7-6 (20)**	**LEAN CLAY with SAND(CL)**
▲	**BRW - 9**	**1.0**	**A-7-6 (19)**	**LEAN CLAY with SAND(CL)**

	BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
●	**BRW - 7**	**1.0**	**AASHTO T-180 Method A**	**49**	**16**	**33**	**121.3 PCF**	**12.6 %**
⊠	**BRW - 8**	**1.0**	**AASHTO T-180 Method A**	**46**	**16**	**30**	**121.8 PCF**	**11.6 %**
▲	**BRW - 9**	**1.0**	**AASHTO T-180 Method A**	**45**	**16**	**29**	**122.2 PCF**	**11.9 %**

APPENDIX C

Summary and Lab Results For Faul Borrow Site (Borrow Site #3)

SUMMARY OF LABORATORY RESULTS

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

PROJECT NUMBER NH-1-200(073)236 #2 **LOCATION** Sheridan County

PCN 21508

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BRW - 1	1.0	43	16	27	9.5	68	A-7-6 (16)	CL	18.8			
BRW - 1	2.0								9.2			
BRW - 1	3.0								12.7			
BRW - 1	4.0								14.9			
BRW - 1	5.0								16.4			
BRW - 2	1.0	38	14	24	25	64	A-6 (12)	CL	17.8			
BRW - 2	2.0								10.4			
BRW - 2	3.0								11.4			
BRW - 2	4.0								13.7			
BRW - 2	5.0								16.1			
BRW - 2	6.0								17.6			
BRW - 2	7.0								17.9			
BRW - 2	8.0								17.1			
BRW - 2	9.0								13.4			
BRW - 2	10.0								17.1			
BRW - 2	11.0								18.7			
BRW - 2	12.0								20.3			
BRW - 2	13.0								20.9			
BRW - 2	14.0								20.0			
BRW - 2	15.0								19.9			
BRW - 3	1.0	41	16	25	25	63	A-7-6 (13)	CL	18.1			
BRW - 3	2.0								10.2			
BRW - 3	3.0								13.4			
BRW - 3	4.0								15.8			
BRW - 3	5.0								17.0			
BRW - 3	6.0								16.2			
BRW - 3	7.0								17.9			
BRW - 3	8.0								18.1			
BRW - 3	9.0								20.1			
BRW - 3	10.0								20.7			
BRW - 4	1.0	43	16	27	9.5	69	A-7-6 (16)	CL	17.0			
BRW - 4	2.0								11.1			
BRW - 4	3.0								16.8			
BRW - 4	4.0								16.9			
BRW - 4	5.0								17.5			
BRW - 4	6.0								17.6			
BRW - 4	7.0								18.5			
BRW - 4	8.0								18.7			
BRW - 4	9.0								18.7			
BRW - 4	10.0								19.5			
BRW - 5	1.0	38	16	22	25	78	A-6 (16)	CL	23.6			
BRW - 5	2.0								13.7			
BRW - 5	3.0								11.2			

NDDOT North Dakota Department of Transportation
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER NH-1-200(073)236 #2 **LOCATION** Sheridan County

PCN 21508

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BRW - 5	4.0								17.4			
BRW - 5	5.0								16.8			
BRW - 5	6.0								18.0			
BRW - 5	7.0								17.4			
BRW - 5	8.0								21.5			
BRW - 5	9.0								21.3			
BRW - 5	10.0								18.4			
BRW - 6	1.0	39	16	23	25	66	A-6 (13)	CL	19.3			
BRW - 6	2.0								9.7			
BRW - 6	3.0								9.9			
BRW - 6	4.0								11.0			
BRW - 6	5.0								12.5			
BRW - 6	6.0								15.7			
BRW - 6	7.0								16.3			
BRW - 6	8.0								21.3			
BRW - 6	9.0								19.5			
BRW - 6	10.0								19.2			
BRW - 7	1.0	38	16	22	9.5	66	A-6 (12)	CL	19.2			
BRW - 7	2.0								9.9			
BRW - 7	3.0								8.5			
BRW - 7	4.0								13.2			
BRW - 7	5.0								15.4			
BRW - 8	1.0	38	16	22	25	67	A-6 (12)	CL	18.6			
BRW - 8	2.0								11.3			
BRW - 8	3.0								12.3			
BRW - 8	4.0								13.9			
BRW - 8	5.0								15.4			
BRW - 8	6.0								16.1			
BRW - 8	7.0								18.0			
BRW - 8	8.0								16.7			
BRW - 8	9.0								16.8			
BRW - 8	10.0								17.3			
BRW - 9	1.0	39	16	23	9.5	67	A-6 (13)	CL	15.6			
BRW - 9	2.0								13.4			
BRW - 9	3.0								16.9			
BRW - 9	4.0								17.0			
BRW - 9	5.0								17.0			
BRW - 9	6.0								18.6			
BRW - 9	7.0								17.9			
BRW - 9	8.0								18.3			
BRW - 9	9.0								18.0			
BRW - 9	10.0								19.6			
BRW - 10	1.0	36	17	19	25	64	A-6 (10)	CL	24.2			

SUMMARY OF LABORATORY RESULTS

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

PROJECT NUMBER NH-1-200(073)236 #2 **LOCATION** Sheridan County

PCN 21508

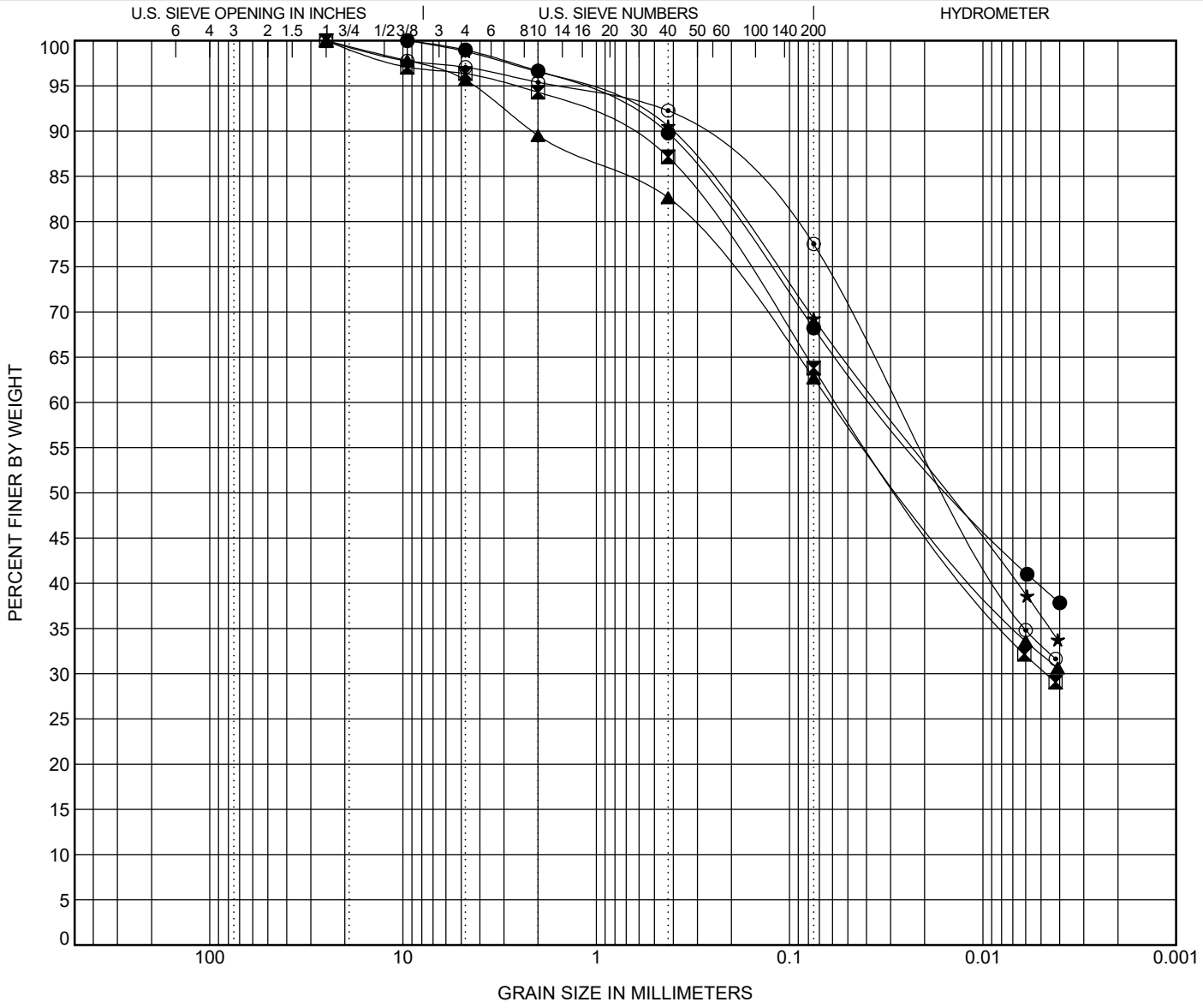
Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BRW - 10	2.0								10.8			
BRW - 10	3.0								11.0			
BRW - 10	4.0								14.5			
BRW - 10	5.0								15.9			

GRAIN SIZE DISTRIBUTION

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

PROJECT NUMBER NH-1-200(073)236 #2 **LOCATION** Sheridan County

PCN 21508



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
● BRW - 1	1.0	A-7-6 (16)	CL	43	16	27		
⊠ BRW - 2	1.0	A-6 (12)	CL	38	14	24		
▲ BRW - 3	1.0	A-7-6 (13)	CL	41	16	25		
★ BRW - 4	1.0	A-7-6 (16)	CL	43	16	27		
⊙ BRW - 5	1.0	A-6 (16)	CL	38	16	22		

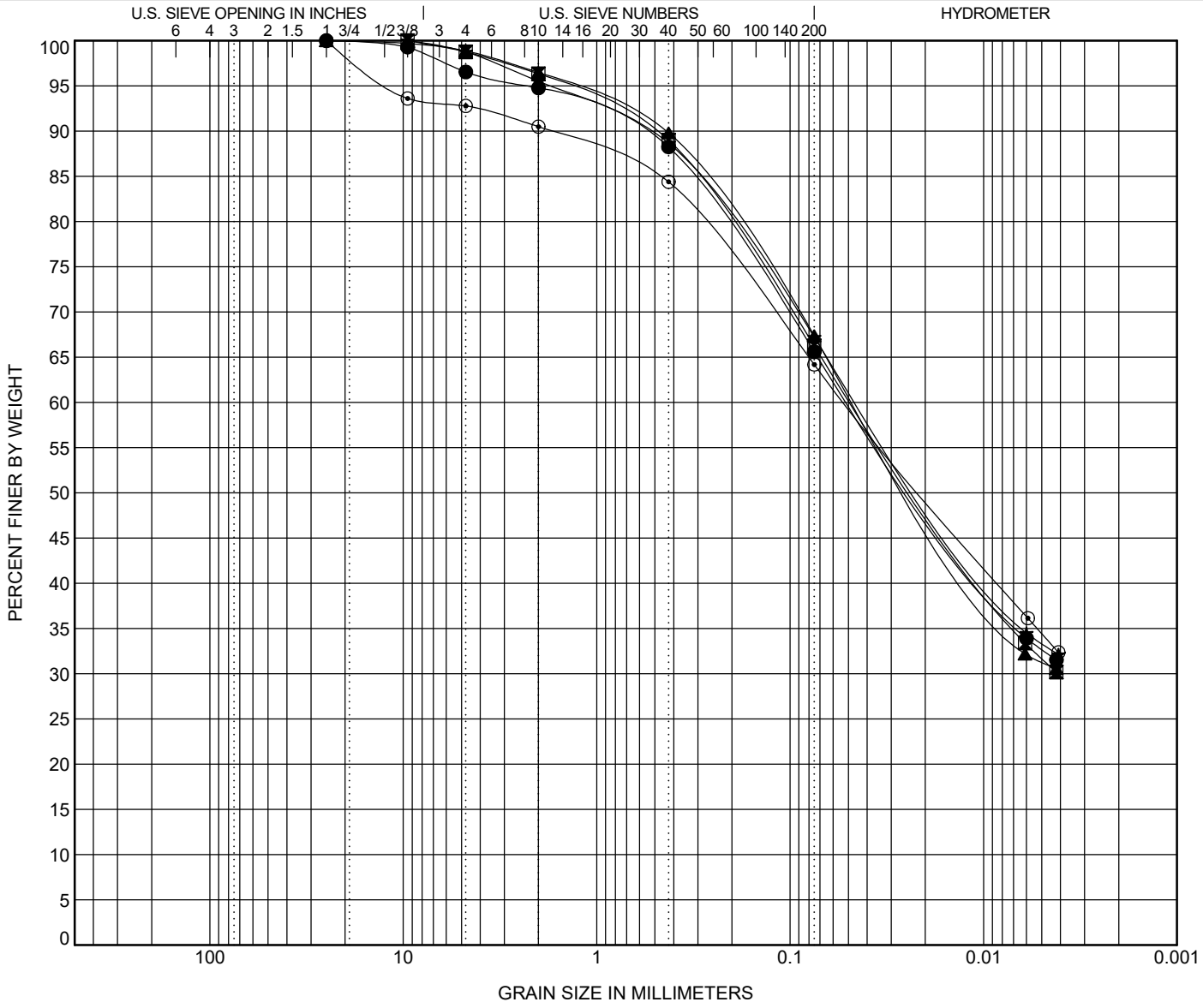
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BRW - 1	1.0	9.5	0.035			1.0	30.8	28.6	39.7
⊠ BRW - 2	1.0	25	0.055	0.005		3.6	32.6	33.3	30.5
▲ BRW - 3	1.0	25	0.059			4.3	33.0	30.5	32.2
★ BRW - 4	1.0	9.5	0.035			1.2	29.5	32.9	36.4
⊙ BRW - 5	1.0	25	0.027			2.9	19.5	44.3	33.2

GRAIN SIZE DISTRIBUTION

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

PROJECT NUMBER NH-1-200(073)236 #2 **LOCATION** Sheridan County

PCN 21508



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
●	**BRW - 6**	**1.0**	**A-6 (13)**	**CL**	**39**	**16**	**23**		
⊠	**BRW - 7**	**1.0**	**A-6 (12)**	**CL**	**38**	**16**	**22**		
▲	**BRW - 8**	**1.0**	**A-6 (12)**	**CL**	**38**	**16**	**22**		
★	**BRW - 9**	**1.0**	**A-6 (13)**	**CL**	**39**	**16**	**23**		
⊙	**BRW - 10**	**1.0**	**A-6 (10)**	**CL**	**36**	**17**	**19**		

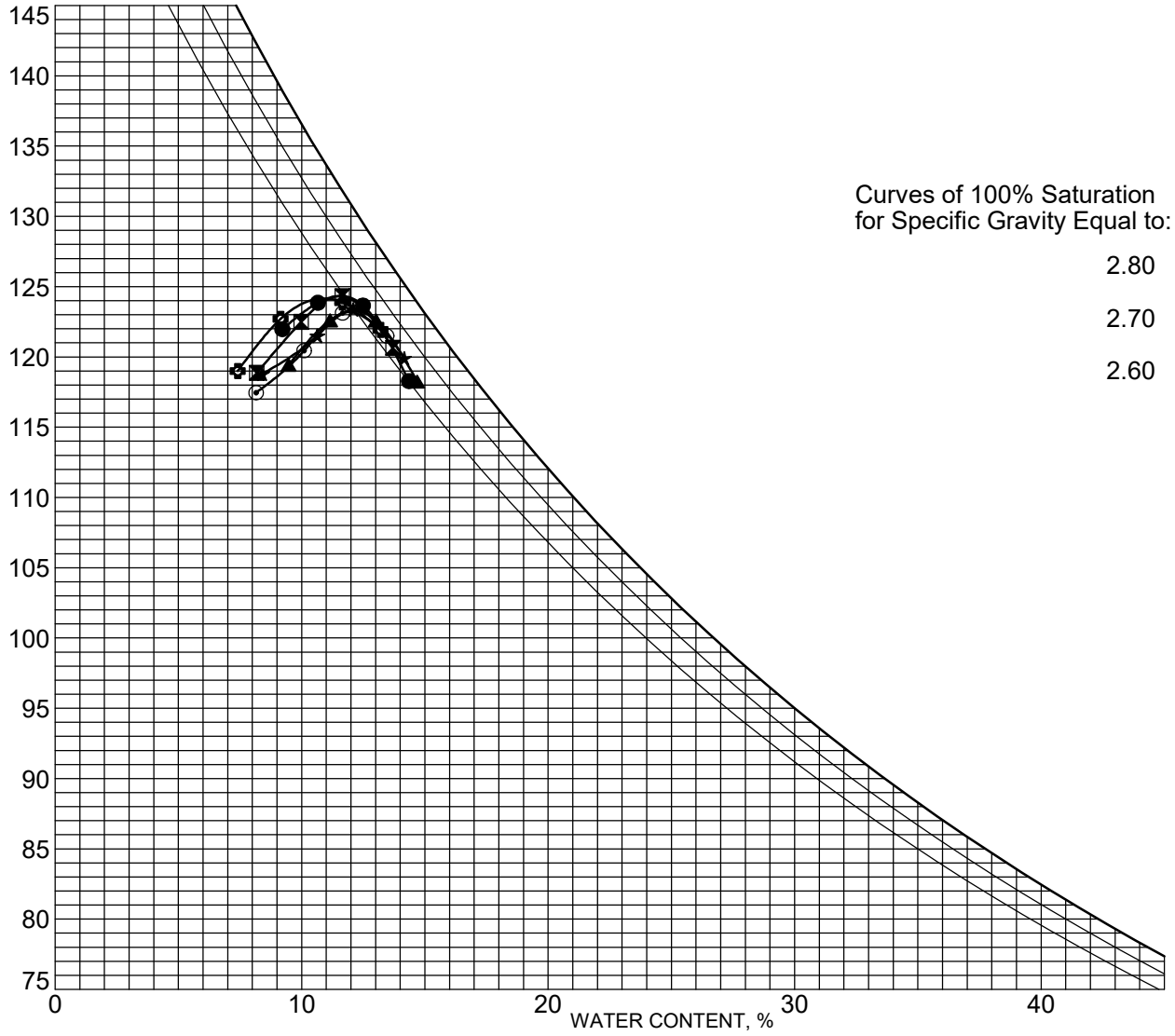
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BRW - 6**	**1.0**	**25**	**0.048**			**3.5**	**30.9**	**32.9**	**32.7**
⊠	**BRW - 7**	**1.0**	**9.5**	**0.047**			**1.2**	**32.5**	**34.6**	**31.7**
▲	**BRW - 8**	**1.0**	**25**	**0.044**			**1.1**	**31.5**	**36.0**	**31.3**
★	**BRW - 9**	**1.0**	**9.5**	**0.043**			**1.3**	**31.5**	**33.9**	**33.4**
⊙	**BRW - 10**	**1.0**	**25**	**0.051**			**7.2**	**28.6**	**29.8**	**34.4**

MOISTURE-DENSITY RELATIONSHIP

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

PROJECT NUMBER NH-1-200(073)236 #2 **LOCATION** Sheridan County

PCN 21508



BOREHOLE		DEPTH	AASHTO Classification	USCS Description
●	**BRW - 1**	**1.0**	**A-7-6 (16)**	**SANDY LEAN CLAY(CL)**
⊠	**BRW - 2**	**1.0**	**A-6 (12)**	**SANDY LEAN CLAY(CL)**
▲	**BRW - 3**	**1.0**	**A-7-6 (13)**	**SANDY LEAN CLAY(CL)**
★	**BRW - 4**	**1.0**	**A-7-6 (16)**	**SANDY LEAN CLAY(CL)**
⊙	**BRW - 5**	**1.0**	**A-6 (16)**	**LEAN CLAY with SAND(CL)**
✿	**BRW - 6**	**1.0**	**A-6 (13)**	**SANDY LEAN CLAY(CL)**

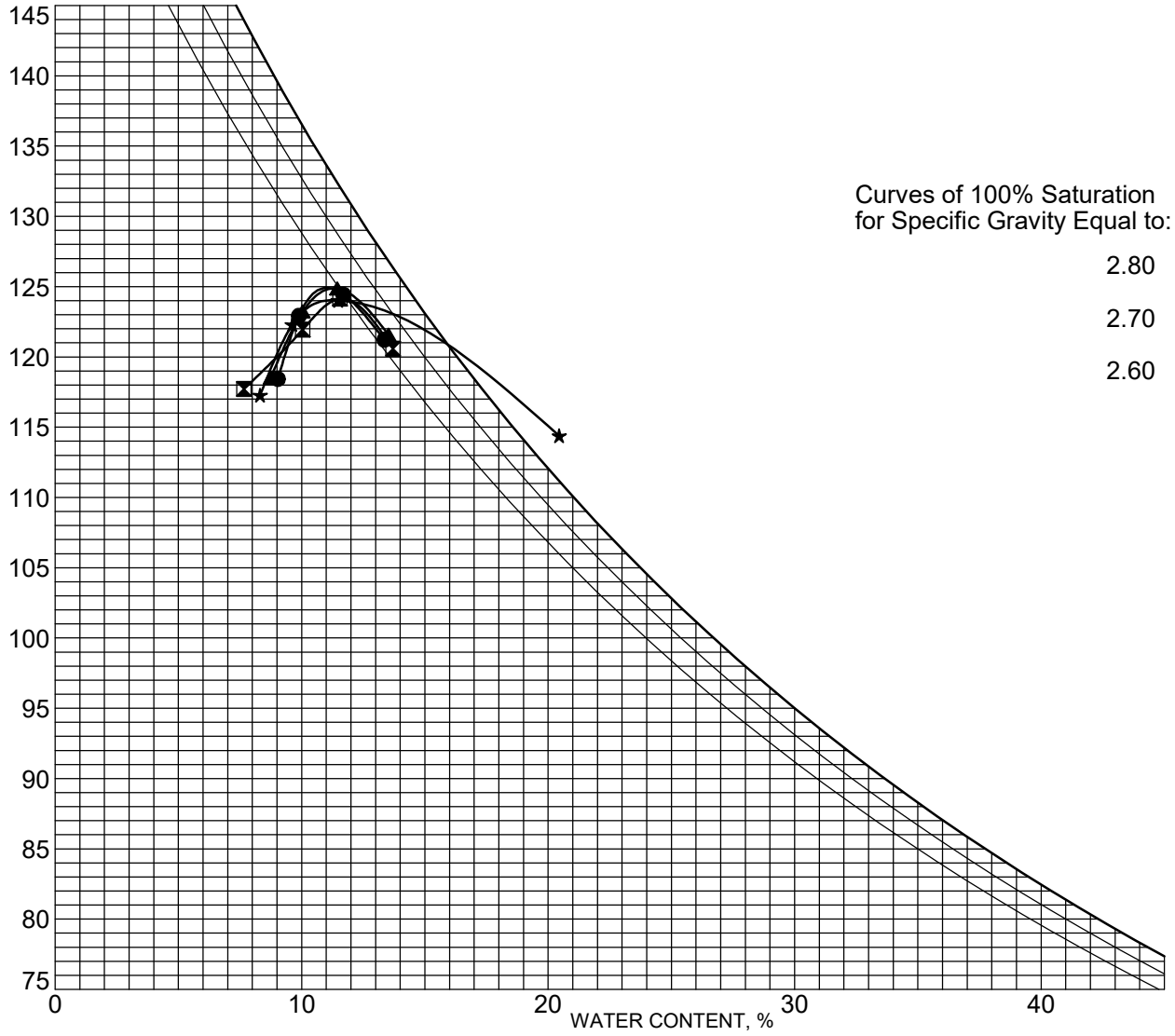
BOREHOLE		DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
●	**BRW - 1**	**1.0**	**AASHTO T-180 Method A**	**43**	**16**	**27**	**124.3 PCF**	**11.5 %**
⊠	**BRW - 2**	**1.0**	**AASHTO T-180 Method A**	**38**	**14**	**24**	**124.3 PCF**	**11.6 %**
▲	**BRW - 3**	**1.0**	**AASHTO T-180 Method A**	**41**	**16**	**25**	**123.3 PCF**	**12.1 %**
★	**BRW - 4**	**1.0**	**AASHTO T-180 Method A**	**43**	**16**	**27**	**123.4 PCF**	**12.1 %**
⊙	**BRW - 5**	**1.0**	**AASHTO T-180 Method A**	**38**	**16**	**22**	**123.2 PCF**	**11.9 %**
✿	**BRW - 6**	**1.0**	**AASHTO T-180 Method A**	**39**	**16**	**23**	**124.2 PCF**	**10.9 %**

MOISTURE-DENSITY RELATIONSHIP

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

PROJECT NUMBER NH-1-200(073)236 #2 **LOCATION** Sheridan County

PCN 21508



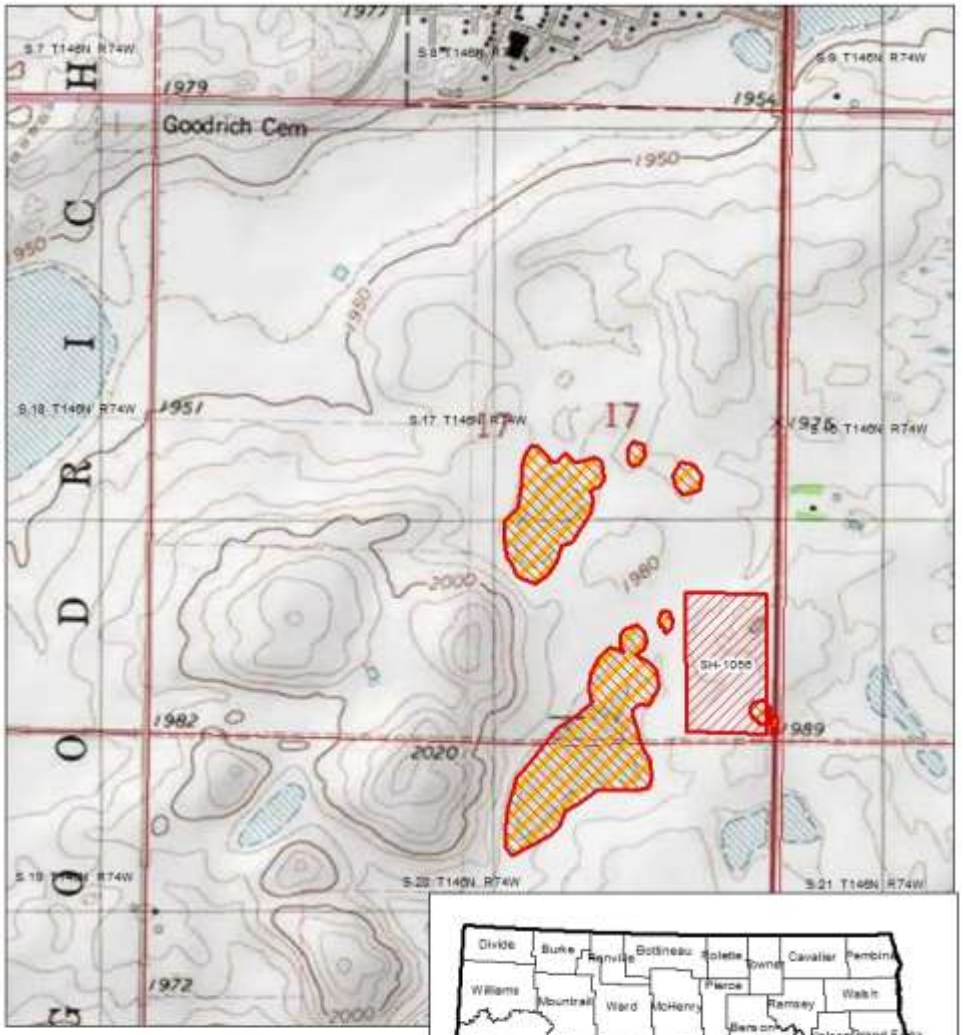
	BOREHOLE	DEPTH	AASHTO Classification	USCS Description
●	**BRW - 7**	**1.0**	**A-6 (12)**	**SANDY LEAN CLAY(CL)**
⊠	**BRW - 8**	**1.0**	**A-6 (12)**	**SANDY LEAN CLAY(CL)**
▲	**BRW - 9**	**1.0**	**A-6 (13)**	**SANDY LEAN CLAY(CL)**
★	**BRW - 10**	**1.0**	**A-6 (10)**	**SANDY LEAN CLAY(CL)**

	BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
●	**BRW - 7**	**1.0**	**AASHTO T-180 Method A**	**38**	**16**	**22**	**124.9 PCF**	**11.0 %**
⊠	**BRW - 8**	**1.0**	**AASHTO T-180 Method A**	**38**	**16**	**22**	**124.2 PCF**	**11.7 %**
▲	**BRW - 9**	**1.0**	**AASHTO T-180 Method A**	**39**	**16**	**23**	**124.9 PCF**	**11.3 %**
★	**BRW - 10**	**1.0**	**AASHTO T-180 Method A**	**36**	**17**	**19**	**124.0 PCF**	**11.3 %**

APPENDIX D

NDDOT Material Source Certificate of Approvals

NDDOT Material Source Certificate of Approval



Expires December 31st

2020

SH-1056

Pit Name: Frueh

SE1/4 S. 17 T. 146 N, R 74 W

County: Sheridan

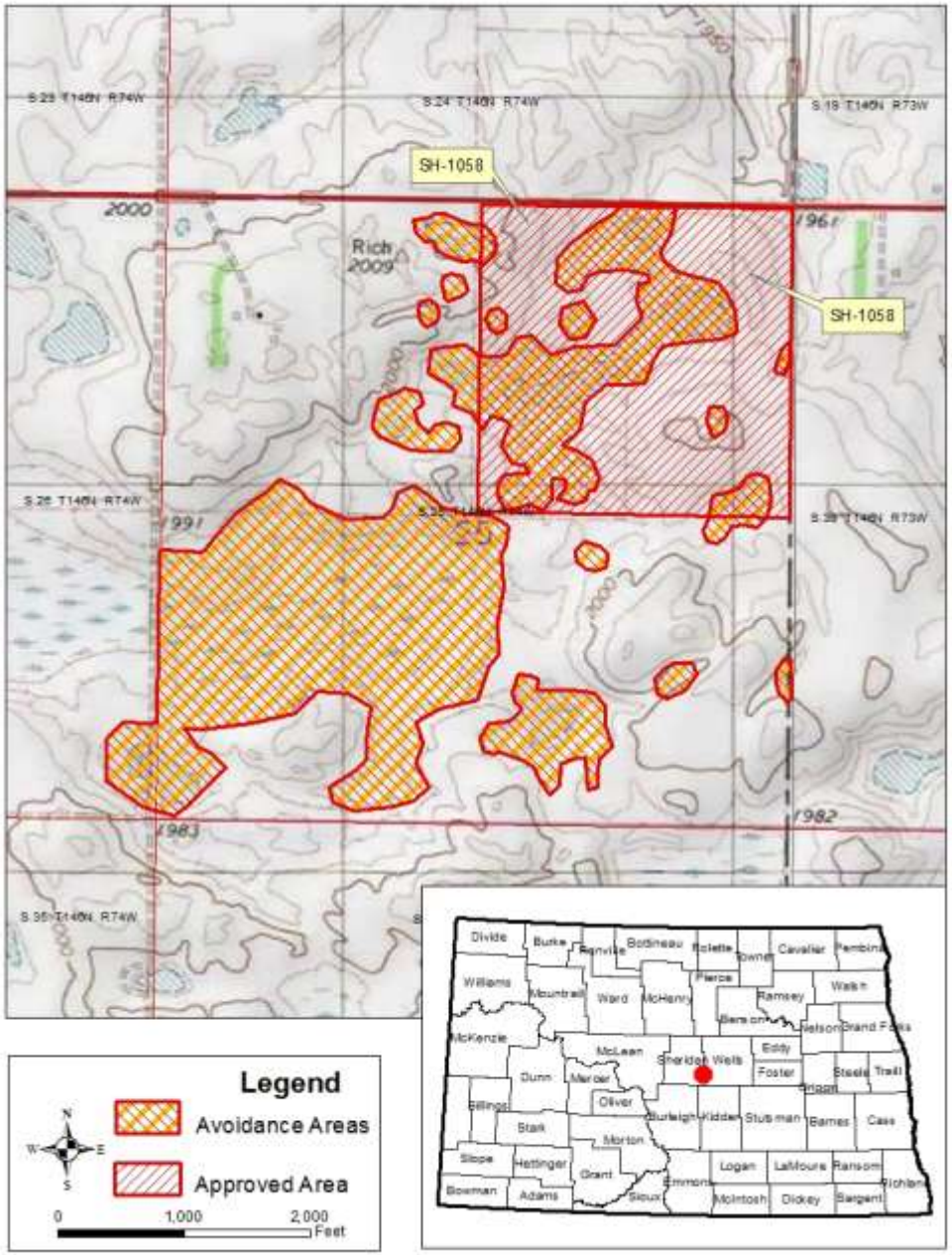
Conditions:

This location is approved for use, provided all avoidance areas shown on the map are avoided and all Conditions listed above and below are complied with.

NDDOT advises that all applicants (contractors or their representatives) may be subject to meeting certain legal responsibilities pursuant to one or more of the following authorities administered by the USFWS: Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.); Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.); and Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250). It is the responsibility of the applicants and/or any individual conducting activities at any approved site to fulfill the requirements of these Acts. The contractor will be responsible obtaining all applicable permits outlined in Section 107 of the Standard Specifications for Road and Bridge Construction (SSRBC). Additionally, contractor will be responsible for any impacts to wetlands, including permitting those impacts and mitigating the loss of the wetlands. As with all projects, if cultural artifacts and/or features (e.g., stone tools, fire hearths, stone circles, burials) are encountered, provisions outlined in Section 107.06 of SSRBC shall be followed.

This approval does not imply landowner permission to acquire material at this location. An agreement with the landowner is still necessary. If you have any questions regarding material sources please email materialsource@nd.gov

NDDOT Material Source Certificate of Approval



Expires December 31st

2020

SH-1058

Pit Name: Faul

NE1/4 S. 25 T. 146 N, R 74 W

County:	Sheridan

Conditions:

This location is approved for use, provided all avoidance areas shown on the map are avoided and all Conditions listed above and below are complied with.

NDDOT advises that all applicants (contractors or their representatives) may be subject to meeting certain legal responsibilities pursuant to one or more of the following authorities administered by the USFWS: Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.); Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.); and Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250). It is the responsibility of the applicants and/or any individual conducting activities at any approved site to fulfill the requirements of these Acts. The contractor will be responsible obtaining all applicable permits outlined in Section 107 of the Standard Specifications for Road and Bridge Construction (SSRBC). Additionally, contractor will be responsible for any impacts to wetlands, including permitting those impacts and mitigating the loss of the wetlands. As with all projects, if cultural artifacts and/or features (e.g., stone tools, fire hearths, stone circles, burials) are encountered, provisions outlined in Section 107.06 of SSRBC shall be followed.

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