LINEAR SOILS SURVEY AND RECOMMENDATIONS

PROJECT NO. SS-7-042(014)000

PCN 20996

COUNTY Divide

Highway 42 RP 0.000 to RP 23.203

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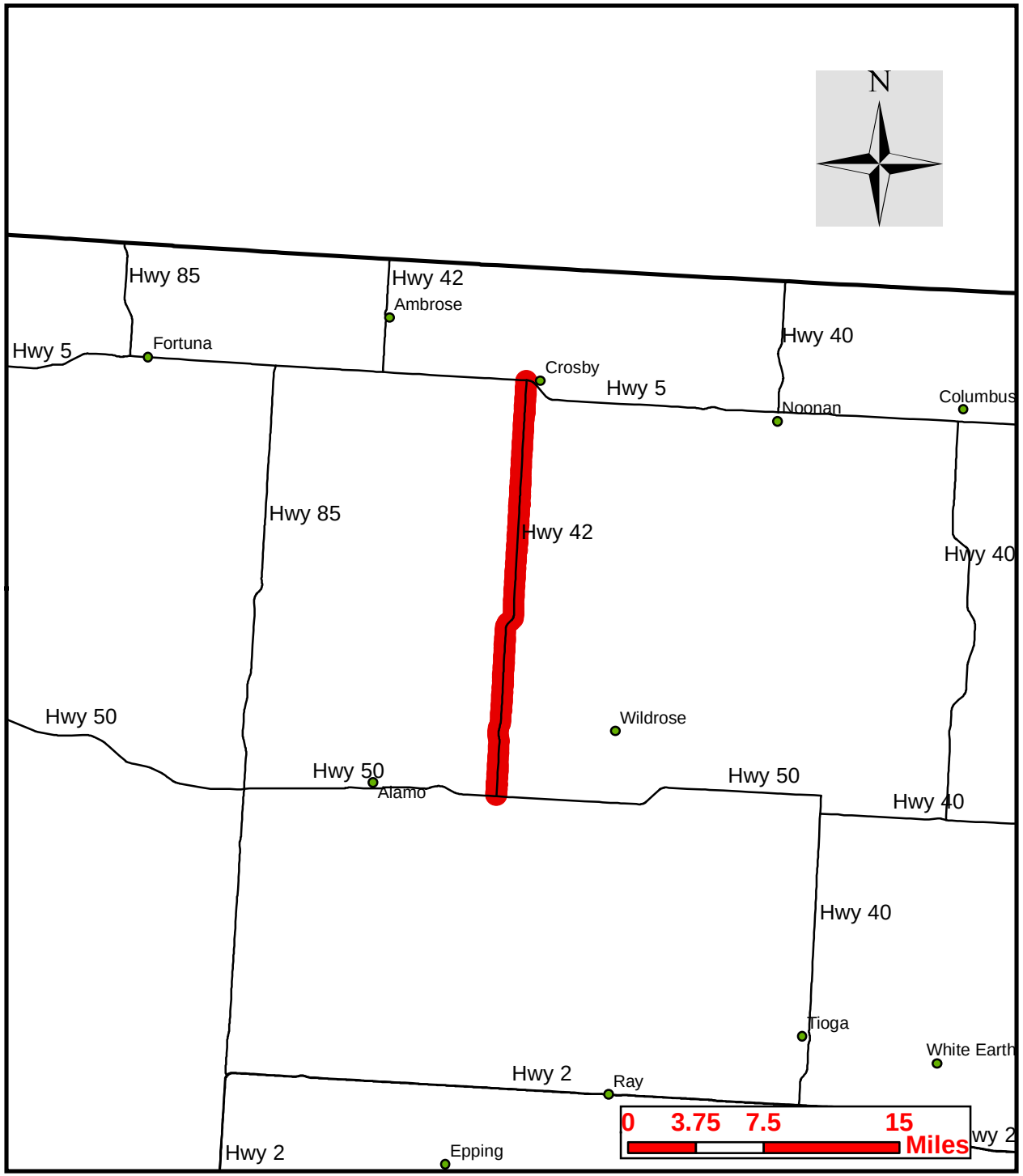
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

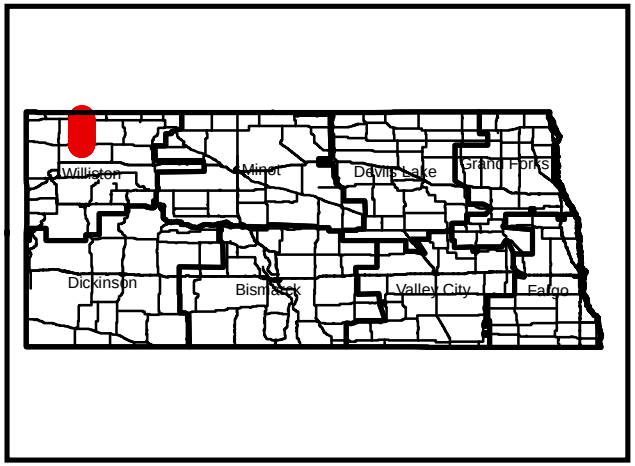
November 2015

Linear Soils Survey and Recommendations

Project: SS-7-042(014)000
PCN: 20996
Scope: Full Depth Reclamation-Cement Stabilized-Hot Bituminous Surfacing
Length: 23.2032 Miles
Location: Junction ND 50 North to East Junction ND 5 - Crosby

Drilled 1000' Invteral and Identified Areas





SS-7-042(014)000

Junction ND 50 North to East Junction ND 5 - Crosby

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 Jeff Jirava, Registration number PE-5950 on 11/23/15 and the original document is stored at the North Dakota Department of Transportation.

REGISTERED PROFESSIONAL ENGINEER
JEFF
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DATE 11/23/15
NORTH DAKOTA

Jeff Jirava, P.E.

23 NOV 2015
Date

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Introduction

Location: Junction ND 50 North to East Junction ND 5 - Crosby
Reference Points: 0.000 to 23.203
Project Length: 23.203
Proposed Project Scope: Full Depth Reclamation - Cement Stabilized, Hot Bituminous Pavement
Investigation Scope: 1000' Interval and Identified Areas

Existing Roadway Section

The existing roadway is composed of three different sections.

Construction History

Table 1 - Construction History RP 0.000 to RP 4.010

Construction History				
Year	**Construction**	**Depth (in)**	**Width (ft)**	**Oil**
1976	Graded by Others		38.0	
1976	Traffic Service Gravel	2.0	36.0	
1976	Aggregate Base	6.0	34.0	
1977	Hot Bit Pavement	2.0	24.0	200-300
1994	Contract Chip Seal		24.0	HFMS-2
2002	Hot Bit Pavement	1.5	24.0	PG 58-28
2006	Federal Aid Chip Seal		25.0	CRS2P

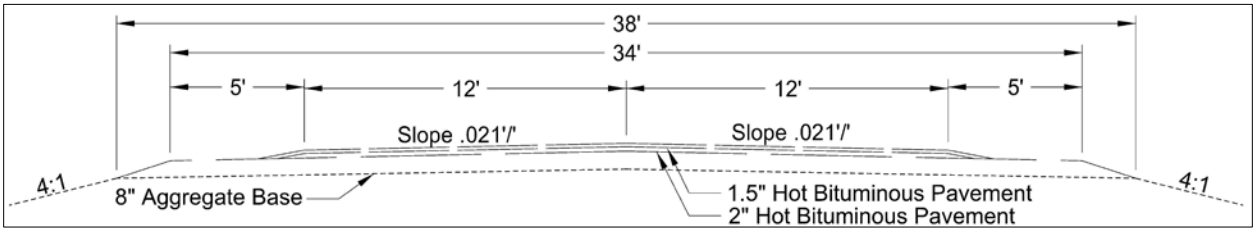

Figure 1 - Existing Typical Section 0.000 to 4.000

Table 2 - Construction History 4.010 to RP 22.176

Construction History				
Year	**Construction**	**Depth (in)**	**Width (ft)**	**Oil**
1952	Grade		26.0	
1968	Widening		38.0	
1968	Aggregate Base	5.0	35.0	
1968	Hot Bit Pavement	2.0	24.0	120-150
1994	Contract Chip Seal		24.0	HFMS-2
2002	Hot Bit Pavement	1.5	24.0	PG 58-28
2006	Federal Aid Chip Seal		25.0	CRS2P

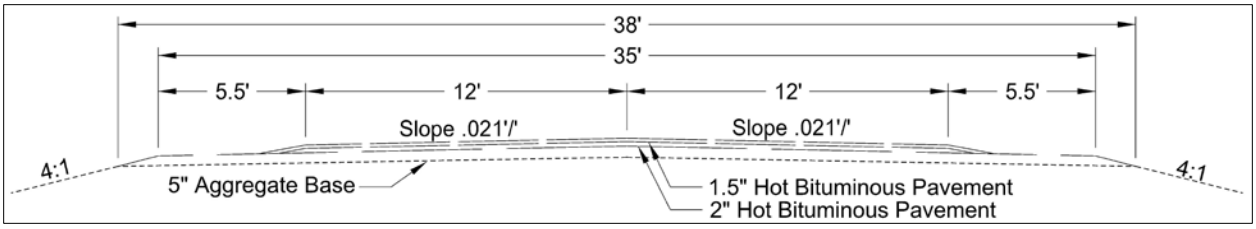

Figure 2 - Existing Typical Section RP 4.000 to 22.176

Table 3 - Construction History RP 22.176 to RP 23.176

Construction History				
Year	**Construction**	**Depth (in)**	**Width (ft)**	**Oil**
1975	Grade		38.0	
1976	Aggregate Base	6.0	34.0	
1976	Hot Bit Pavement	2.0	24.0	120-150
1994	Contract Chip Seal		24.0	HFMS-2
2002	Hot Bit Pavement	1.5	24.0	PG 58-28
2006	Federal Aid Chip Seal		25.0	CRS2P

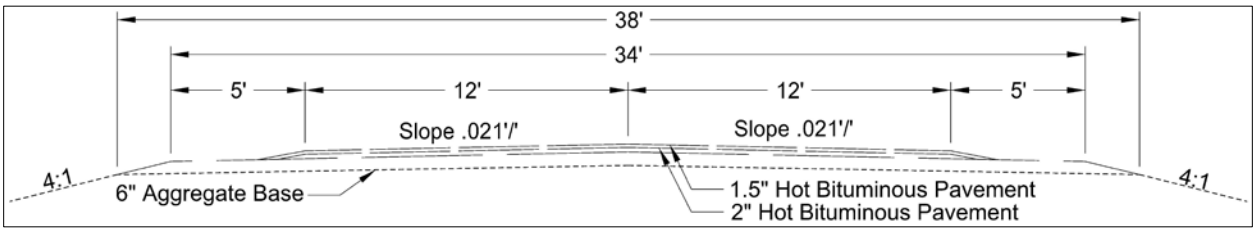

Figure 3 - Existing Typical Section RP 22.176 to 23.176

Existing Roadway Condition

Distress Data

The primary distresses on the roadway are longitudinal and transverse cracking.

Table 4 - Distress Data (2014)

Reference Point	Alligator Cracking	Longitudinal Cracking	Transverse Cracking	Block Cracking	Bituminous Patching	Rutting
	(0-18)	(0-9)	(0-9)	(0-9)	(0-18)	(0-12)
0	3	7	7	0	6	0
1	3	1	7	0	6	0
2	3	7	7	0	6	0
3	3	1	7	0	6	0
4	3	4	7	0	6	0
5	3	7	7	0	6	0
6	3	7	7	0	6	0
7	3	1	7	0	6	0
8	3	4	7	0	6	0
9	3	4	7	0	6	0
10	3	7	7	0	6	0
11	3	7	7	0	6	0
12	3	7	7	0	6	0
13	12	7	7	0	6	0
14	3	7	7	0	6	0
15	3	7	7	0	6	0
16	3	7	7	0	6	0
17	3	7	7	0	6	0
18	3	4	7	0	6	0
19	3	7	7	0	6	0
20	3	7	7	0	6	0
21	3	7	7	0	6	0
22	3	4	7	0	6	0
23	3	1	4	0	6	0
Average	**3**	**5**	**7**	**0**	**6**	**0**

Ride Data

The ride data is generally in the fair to poor classifications. This correlates to the longitudinal and transverse cracking distresses.

Table 5 - Ride Data (2014)

Reference Point	Distress Score		Rut (inches)		International Roughness Index (inches/mile)	
	Excellent	**≥ 98**	**Excellent**	**< 0.25**	**Excellent**	**< 61**
	Good	**88 - 97**	**Good**	**0.25 - 0.375**	**Good**	**61 - 99**
	Fair	**77 - 87**	**Fair**	**0.376 - 0.50**	**Fair**	**100 - 145**
	Poor	**≤ 76**	**Poor**	**> 0.50**	**Poor**	**>145**
0	76		0.18		133	
1	82		0.14		130	
2	76		0.15		120	
3	82		0.11		125	
4	79		0.15		156	
5	76		0.14		151	
6	76		0.12		153	
7	82		0.10		145	
8	79		0.15		154	
9	79		0.12		141	
10	76		0.13		142	
11	76		0.09		129	
12	76		0.12		147	
13	67		0.13		165	
14	76		0.14		168	
15	76		0.12		164	
16	76		0.12		149	
17	76		0.13		159	
18	79		0.13		155	
19	76		0.13		164	
20	76		0.13		165	
21	76		0.18		113	
22	79		0.10		77	
23	85		0.07		114	
Average	**77**		**0.13**		**142**	

Maintenance Review

Date of Maintenance Review: 8/19/2015
Materials and Research Person Conducting the Review: Jamie Naumann
District Maintenance Person Conducting Review: Gerald Johnson

The summary of the identified maintenance areas that were drilled are shown in the following table. The evaluation log indicating all areas that were evaluated can be found in Appendix B.

Table 6 - Identified Maintenance Areas Drilled

Location RP + Feet	Distress Identified	Maintenance Comments
0+3300 to 0+3370	Frost Heave	Appeared in 2013. Dura Patched in spring of 2015.
16+1472 to 16+1485	Water Pumping	Pumps water all year

Summary of Soil Analysis

A summary of the locations that were drilled is shown in following table. A map of the boring locations is shown in Appendix C.

Table 7 - Boring Locations Summary

Location RP + Feet	Boring Interval, Depth and Method	Reason for Boring
0+0000 to 23+0700	Every 1000 feet, 5 feet deep using a solid flight auger.	Obtain subgrade information throughout the area
0+3300 to 0+3370	In the distress area and Adjacent to the distress area, 5 feet deep using a solid flight auger	Obtain subgrade information throughout the area
16+1472 to 16+1485	In the distress area and Adjacent to the distress area, 5 feet deep using a solid flight auger	Obtain subgrade information throughout the area

Soil Sample Distribution

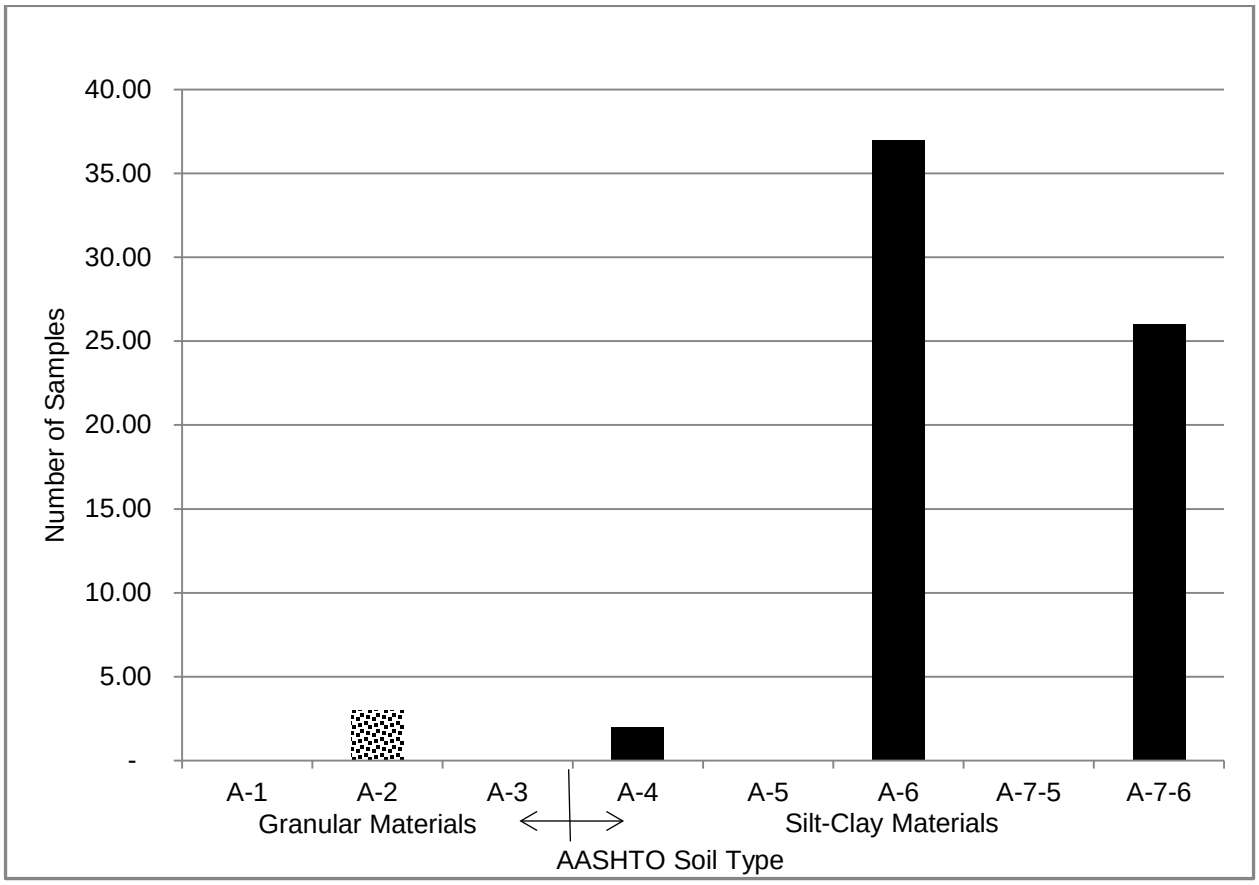

Figure 4 - Soil Sample Distribution

Moisture

The moisture contents provided in this report and summarized below have been obtained from samples taken on 9/16/15.

Table 8 - Summary of In-Place and Optimum Moisture Contents

Quantity	AASHTO Classification	In-Place Moisture Range (%)	In-Place Moisture Average (%)	T-180 Optimum Moisture Average (%)	Difference Between Average In-Place and T-180 Optimum Moistures (%)
3	A-2-4	9.2-12.5	10.6	7.4	3.2
2	A-4	7.6-11.1	15.8	9.4	6.4
37	A-6	10.2-27.6	20.0	11.4	9.2
26	A-7-6	16.6-30.9	22.2	12.7	9.5

Table 9 - Summary of In-Place versus Optimum Moisture Content

In-Place Moisture vs. Optimum Moisture						
Quantity	**AASHTO Classification**	**Below Optimum**	**Optimum to Moderate** (0 to 6% over optimum)	**Moderate to High** (6 to 10% over optimum)	**High** (10 to 16% over optimum)	**Very High** (> 16% over optimum)
3	A-2-4	0%	100%	0%	0%	0%
2	A-4	0%	50%	0%	50%	0%
37	A-6	3%	19%	46%	32%	0%
26	A-7-6	0%	12%	50%	34%	4%

Atterberg Limits

Table 10 - Summary of Atterberg Limits

AASHTO Classification	Liquid Limit Range (%)	Liquid Limit Average (%)	Plastic Limit Range (%)	Plastic Limit Averag e (%)	Plasticity Index Range (%)	Plasticity Index Average (%)
A-2-4	0.0-21.0	12.9	0.0-15.0	9.5	0.0-7.4	3.3
A-4	22.2-30.9	26.6	14.3-22.1	18.2	7.9-8.8	8.4
A-6	32.0-40.4	37.3	14.7-21.7	18.1	14.8-25.5	19.3
A-7-6	40.6-49.8	43.4	14.8-22.7	18.9	20.7-28.6	24.7

Swell Potential

The swell potential, which is based on the Plasticity Index (PI), is shown in the following table.

Table 11 - Swell Potential

Low (Plasticity Index < 25)	**Marginal** (25 ≤ Plasticity Index ≤ 35)	**High** (Plasticity Index > 35)
82%	18%	0%0

Frost Susceptibility

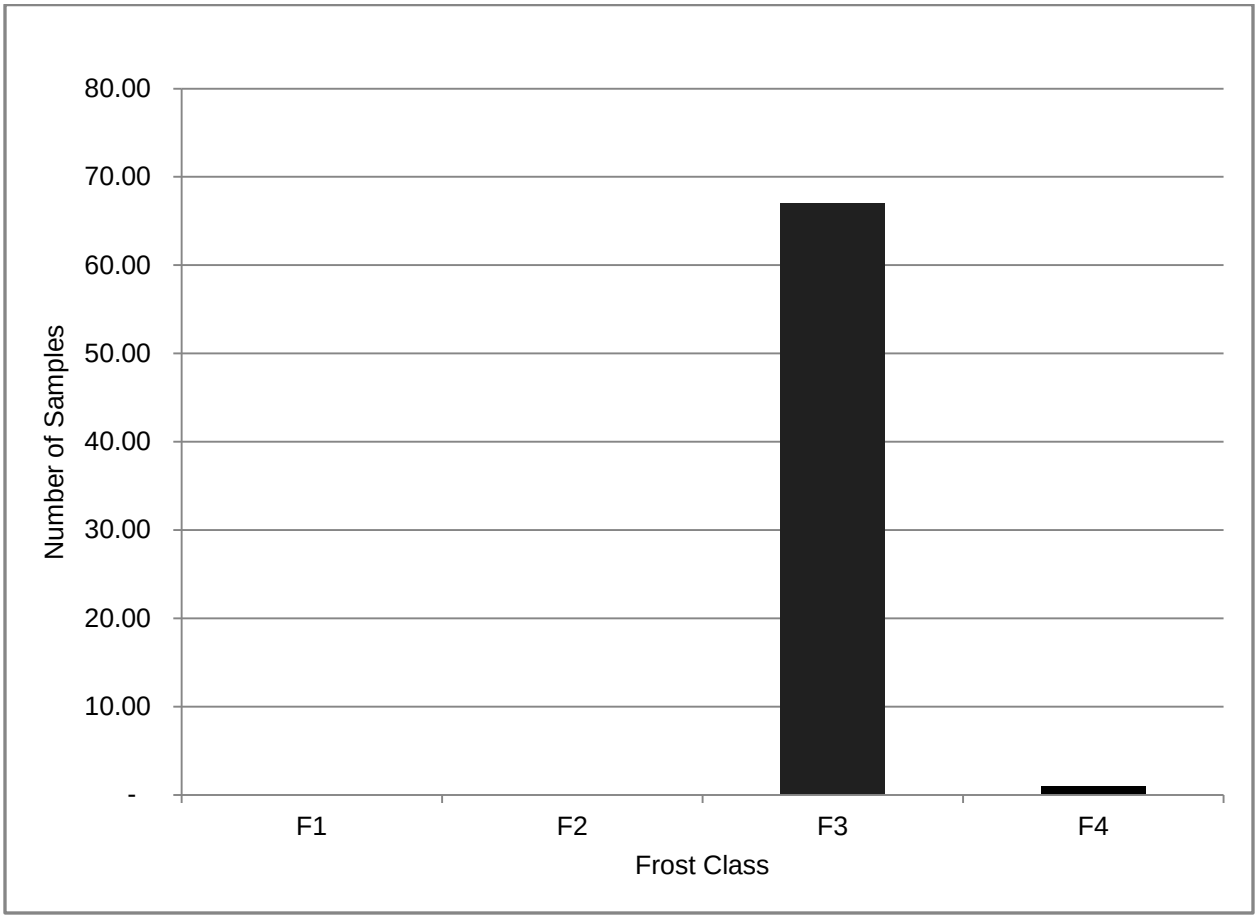

Figure 5 - Frost Susceptibility Distribution

Group Index

The Group Index is a parameter used to evaluate the quality of a soil as a subgrade material. The group index is always zero for A-1, A-2 and A-3 soils (Granular Soils). A group index of 20 or greater indicates a “very poor” subgrade material. The group indices are summarized in the following table.

Table 12 - Group Indices

AASHTO Classification	Group Index Range	Group Index Average
A-2-4	0	0
A-4	0-7	3.5
A-6	4-17	11
A-7-6	12-26	18

Existing Roadway Section

Table 13- Existing Asphalt Thickness

EXISTING ASPHALT THICKNESS (FEET)									
0+0126	0.5	4+2000	0.5	9+3000	0.5	14+4000	0.6	19+1000	0.6
0+1000	0.3	4+3000	0.5	9+4000	0.5	14+5000	0.4	19+2000	0.5
0+2000	0.3	4+4000	0.5	10+0000	0.5	15+0000	0.5	19+3000	0.5
0+3000	0.3	5+0000	0.5	10+1000	0.5	15+2000	0.5	19+4000	0.4
0+4000	0.4	5+1000	0.5	10+2000	0.5	15+3000	0.5	20+0000	0.6
1+0015	0.4	5+2000	0.4	10+3000	0.4	15+4000	0.6	20+1000	0.4
1+1000	0.3	5+3000	0.4	10+4000	0.5	16+0000	0.5	20+2000	0.5
1+2000	0.6	5+4000	0.4	11+0000	0.6	16+1000	0.5	20+3000	0.4
1+3000	0.3	6+0000	0.6	11+1000	0.6	16+1430	0.7	20+4000	0.6
1+4000	0.4	6+1000	0.3	11+2000	0.5	16+1470	0.9	21+0000	0.5
2+0000	0.5	6+2000	0.5	11+3000	0.5	16+1504	1.0	21+1000	0.6
2+1000	0.4	6+3000	0.5	11+4000	0.5	16+1564	0.6	21+2000	0.5
2+2000	0.3	6+4000	0.5	12+0000	0.6	16+2000	0.4	21+3000	0.6
2+3000	0.5	6+5000	0.4	12+1000	0.5	16+3000	0.4	21+4000	0.6
2+4000	0.5	7+0000	0.5	12+2000	0.4	16+4000	0.6	22+0000	0.6
3+0030	0.4	7+2000	0.5	12+3000	0.5	17+0000	0.4	22+1000	0.5
3+1000	0.5	7+3000	0.4	12+4000	0.5	17+1000	0.5	22+2000	0.5
3+2000	0.4	7+4000	0.5	13+0000	0.4	17+2000	0.5	22+3000	0.4
3+3000	0.7	8+0000	0.4	13+1000	0.4	17+3000	0.5	22+4000	0.5
3+4000	0.5	8+1000	0.5	13+2000	0.4	17+4000	0.5	23+0000	0.4
4+0000	0.6	8+2000	0.5	13+3000	0.4	18+0000	0.5		
0+3269	0.3	8+3000	0.4	13+4000	0.4	18+1000	0.6		
0+3352	0.4	8+4000	0.5	14+0000	0.5	18+2000	0.5		
0+3400	0.4	9+0000	0.3	14+1000	0.5	18+3000	0.5		
0+3450	0.3	9+1000	0.4	14+2000	0.5	18+4000	0.6		
4+1000	0.3	9+2000	0.5	14+3000	0.5	19+0000	0.6	**AVG**	**0.5**

Table 14 - Existing Aggregate Depth

EXISTING AGGREGATE DEPTH (FEET)									
0+0126	0.3	4+2000	0.4	9+3000	0.4	14+4000	0.3	19+1000	0.4
0+1000	0.5	4+3000	0.4	9+4000	0.4	14+5000	0.4	19+2000	0.3
0+2000	0.5	4+4000	0.4	10+0000	0.4	15+0000	0.4	19+3000	0.3
0+3000	0.5	5+0000	0.6	10+1000	0.4	15+2000	0.4	19+4000	0.4
0+4000	0.6	5+1000	0.6	10+2000	0.3	15+3000	0.3	20+0000	0.4
1+0015	0.5	5+2000	0.6	10+3000	0.3	15+4000	0.4	20+1000	0.4
1+1000	0.5	5+3000	0.5	10+4000	0.4	16+0000	0.3	20+2000	0.3
1+2000	0.5	5+4000	0.5	11+0000	0.5	16+1000	0.3	20+3000	0.4
1+3000	0.5	6+0000	0.6	11+1000	0.3	16+1430	0.5	20+4000	0.3
1+4000	0.5	6+1000	0.4	11+2000	0.4	16+1470	0.4	21+0000	0.3
2+0000	0.6	6+2000	0.3	11+3000	0.3	16+1504	0.4	21+1000	0.4
2+1000	0.5	6+3000	0.3	11+4000	0.4	16+1564	0.5	21+2000	0.7
2+2000	0.5	6+4000	0.3	12+0000	0.4	16+2000	0.5	21+3000	0.6
2+3000	0.5	6+5000	0.3	12+1000	0.3	16+3000	0.5	21+4000	0.7
2+4000	0.4	7+0000	0.4	12+2000	0.6	16+4000	0.4	22+0000	0.6
3+0030	0.5	7+2000	0.6	12+3000	0.3	17+0000	0.4	22+1000	0.5
3+1000	0.4	7+3000	0.4	12+4000	0.4	17+1000	0.4	22+2000	0.9
3+2000	0.4	7+4000	0.3	13+0000	0.5	17+2000	0.3	22+3000	0.4
3+3000	0.4	8+0000	0.3	13+1000	0.3	17+3000	0.3	22+4000	0.4
3+4000	0.6	8+1000	0.3	13+2000	0.3	17+4000	0.3	23+0000	0.7
4+0000	0.4	8+2000	0.4	13+3000	0.4	18+0000	0.3		
0+3269	0.5	8+3000	0.4	13+4000	0.4	18+1000	0.3		
0+3352	0.4	8+4000	0.3	14+0000	0.4	18+2000	0.3		
0+3400	0.4	9+0000	0.5	14+1000	0.4	18+3000	0.4		
0+3450	0.5	9+1000	0.4	14+2000	0.3	18+4000	0.3		
4+1000	0.5	9+2000	0.5	14+3000	0.4	19+0000	0.4	**AVG**	**0.4**

Design Recommendations

The subgrade investigation yielded that the soils were fairly consistent with the majority of the soils having low swell potential and group indices. The moisture content in the subgrade soils were generally 10% or greater than optimum, but that is not unusual for A-6 and A-7-6 soils when using the AASHTO T-180 compaction method.

The subgrade soils that were investigated for the frost heave area from 0+3300 to 0+3370 did not indicate any problematic soils or higher moisture contents, therefore there is no work required for the subgrade in this area. The area where there is an issue with water pumping from 16+1472 to 16+1485 indicated slightly higher moisture contents. The soil properties in this area were consistent with the adjacent segments of the roadway in this area. Subgrade work will be recommended in this area to strengthen the section and facilitate drainage.

Design Information

Subcut:

Table 15 - Subcut Recommendations

Location	Subcut Depth
16+1450 to 16+1500	12 Inches below the proposed subgrade elevation.

Subcut Transition: 20:1 transitions should be used on both ends of the subcut.

Geotextile: Place Geosynthetic Geogrid – Type G on the subgrade prior to placement of aggregate.

Aggregate Compaction Method: T-180 – As per section 714.04 A.7

The recommendations in this report are based on the scope specified in the Introduction. If the scope of work, vertical profile or horizontal alignment is changed, in either the conceptual phase or the design phase, the Geotechnical Engineer must be notified as soon as possible to ensure that there is adequate geotechnical information addressing these areas.

APPENDIX A

SOIL CLASSIFICATION AND FROST SUSCEPTIBILITY

AASHTO Soil Classification System

Table 5.1. AASHTO Classification System

General Classification	*Granular materials (35% or less passing No. 200 Sieve (0.075 mm)*							*Silt-clay Materials More than 35% passing No. 200 Sieve (0.075 mm)*			
Group Classification	*A—1*		*A—3*	*A—2*				*A—4*	*A—5*	*A—6*	*A—7*
	A—1—a	*A—1—b*		*A—2—4*	*A—2—5*	*A—2—6*	*A—2—7*				*A—7—5* *A—7—6*
(*a*) Sieve Analysis: Percent Passing											
(*i*) 2.00 mm (No. 10)	50 max										
(*ii*) 0.425 mm (No. 40)	30 max	50 max	51 min								
(*iii*) 0.075 mm (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
(*b*) Characteristics of fraction passing 0.425 mm (No. 40)											
(*i*) Liquid limit				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
(*ii*) Plasticity index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min*
(*c*) Usual types of significant Constituent materials	Stone Fragments Gravel and sand		Fine Sand	Silty or Clayey Gravel Sand				Silty Soils		Clayey Soils	
(*d*) General rating as subgrade.	Excellent to Good							Fair to Poor			

* If plasticity index is equal to or less than (liquid Limit—30), the soil is A—7—5 (*i.e.* PL > 30%)
If plasticity index is greater than (Liquid Limit—30), the soil is A—7—6 (*i.e.* PL < 30%)

Frost Susceptibility Index (Bases on US Army Corps of Engineers)

Frost Class	Frost Susceptibility	Soil Type	Percent Finer than 0.02 mm by weight %
F1	Negligible to Low	• Gravely Soils	3 – 10
F2	Low to Medium	• Gravely Soils • Sands	10 – 20 3 – 15
F3	High	• Gravelly Soils • Sands, except very fine silty sands • Clays, PI > 12	Greater than 20 Greater than 15 ---
F4	Very High	• All Silts • Very Fine Silty Sands • Clays, PI > 12 • Varved Clays and other fine-grained banded sediments	--- Greater than 15 --- ---

APPENDIX B

PAVEMENT EVALUATION AND PHOTOS

PAVEMENT EVALUATION LOG FOR LINEAR SOIL SURVEY

North Dakota Department of Transportation, Materials & Research
SFN 60472 (9-2013)

Project Number	PCN	Date of Survey
SS-7-042(014)000	20996	8/19/2015

Section Maintenance Contact	Completed By
Jerry Johnson	Jamie Naumann

Highway Reference Points	Surface Type
0+0000 to 23+0949	Asphalt

Location	Pavement Distress	Description	Maintenance Comment	Picture Number	Drilling Required
0+0000 to 23 +0949	Transv. Cracks	Depressed,RT, LC-WP, MHP	Patches were spread out through project.	1-15	No
0+3300 to 0 +3370	Other	FH	Dura-patched in spring of 2015. Appeared in 2013.		Yes
14+4740	Culvert	Double culvert, MBP	End section separation.	30	No
16+1472 to 16+1485	Other	Water pumping	Pumps water all year.	16-17	Yes
19+0298	Culvert	MHP-2015	Shallow culvert. Siltation, holes in road surface, end sections separated.	24-29	No
20+0030	Culvert	MBP-2015	Shallow culvert. End section separation, holes in shoulder , siltation.	19-23	No
20+0285-to 20+0315	Rutting	Shoving, MBP-Both lanes		18	No
	Select One				Select One
	Select One				Select One

Comments

Met with Jerry Johnson on 8/19/2015 and he indicated these areas of greatest distress. Approximate depth of the rutting was 0.15'. Crack spacing was 20'. Last date of crack seal was in 2011. The culverts marked shallow had approximately 1.5' of material to the top of the asphalt.

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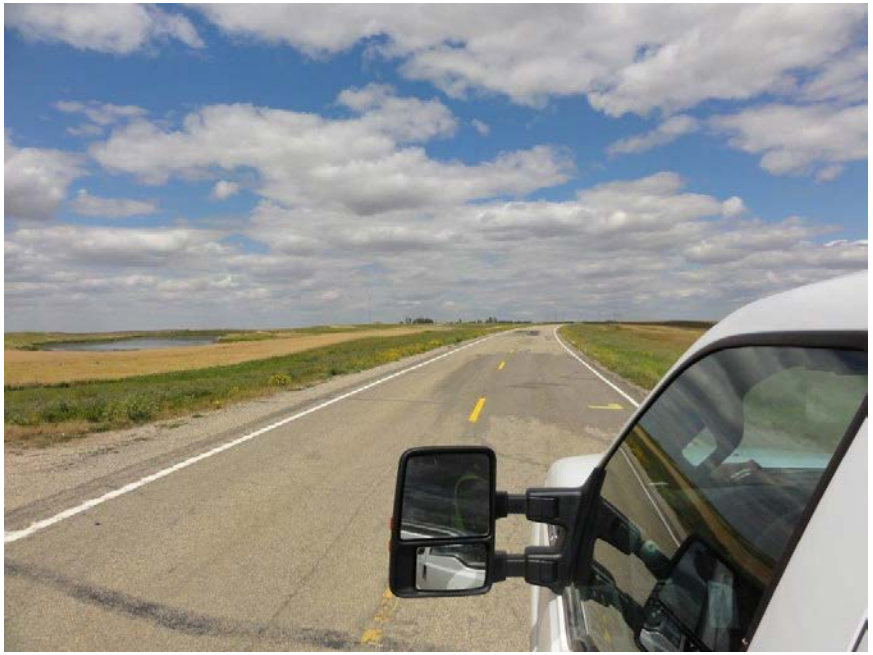

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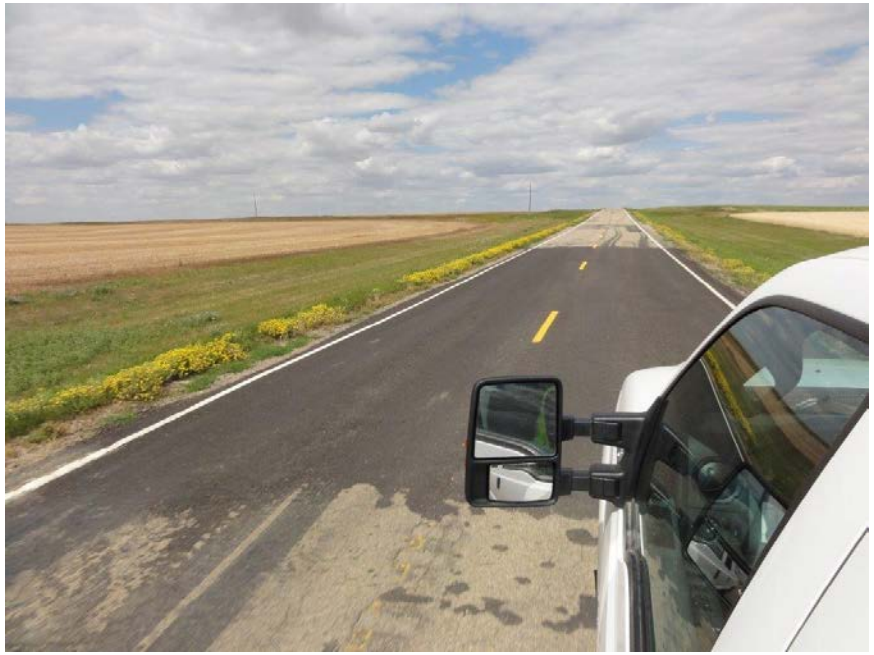

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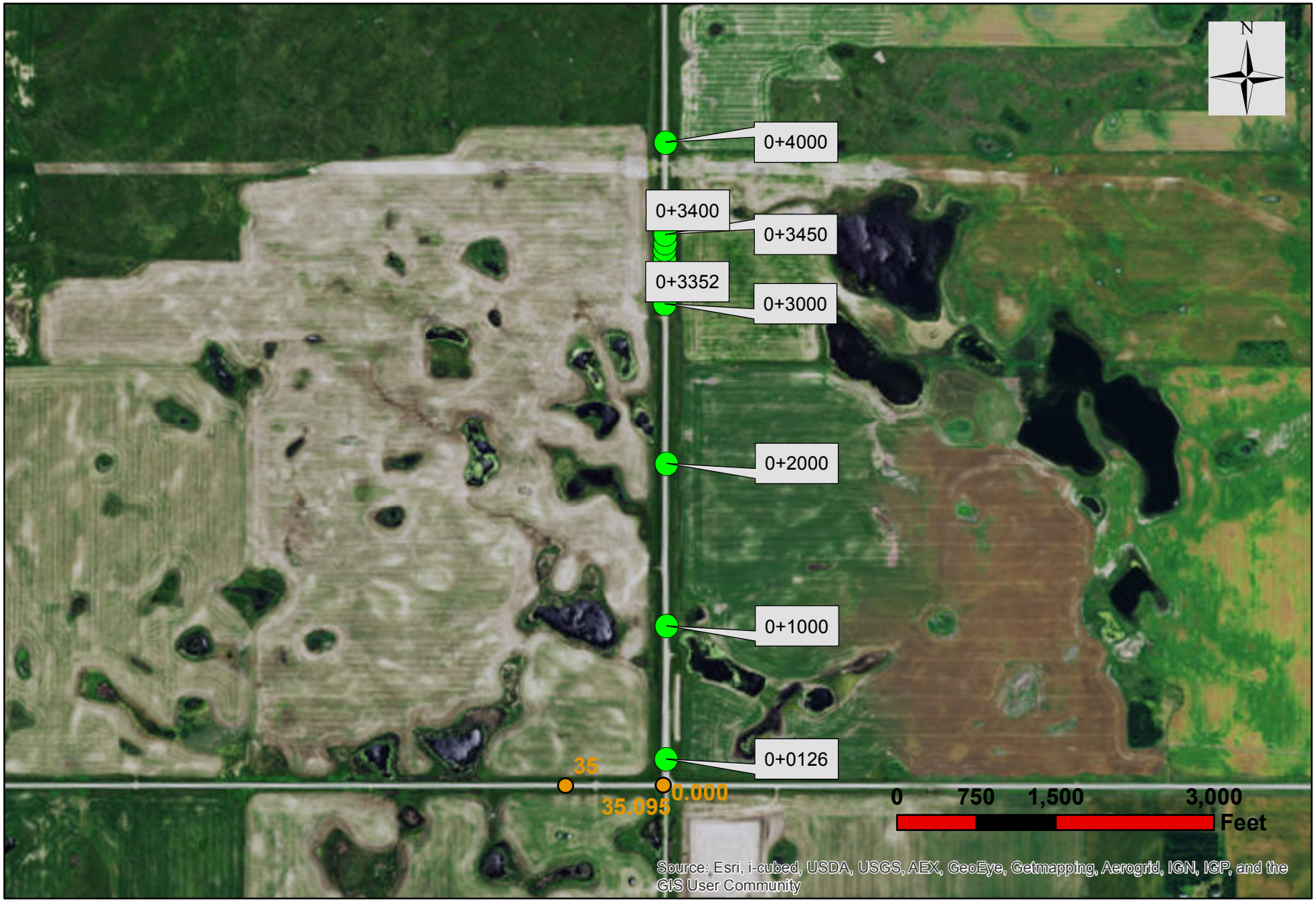
APPENDIX C

BORING LOCATIONS



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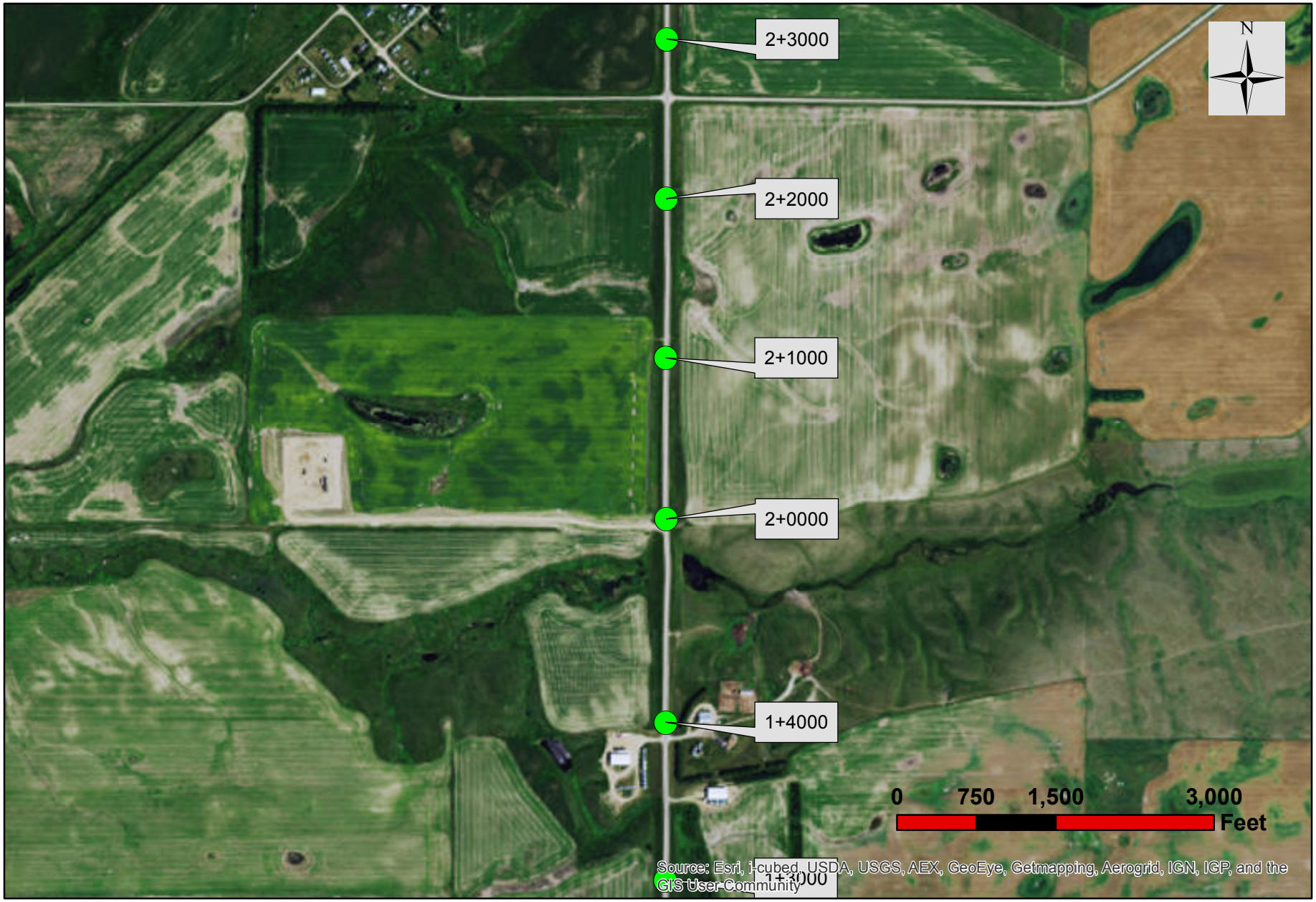
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

Legend

- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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- Reference Point

Project Number: SS-7-042(014)000

Legend

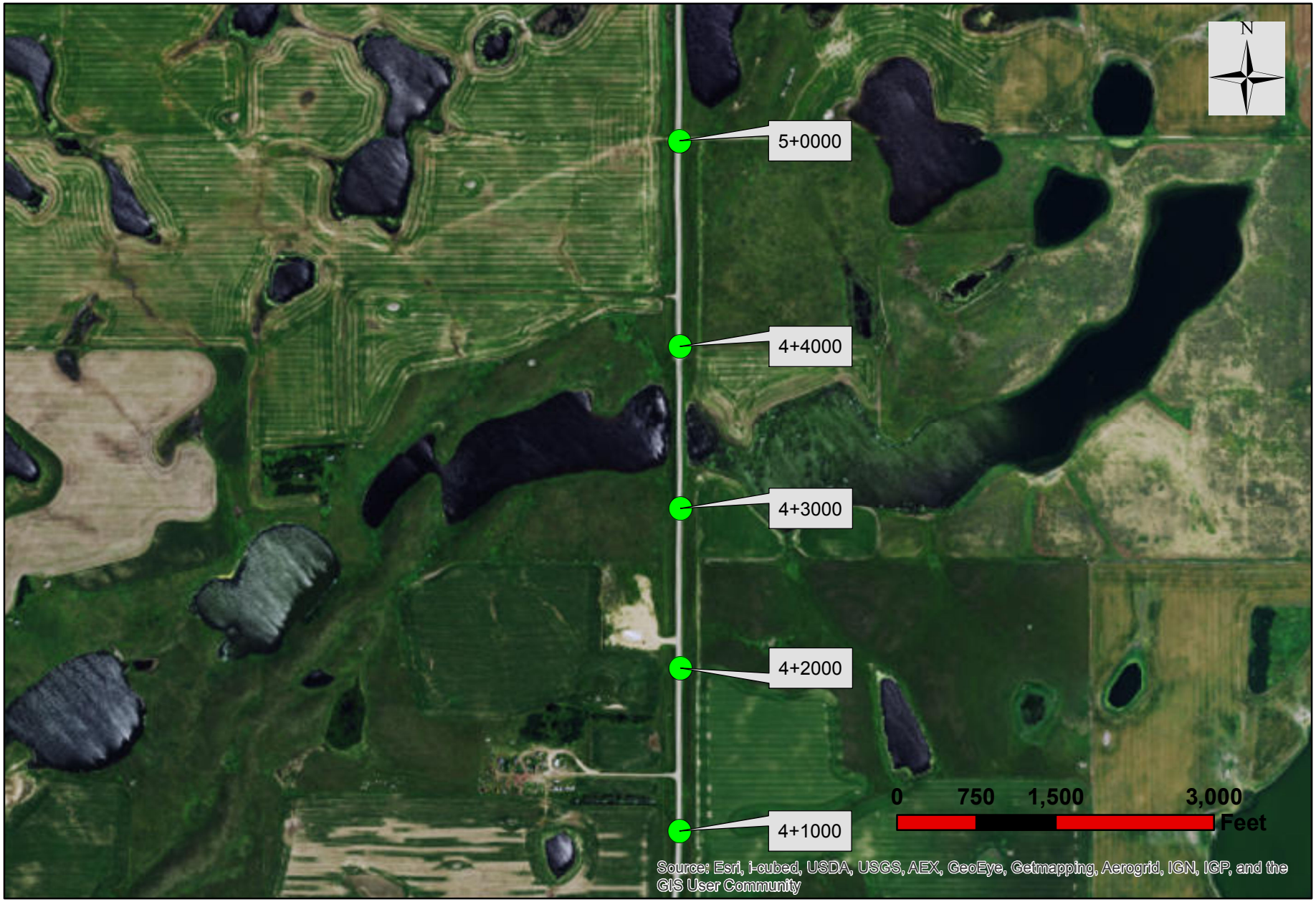
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

Legend

- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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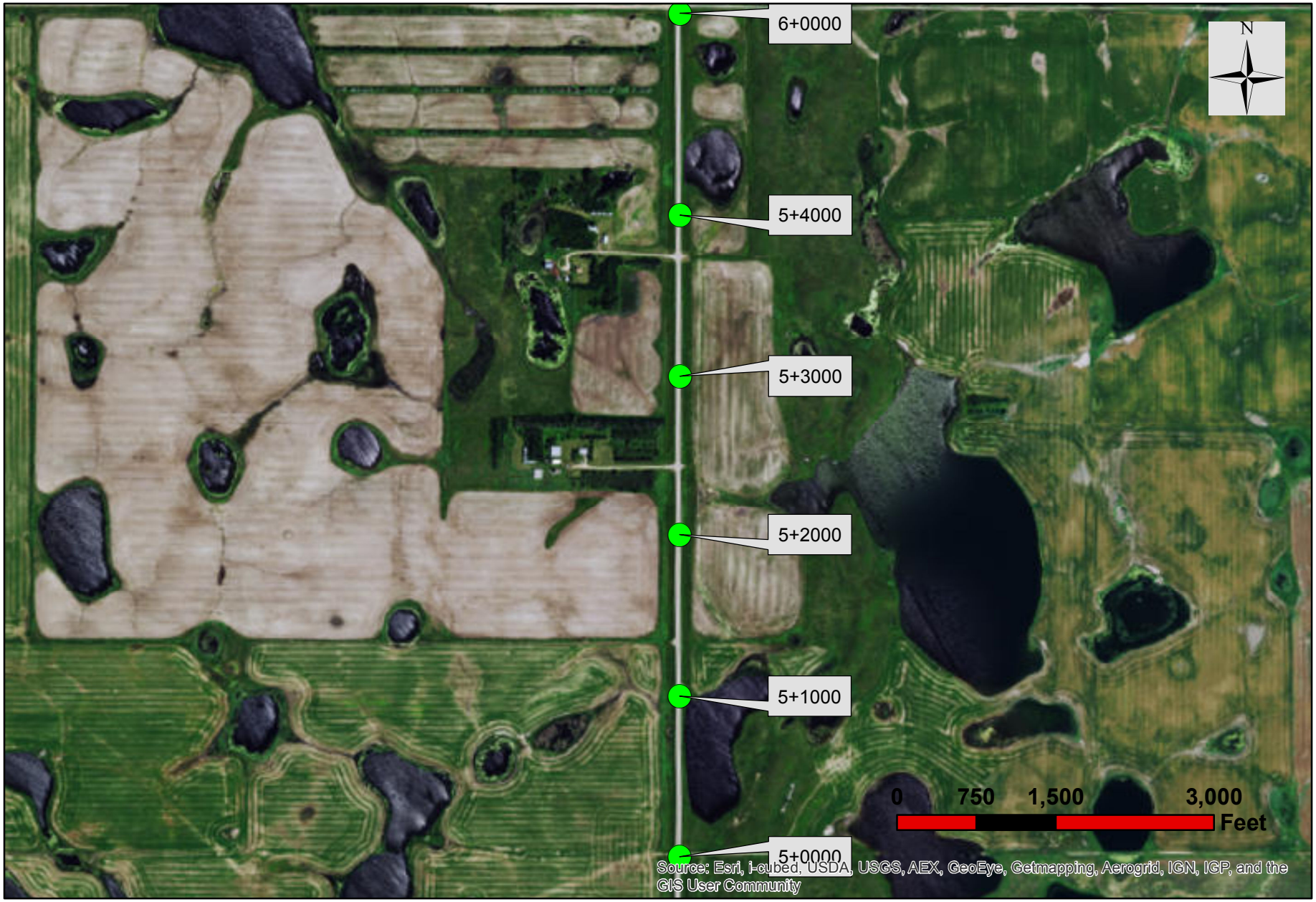
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

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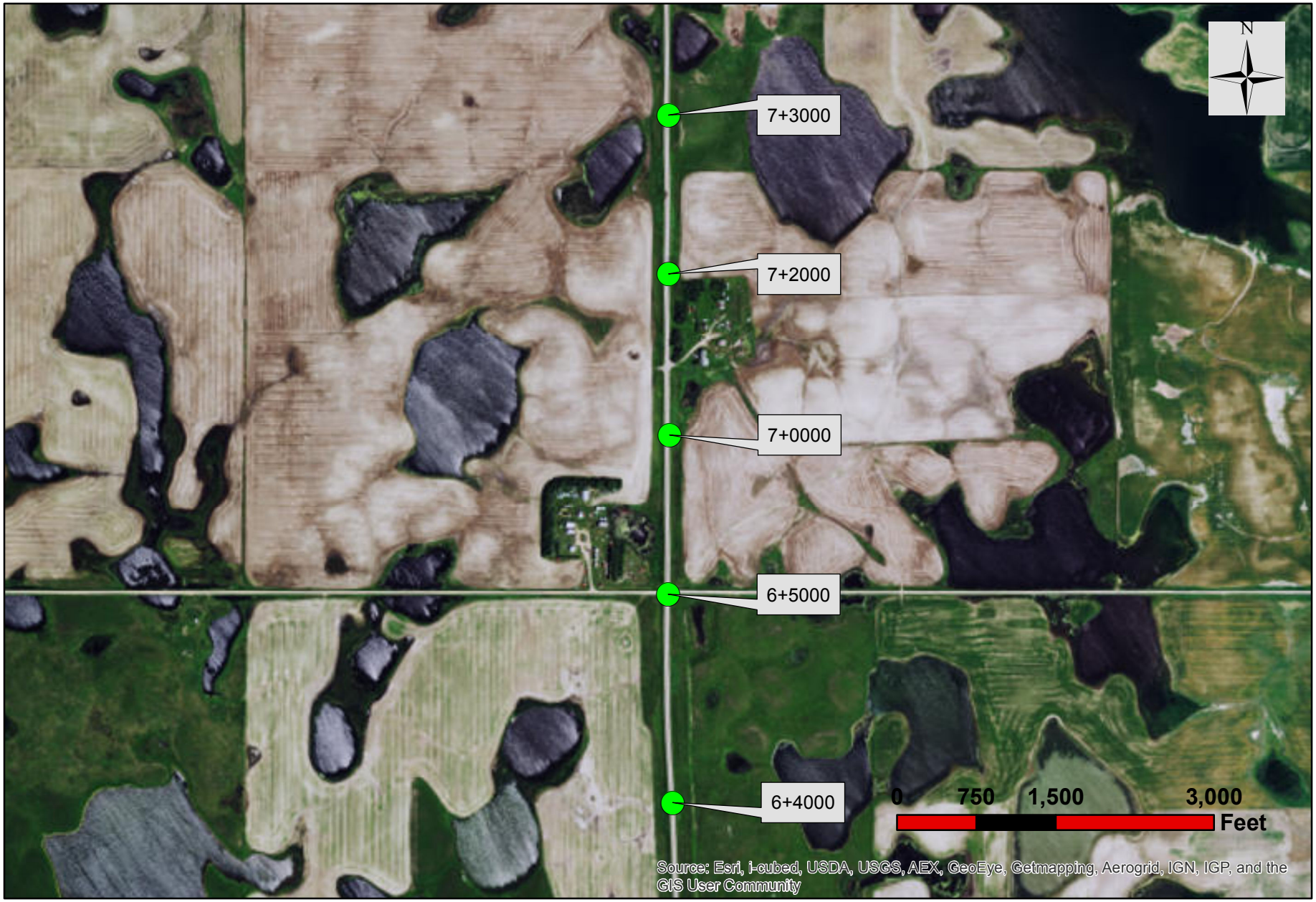
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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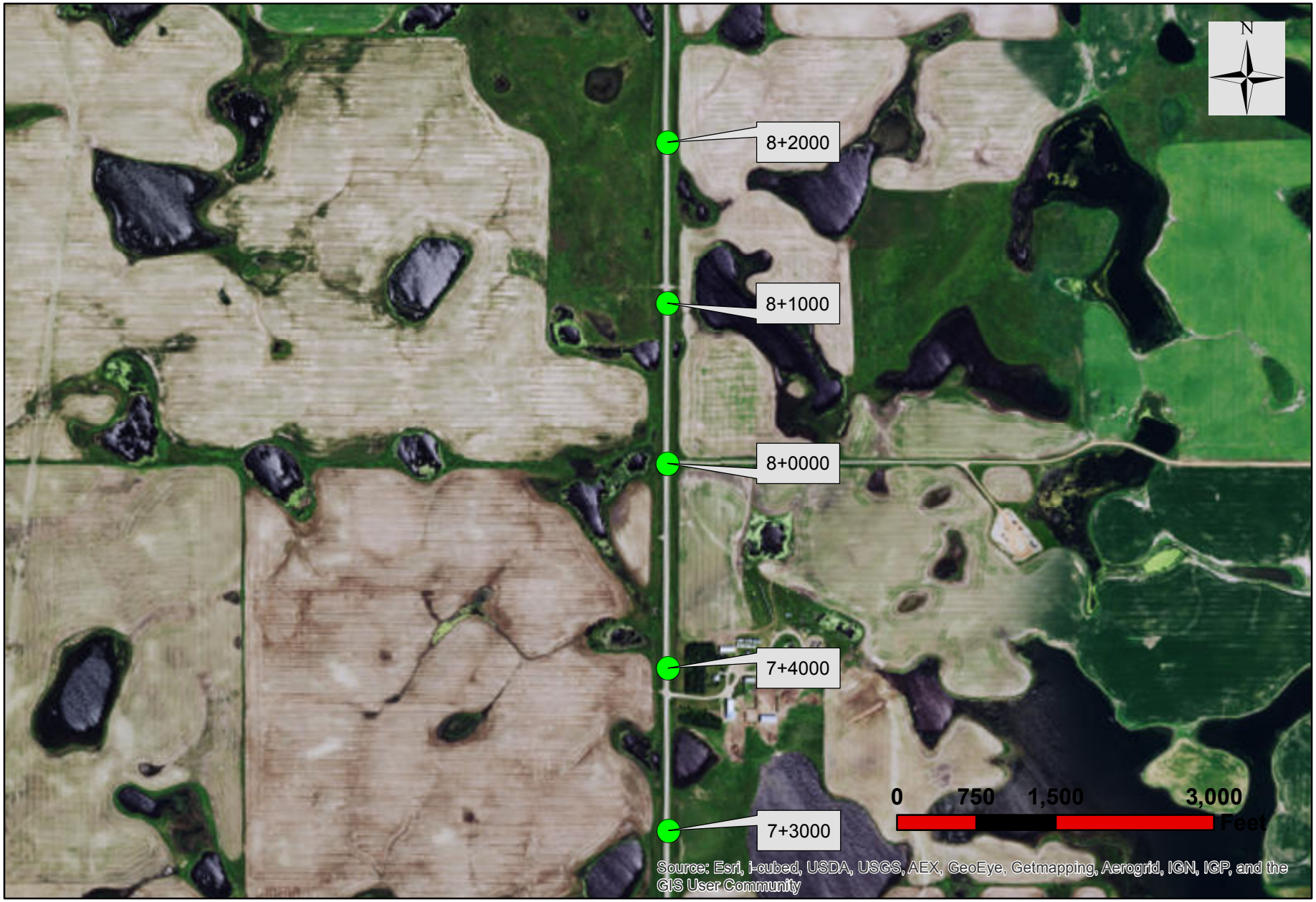
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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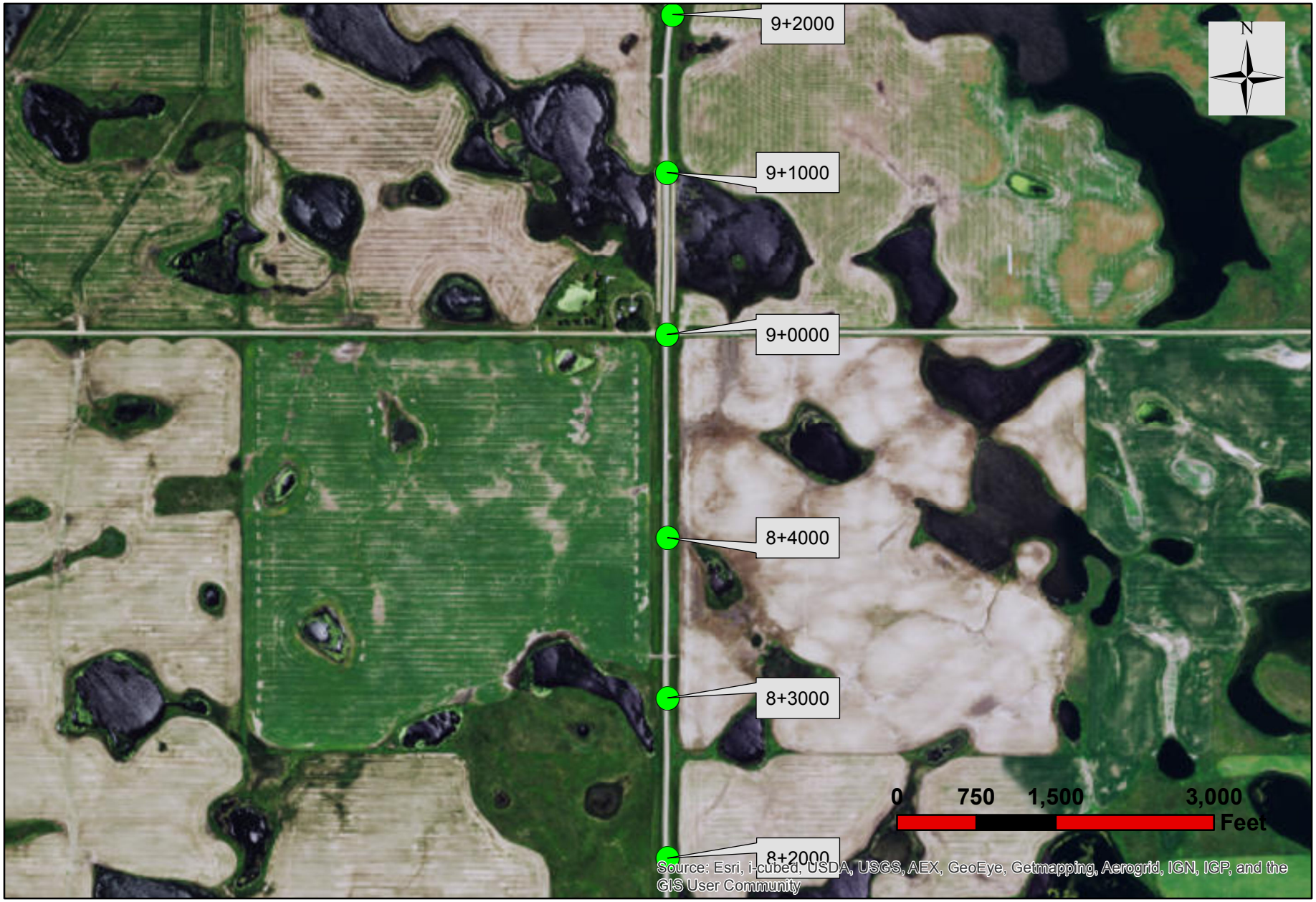
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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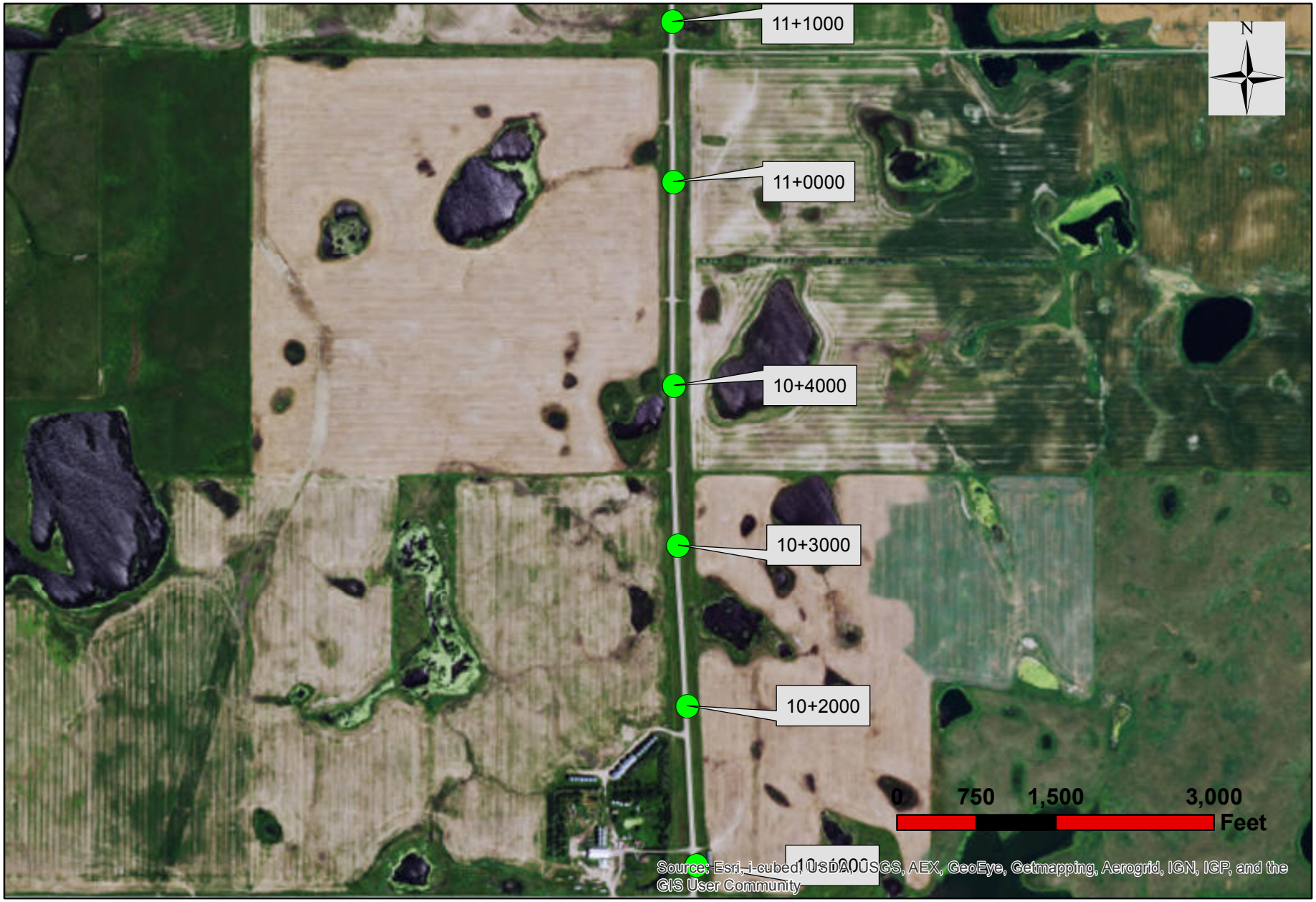
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

Legend

- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

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- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

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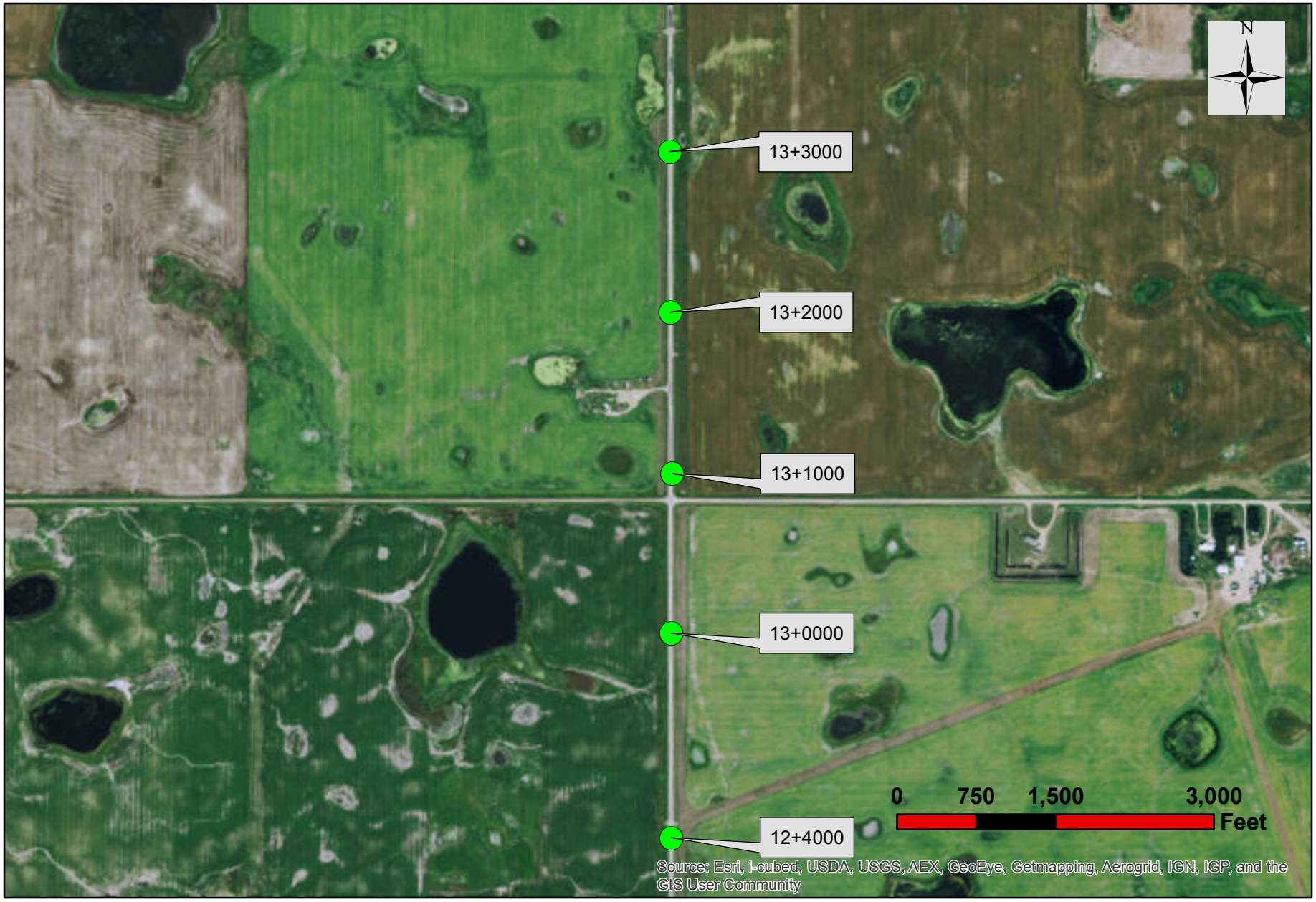
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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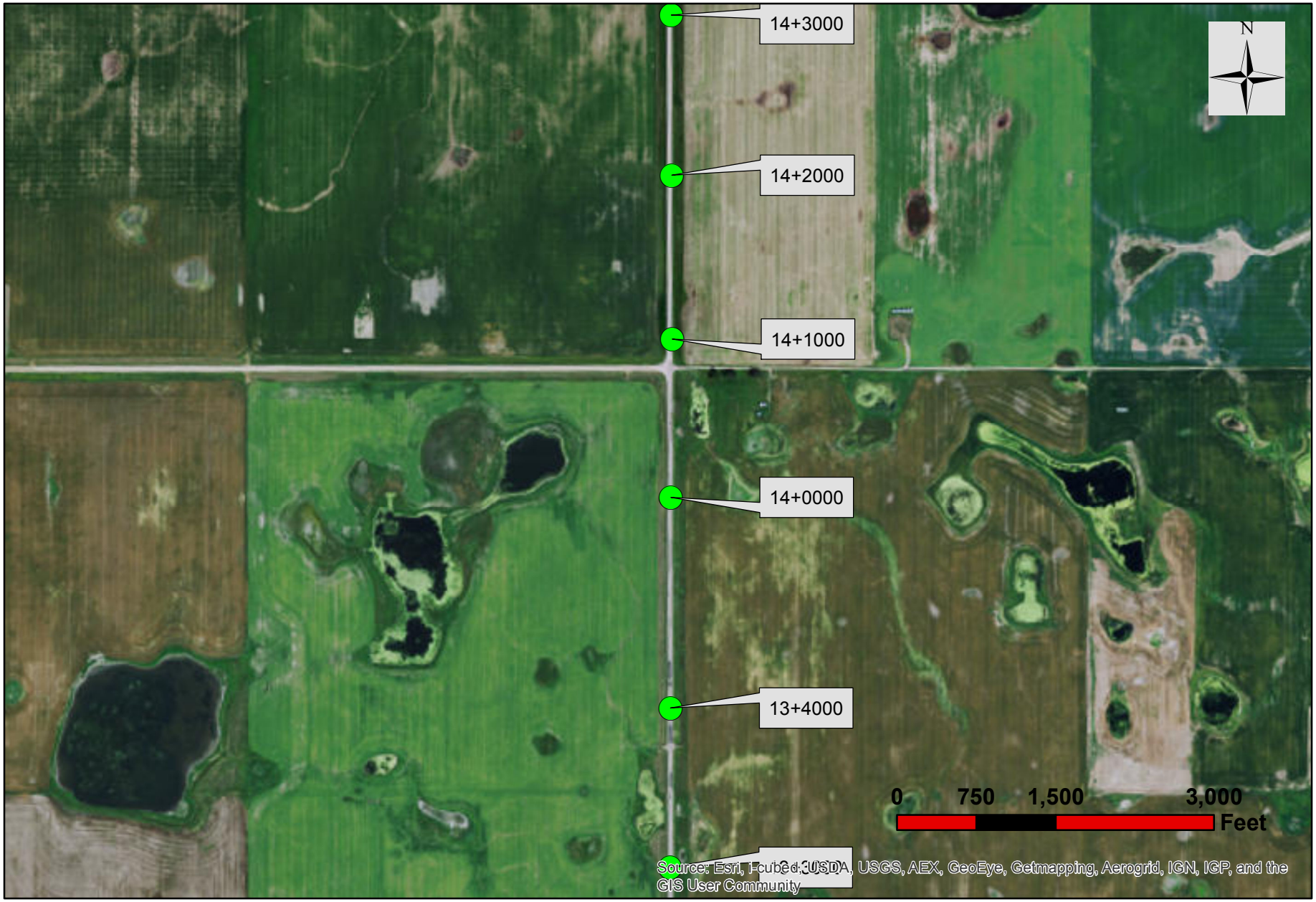
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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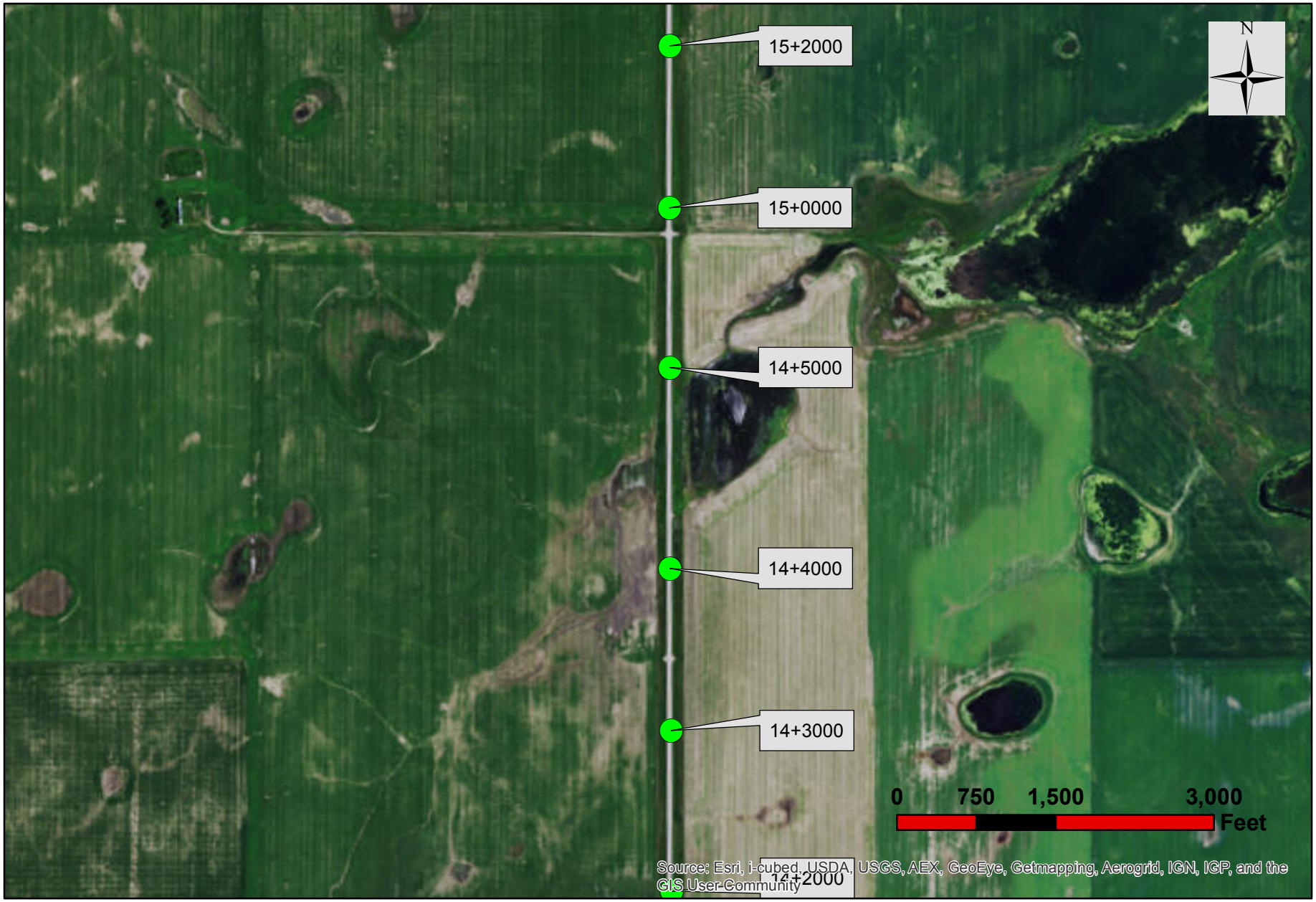
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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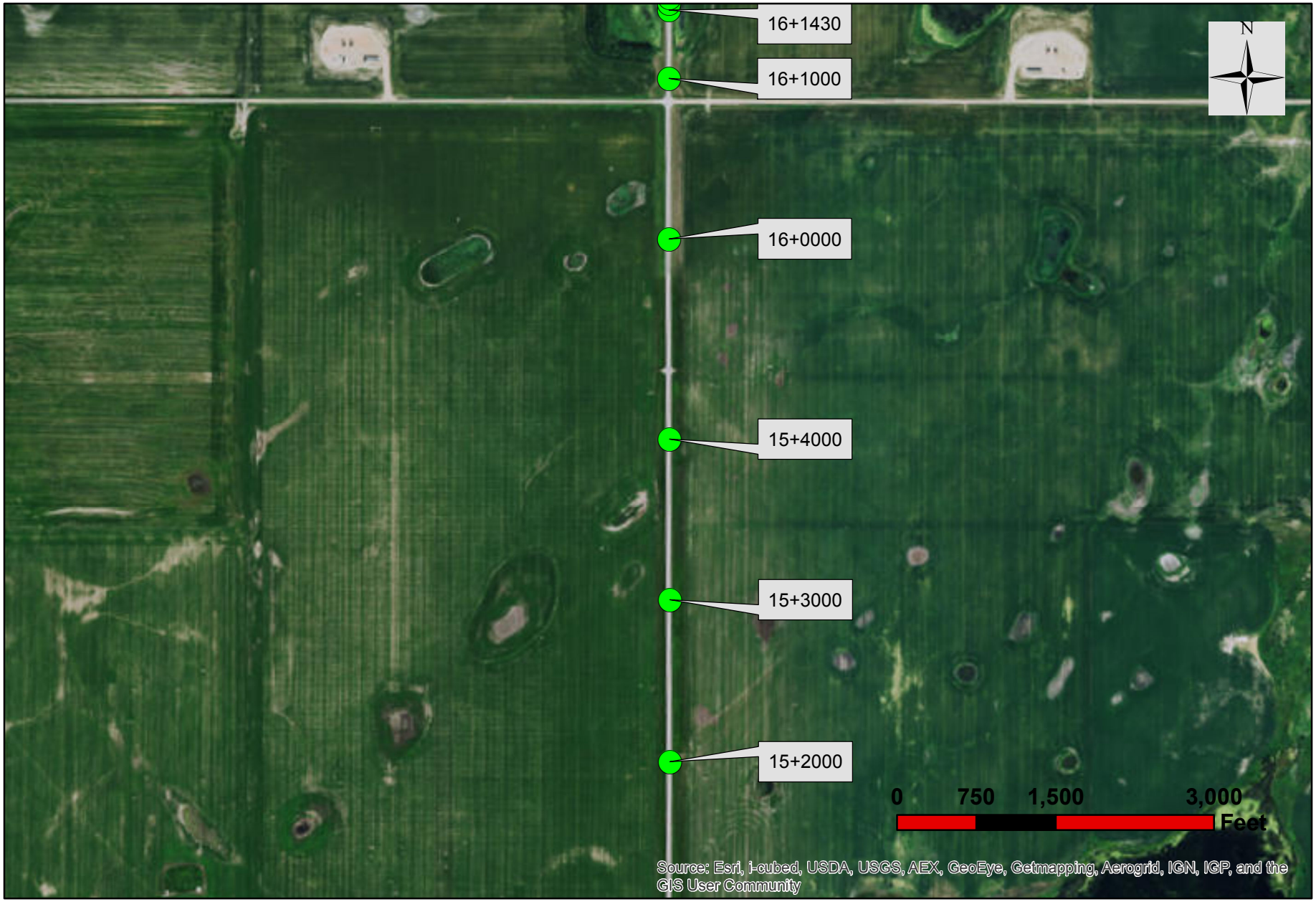
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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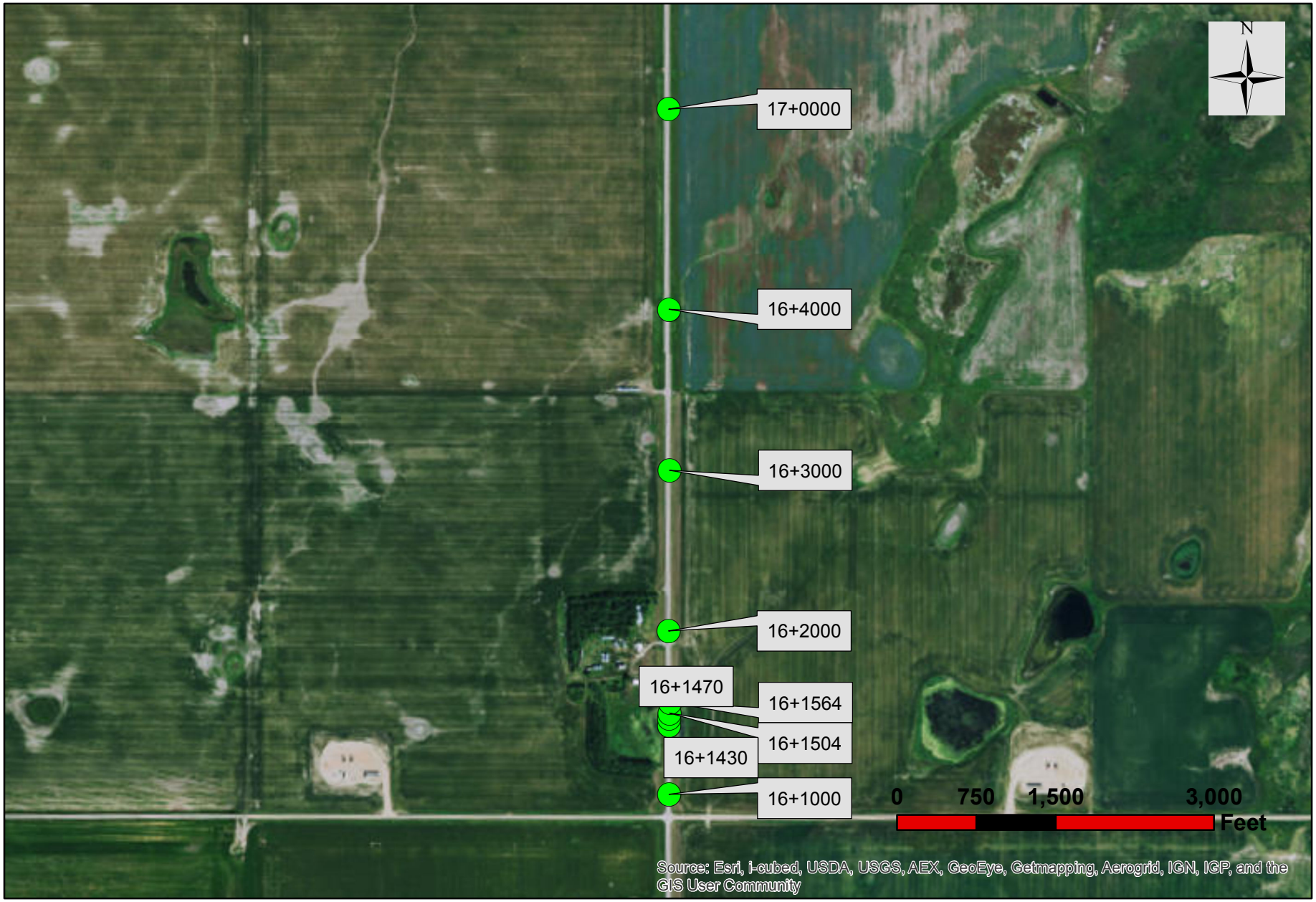
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



Legend

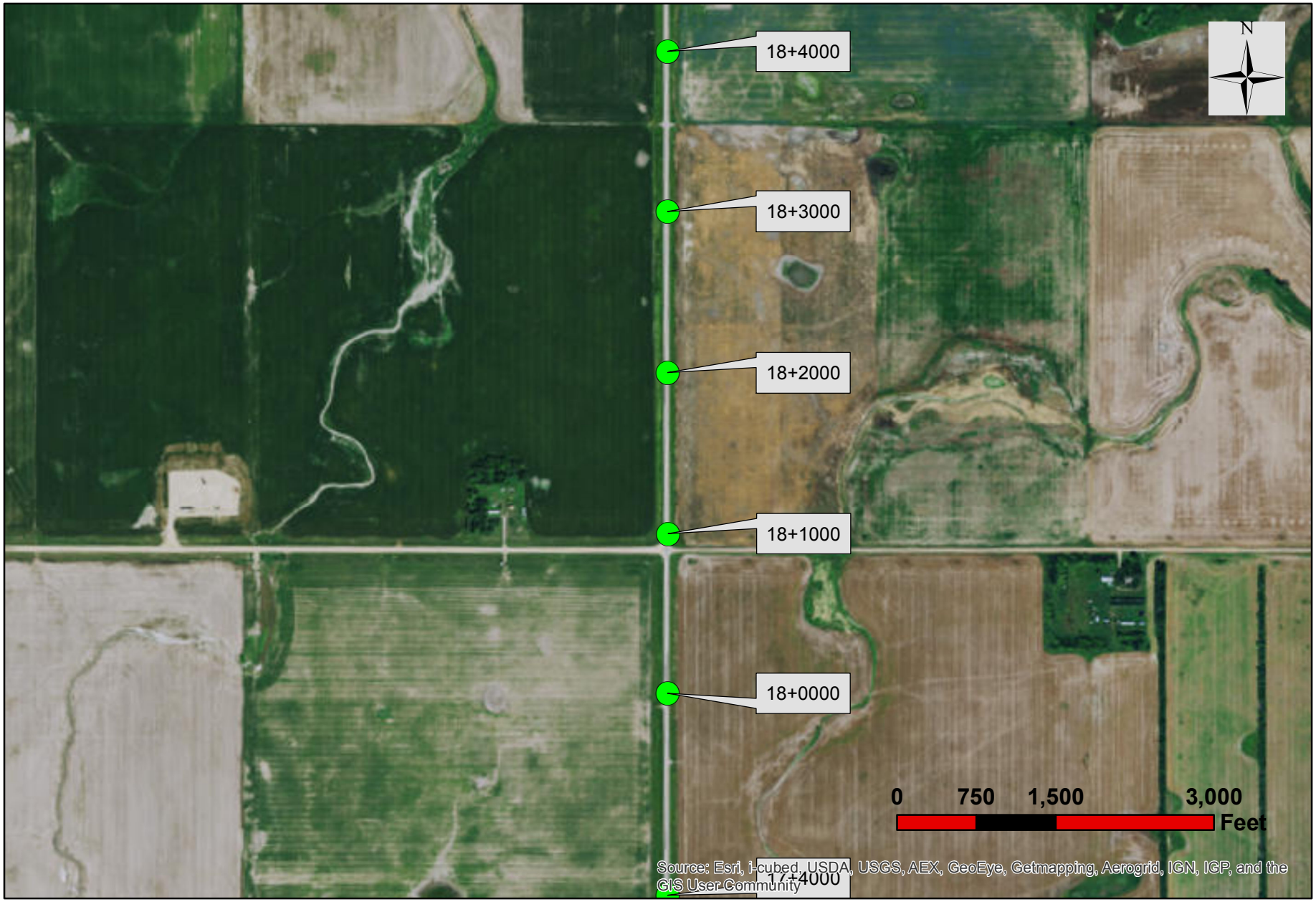
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

Legend

- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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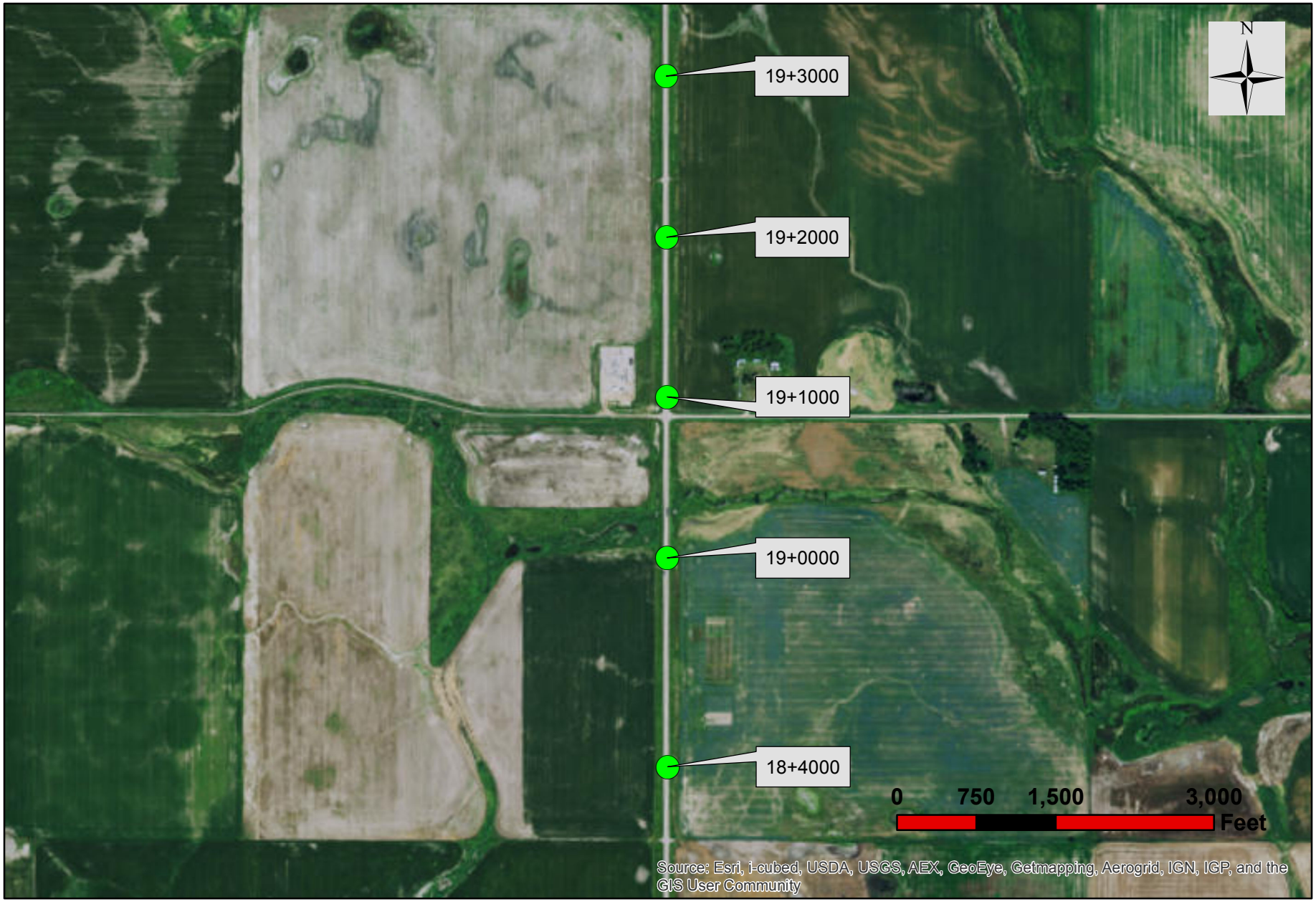
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

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- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

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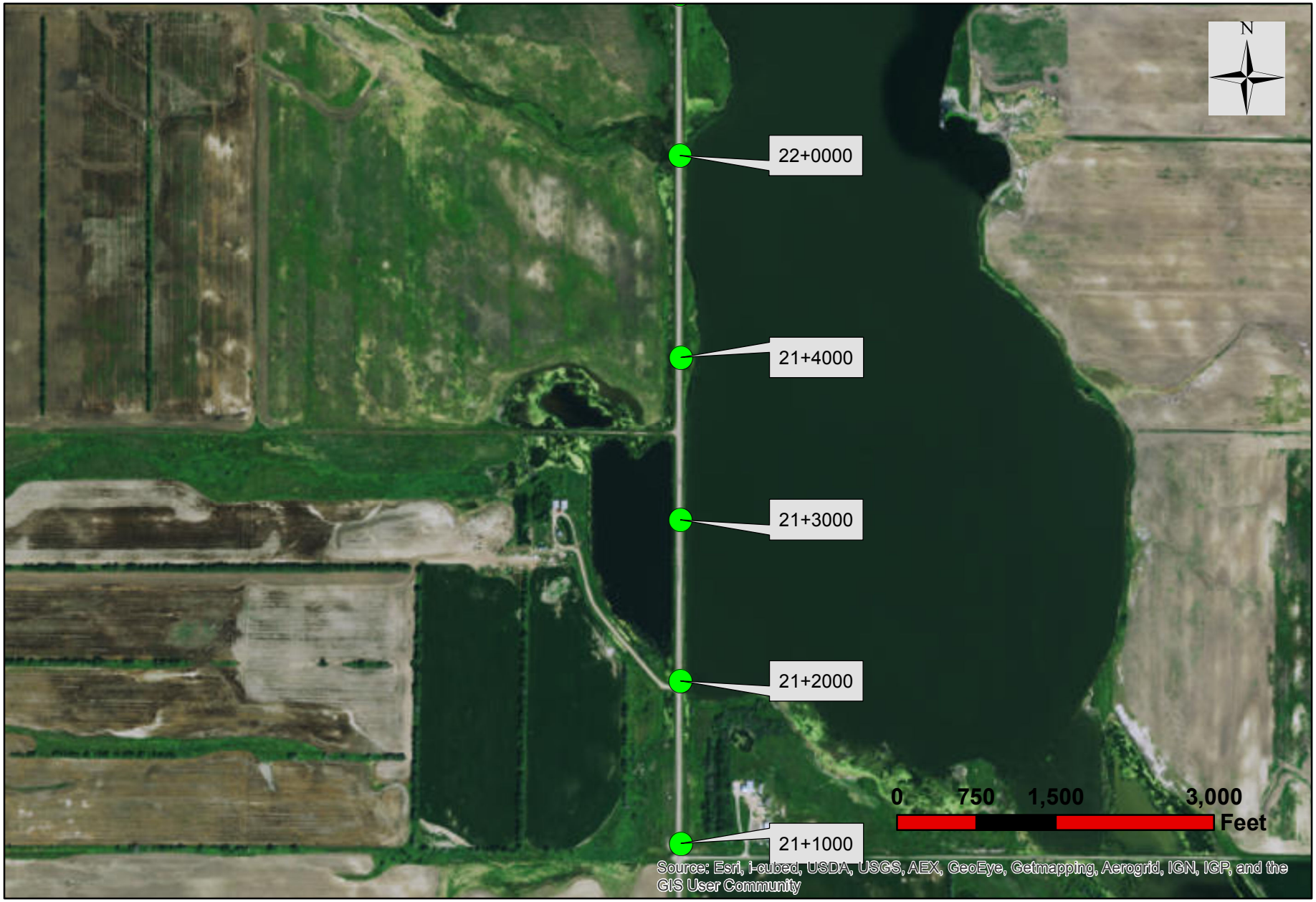
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



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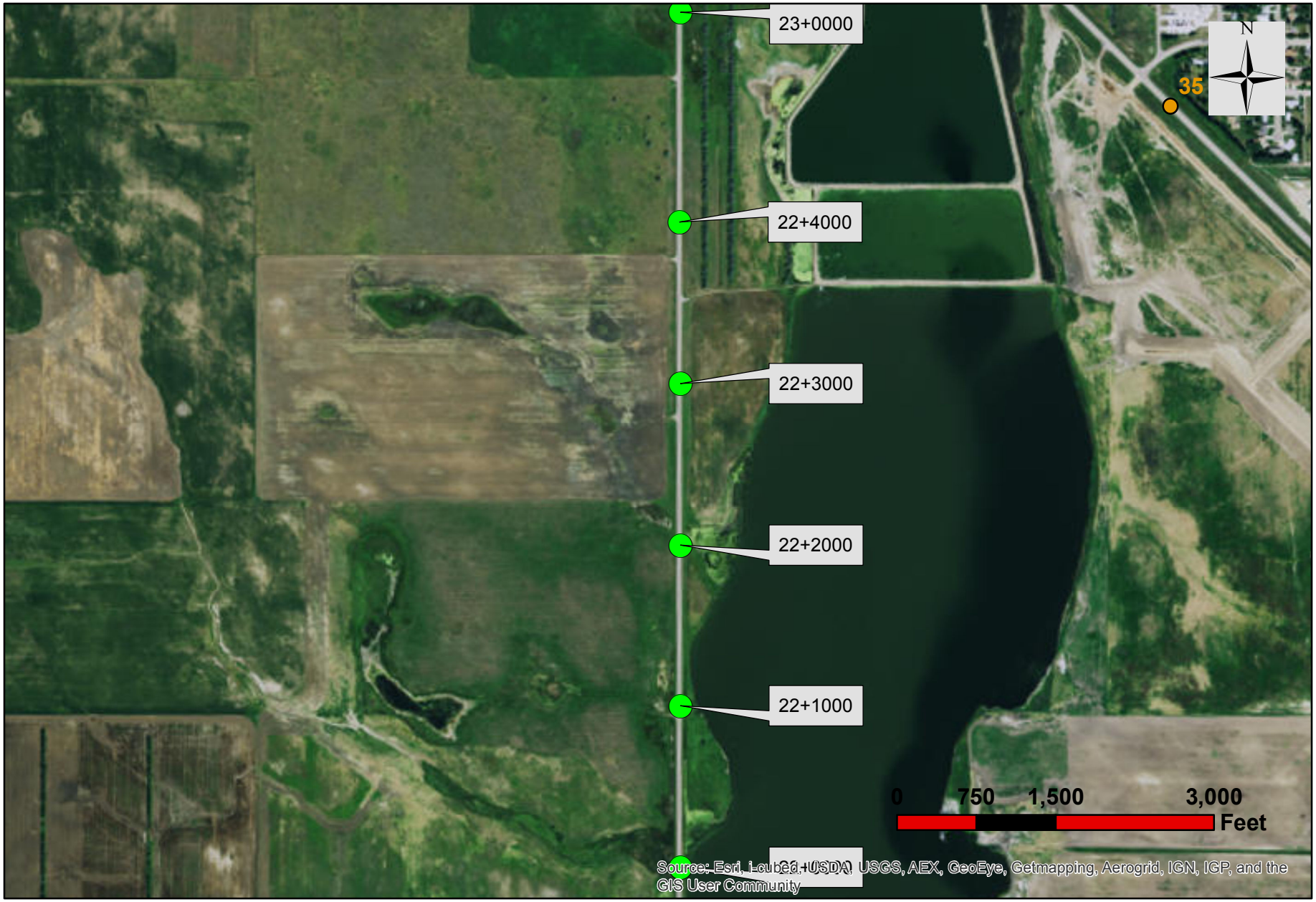
- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000



Legend

- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

Legend

- Boring Locations
- Reference Point

Project Number: SS-7-042(014)000

APPENDIX D

SUMMARY OF SOILS ANALYSIS

Project No.: SS-7-042(014)000

PCN: 20996

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL	0-5% Over PL	>5% Over PL
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt.	0 ≤ MC < 6% Over opt.	6 ≤ MC < 10% Over opt.
					10 ≤ MC < 16% Over opt.	MC >16% Over opt.	

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
1148	0+0126	Rt 5 NB	0.5-5	18.3	A-6(5)	5	10.6	16	16.4	16.9	15.9	16.6	16.4																					F3
1150	0+2000	Rt 5 NB	0.3-5	16.5	A-6(4)	4	9.2	16	13.9	15.1	15.6	10.5	14.5																					F3
1169	0+3269	Rt 7 NB	0.3-5	18.6	A-6(8)	8	11.7	17	18.7	18.5	20.7	18.9	16.7																					F3
1170	0+3352	Rt 7 NB	0.4-5	16.0	A-6(9)	9	10.1	19	16.8	18.3	19.1	15.7	14.2																					F3
1172	0+3450	Rt 7 NB	0.3-5	13.6	A-2-4(0)	0	6.5	7	9.2	15.7	8.4	5.9	6.9																					F3
1152	0+4000	Rt 5 NB	0.4-5	20.7	A-6(7)	7	11.7	16	22.2	22.9	23.0	21.9	21.2																					F3
			0-0						20.3	16.4	21.0	20.5	23.2																					
			0-0						29.5	30.5	27.3	32.1	28.1																					
			0-0						19.6	18.2	19.7	19.8	20.6																					
			0-0						24.4	23.0	25.1	25.9	23.8																					
			0-0						19.3	19.3	18.8	20.8	18.3																					
			0-0						18.3	17.9	17.2	20.0	18.3																					
			0-0						26.2	21.4	23.0	27.6	32.8																					

Project No.:

PCN:

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL	0-5% Over PL	>5% Over PL
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt.	0 ≤ MC < 6% Over opt.	6 ≤ MC < 10% Over opt.	10 ≤ MC < 16% Over opt.	MC >16% Over opt.

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
			0-0						22.7	21.9	21.9	24.1	23.0																					
			0-0						21.3	19.3	21.7	24.6	19.6																					
			0-0						21.9	23.6	24.1	20.8	19.0																					
			0-0						17.0	19.2	16.5	16.2	16.0																					
			0-0						19.8	20.5	20.2	17.9	20.7																					
			0-0						19.8	19.4	20.2	21.1	18.7																					
			0-0						24.0	23.4	23.5	25.2	23.9																					
			0-0						37.5	21.1	23.9	25.6	79.5																					
			0-0						19.8	21.9	18.7	19.2	19.3																					
			0-0						21.0	19.5	23.1	19.1	22.4																					
			0-0						24.6	25.9	24.3	21.1	26.9																					
			0-0						37.2	19.7	73.7	12.6	42.9																					
			0-0						21.0	18.3	21.0	23.5	21.1																					

Project No.:

PCN:

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL / 0-5% Over PL / >5% Over PL
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt. / 0 ≤ MC < 6% Over opt. / 6 ≤ MC < 10% Over opt. / 10 ≤ MC < 16% Over opt. / MC >16% Over opt.

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
			0-0						20.4	4.5	27.0	26.8	23.4																					
			0-0						17.3	14.9	11.9	23.1	19.4																					
			0-0						24.9	17.1	42.5	19.4	20.7																					
			0-0						17.5	17.1	18.0	17.6	17.2																					
			0-0						19.0	19.5	18.6	19.1	18.6																					
			0-0						24.6	18.4	17.9	17.5	44.7																					
			0-0						19.8	19.7	19.7	19.7	20.1																					
			0-0						17.1	15.1	19.4	18.1	15.9																					
			0-0						14.4	12.8	15.1	9.2	20.6																					
			0-0						16.9	17.8	21.1	10.5	18.3																					
			0-0						9.9	10.7	9.2	11.8	8.0																					
			0-0						16.6	18.1	10.8	14.4	23.2																					
			0-0						16.7	17.2	13.9	19.6	16.0																					

Project No.:

PCN:

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL	0-5% Over PL	>5% Over PL
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt.	0 ≤ MC < 6% Over opt.	6 ≤ MC < 10% Over opt.
					10 ≤ MC < 16% Over opt.	MC >16% Over opt.	

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
			0-0						17.8	18.7	16.5	24.1	12.1																					
			0-0						21.2	17.4	13.7	23.3	30.4																					
			0-0						20.0	20.2	15.5	20.9	23.2																					
			0-0						14.0	15.8	12.7	14.8	12.9																					
			0-0						23.4	22.6	23.0	23.0	25.1																					
			0-0						26.6	16.0	27.9	31.7	30.8																					
			0-0						16.0	14.1	15.8	16.4	17.5																					
			0-0						18.7	17.3	18.6	20.0	18.8																					
			0-0						16.8	14.5	15.4	17.5	19.6																					
			0-0						24.6	25.1	22.8	21.7	28.6																					
			0-0						22.8	25.8	22.8	22.3	20.5																					
			0-0						18.8	18.3	19.9	18.3	18.6																					
			0-0						26.0	28.4	22.2	25.5	27.7																					

Project No.:

PCN:

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL / 0-5% Over PL / >5% Over PL
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt. / 0 ≤ MC < 6% Over opt. / 6 ≤ MC < 10% Over opt. / 10 ≤ MC < 16% Over opt. / MC >16% Over opt.

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
			0-0						25.8	28.8	25.8	24.4	24.1																					
			0-0						17.0	19.4	14.5	14.7	19.2																					
			0-0						25.9	28.6	28.6	23.4	22.9																					
			0-0						26.2	28.2	26.5	24.2	26.0																					
			0-0						22.4	26.2	20.9	24.1	18.6																					
1154	1+1000	Rt 5 NB	0.3-5	17.3	A-7-6(15)	15	10.8	24	16.6	15.3	16.1	16.2	18.6																					F3
1156	1+3000	Rt 5 NB	0.3-5	19.8	A-6(9)	9	12.0	16	15.4	14.1	15.5	18.0	14.0																					F3
1159	2+1000	Rt 5 NB	0.4-5	17.1	A-7-6(16)	16	11.3	26	17.8	19.8	17.9	16.8	16.7																					F3
1161	2+3000	Rt 5 NB	0.5-5	17.6	A-6(12)	12	11.0	18	10.2	17.1	15.8	16.2	-8.4																					F3
1162	2+4000	Rt 5 NB	0.5-4.5	19.0	A-6(9)	9	11.7	20	16.0	15.8	17.0	15.6	15.6																					F3
1164	3+1000	Rt 5 NB	0.5-5	17.5	A-7-6(14)	14	12.6	23	19.2	23.4	23.1	15.0	15.5																					F3
1166	3+3000	Rt 5 NB	0.7-5	18.9	A-7-6(13)	13	11.5	23	18.3	17.7	17.6	18.9	18.9																					F3
1168	4+0000	Rt 7 NB	0.6-5	17.5	A-6(10)	10	11.8	20	20.4	20.6	22.6	19.8	18.6																					F3

Project No.: SS-7-042(014)000

PCN: 20996

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL	0-5% Over PL	>5% Over PL	
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt.	0 ≤ MC < 6% Over opt.	6 ≤ MC < 10% Over opt.	10 ≤ MC < 16% Over opt.	MC >16% Over opt.

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
1173	4+1000	Rt 7 NB	0.3-5	18.2	A-6(10)	10	11.4	20	19.4	19.3	17.6	22.9	17.8																					F3
1174	4+2000	Rt 7 NB	0.5-5	17.6	A-7-6(12)	12	10.8	23	18.1	15.0	16.6	18.3	22.5																					F3
1176	4+4000	Rt 7 NB	0.5-5	19.0	A-7-6(13)	13	11.2	23	20.5	26.0	20.3	17.8	17.8																					F3
1178	5+1000	Rt 7 NB	0.5-5	18.2	A-6(11)	11	11.2	20	17.2	17.6	12.6	17.8	20.6																					F3
1180	5+3000	Rt 7 NB	0.4-5	17.6	A-7-6(12)	12	11.2	23	18.2	16.3	22.5	18.7	15.3																					F3
1182	6+0000	Rt 7 NB	0.6-5	15.7	A-6(8)	8	10.3	16	19.8	19.4	18.4	21.1	20.5																					F3
1183	6+1000	Rt 7 NB	0.3-5	0.0		15	10.5	0	17.3	15.4	15.5	16.0	22.3																					
1184	6+2000	Rt 7 NB	0.5-5	18.1	A-7-6(15)	15	11.7	26	18.4	19.1	19.5	17.6	17.2																					F3
1186	6+4000	Rt 7 NB	0.5-5	16.8	A-6(13)	13	11.2	23	16.8	16.8	14.6	18.1	17.6																					F3
1188	7+0000	Rt 7 NB	0.5-5	19.4	A-7-6(16)	16	12.5	25	21.5	20.1	22.8	20.5	22.7																					F3
1190	7+3000	Rt 7 NB	0.4-5	18.9	A-6(13)	13	10.4	21	17.2	19.2	16.7	17.2	15.7																					F3
1192	8+0000	Rt 7 NB	0.4-5	14.9	A-6(12)	12	10.3	26	19.8	22.0	22.4	16.1	18.6																					F3
1194	8+2000	Rt 7 NB	0.5-5	18.4	A-6(11)	11	10.4	19	17.5	14.5	14.3	17.0	24.2																					F3

Project No.: SS-7-042(014)000

PCN: 20996

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL	0-5% Over PL	>5% Over PL
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt.	0 ≤ MC < 6% Over opt.	6 ≤ MC < 10% Over opt.
					10 ≤ MC < 16% Over opt.	MC >16% Over opt.	

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
1196	8+4000	Rt 7 NB	0.5-5	20.0	A-6(9)	9	11.0	16	20.2	19.2	17.6	21.2	22.9																					F3
1198	9+1000	Rt 7 NB	0.4-5	15.7	A-6(6)	6	9.3	18	13.8	14.2	16.2	12.1	12.5																					F3
1200	9+3000	Rt 7 NB	0.5-5	16.7	A-6(8)	8	10.5	19	22.6	27.5	25.5	17.7	19.9																					F3
1202	10+0000	Rt 7 NB	0.5-5	16.2	A-7-6(20)	20	12.1	28	17.4	17.8	7.4	20.7	23.5																					F3
1204	10+2000	Rt 7 NB	0.5-5	17.3	A-7-6(20)	20	12.6	26	19.2	−1.3	21.3	38.1	18.6																					F3
1205	10+3000	Rt 7 NB	0.4-5	14.8	A-7-6(16)	16	11.4	27	19.6	19.4	18.7	21.2	19.3																					F3
1206	10+4000	Rt 7 NB	0.5-5	15.4	A-6(14)	14	11.3	24	20.7	21.1	17.8	20.4	23.5																					F3
1208	11+1000	Rt 7 NB	0.6-5	15.7	A-6(12)	12	11.9	23	18.1	20.1	16.7	15.5	20.2																					F3
1210	11+3000	Rt 7 NB	0.5-5	15.9	A-7-6(16)	16	11.8	26	19.4	25.6	13.0	18.7	20.2																					F3
1212	12+0000	Rt 7 NB	0.6-5	15.1	A-6(13)	13	11.6	24	21.6	20.7	19.7	22.8	23.3																					F3
1213	12+1000	Rt 7 NB	0.5-5	0.0		11		0	22.2	23.7	22.3	21.2	21.8																					
1214	12+2000	Rt 7 NB	0.4-5	18.1	A-6(11)	11	10.9	20	21.7	23.4	22.7	20.3	20.3																					F3
1215	12+3000	Rt 7 NB	0.5-5	0.0		0		0	22.2	25.3	21.6	20.8	21.3																					

Project No.: SS-7-042(014)000

PCN: 20996

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL	0-5% Over PL	>5% Over PL
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt.	0 ≤ MC < 6% Over opt.	6 ≤ MC < 10% Over opt.
					10 ≤ MC < 16% Over opt.	MC >16% Over opt.	

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
1216	12+4000	Rt 7 NB	0.5-5	19.9	A-6(9)	9	11.6	17	24.6	25.0	23.6	22.6	27.3																					F3
1218	13+1000	Rt 7 NB	0.4-5	21.0	A-6(9)	9	12.2	16	22.2	23.0	15.7	27.2	23.0																					F3
1220	13+3000	Rt 7 NB	0.4-5	19.1	A-6(14)	14	12.1	21	27.6	42.0	23.3	21.3	23.7																					F3
1222	14+0000	Rt 7 NB	0.5-4.8	14.7	A-6(7)	7	10.7	17	22.6	22.0	15.8	17.0	35.8																					F3
1224	14+2000	Rt 7 NB	0.5-5	19.7	A-7-6(26)	26	15.3	29	27.0	32.3	23.4	26.4	25.9																					F3
1226	14+4000	Rt 7 NB	0.6-5	22.7	A-7-6(25)	25	15.4	27	29.1	32.5	24.2	30.4	29.3																					F3
1228	15+0000	Rt 7 NB	0.5-5	20.6	A-7-6(23)	23	14.6	25	28.9	30.4	30.0	28.4	26.8																					F3
1230	15+3000	Rt 7 NB	0.5-5	18.6	A-6(14)	14	12.7	20	24.4	24.0	24.0	25.3	24.1																					F3
1232	16+0000	Rt 7 NB	0.5-5	18.5	A-6(7)	7	11.5	15	20.3	19.4	19.6	21.0	21.1																					F3
1234	16+1430	Rt 7 NB	0.7-5	17.6	A-6(11)	11	12.2	18	21.6	22.9	24.3	18.3	20.8																					F3
1235	16+1470	Rt 7 NB	0.9-5	19.4	A-6(15)	15	13.0	20	25.7	25.6	29.3	24.5	23.4																					F3
1236	16+1504	Rt 7 NB	1-5	17.1	A-6(17)	17	12.9	23	25.2	21.5	26.3	26.5	26.4																					F3
1237	16+1564	Rt 7 NB	0.6-5	20.1	A-7-6(17)	17	12.9	21	28.5	29.4	27.7	28.2	28.8																					F3

Project No.: SS-7-042(014)000

PCN: 20996

Color Key

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Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
1238	16+2000	Rt 7 NB	0.4-5	19.3	A-7-6(18)	18	15.2	21	23.3	23.8	23.3	20.9	25.1																					F3
1240	16+4000	Rt 7 NB	0.6-5	20.3	A-7-6(15)	15	13.4	22	30.8	25.9	24.2	50.8	22.5																					F3
1242	17+1000	Rt 7 NB	0.5-5	20.4	A-6(12)	12	12.7	19	24.2	25.0	28.9	21.3	21.8																					F3
1244	17+3000	Rt 7 NB	0.5-5	19.0	A-7-6(19)	19	12.3	23	25.7	18.5	25.3	32.6	26.3																					F3
1246	18+0000	Rt 7 NB	0.5-5	20.2	A-7-6(14)	14	12.6	21	22.9	23.9	25.3	21.8	20.5																					F3
1248	18+2000	Rt 7 NB	0.5-5	19.5	A-7-6(16)	16	13.2	23	22.8	21.5	25.1	23.1	21.4																					F3
1250	18+4000	Rt 7 NB	0.6-5	20.2	A-7-6(20)	20	13.7	25	25.2	26.4	29.0	29.0	16.2																					F3
1252	19+1000	Rt 7 NB	0.6-5	21.5	A-7-6(25)	25	14.0	27	27.5	22.2	23.8	30.0	33.9																					F3
1254	19+3000	Rt 7 NB	0.5-5	20.6	A-7-6(22)	22	13.3	26	17.7	26.7	-12.4	28.2	28.4																					F3
1255	19+4000	Rt 7 NB	0.4-5	0.0		16		0	23.0	25.9	18.0	22.0	26.1																					
1256	20+0000	Rt 7 NB	0.6-5	19.5	A-6(16)	16	12.3	20	23.9	26.0	19.3	21.4	29.0																					F3
1258	20+2000	Rt 7 NB	0.5-5	20.3	A-6(12)	12	12.4	17	21.6	28.7	17.3	19.5	20.9																					F3
1260	20+4000	Rt 7 NB	0.6-5	21.7	A-6(13)	13	12.3	15	26.5	28.8	27.4	25.0	24.9																					F3

Project No.: SS-7-042(014)000

PCN: 20996

Color Key

Swell Potential:	Low	Marginal	High	Moisture Content:	Below PL	0-5% Over PL	>5% Over PL	
Group Index:	GI≤20	GI>20		Ave. In-Place: Moisture Content	MC < Opt.	0 ≤ MC < 6% Over opt.	6 ≤ MC < 10% Over opt.	10 ≤ MC < 16% Over opt.	MC >16% Over opt.

Lab No.	STA	Offset	Depth of Sample (ft)	Plastic Limit (PL)	AASHTO Class	Group Index	Optimum Moisture	Swell Potential (PI)	Ave. In-Place Moisture	Moisture Content @ Depth (ft) 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Frost Class
1262	21+1000	Rt 7 NB	0.6-5	22.1	A-4(7)	7	11.1	9	21.6	13.1	18.8	27.8	26.7																					F4
1263	21+2000	Rt 7 NB	0.5-5	0.0		13		0	17.7	18.8	13.5	20.7	17.7																					
1264	21+3000	Rt 7 NB	0.6-5	17.0	A-7-6(13)	13	11.8	24	23.4	17.9	29.3	21.6	24.9																					F3
1266	22+0000	Rt 7 NB	0.6-5	15.6	A-6(11)	11	10.5	23	18.8	18.3	18.8	17.1	20.8																					F3
1268	22+2000	Rt 7 NB	0.5-5	0.0	A-2-4(0)	0	7.5	0	10.0	7.9	15.2	8.7	8.4																					F3
1270	22+4000	Rt 7 NB	0.5-5	15.0	A-2-4(0)	0	8.2	3	12.5	9.5	21.0	6.5	13.1																					F3
1272	23+0700	Rt 7 NB	0.7-5	14.3	A-4(0)	0	7.6	8	10.0	9.5	7.1	12.6	10.8																					F3

APPENDIX E

LAB RESULTS

Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1148	1149	1150	1151
Reference Pt + Feet	0+0126	0+1000	0+2000	0+3000
Distance From CenterLine (Ft.)	Rt 5 NB	Rt 5 NB	Rt 5 NB	Rt 5 NB
Depth, Ft.	0.5 - 5.0	0.3 - 5.0	0.3 - 5.0	0.3 - 5.0
Field Sample No.	1148	1149	1150	1151
% Pass. 3/8" Sieve	95	98	92	100
% Pass. No. 4 Sieve	92	95	87	98
% Pass. No. 10 Sieve	88	91	82	95
% Coarse Sand (-No. 10 + No. 40)	13		12	
% Fine Sand (-No. 40 + No. 200)	24		23	
% Silt (0.074 - 0.005 mm)	24		21	
% Clay (-0.005 mm)	26		26	
Liquid Limit (-No. 40)	34		33	
Plasticity Index (-No. 40)	16		17	
Plastic Limit	18		17	
Soil Color	BRN/GRY	BRN/GRY/BLK	BRN/GRY	BRN/BLK
Textural Class	CLY LM		SNDY CLY LM	
Soil Class (AASHTO M-145)	A-6(5)		A-6(4)	
Frost Class	F3		F3	
Optimum Moisture (%)	10.6	9.9	9.2	12.1
Maximum Dry Density (pcf)	125.1	128.2	130.4	122.7
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 16.9	2 | 17.8	2 | 15.1	2 | 17.2
	3 | 15.9	3 | 21.1	3 | 15.6	3 | 13.9
	4 | 16.6	4 | 10.5	4 | 10.5	4 | 19.6
	5 | 16.4	5 | 18.3	5 | 14.5	5 | 16.0
Avg. Moisture of Sample Depth	16.5	16.9	14.0	16.7

Scott W. Wutzke, Testing Lab Supervisor
Date Printed: 11/6/2015

Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1169	1170	1171	1172
Reference Pt + Feet	0+3269	0+3352	0+3400	0+3450
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.3 - 5.0	0.4 - 5.0	0.4 - 5.0	0.3 - 5.0
Field Sample No.	1169	1170	1171	1172
% Pass. 3/8" Sieve	100	100		85
% Pass. No. 4 Sieve	99	96		78
% Pass. No. 10 Sieve	97	94		70
% Coarse Sand (-No. 10 + No. 40)	9	10		19
% Fine Sand (-No. 40 + No. 200)	26	23		28
% Silt (0.074 - 0.005 mm)	27	26		10
% Clay (-0.005 mm)	34	36		14
Liquid Limit (-No. 40)	36	35		21
Plasticity Index (-No. 40)	17	19		7
Plastic Limit	19	16		14
Soil Color	BRN/BLK	BRN	BRN	BRN/BLK
Textural Class	CLY	CLY		SNDY LM
Soil Class (AASHTO M-145)	A-6(8)	A-6(9)		A-2-4(0)
Frost Class	F3	F3		F3
Optimum Moisture (%)	11.7	10.1	10.3	6.5
Maximum Dry Density (pcf)	121.2	128.8	128.1	137.2
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 18.5	2 | 18.3	2 | 19.2	2 | 15.7
	3 | 20.7	3 | 19.1	3 | 16.5	3 | 8.4
	4 | 18.9	4 | 15.7	4 | 16.2	4 | 5.9
	5 | 16.7	5 | 14.2	5 | 16.0	5 | 6.9
Avg. Moisture of Sample Depth	18.7	16.8	17.0	9.2

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Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1152	1153	1154	1155
Reference Pt + Feet	0+4000	1+0015	1+1000	1+2000
Distance From CenterLine (Ft.)	Rt 5 NB	Rt 5 NB	Rt 5 NB	Rt 5 NB
Depth, Ft.	0.4 - 5.0	0.4 - 5.0	0.3 - 5.0	0.6 - 5.0
Field Sample No.	1152	1153	1154	1155
% Pass. 3/8" Sieve	98	99	100	95
% Pass. No. 4 Sieve	97	95	98	93
% Pass. No. 10 Sieve	95	90	96	89
% Coarse Sand (-No. 10 + No. 40)	10		7	
% Fine Sand (-No. 40 + No. 200)	24		19	
% Silt (0.074 - 0.005 mm)	27		33	
% Clay (-0.005 mm)	33		38	
Liquid Limit (-No. 40)	36		41	
Plasticity Index (-No. 40)	16		24	
Plastic Limit	21		17	
Soil Color	BRN/GRY/BLK	BRN/GRY/BLK	BRN/GRY	BRN/GRY/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-6(7)		A-7-6(15)	
Frost Class	F3		F3	
Optimum Moisture (%)	11.7	12.6	10.8	9.8
Maximum Dry Density (pcf)	121.6	119.8	125.7	128.1
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 22.9	2 | 17.4	2 | 15.3	2 | 15.8
	3 | 23.0	3 | 13.7	3 | 16.1	3 | 12.7
	4 | 21.9	4 | 23.3	4 | 16.2	4 | 14.8
	5 | 21.2	5 | 30.4	5 | 18.6	5 | 12.9
Avg. Moisture of Sample Depth	22.2	21.2	16.6	14.0

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Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1156	1157	1202	1203
Reference Pt + Feet	1+3000	1+4000	10+0000	10+1000
Distance From CenterLine (Ft.)	Rt 5 NB	Rt 5 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.3 - 5.0	0.4 - 5.0	0.5 - 5.0	0.5 - 5.0
Field Sample No.	1156	1157	1202	1203
% Pass. 3/8" Sieve	99	100	100	
% Pass. No. 4 Sieve	98	99	100	
% Pass. No. 10 Sieve	96	97	99	
% Coarse Sand (-No. 10 + No. 40)	7		5	
% Fine Sand (-No. 40 + No. 200)	20		19	
% Silt (0.074 - 0.005 mm)	35		29	
% Clay (-0.005 mm)	34		46	
Liquid Limit (-No. 40)	36		45	
Plasticity Index (-No. 40)	16		28	
Plastic Limit	20		16	
Soil Color	BRN/GRY/BLK	BRN/GRY	BRN/GRY/BLK	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-6(9)		A-7-6(20)	
Frost Class	F3		F3	
Optimum Moisture (%)	12.0	10.1	12.1	10.5
Maximum Dry Density (pcf)	121.6	127.0	122.0	125.6
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 14.1	2 | 14.1	2 | 17.8	2 | 18.4
	3 | 15.5	3 | 15.8	3 | 7.4	3 | 17.9
	4 | 18.0	4 | 16.4	4 | 20.7	4 | 17.5
	5 | 14.0	5 | 17.5	5 | 23.5	5 | 44.7
Avg. Moisture of Sample Depth	15.4	15.9	17.3	24.7

Scott W. Wutzke, Testing Lab Supervisor
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Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

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County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1204	1205	1206	1207
Reference Pt + Feet	10+2000	10+3000	10+4000	11+0000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.4 - 5.0	0.5 - 5.0	0.6 - 5.0
Field Sample No.	1204	1205	1206	1207
% Pass. 3/8" Sieve	100	100	100	
% Pass. No. 4 Sieve	100	100	99	
% Pass. No. 10 Sieve	99	98	97	
% Coarse Sand (-No. 10 + No. 40)	4	6	6	
% Fine Sand (-No. 40 + No. 200)	17	23	23	
% Silt (0.074 - 0.005 mm)	28	29	28	
% Clay (-0.005 mm)	50	41	40	
Liquid Limit (-No. 40)	43	42	40	
Plasticity Index (-No. 40)	26	27	24	
Plastic Limit	17	15	15	
Soil Color	BRN/TAN	BRN	BRN/GRY/BLK	BRN/GRY
Textural Class	CLY	CLY	CLY	
Soil Class (AASHTO M-145)	A-7-6(20)	A-7-6(16)	A-6(14)	
Frost Class	F3	F3	F3	
Optimum Moisture (%)	12.6	11.4	11.3	11.5
Maximum Dry Density (pcf)	120.5	124.0	123.1	123.2
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | -1.3	2 | 19.4	2 | 21.1	2 | 19.4
	3 | 21.3	3 | 18.7	3 | 17.8	3 | 20.2
	4 | 38.1	4 | 21.2	4 | 20.4	4 | 21.1
	5 | 18.6	5 | 19.3	5 | 23.5	5 | 18.7
Avg. Moisture of Sample Depth	19.1	19.6	20.7	19.8

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300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1208	1209	1210	1211
Reference Pt + Feet	11+1000	11+2000	11+3000	11+4000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.6 - 5.0	0.5 - 5.0	0.5 - 5.0	0.5 - 5.0
Field Sample No.	1208	1209	1210	1211
% Pass. 3/8" Sieve	100		100	
% Pass. No. 4 Sieve	99		99	
% Pass. No. 10 Sieve	96		98	
% Coarse Sand (-No. 10 + No. 40)	8		6	
% Fine Sand (-No. 40 + No. 200)	23		20	
% Silt (0.074 - 0.005 mm)	29		27	
% Clay (-0.005 mm)	37		45	
Liquid Limit (-No. 40)	39		42	
Plasticity Index (-No. 40)	23		26	
Plastic Limit	16		16	
Soil Color	BRN/BLK	BRN/BLK	BRN	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-6(12)		A-7-6(16)	
Frost Class	F3		F3	
Optimum Moisture (%)	11.9		11.8	
Maximum Dry Density (pcf)	123.4		123.0	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 20.1	2 | 20.5	2 | 25.6	2 | 17.1
	3 | 16.7	3 | 20.2	3 | 13.0	3 | 18.0
	4 | 15.5	4 | 17.9	4 | 18.7	4 | 17.6
	5 | 20.2	5 | 20.7	5 | 20.2	5 | 17.2
Avg. Moisture of Sample Depth	18.1	19.8	19.4	17.4

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		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1212	1213	1214	1215
Reference Pt + Feet	12+0000	12+1000	12+2000	12+3000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.6 - 5.0	0.5 - 5.0	0.4 - 5.0	0.5 - 5.0
Field Sample No.	1212	1213	1214	1215
% Pass. 3/8" Sieve	100		99	
% Pass. No. 4 Sieve	98		98	
% Pass. No. 10 Sieve	96	0	95	0
% Coarse Sand (-No. 10 + No. 40)	7		8	
% Fine Sand (-No. 40 + No. 200)	23	0	23	0
% Silt (0.074 - 0.005 mm)	29	0	28	0
% Clay (-0.005 mm)	37	0	37	0
Liquid Limit (-No. 40)	40	0	38	0
Plasticity Index (-No. 40)	25	NP	20	NP
Plastic Limit	15	0	18	0
Soil Color	BRN/GRY	BRN	BRN	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-6(13)		A-6(11)	
Frost Class	F3		F3	
Optimum Moisture (%)	11.6		10.9	
Maximum Dry Density (pcf)	124.3		124.5	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 20.7	2 | 23.7	2 | 23.4	2 | 25.3
	3 | 19.7	3 | 22.3	3 | 22.7	3 | 21.6
	4 | 22.8	4 | 21.2	4 | 20.3	4 | 20.8
	5 | 23.3	5 | 21.8	5 | 20.3	5 | 21.3
Avg. Moisture of Sample Depth	21.6	22.3	21.7	22.3

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		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1216	1217	1218	1219
Reference Pt + Feet	12+4000	13+0000	13+1000	13+2000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.4 - 4.8	0.4 - 5.0	0.4 - 5.0
Field Sample No.	1216	1217	1218	1219
% Pass. 3/8" Sieve	100		100	
% Pass. No. 4 Sieve	97		98	
% Pass. No. 10 Sieve	94		96	
% Coarse Sand (-No. 10 + No. 40)	8		8	
% Fine Sand (-No. 40 + No. 200)	20		23	
% Silt (0.074 - 0.005 mm)	31		31	
% Clay (-0.005 mm)	35		34	
Liquid Limit (-No. 40)	37		37	
Plasticity Index (-No. 40)	17		16	
Plastic Limit	20		21	
Soil Color	BRN/BLK	BRN/BLK	BRN/GRY/BLK	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-6(9)		A-6(9)	
Frost Class	F3		F3	
Optimum Moisture (%)	11.6		12.2	
Maximum Dry Density (pcf)	121.7		122.4	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 25.0	2 | 25.9	2 | 23.0	2 | 21.9
	3 | 23.6	3 | 24.3	3 | 15.7	3 | 18.7
	4 | 22.6	4 | 21.1	4 | 27.2	4 | 19.2
	5 | 27.3	5 | 26.9	5 | 23.0	5 | 19.3
Avg. Moisture of Sample Depth	24.6	23.8	22.3	19.7

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Comments

Lab Number	1220	1221	1222	1223
Reference Pt + Feet	13+3000	13+4000	14+0000	14+1000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.4 - 5.0	0.4 - 5.0	0.5 - 4.8	0.5 - 5.0
Field Sample No.	1220	1221	1222	1223
% Pass. 3/8" Sieve	100		100	
% Pass. No. 4 Sieve	99		99	
% Pass. No. 10 Sieve	97		97	
% Coarse Sand (-No. 10 + No. 40)	6		7	
% Fine Sand (-No. 40 + No. 200)	18		33	
% Silt (0.074 - 0.005 mm)	31		28	
% Clay (-0.005 mm)	41		29	
Liquid Limit (-No. 40)	40		32	
Plasticity Index (-No. 40)	21		17	
Plastic Limit	19		15	
Soil Color	BRN/BLK	BRN/BLK	BRN/BLK	BRN/GRY/BLK
Textural Class	CLY		CLY LM	
Soil Class (AASHTO M-145)	A-6(14)		A-6(7)	
Frost Class	F3		F3	
Optimum Moisture (%)	12.1		10.7	
Maximum Dry Density (pcf)	121.2		125.2	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 42.0	2 | 23.4	2 | 22.0	2 | 21.4
	3 | 23.3	3 | 23.5	3 | 15.8	3 | 23.0
	4 | 21.3	4 | 25.2	4 | 17.0	4 | 27.6
	5 | 23.7	5 | 23.9	5 | 35.8	5 | 32.8
Avg. Moisture of Sample Depth	27.6	24.1	18.3	26.2

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Comments

Lab Number	1224	1225	1226	1227
Reference Pt + Feet	14+2000	14+3000	14+4000	14+5000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.6 - 5.0	0.4 - 5.0
Field Sample No.	1224	1225	1226	1227
% Pass. 3/8" Sieve	100		100	
% Pass. No. 4 Sieve	100		98	
% Pass. No. 10 Sieve	99		96	
% Coarse Sand (-No. 10 + No. 40)	3		4	
% Fine Sand (-No. 40 + No. 200)	8		6	
% Silt (0.074 - 0.005 mm)	34		35	
% Clay (-0.005 mm)	54		51	
Liquid Limit (-No. 40)	48		50	
Plasticity Index (-No. 40)	29		27	
Plastic Limit	20		23	
Soil Color	BRN/BLK	BRN/BLK	BRN/TAN	BRN/TAN
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-7-6(26)		A-7-6(25)	
Frost Class	F3		F3	
Optimum Moisture (%)	15.3		15.4	
Maximum Dry Density (pcf)	112.9		112.4	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 32.3	2 | 30.5	2 | 32.5	2 | 23.0
	3 | 23.4	3 | 27.3	3 | 24.2	3 | 25.1
	4 | 26.4	4 | 32.1	4 | 30.4	4 | 25.9
	5 | 25.9	5 | 28.1	5 | 29.3	5 | 23.8
Avg. Moisture of Sample Depth	26.9	29.5	29.1	24.5

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Comments

Lab Number	1228	1229	1230	1231
Reference Pt + Feet	15+0000	15+2000	15+3000	15+4000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.5 - 5.0	0.6 - 5.0
Field Sample No.	1228	1229	1230	1231
% Pass. 3/8" Sieve	100		100	
% Pass. No. 4 Sieve	100		99	
% Pass. No. 10 Sieve	98		98	
% Coarse Sand (-No. 10 + No. 40)	4		5	
% Fine Sand (-No. 40 + No. 200)	9		16	
% Silt (0.074 - 0.005 mm)	38		38	
% Clay (-0.005 mm)	48		40	
Liquid Limit (-No. 40)	46		38	
Plasticity Index (-No. 40)	25		20	
Plastic Limit	21		19	
Soil Color	BRN/BLK	BRN	BRN	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-7-6(23)		A-6(14)	
Frost Class	F3		F3	
Optimum Moisture (%)	14.6		12.7	
Maximum Dry Density (pcf)	114.3		120.0	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 30.4	2 | 25.1	2 | 24.0	2 | 21.9
	3 | 30.0	3 | 22.8	3 | 24.0	3 | 21.9
	4 | 28.4	4 | 21.7	4 | 25.3	4 | 24.1
	5 | 26.8	5 | 28.6	5 | 24.1	5 | 23.0
Avg. Moisture of Sample Depth	28.9	24.6	24.3	22.7

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Comments

Lab Number	1232	1233	1234	1235
Reference Pt + Feet	16+0000	16+1000	16+1430	16+1470
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.7 - 5.0	0.9 - 5.0
Field Sample No.	1232	1233	1234	1235
% Pass. 3/8" Sieve	100		100	100
% Pass. No. 4 Sieve	99		99	99
% Pass. No. 10 Sieve	96		97	98
% Coarse Sand (-No. 10 + No. 40)	11		5	4
% Fine Sand (-No. 40 + No. 200)	21		19	15
% Silt (0.074 - 0.005 mm)	35		39	35
% Clay (-0.005 mm)	30		34	44
Liquid Limit (-No. 40)	33		35	40
Plasticity Index (-No. 40)	15		18	20
Plastic Limit	19		18	19
Soil Color	BRN	BRN/BLK	BRN/GRY/BLK	BRN/GRY/BLK
Textural Class	CLY LM		CLY	CLY
Soil Class (AASHTO M-145)	A-6(7)		A-6(11)	A-6(15)
Frost Class	F3		F3	F3
Optimum Moisture (%)	11.5		12.2	13.0
Maximum Dry Density (pcf)	123.7		122.6	121.2
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 19.4	2 | 23.6	2 | 22.9	2 | 25.6
	3 | 19.6	3 | 24.1	3 | 24.3	3 | 29.3
	4 | 21.0	4 | 20.8	4 | 18.3	4 | 24.5
	5 | 21.1	5 | 19.0	5 | 20.8	5 | 23.4
Avg. Moisture of Sample Depth	20.3	21.9	21.5	25.7

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Comments

Lab Number	1236	1237	1238	1239
Reference Pt + Feet	16+1504	16+1564	16+2000	16+3000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	1.0 - 5.0	0.6 - 5.0	0.4 - 5.0	0.4 - 5.0
Field Sample No.	1236	1237	1238	1239
% Pass. 3/8" Sieve	100	100	100	
% Pass. No. 4 Sieve	99	99	100	
% Pass. No. 10 Sieve	98	96	98	
% Coarse Sand (-No. 10 + No. 40)	5	4	3	
% Fine Sand (-No. 40 + No. 200)	14	10	11	
% Silt (0.074 - 0.005 mm)	40	50	44	
% Clay (-0.005 mm)	39	31	41	
Liquid Limit (-No. 40)	40	41	41	
Plasticity Index (-No. 40)	23	21	21	
Plastic Limit	17	20	19	
Soil Color	BRN/GRY/BLK	BRN/GRY/BLK	BRN	BRN/GRY/BLK
Textural Class	CLY	CLY	CLY	
Soil Class (AASHTO M-145)	A-6(17)	A-7-6(17)	A-7-6(18)	
Frost Class	F3	F3	F3	
Optimum Moisture (%)	12.9	12.9	15.2	
Maximum Dry Density (pcf)	120.8	118.8	116.5	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 21.5	2 | 29.4	2 | 23.8	2 | 21.1
	3 | 26.3	3 | 27.7	3 | 23.3	3 | 23.9
	4 | 26.5	4 | 28.2	4 | 20.9	4 | 25.6
	5 | 26.4	5 | 28.8	5 | 25.1	5 | 79.5
Avg. Moisture of Sample Depth	25.2	28.5	23.3	37.5

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Comments

Lab Number	1240	1241	1242	1243
Reference Pt + Feet	16+4000	17+0000	17+1000	17+2000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.6 - 5.0	0.4 - 5.0	0.5 - 5.0	0.5 - 5.0
Field Sample No.	1240	1241	1242	1243
% Pass. 3/8" Sieve	100		100	
% Pass. No. 4 Sieve	99		98	
% Pass. No. 10 Sieve	96		93	
% Coarse Sand (-No. 10 + No. 40)	5		7	
% Fine Sand (-No. 40 + No. 200)	18		17	
% Silt (0.074 - 0.005 mm)	34		32	
% Clay (-0.005 mm)	39		38	
Liquid Limit (-No. 40)	43		39	
Plasticity Index (-No. 40)	22		19	
Plastic Limit	20		20	
Soil Color	BRN/BLK	BRN/BLK	BRN/BLK	BRN
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-7-6(15)		A-6(12)	
Frost Class	F3		F3	
Optimum Moisture (%)	13.4		12.7	
Maximum Dry Density (pcf)	116.7		119.1	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 25.9	2 | 25.8	2 | 25.0	2 | 28.4
	3 | 24.2	3 | 22.8	3 | 28.9	3 | 22.2
	4 | 50.8	4 | 22.3	4 | 21.3	4 | 25.5
	5 | 22.5	5 | 20.5	5 | 21.8	5 | 27.7
Avg. Moisture of Sample Depth	30.9	22.8	24.2	26.0

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Comments

Lab Number	1244	1245	1246	1247
Reference Pt + Feet	17+3000	17+4000	18+0000	18+1000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.5 - 5.0	0.6 - 5.0
Field Sample No.	1244	1245	1246	1247
% Pass. 3/8" Sieve	97		99	
% Pass. No. 4 Sieve	96		98	
% Pass. No. 10 Sieve	94		95	
% Coarse Sand (-No. 10 + No. 40)	2		5	
% Fine Sand (-No. 40 + No. 200)	10		16	
% Silt (0.074 - 0.005 mm)	39		34	
% Clay (-0.005 mm)	43		40	
Liquid Limit (-No. 40)	42		41	
Plasticity Index (-No. 40)	23		21	
Plastic Limit	19		20	
Soil Color	BRN/BLK	BRN	BRN/BLK	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-7-6(19)		A-7-6(14)	
Frost Class	F3		F3	
Optimum Moisture (%)	12.3		12.6	
Maximum Dry Density (pcf)	121.2		118.7	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 18.5	2 | 28.8	2 | 23.9	2 | 28.6
	3 | 25.3	3 | 25.8	3 | 25.3	3 | 28.6
	4 | 32.6	4 | 24.4	4 | 21.8	4 | 23.4
	5 | 26.3	5 | 24.1	5 | 20.5	5 | 22.9
Avg. Moisture of Sample Depth	25.7	25.8	22.9	25.9

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Comments

Lab Number	1248	1249	1250	1251
Reference Pt + Feet	18+2000	18+3000	18+4000	19+0000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.6 - 5.0	0.6 - 5.0
Field Sample No.	1248	1249	1250	1251
% Pass. 3/8" Sieve	100		98	
% Pass. No. 4 Sieve	97		98	
% Pass. No. 10 Sieve	93		96	
% Coarse Sand (-No. 10 + No. 40)	6		6	
% Fine Sand (-No. 40 + No. 200)	12		10	
% Silt (0.074 - 0.005 mm)	35		35	
% Clay (-0.005 mm)	40		45	
Liquid Limit (-No. 40)	43		45	
Plasticity Index (-No. 40)	23		25	
Plastic Limit	20		20	
Soil Color	BRN/BLK	BRN/BLK	BRN/BLK	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-7-6(16)		A-7-6(20)	
Frost Class	F3		F3	
Optimum Moisture (%)	13.2		13.7	
Maximum Dry Density (pcf)	118.5		117.6	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 21.5	2 | 28.2	2 | 26.4	2 | 26.2
	3 | 25.1	3 | 26.5	3 | 29.0	3 | 20.9
	4 | 23.1	4 | 24.2	4 | 29.0	4 | 24.1
	5 | 21.4	5 | 26.0	5 | 16.2	5 | 18.6
Avg. Moisture of Sample Depth	22.7	26.2	25.1	22.5

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Comments

Lab Number	1252	1253	1254	1255
Reference Pt + Feet	19+1000	19+2000	19+3000	19+4000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.6 - 5.0	0.5 - 5.0	0.5 - 5.0	0.4 - 5.0
Field Sample No.	1252	1253	1254	1255
% Pass. 3/8" Sieve	100	0	100	
% Pass. No. 4 Sieve	100		99	
% Pass. No. 10 Sieve	98		95	0
% Coarse Sand (-No. 10 + No. 40)	3		5	
% Fine Sand (-No. 40 + No. 200)	7		7	0
% Silt (0.074 - 0.005 mm)	42		42	0
% Clay (-0.005 mm)	47		41	0
Liquid Limit (-No. 40)	49		46	0
Plasticity Index (-No. 40)	27		26	NP
Plastic Limit	22		21	0
Soil Color	BRN/TAN	BRN/BLK	BRN/BLK	BRN/BLK
Textural Class	CLY		CLY	
Soil Class (AASHTO M-145)	A-7-6(25)		A-7-6(22)	
Frost Class	F3		F3	
Optimum Moisture (%)	14.0		13.3	
Maximum Dry Density (pcf)	117.6		117.7	
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 22.2	2 | 32.9	2 | 26.7	2 | 25.9
	3 | 23.8	3 | -174.9	3 | -12.4	3 | 18.0
	4 | 30.0	4 | 29.4	4 | 28.2	4 | 22.0
	5 | 33.9	5 | 28.5	5 | 28.4	5 | 26.1
Avg. Moisture of Sample Depth	27.5	-21.0	17.7	23.0

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Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
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County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1158	1159	1160	1161
Reference Pt + Feet	2+0000	2+1000	2+2000	2+3000
Distance From CenterLine (Ft.)	Rt 5 NB	Rt 5 NB	Rt 5 NB	Rt 5 NB
Depth, Ft.	0.5 - 5.0	0.4 - 5.0	0.3 - 5.0	0.5 - 5.0
Field Sample No.	1158	1159	1160	1161
% Pass. 3/8" Sieve		99		100
% Pass. No. 4 Sieve		97		99
% Pass. No. 10 Sieve		96		99
% Coarse Sand (-No. 10 + No. 40)		6		4
% Fine Sand (-No. 40 + No. 200)		21		19
% Silt (0.074 - 0.005 mm)		28		40
% Clay (-0.005 mm)		40		36
Liquid Limit (-No. 40)		43		36
Plasticity Index (-No. 40)		26		18
Plastic Limit		17		18
Soil Color	BRN/GRY	BRN/BLK	BRN	BRN
Textural Class		CLY		CLY
Soil Class (AASHTO M-145)		A-7-6(16)		A-6(12)
Frost Class		F3		F3
Optimum Moisture (%)	11.0	11.3	10.9	11.0
Maximum Dry Density (pcf)	124.2	125.9	125.9	125.1
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 15.1	2 | 19.8	2 | 19.4	2 | 17.1
	3 | 19.4	3 | 17.9	3 | 14.5	3 | 15.8
	4 | 18.1	4 | 16.8	4 | 14.7	4 | 16.2
	5 | 15.9	5 | 16.7	5 | 19.2	5 | -8.4
Avg. Moisture of Sample Depth	17.2	17.8	17.0	10.2

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		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1162	1256	1257	1258
Reference Pt + Feet	2+4000	20+0000	20+1000	20+2000
Distance From CenterLine (Ft.)	Rt 5 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 4.5	0.6 - 5.0	0.4 - 5.0	0.5 - 5.0
Field Sample No.	1162	1256	1257	1258
% Pass. 3/8" Sieve	99	100		99
% Pass. No. 4 Sieve	97	99		98
% Pass. No. 10 Sieve	94	94		91
% Coarse Sand (-No. 10 + No. 40)	10	4		6
% Fine Sand (-No. 40 + No. 200)	23	10		9
% Silt (0.074 - 0.005 mm)	27	46		47
% Clay (-0.005 mm)	34	34		29
Liquid Limit (-No. 40)	39	40		38
Plasticity Index (-No. 40)	20	20		17
Plastic Limit	19	20		20
Soil Color	BRN/GRY/BLK	BRN/BLK	BRN/TAN	BRN/BLK
Textural Class	CLY	CLY		CLY LM
Soil Class (AASHTO M-145)	A-6(9)	A-6(16)		A-6(12)
Frost Class	F3	F3		F3
Optimum Moisture (%)	11.7	12.3		12.4
Maximum Dry Density (pcf)	123.7	120.2		119.3
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 15.8	2 | 26.0	2 | 16.0	2 | 28.7
	3 | 17.0	3 | 19.3	3 | 27.9	3 | 17.3
	4 | 15.6	4 | 21.4	4 | 31.7	4 | 19.5
	5 | 15.6	5 | 29.0	5 | 30.8	5 | 20.9
Avg. Moisture of Sample Depth	16.1	23.9	26.6	21.6

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Comments

Lab Number	1259	1260	1261	1262
Reference Pt + Feet	20+3000	20+4000	21+0000	21+1000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.4 - 5.0	0.6 - 5.0	0.5 - 5.0	0.6 - 5.0
Field Sample No.	1259	1260	1261	1262
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		98		99
% Pass. No. 10 Sieve		93		97
% Coarse Sand (-No. 10 + No. 40)		5		5
% Fine Sand (-No. 40 + No. 200)		6		9
% Silt (0.074 - 0.005 mm)		54		62
% Clay (-0.005 mm)		29		21
Liquid Limit (-No. 40)		37		31
Plasticity Index (-No. 40)		15		9
Plastic Limit		22		22
Soil Color	BRN	BRN	BRN/TAN	BRN
Textural Class		SLTY CLY LM		SLTY CLY LM
Soil Class (AASHTO M-145)		A-6(13)		A-4(7)
Frost Class		F3		F4
Optimum Moisture (%)		12.3		11.1
Maximum Dry Density (pcf)		120.4		122.5
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 22.6	2 | 28.8	2 | 20.2	2 | 13.1
	3 | 23.0	3 | 27.4	3 | 15.5	3 | 18.8
	4 | 23.0	4 | 25.0	4 | 20.9	4 | 27.8
	5 | 25.1	5 | 24.9	5 | 23.2	5 | 26.7
Avg. Moisture of Sample Depth	23.5	26.5	20.0	21.6

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Comments

Lab Number	1263	1264	1265	1266
Reference Pt + Feet	21+2000	21+3000	21+4000	22+0000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.6 - 5.0	0.6 - 4.0	0.6 - 5.0
Field Sample No.	1263	1264	1265	1266
% Pass. 3/8" Sieve		98		100
% Pass. No. 4 Sieve		96		96
% Pass. No. 10 Sieve	0	93		93
% Coarse Sand (-No. 10 + No. 40)		7		9
% Fine Sand (-No. 40 + No. 200)	0	22		24
% Silt (0.074 - 0.005 mm)	0	31		27
% Clay (-0.005 mm)	0	33		34
Liquid Limit (-No. 40)	0	41		39
Plasticity Index (-No. 40)	NP	24		23
Plastic Limit	0	17		16
Soil Color	BRN/GRY/BLK	BRN/GRY/BLK	BRN/GRY/BLK	BRN/GRY/BLK
Textural Class		CLY		CLY
Soil Class (AASHTO M-145)		A-7-6(13)		A-6(11)
Frost Class		F3		F3
Optimum Moisture (%)		11.8		10.5
Maximum Dry Density (pcf)		123.7		127.4
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 18.8	2 | 17.9	2 | 18.7	2 | 18.3
	3 | 13.5	3 | 29.3	3 | 16.5	3 | 18.8
	4 | 20.7	4 | 21.6	4 | 24.1	4 | 17.1
	5 | 17.7	5 | 24.9	5 | 12.1	5 | 20.8
Avg. Moisture of Sample Depth	17.7	23.4	19.8	18.8

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Comments

Lab Number	1267	1268	1269	1270
Reference Pt + Feet	22+1000	22+2000	22+3000	22+4000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.4 - 5.0	0.5 - 5.0
Field Sample No.	1267	1268	1269	1270
% Pass. 3/8" Sieve		99		100
% Pass. No. 4 Sieve		99		98
% Pass. No. 10 Sieve		96		95
% Coarse Sand (-No. 10 + No. 40)		22		11
% Fine Sand (-No. 40 + No. 200)		45		53
% Silt (0.074 - 0.005 mm)		16		21
% Clay (-0.005 mm)		13		11
Liquid Limit (-No. 40)		0		18
Plasticity Index (-No. 40)		NP		3
Plastic Limit		0		15
Soil Color	BRN/BLK	BRN	BRN	BRN
Textural Class		SNDY LM		SNDY LM
Soil Class (AASHTO M-145)		A-2-4(0)		A-2-4(0)
Frost Class		F3		F3
Optimum Moisture (%)		7.5		8.2
Maximum Dry Density (pcf)		131.0		129.8
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 18.1	2 | 7.9	2 | 10.7	2 | 9.5
	3 | 10.8	3 | 15.2	3 | 9.2	3 | 21.0
	4 | 14.4	4 | 8.7	4 | 11.8	4 | 6.5
	5 | 23.2	5 | 8.4	5 | 8.0	5 | 13.1
Avg. Moisture of Sample Depth	16.7	10.0	9.9	12.5

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Comments

Lab Number	1271	1272	1163	1164
Reference Pt + Feet	23+0000	23+0700	3+0030	3+1000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 5 NB	Rt 5 NB
Depth, Ft.	0.4 - 5.0	0.7 - 5.0	0.4 - 5.0	0.5 - 5.0
Field Sample No.	1271	1272	1163	1164
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		99		99
% Pass. No. 10 Sieve		96		98
% Coarse Sand (-No. 10 + No. 40)		13		6
% Fine Sand (-No. 40 + No. 200)		45		23
% Silt (0.074 - 0.005 mm)		20		28
% Clay (-0.005 mm)		19		40
Liquid Limit (-No. 40)		22		41
Plasticity Index (-No. 40)		8		23
Plastic Limit		14		18
Soil Color	BRN	BRN/BLK	BRN/BLK	BRN/BLK
Textural Class		SNDY LM		CLY
Soil Class (AASHTO M-145)		A-4(0)		A-7-6(14)
Frost Class		F3		F3
Optimum Moisture (%)		7.6	11.3	12.6
Maximum Dry Density (pcf)		132.2	125.5	122.5
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 12.8	2 | 9.5	2 | 14.5	2 | 23.4
	3 | 15.1	3 | 7.1	3 | 15.4	3 | 23.1
	4 | 9.2	4 | 12.6	4 | 17.5	4 | 15.0
	5 | 20.6	5 | 10.8	5 | 19.6	5 | 15.5
Avg. Moisture of Sample Depth	14.5	10.0	16.8	19.2

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Comments

Lab Number	1165	1166	1167	1168
Reference Pt + Feet	3+2000	3+3000	3+4000	4+0000
Distance From CenterLine (Ft.)	Rt 5 NB	Rt 5 NB	Rt 5 NB	Rt 7 NB
Depth, Ft.	0.4 - 5.0	0.7 - 5.0	0.5 - 5.0	0.6 - 5.0
Field Sample No.	1165	1166	1167	1168
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		98		98
% Pass. No. 10 Sieve		96		94
% Coarse Sand (-No. 10 + No. 40)		7		8
% Fine Sand (-No. 40 + No. 200)		22		23
% Silt (0.074 - 0.005 mm)		31		32
% Clay (-0.005 mm)		36		31
Liquid Limit (-No. 40)		42		37
Plasticity Index (-No. 40)		23		20
Plastic Limit		19		18
Soil Color	BRN/GRY	BRN	BRN	BRN
Textural Class		CLY		CLY
Soil Class (AASHTO M-145)		A-7-6(13)		A-6(10)
Frost Class		F3		F3
Optimum Moisture (%)	11.3	11.5	11.5	11.8
Maximum Dry Density (pcf)	124.3	124.1	124.0	122.9
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 18.3	2 | 17.7	2 | 17.3	2 | 20.6
	3 | 19.9	3 | 17.6	3 | 18.6	3 | 22.6
	4 | 18.3	4 | 18.9	4 | 20.0	4 | 19.8
	5 | 18.6	5 | 18.9	5 | 18.8	5 | 18.6
Avg. Moisture of Sample Depth	18.7	18.3	18.7	20.4

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Comments

Lab Number	1173	1174	1175	1176
Reference Pt + Feet	4+1000	4+2000	4+3000	4+4000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.3 - 5.0	0.5 - 5.0	0.5 - 5.0	0.5 - 5.0
Field Sample No.	1173	1174	1175	1176
% Pass. 3/8" Sieve	100	99		100
% Pass. No. 4 Sieve	98	97		99
% Pass. No. 10 Sieve	95	95		97
% Coarse Sand (-No. 10 + No. 40)	9	8		7
% Fine Sand (-No. 40 + No. 200)	26	23		24
% Silt (0.074 - 0.005 mm)	26	27		25
% Clay (-0.005 mm)	34	37		41
Liquid Limit (-No. 40)	38	41		42
Plasticity Index (-No. 40)	20	23		23
Plastic Limit	18	18		19
Soil Color	BRN/GRY	BRN/GRY	BRN/GRY	BRN/GRY
Textural Class	CLY	CLY		CLY
Soil Class (AASHTO M-145)	A-6(10)	A-7-6(12)		A-7-6(13)
Frost Class	F3	F3		F3
Optimum Moisture (%)	11.4	10.8	11.3	11.2
Maximum Dry Density (pcf)	122.9	125.9	123.6	123.2
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 19.3	2 | 15.0	2 | 18.2	2 | 26.0
	3 | 17.6	3 | 16.6	3 | 19.7	3 | 20.3
	4 | 22.9	4 | 18.3	4 | 19.8	4 | 17.8
	5 | 17.8	5 | 22.5	5 | 20.6	5 | 17.8
Avg. Moisture of Sample Depth	19.4	18.1	19.6	20.4

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Comments

Lab Number	1177	1178	1179	1180
Reference Pt + Feet	5+0000	5+1000	5+2000	5+3000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.4 - 5.0	0.4 - 5.0
Field Sample No.	1177	1178	1179	1180
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		97		100
% Pass. No. 10 Sieve		95		99
% Coarse Sand (-No. 10 + No. 40)		8		7
% Fine Sand (-No. 40 + No. 200)		22		30
% Silt (0.074 - 0.005 mm)		47		21
% Clay (-0.005 mm)		19		41
Liquid Limit (-No. 40)		38		41
Plasticity Index (-No. 40)		20		23
Plastic Limit		18		18
Soil Color	BRN/GRY	BRN/GRY/BLK	BRN/GRY/BLK	BRN/GRY/BLK
Textural Class		LM		CLY
Soil Class (AASHTO M-145)		A-6(11)		A-7-6(12)
Frost Class		F3		F3
Optimum Moisture (%)	11.2	11.2	11.2	11.2
Maximum Dry Density (pcf)	125.6	123.2	124.2	124.0
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 19.7	2 | 17.6	2 | 19.5	2 | 16.3
	3 | 19.7	3 | 12.6	3 | 23.1	3 | 22.5
	4 | 19.7	4 | 17.8	4 | 19.1	4 | 18.7
	5 | 20.1	5 | 20.6	5 | 22.4	5 | 15.3
Avg. Moisture of Sample Depth	19.8	17.2	21.0	18.2

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Comments

Lab Number	1181	1182	1183	1184
Reference Pt + Feet	5+4000	6+0000	6+1000	6+2000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.4 - 5.0	0.6 - 5.0	0.3 - 5.0	0.5 - 5.0
Field Sample No.	1181	1182	1183	1184
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		99		99
% Pass. No. 10 Sieve		96	0	96
% Coarse Sand (-No. 10 + No. 40)		6		6
% Fine Sand (-No. 40 + No. 200)		24	0	23
% Silt (0.074 - 0.005 mm)		35	0	29
% Clay (-0.005 mm)		31	0	38
Liquid Limit (-No. 40)		32	0	44
Plasticity Index (-No. 40)		16	NP	26
Plastic Limit		16	0	18
Soil Color	BRN	BRN/GRY	BRN	BRN/GRY
Textural Class		CLY		CLY
Soil Class (AASHTO M-145)		A-6(8)		A-7-6(15)
Frost Class		F3		F3
Optimum Moisture (%)	12.3	10.3	10.5	11.7
Maximum Dry Density (pcf)	118.7	126.4	127.6	122.3
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 18.3	2 | 19.4	2 | 15.4	2 | 19.1
	3 | 21.0	3 | 18.4	3 | 15.5	3 | 19.5
	4 | 23.5	4 | 21.1	4 | 16.0	4 | 17.6
	5 | 21.1	5 | 20.5	5 | 22.3	5 | 17.2
Avg. Moisture of Sample Depth	20.9	19.8	17.3	18.3

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Comments

Lab Number	1185	1186	1187	1188
Reference Pt + Feet	6+3000	6+4000	6+5000	7+0000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.4 - 5.0	0.5 - 5.0
Field Sample No.	1185	1186	1187	1188
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		99		99
% Pass. No. 10 Sieve		97		97
% Coarse Sand (-No. 10 + No. 40)		8		7
% Fine Sand (-No. 40 + No. 200)		23		19
% Silt (0.074 - 0.005 mm)		29		27
% Clay (-0.005 mm)		37		43
Liquid Limit (-No. 40)		40		44
Plasticity Index (-No. 40)		23		25
Plastic Limit		17		19
Soil Color	BRN	BRN	BRN/GRY	BRN/BLK
Textural Class		CLY		CLY
Soil Class (AASHTO M-145)		A-6(13)		A-7-6(16)
Frost Class		F3		F3
Optimum Moisture (%)	11.3	11.2	11.5	12.5
Maximum Dry Density (pcf)	124.1	123.4	123.4	120.7
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 19.5	2 | 16.8	2 | 19.3	2 | 20.1
	3 | 18.6	3 | 14.6	3 | 18.8	3 | 22.8
	4 | 19.1	4 | 18.1	4 | 20.8	4 | 20.5
	5 | 18.6	5 | 17.6	5 | 18.3	5 | 22.7
Avg. Moisture of Sample Depth	19.0	16.8	19.3	21.5

Scott W. Wutzke, Testing Lab Supervisor
Date Printed: 11/6/2015

Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1189	1190	1191	1192
Reference Pt + Feet	7+2000	7+3000	7+4000	8+0000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.4 - 5.0	0.5 - 5.0	0.4 - 5.0
Field Sample No.	1189	1190	1191	1192
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		99		97
% Pass. No. 10 Sieve		96		93
% Coarse Sand (-No. 10 + No. 40)		7		10
% Fine Sand (-No. 40 + No. 200)		20		22
% Silt (0.074 - 0.005 mm)		33		26
% Clay (-0.005 mm)		37		35
Liquid Limit (-No. 40)		40		40
Plasticity Index (-No. 40)		21		26
Plastic Limit		19		15
Soil Color	BRN	BRN	BRN/TAN	BRN
Textural Class		CLY		CLY
Soil Class (AASHTO M-145)		A-6(13)		A-6(12)
Frost Class		F3		F3
Optimum Moisture (%)	11.3	10.4	12.1	10.3
Maximum Dry Density (pcf)	124.7	125.9	123.6	125.8
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 17.9	2 | 19.2	2 | 16.4	2 | 22.0
	3 | 17.2	3 | 16.7	3 | 21.0	3 | 22.4
	4 | 20.0	4 | 17.2	4 | 20.5	4 | 16.1
	5 | 18.3	5 | 15.7	5 | 23.2	5 | 18.6
Avg. Moisture of Sample Depth	18.4	17.2	20.3	19.8

Scott W. Wutzke, Testing Lab Supervisor
Date Printed: 11/6/2015

Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1193	1194	1195	1196
Reference Pt + Feet	8+1000	8+2000	8+3000	8+4000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.5 - 5.0	0.5 - 5.0	0.4 - 5.0	0.5 - 5.0
Field Sample No.	1193	1194	1195	1196
% Pass. 3/8" Sieve		100		100
% Pass. No. 4 Sieve		98		99
% Pass. No. 10 Sieve		95		97
% Coarse Sand (-No. 10 + No. 40)		8		8
% Fine Sand (-No. 40 + No. 200)		21		22
% Silt (0.074 - 0.005 mm)		28		36
% Clay (-0.005 mm)		38		31
Liquid Limit (-No. 40)		38		36
Plasticity Index (-No. 40)		19		16
Plastic Limit		18		20
Soil Color	BRN/GRY/BLK	BRN	BRN/GRY/BLK	BRN
Textural Class		CLY		CLY
Soil Class (AASHTO M-145)		A-6(11)		A-6(9)
Frost Class		F3		F3
Optimum Moisture (%)	12.7	10.4	10.2	11.0
Maximum Dry Density (pcf)	119.5	126.4	126.0	122.2
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 19.3	2 | 14.5	2 | 19.7	2 | 19.2
	3 | 21.7	3 | 14.3	3 | 73.7	3 | 17.6
	4 | 24.6	4 | 17.0	4 | 12.6	4 | 21.2
	5 | 19.6	5 | 24.2	5 | 42.9	5 | 22.9
Avg. Moisture of Sample Depth	21.3	17.5	37.2	20.2

Scott W. Wutzke, Testing Lab Supervisor
Date Printed: 11/6/2015

Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1197	1198	1199	1200
Reference Pt + Feet	9+0000	9+1000	9+2000	9+3000
Distance From CenterLine (Ft.)	Rt 7 NB	Rt 7 NB	Rt 7 NB	Rt 7 NB
Depth, Ft.	0.3 - 5.0	0.4 - 5.0	0.5 - 5.0	0.5 - 5.0
Field Sample No.	1197	1198	1199	1200
% Pass. 3/8" Sieve		100		99
% Pass. No. 4 Sieve		96		96
% Pass. No. 10 Sieve		92		91
% Coarse Sand (-No. 10 + No. 40)		14		10
% Fine Sand (-No. 40 + No. 200)		27		25
% Silt (0.074 - 0.005 mm)		23		26
% Clay (-0.005 mm)		28		31
Liquid Limit (-No. 40)		34		36
Plasticity Index (-No. 40)		18		19
Plastic Limit		16		17
Soil Color	BRN/BLK	BRN/GRY	BRN/GRY/BLK	BRN/GRY/BLK
Textural Class		CLY LM		CLY
Soil Class (AASHTO M-145)		A-6(6)		A-6(8)
Frost Class		F3		F3
Optimum Moisture (%)	13.8	9.3	10.8	10.5
Maximum Dry Density (pcf)	117.1	129.4	124.4	124.4
% Organic Content				
Depth (Ft.) | Moisture (%)	2 | 4.5	2 | 14.2	2 | 14.9	2 | 27.5
	3 | 27.0	3 | 16.2	3 | 11.9	3 | 25.5
	4 | 26.8	4 | 12.1	4 | 23.1	4 | 17.7
	5 | 23.4	5 | 12.5	5 | 19.4	5 | 19.9
Avg. Moisture of Sample Depth	20.5	13.8	17.3	22.7

Scott W. Wutzke, Testing Lab Supervisor
Date Printed: 11/6/2015

Linear Laboratory Analysis

Department of Transportation, Materials and Research Division
300 Airport Road, Bismarck ND 58504 (701) 328-6900

Report Number	SS-47-2015	**Date Reported**	10/7/2015	**District**	Bismarck
County	DIVIDE	**Submitted By**	Naumann	**Project Number**	SS-7-042(014)000
		AASHTO Test Method	T-180	**PCN**	20996

Comments

Lab Number	1201		
Reference Pt + Feet	9+4000		
Distance From CenterLine (Ft.)	Rt 7 NB		
Depth, Ft.	0.5 - 5.0		
Field Sample No.	1201		
% Pass. 3/8" Sieve			
% Pass. No. 4 Sieve			
% Pass. No. 10 Sieve			
% Coarse Sand (-No. 10 + No. 40)			
% Fine Sand (-No. 40 + No. 200)			
% Silt (0.074 - 0.005 mm)			
% Clay (-0.005 mm)			
Liquid Limit (-No. 40)			
Plasticity Index (-No. 40)			
Plastic Limit			
Soil Color	BRN		
Textural Class			
Soil Class (AASHTO M-145)			
Frost Class			
Optimum Moisture (%)	10.4		
Maximum Dry Density (pcf)	125.4		
% Organic Content			
Depth (Ft.) | Moisture (%)	2	|	17.1
	3	|	42.5
	4	|	19.4
	5	|	20.7
Avg. Moisture of Sample Depth	24.9		

Scott W. Wutzke, Testing Lab Supervisor
Date Printed: 11/6/2015

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		1148

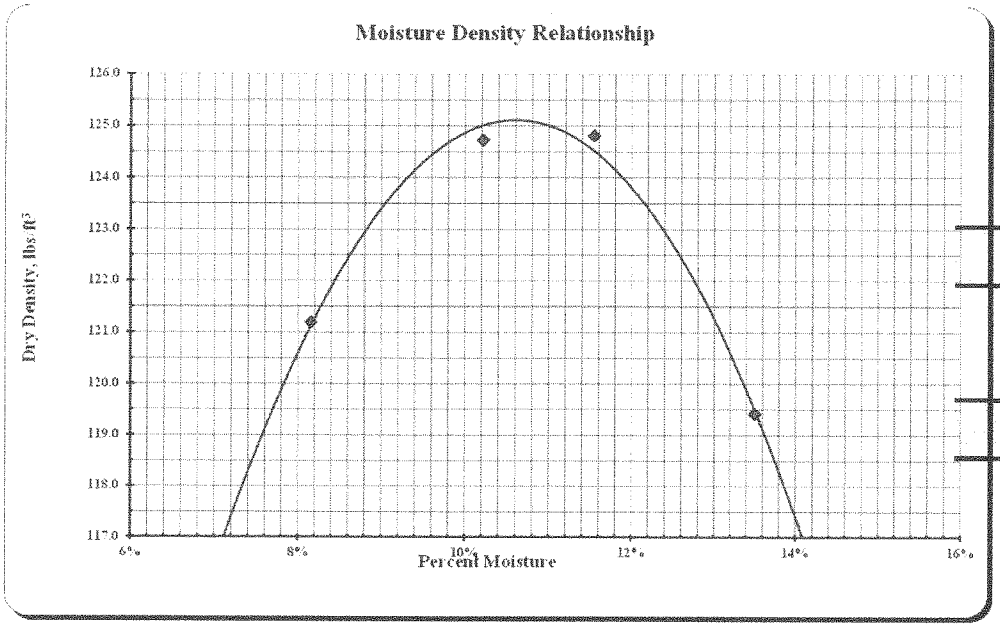
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.75	8.96	9.02	8.90		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.35	4.56	4.62	4.50		
E Wet Density = D / A	lbs./cu.ft.	131.1	137.5	139.2	135.5		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**121.2**	**124.7**	**124.8**	**119.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		1	2	3	4		
G Wet Weight / Container	grams	149.3	160.3	155.0	156.9		
H Dry Weight / Container	grams	140.8	148.9	142.8	142.6		
I Moisture Loss = G - H	grams	8.5	11.4	12.2	14.3		
J Tare Weight of Container	grams	36.6	37.3	37.1	36.7		
K Dry Soil = H - J	grams	104.2	111.6	105.7	105.9		
L %Moisture = (I / K) x 100	%	**8.2%**	**10.2%**	**11.5%**	**13.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.1 lbs./cu.ft.

Optimum Moisture

10.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1149**

Density

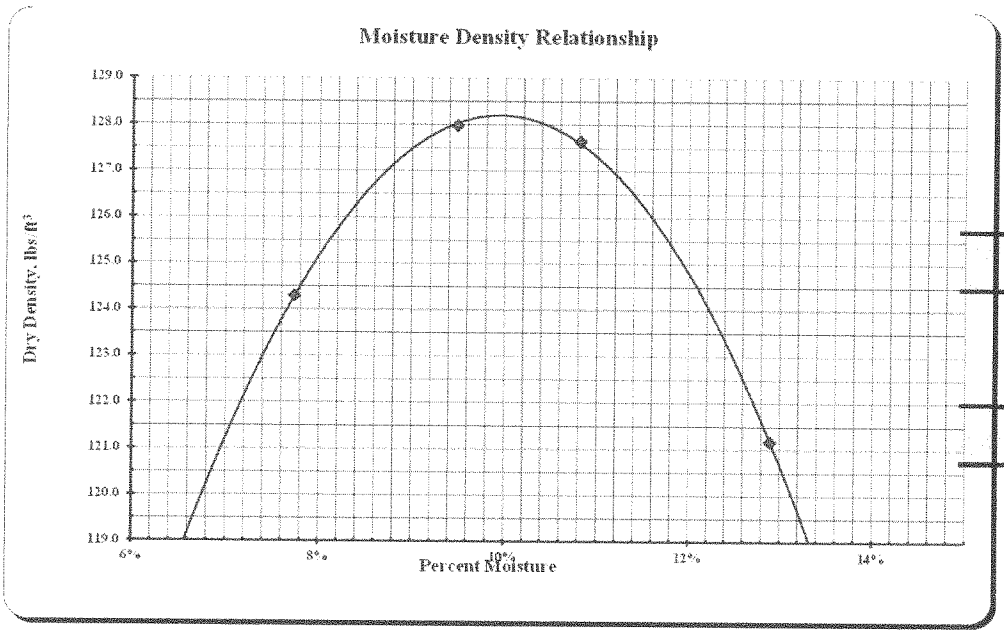
		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.85	9.05	9.10	8.94		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.45	4.65	4.70	4.54		
E Wet Density = D / A	lbs./cu.ft.	133.9	140.1	141.4	136.8		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**124.3**	**128.0**	**127.6**	**121.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		5	6	7	8		
G Wet Weight / Container	grams	162.4	160.6	161.3	147.3		
H Dry Weight / Container	grams	153.4	149.9	149.1	134.7		
I Moisture Loss = G - H	grams	9.0	10.7	12.2	12.6		
J Tare Weight of Container	grams	37.1	37.1	36.3	37.0		
K Dry Soil = H - J	grams	116.3	112.8	112.8	97.7		
L %Moisture = (I / K) x 100	%	**7.7%**	**9.5%**	**10.8%**	**12.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

128.2 lbs./cu.ft.

Optimum Moisture

9.9%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1151**

Density

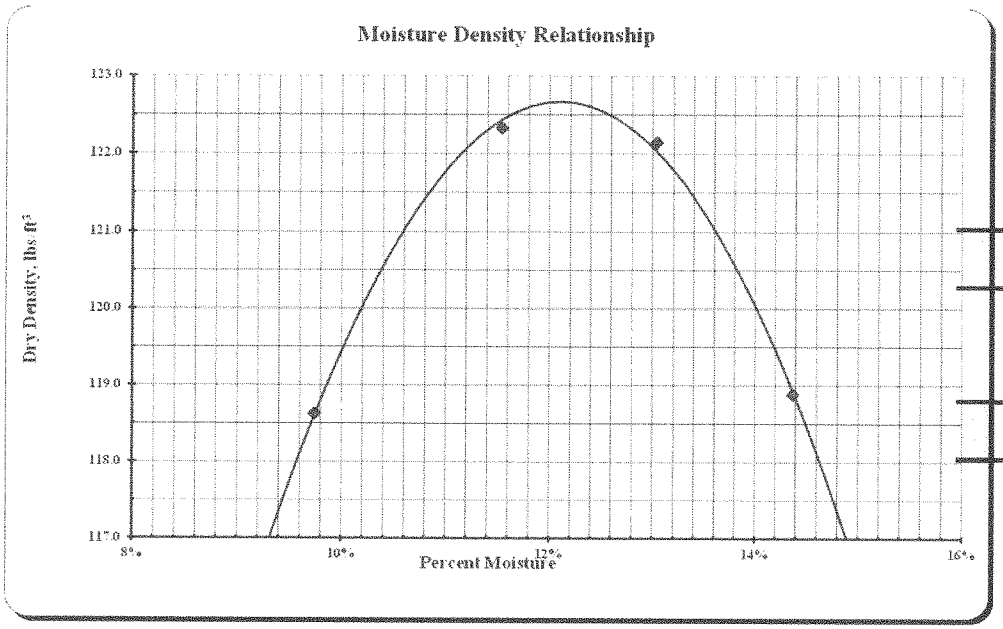
		Test Count	4				
	Determination No.	1	2	3	4	5	6
A	Volume of Mold cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.72	8.93	8.98	8.91		
C	Weight of Mold lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C lbs.	4.32	4.53	4.58	4.51		
E	Wet Density = D / A lbs./cu.ft.	130.2	136.4	138.1	136.0		
F	Dry Density = (E x 100) / (100 + L) lbs./cu.ft.	**118.6**	**122.3**	**122.1**	**118.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	12	13	14	15		
G	Wet Weight / Container grams	155.2	156.0	155.8	153.5		
H	Dry Weight / Container grams	144.7	143.7	142.2	138.9		
I	Moisture Loss = G - H grams	10.5	12.3	13.6	14.6		
J	Tare Weight of Container grams	36.9	37.1	37.9	37.3		
K	Dry Soil = H - J grams	107.8	106.6	104.3	101.6		
L	%Moisture = (I / K) x 100 %	**9.7%**	**11.5%**	**13.0%**	**14.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

122.7 lbs./cu.ft.

Optimum Moisture

12.1%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1152**

Density

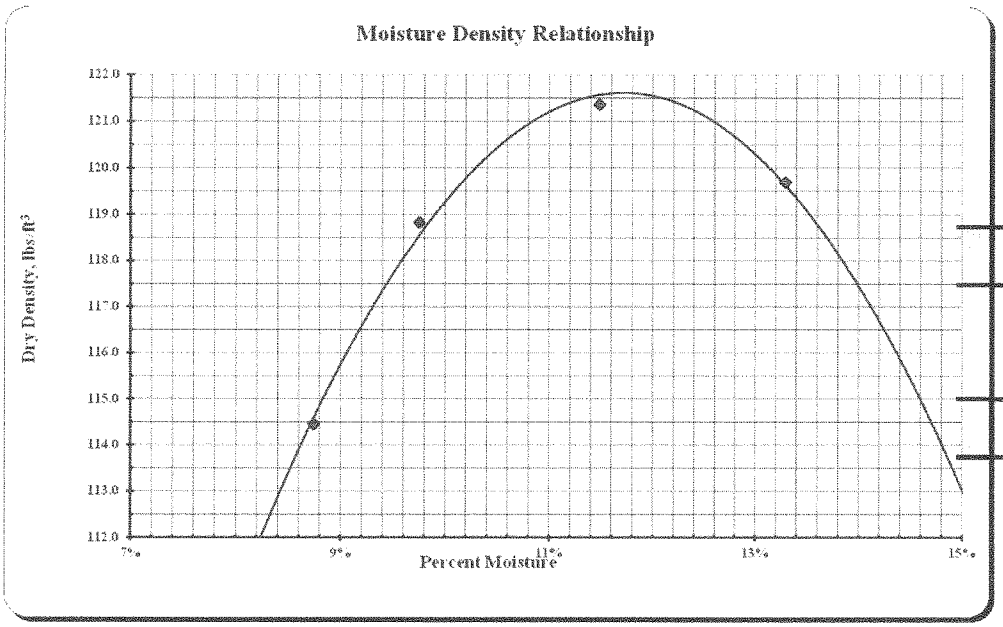
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.53	8.73	8.89	8.90		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.13	4.33	4.49	4.50		
E	Wet Density = D / A	lbs./cu.ft.	124.5	130.4	135.3	135.6		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**114.5**	**118.8**	**121.4**	**119.7**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		16	17	18	19		
G	Wet Weight / Container	grams	154.1	147.1	163.3	149.6		
H	Dry Weight / Container	grams	144.7	137.3	150.3	136.4		
I	Moisture Loss = G - H	grams	9.4	9.8	13.0	13.2		
J	Tare Weight of Container	grams	37.2	36.8	37.1	37.1		
K	Dry Soil = H - J	grams	107.5	100.5	113.2	99.3		
L	%Moisture = (I / K) x 100	%	**8.7%**	**9.8%**	**11.5%**	**13.3%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

121.6 lbs./cu.ft.

Optimum Moisture

11.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			

Offset From Centerline	Type of Soil

AASTHO Designation	Date	
T-180	**10/19/2015**	**1153**

Density

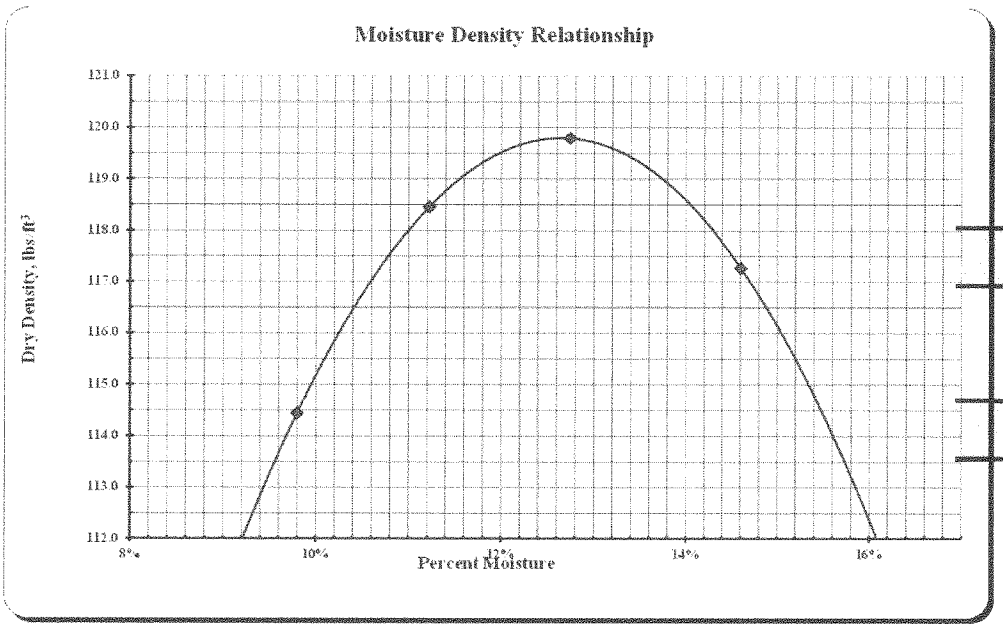
		Test Count	4				
	Determination No.	1	2	3	4	5	6
A	Volume of Mold cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.57	8.77	8.88	8.86		
C	Weight of Mold lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C lbs.	4.17	4.37	4.48	4.46		
E	Wet Density = D / A lbs./cu.ft.	125.7	131.7	135.1	134.4		
F	Dry Density = (E x 100) / (100 + L) lbs./cu.ft.	**114.4**	**118.5**	**119.8**	**117.3**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	20	21	22	23		
G	Wet Weight / Container grams	151.9	160.0	159.1	155.9		
H	Dry Weight / Container grams	141.6	147.6	145.3	140.8		
I	Moisture Loss = G - H grams	10.3	12.4	13.8	15.1		
J	Tare Weight of Container grams	36.5	37.1	37.0	37.4		
K	Dry Soil = H - J grams	105.1	110.5	108.3	103.4		
L	%Moisture = (I / K) x 100 %	**9.8%**	**11.2%**	**12.7%**	**14.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

119.8 lbs./cu.ft.

Optimum Moisture

12.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/19/2015**		**1154**

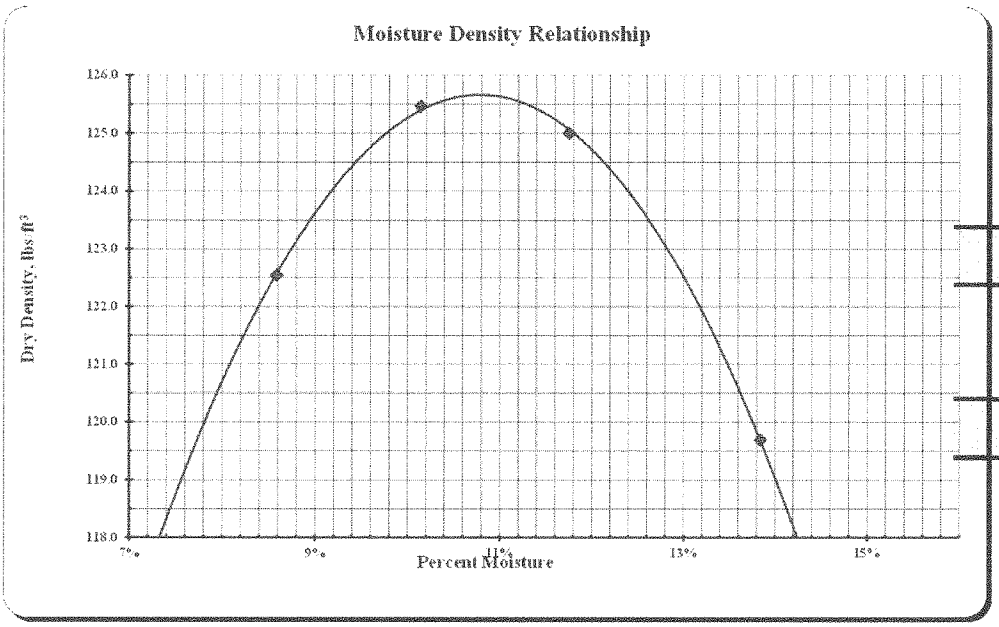
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.82	8.99	9.04	8.92		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.42	4.59	4.64	4.52		
E Wet Density = D / A	lbs./cu.ft.	133.1	138.2	139.7	136.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**122.5**	**125.5**	**125.0**	**119.7**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		24	25	26	27		
G Wet Weight / Container	grams	158.6	161.0	152.9	150.2		
H Dry Weight / Container	grams	149.0	149.6	140.7	136.4		
I Moisture Loss = G - H	grams	9.6	11.4	12.2	13.8		
J Tare Weight of Container	grams	37.2	37.2	36.9	36.7		
K Dry Soil = H - J	grams	111.8	112.4	103.8	99.7		
L %Moisture = (I / K) x 100	%	**8.6%**	**10.1%**	**11.8%**	**13.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.7 lbs./cu.ft.

Optimum Moisture

10.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1155**

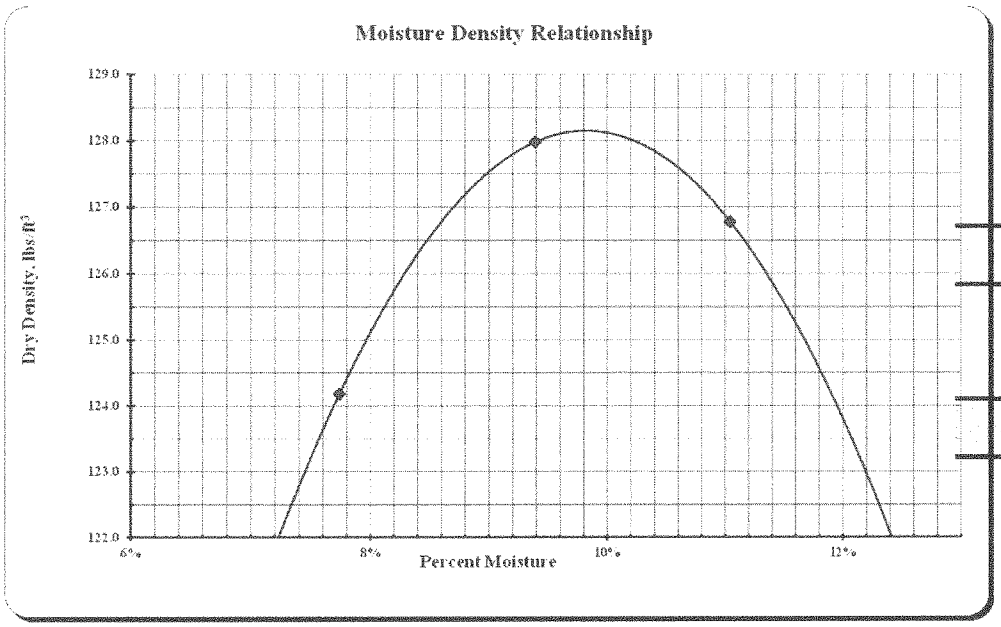
Density		Test Count	3				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.84	9.05	9.07			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.44	4.65	4.67			
E Wet Density = D / A	lbs./cu.ft.	133.8	140.0	140.8			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**124.2**	**128.0**	**126.8**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		28	29	30			
G Wet Weight / Container	grams	159.7	163.0	148.7			
H Dry Weight / Container	grams	150.9	152.2	137.6			
I Moisture Loss = G - H	grams	8.8	10.8	11.1			
J Tare Weight of Container	grams	37.2	37.2	37.1			
K Dry Soil = H - J	grams	113.7	115.0	100.5			
L %Moisture = (I / K) x 100	%	**7.7%**	**9.4%**	**11.0%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

128.1 lbs./cu.ft.

Optimum Moisture

9.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/20/2015**		**1156**

Density

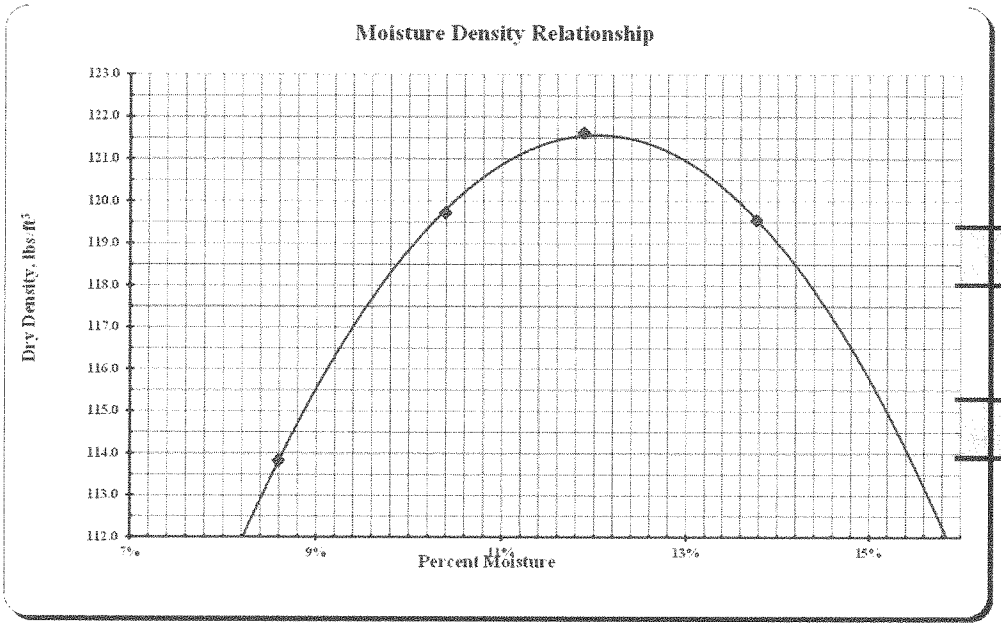
		Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.51	8.79	8.92	8.92		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.10	4.39	4.52	4.52		
E	Wet Density = D / A	lbs./cu.ft.	123.6	132.2	136.1	136.0		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.8**	**119.7**	**121.6**	**119.6**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		93	94	95	96		
G	Wet Weight / Container	grams	148.8	153.5	151.4	144.6		
H	Dry Weight / Container	grams	140.0	142.6	139.3	131.6		
I	Moisture Loss = G - H	grams	8.8	10.9	12.1	13.0		
J	Tare Weight of Container	grams	37.6	37.7	37.5	37.2		
K	Dry Soil = H - J	grams	102.4	104.9	101.8	94.4		
L	%Moisture = (I / K) x 100	%	**8.6%**	**10.4%**	**11.9%**	**13.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

121.6 lbs./cu.ft.

Optimum Moisture

12.0%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/20/2015**		**1157**

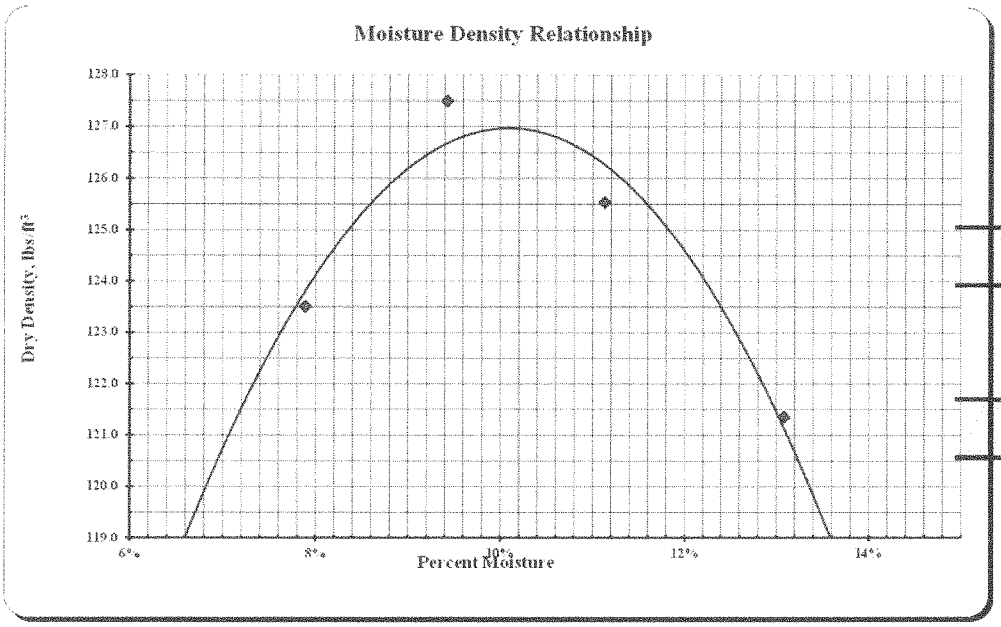
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.82	9.03	9.03	8.96		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.42	4.63	4.63	4.56		
E Wet Density = D / A	lbs./cu.ft.	133.3	139.5	139.5	137.2		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**123.5**	**127.5**	**125.5**	**121.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		31	32	33	34		
G Wet Weight / Container	grams	154.6	149.5	157.9	154.7		
H Dry Weight / Container	grams	146.0	139.8	145.8	141.2		
I Moisture Loss = G - H	grams	8.6	9.7	12.1	13.5		
J Tare Weight of Container	grams	37.0	36.9	37.1	38.0		
K Dry Soil = H - J	grams	109.0	102.9	108.7	103.2		
L %Moisture = (I / K) x 100	%	**7.9%**	**9.4%**	**11.1%**	**13.1%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

127.0 lbs./cu.ft.

Optimum Moisture

10.1%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

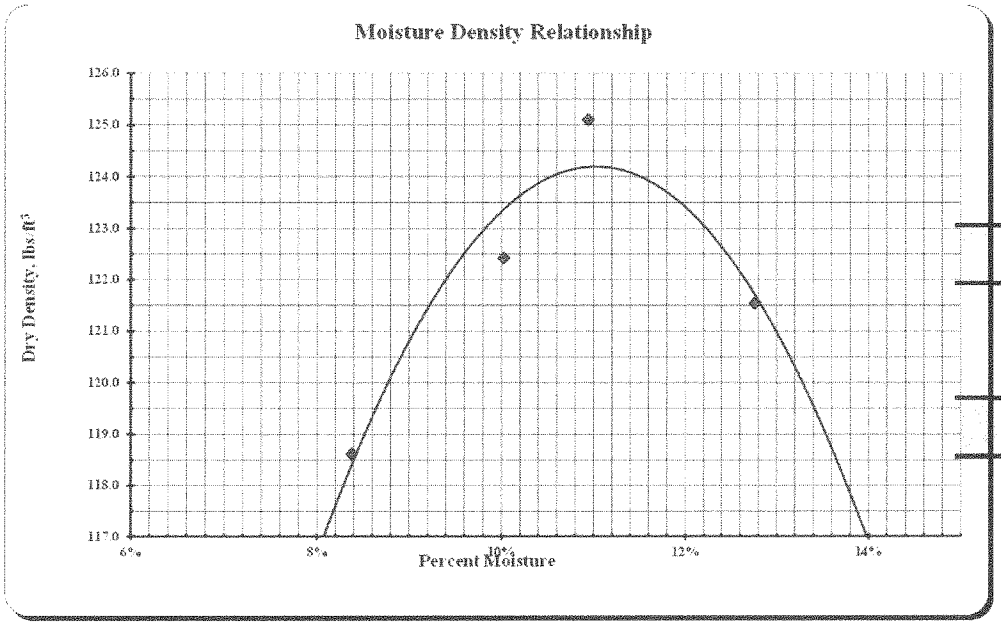
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1158**

Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.67	8.87	9.01	8.95		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.27	4.47	4.61	4.55		
E Wet Density = D / A	lbs./cu.ft.	128.6	134.7	138.8	137.0		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**118.6**	**122.4**	**125.1**	**121.5**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		61	62	63	64		
G Wet Weight / Container	grams	138.2	166.0	162.0	156.6		
H Dry Weight / Container	grams	130.4	154.3	149.7	143.1		
I Moisture Loss = G - H	grams	7.8	11.7	12.3	13.5		
J Tare Weight of Container	grams	37.3	37.6	37.3	37.3		
K Dry Soil = H - J	grams	93.1	116.7	112.4	105.8		
L %Moisture = (I / K) x 100	%	**8.4%**	**10.0%**	**10.9%**	**12.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

124.2 lbs./cu.ft.

Optimum Moisture

11.0%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1159**

Density

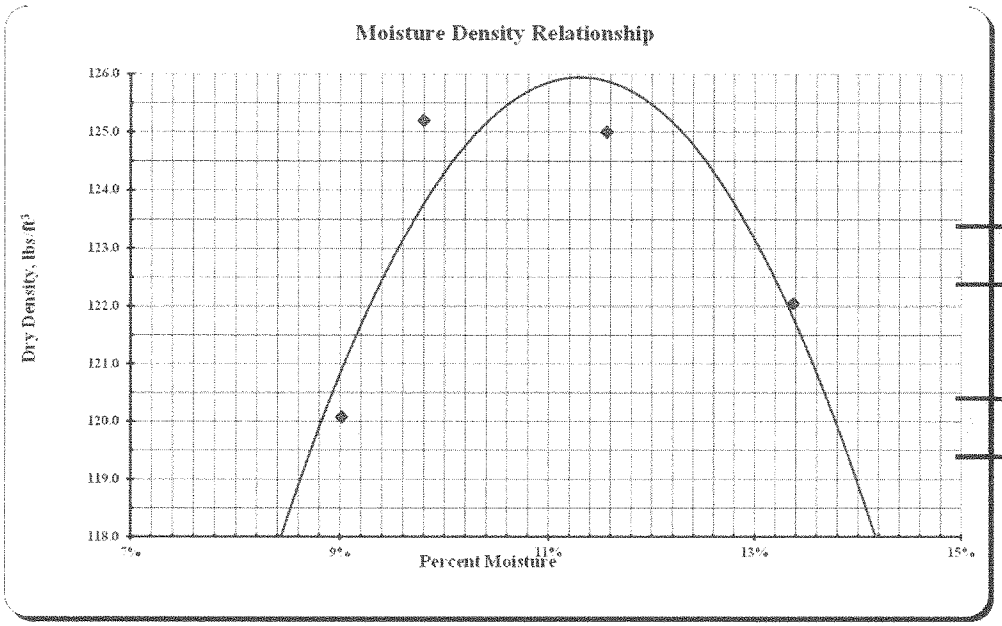
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.75	8.97	9.03	9.00		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.35	4.56	4.63	4.59		
E	Wet Density = D / A	lbs./cu.ft.	130.9	137.5	139.5	138.4		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.1**	**125.2**	**125.0**	**122.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		65	66	67	68		
G	Wet Weight / Container	grams	156.3	152.0	160.7	148.9		
H	Dry Weight / Container	grams	146.5	141.8	147.9	135.7		
I	Moisture Loss = G - H	grams	9.8	10.2	12.8	13.2		
J	Tare Weight of Container	grams	37.8	37.7	37.2	37.0		
K	Dry Soil = H - J	grams	108.7	104.1	110.7	98.7		
L	%Moisture = (I / K) x 100	%	**9.0%**	**9.8%**	**11.6%**	**13.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

125.9 lbs./cu.ft.

Optimum Moisture

11.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/19/2015**		**1160**

Density

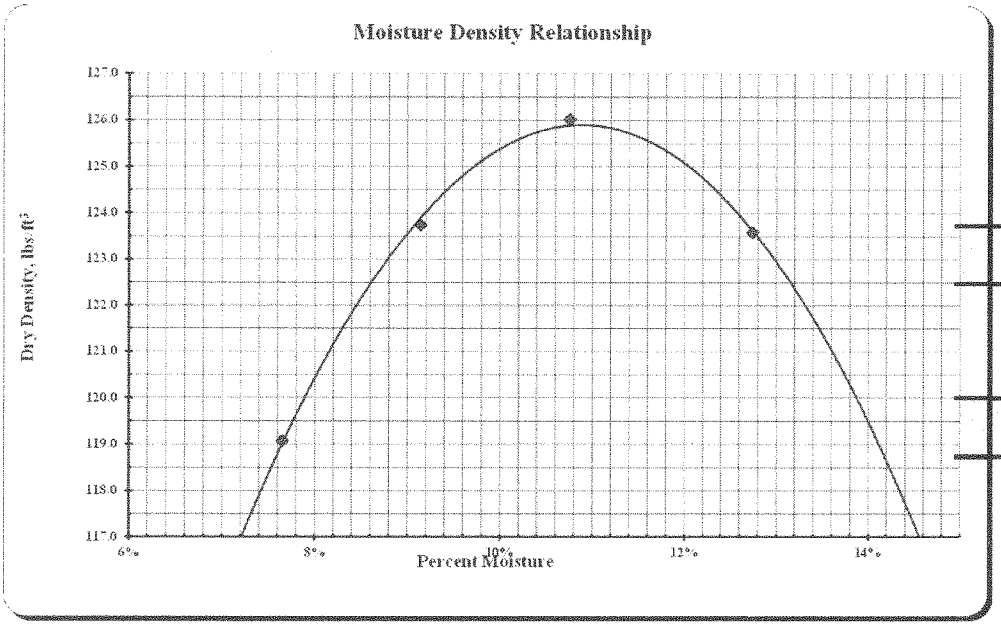
		Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.66	8.89	9.04	9.03		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.26	4.48	4.63	4.63		
E	Wet Density = D / A	lbs./cu.ft.	128.2	135.1	139.6	139.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.1**	**123.7**	**126.0**	**123.6**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		69	70	71	72		
G	Wet Weight / Container	grams	168.5	155.8	161.8	152.6		
H	Dry Weight / Container	grams	159.2	145.9	149.7	139.5		
I	Moisture Loss = G - H	grams	9.3	9.9	12.1	13.1		
J	Tare Weight of Container	grams	37.7	37.6	37.2	36.7		
K	Dry Soil = H - J	grams	121.5	108.3	112.5	102.8		
L	%Moisture = (I / K) x 100	%	**7.7%**	**9.1%**	**10.8%**	**12.7%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

125.9 lbs./cu.ft.

Optimum Moisture

10.9%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/19/2015**		**1161**

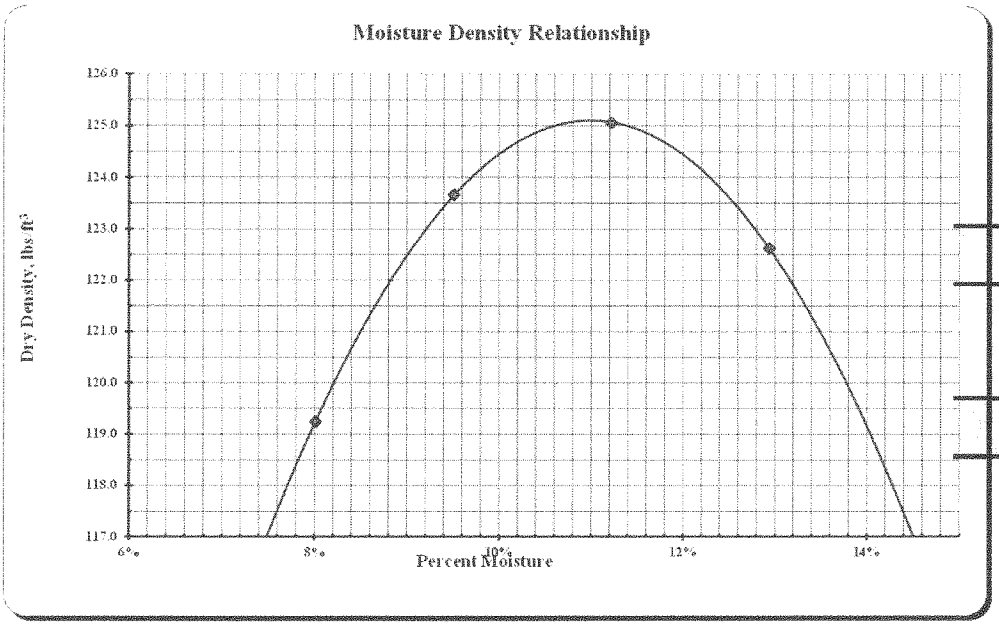
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.68	8.90	9.02	9.00		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.28	4.50	4.62	4.60		
E Wet Density = D / A	lbs./cu.ft.	128.8	135.4	139.1	138.5		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.2**	**123.7**	**125.1**	**122.6**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		73	74	75	76		
G Wet Weight / Container	grams	141.2	149.1	150.3	144.5		
H Dry Weight / Container	grams	133.5	139.4	138.9	132.3		
I Moisture Loss = G - H	grams	7.7	9.7	11.4	12.2		
J Tare Weight of Container	grams	37.4	37.4	37.3	38.0		
K Dry Soil = H - J	grams	96.1	102.0	101.6	94.3		
L %Moisture = (I / K) x 100	%	**8.0%**	**9.5%**	**11.2%**	**12.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

125.1 lbs./cu.ft.

Optimum Moisture

11.0%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1162**

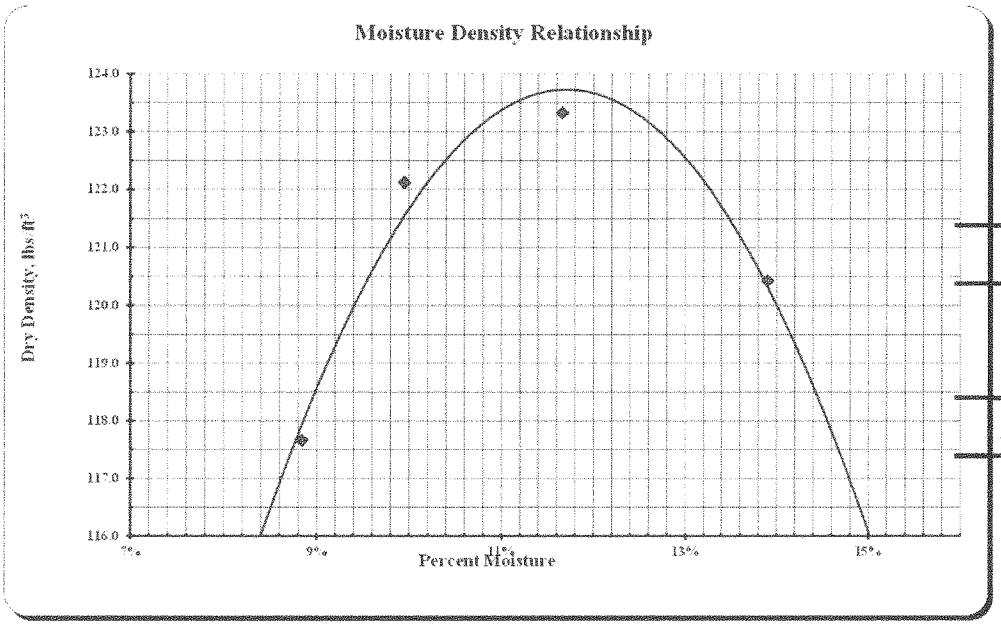
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.65	8.86	8.97	8.96		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.25	4.46	4.57	4.55		
E Wet Density = D / A	lbs./cu.ft.	128.1	134.3	137.7	137.2		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**117.7**	**122.1**	**123.3**	**120.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		77	78	79	80		
G Wet Weight / Container	grams	152.5	147.7	145.3	142.8		
H Dry Weight / Container	grams	143.1	137.7	134.0	129.9		
I Moisture Loss = G - H	grams	9.4	10.0	11.3	12.9		
J Tare Weight of Container	grams	36.8	37.2	37.1	37.1		
K Dry Soil = H - J	grams	106.3	100.5	96.9	92.8		
L %Moisture = (I / K) x 100	%	**8.8%**	**10.0%**	**11.7%**	**13.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

123.7 lbs./cu.ft.

Optimum Moisture

11.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1163**

Density

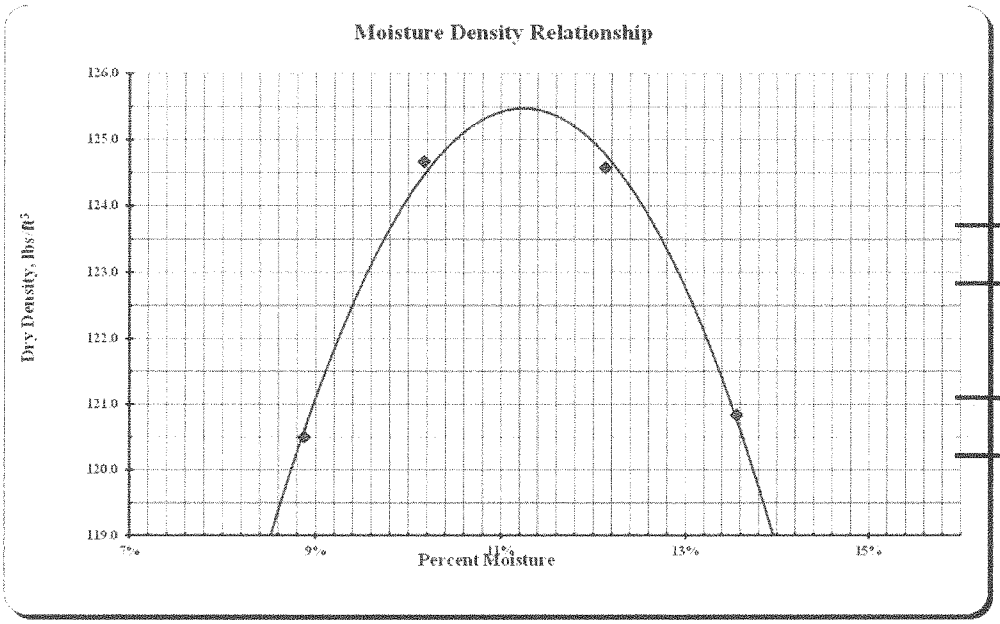
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.76	8.96	9.04	8.96		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.36	4.56	4.64	4.56		
E	Wet Density = D / A	lbs./cu.ft.	131.2	137.3	139.7	137.2		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.5**	**124.7**	**124.6**	**120.8**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		81	82	83	84		
G	Wet Weight / Container	grams	149.4	155.5	144.4	146.6		
H	Dry Weight / Container	grams	140.3	144.6	132.8	133.5		
I	Moisture Loss = G - H	grams	9.1	10.9	11.6	13.1		
J	Tare Weight of Container	grams	37.8	37.4	37.2	36.9		
K	Dry Soil = H - J	grams	102.5	107.2	95.6	96.6		
L	%Moisture = (I / K) x 100	%	**8.9%**	**10.2%**	**12.1%**	**13.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

125.5 lbs./cu.ft.

Optimum Moisture

11.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/19/2015**		**1164**

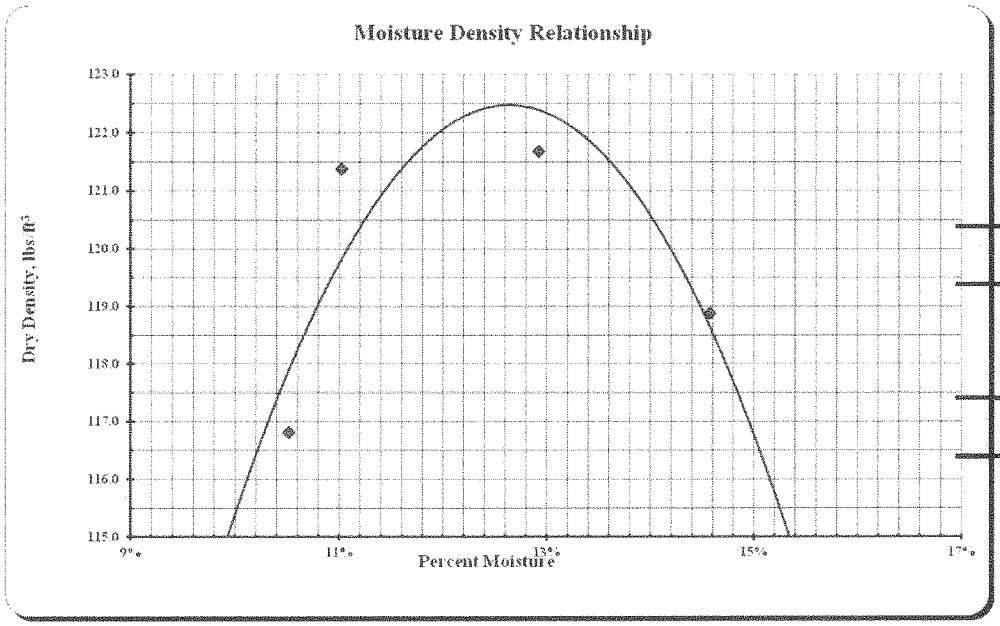
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.69	8.88	8.96	8.92		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.29	4.47	4.56	4.52		
E Wet Density = D / A	lbs./cu.ft.	129.1	134.8	137.4	136.2		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**116.8**	**121.4**	**121.7**	**118.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	85	86	87	88		
G Wet Weight / Container	grams	153.4	148.4	140.6	146.3		
H Dry Weight / Container	grams	142.4	137.4	128.8	132.5		
I Moisture Loss = G - H	grams	11.0	11.0	11.8	13.8		
J Tare Weight of Container	grams	37.8	37.6	37.5	37.8		
K Dry Soil = H - J	grams	104.6	99.8	91.3	94.7		
L %Moisture = (I / K) x 100	%	**10.5%**	**11.0%**	**12.9%**	**14.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

122.5 lbs./cu.ft.

Optimum Moisture

12.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/19/2015**		**1165**

Density

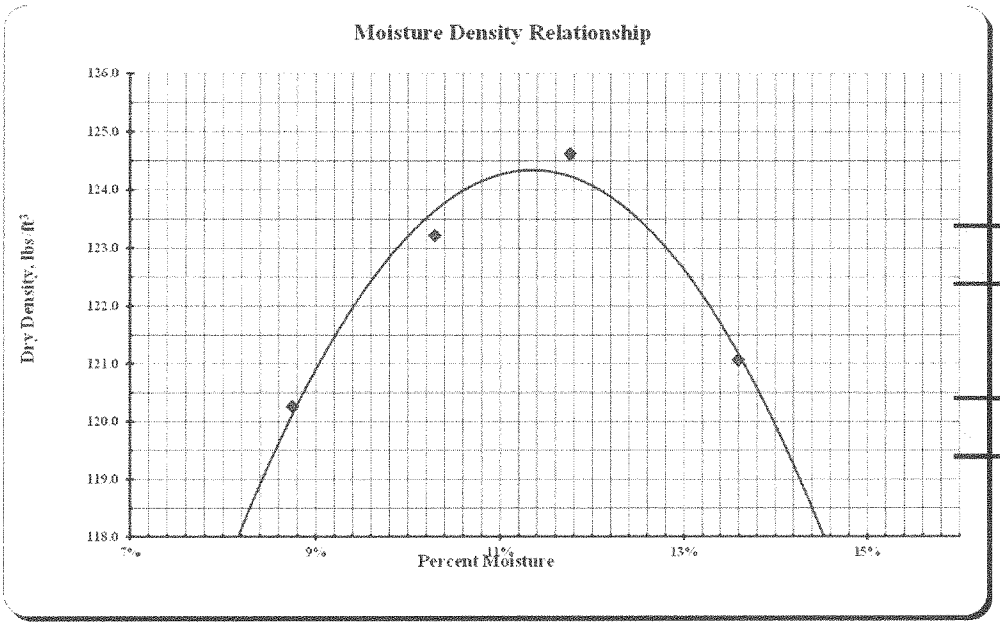
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.74	8.91	9.03	8.97		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.34	4.51	4.62	4.57		
E	Wet Density = D / A	lbs./cu.ft.	130.8	135.9	139.3	137.5		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.3**	**123.2**	**124.6**	**121.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		89	90	91	92		
G	Wet Weight / Container	grams	153.2	148.3	143.1	157.7		
H	Dry Weight / Container	grams	143.9	138.0	132.0	143.3		
I	Moisture Loss = G - H	grams	9.3	10.3	11.1	14.4		
J	Tare Weight of Container	grams	37.6	37.9	37.6	37.4		
K	Dry Soil = H - J	grams	106.3	100.1	94.4	105.9		
L	%Moisture = (I / K) x 100	%	**8.7%**	**10.3%**	**11.8%**	**13.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

124.3 lbs./cu.ft.

Optimum Moisture

11.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/20/2015**		**1166**

Density

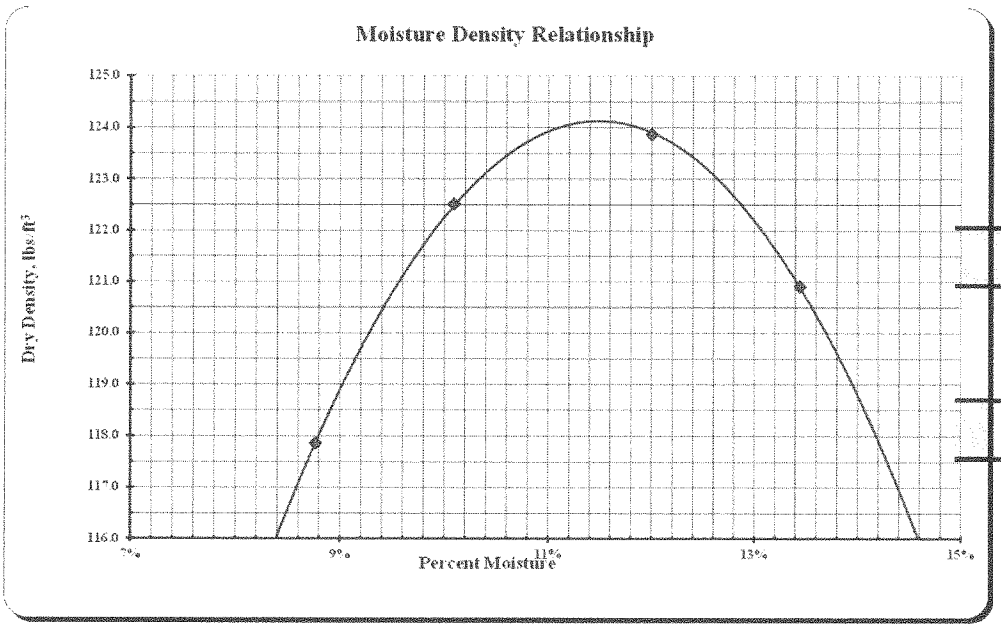
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.66	8.88	9.01	8.96		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.26	4.48	4.61	4.55		
E	Wet Density = D / A	lbs./cu.ft.	128.2	134.9	138.7	137.2		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**117.9**	**122.5**	**123.9**	**120.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		61	62	63	64		
G	Wet Weight / Container	grams	153.9	159.8	146.5	148.7		
H	Dry Weight / Container	grams	144.5	148.6	134.8	135.5		
I	Moisture Loss = G - H	grams	9.4	11.2	11.7	13.2		
J	Tare Weight of Container	grams	37.3	37.6	37.3	37.3		
K	Dry Soil = H - J	grams	107.2	111.0	97.5	98.2		
L	%Moisture = (I / K) x 100	%	**8.8%**	**10.1%**	**12.0%**	**13.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

124.1 lbs./cu.ft.

Optimum Moisture

11.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/20/2015**		**1167**

Density

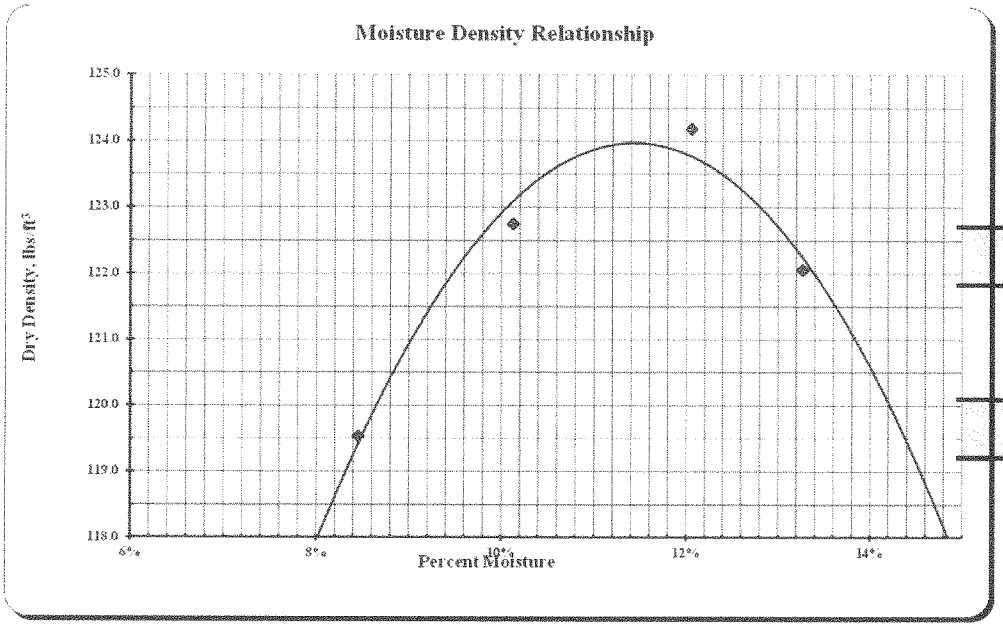
		Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.71	8.89	9.02	8.99		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.30	4.49	4.62	4.59		
E	Wet Density = D / A	lbs./cu.ft.	129.6	135.2	139.2	138.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.5**	**122.8**	**124.2**	**122.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		65	66	67	68		
G	Wet Weight / Container	grams	159.7	151.9	157.1	151.4		
H	Dry Weight / Container	grams	150.2	141.4	144.2	138.0		
I	Moisture Loss = G - H	grams	9.5	10.5	12.9	13.4		
J	Tare Weight of Container	grams	37.8	37.7	37.2	37.0		
K	Dry Soil = H - J	grams	112.4	103.7	107.0	101.0		
L	%Moisture = (I / K) x 100	%	**8.5%**	**10.1%**	**12.1%**	**13.3%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

124.0 lbs./cu.ft.

Optimum Moisture

11.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			

Offset From Centerline	Type of Soil

AASTHO Designation	Date	
T-180	**10/20/2015**	**1168**

Density

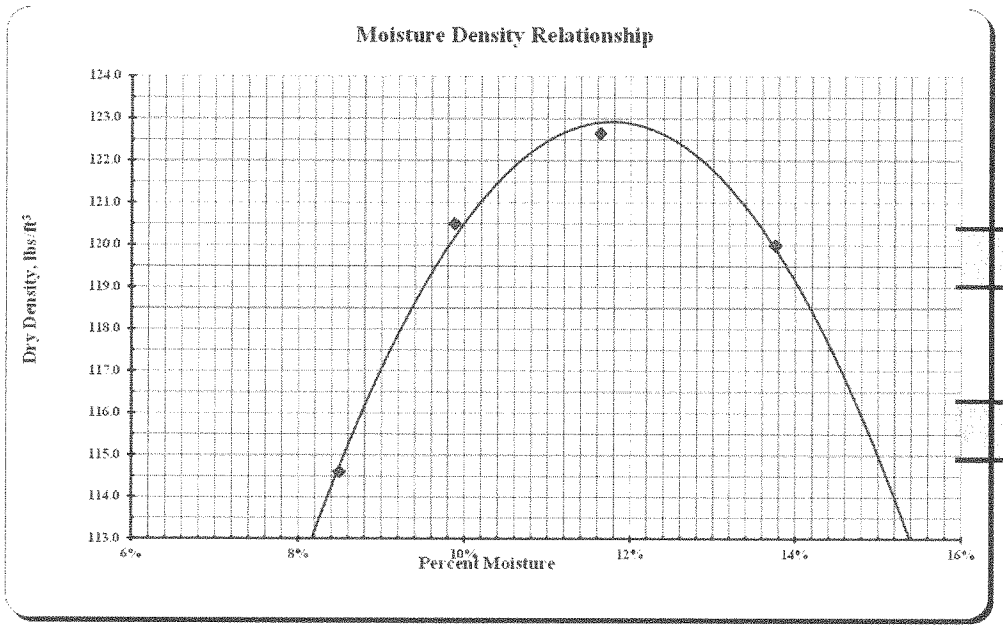
		Test Count	4				
	Determination No.	1	2	3	4	5	6
A	Volume of Mold cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.53	8.80	8.95	8.93		
C	Weight of Mold lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C lbs.	4.13	4.40	4.55	4.53		
E	Wet Density = D / A lbs./cu.ft.	124.3	132.4	136.9	136.5		
F	Dry Density = (E x 100) / (100 + L) lbs./cu.ft.	**114.6**	**120.5**	**122.7**	**120.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	69	70	71	72		
G	Wet Weight / Container grams	161.6	154.4	145.6	159.1		
H	Dry Weight / Container grams	151.9	143.9	134.3	144.3		
I	Moisture Loss = G - H grams	9.7	10.5	11.3	14.8		
J	Tare Weight of Container grams	37.7	37.6	37.2	36.7		
K	Dry Soil = H - J grams	114.2	106.3	97.1	107.6		
L	%Moisture = (I / K) x 100 %	**8.5%**	**9.9%**	**11.6%**	**13.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

122.9 lbs./cu.ft.

Optimum Moisture

11.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/20/2015**		**1169**

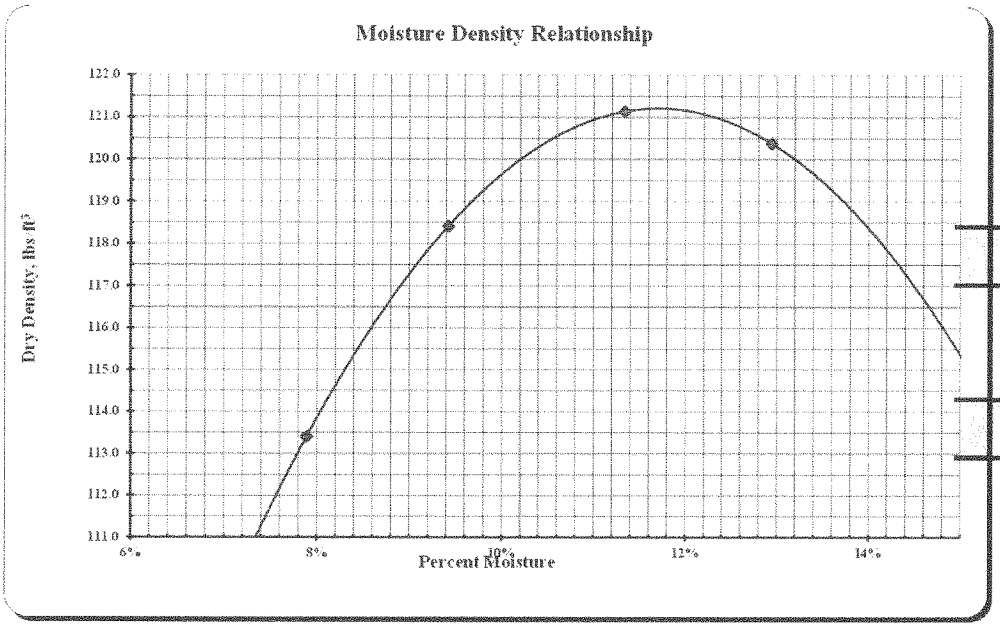
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.46	8.70	8.88	8.92		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.06	4.30	4.48	4.51		
E Wet Density = D / A	lbs./cu.ft.	122.3	129.6	134.9	136.0		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.4**	**118.4**	**121.1**	**120.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		73	74	75	76		
G Wet Weight / Container	grams	159.1	151.2	156.1	142.7		
H Dry Weight / Container	grams	150.2	141.4	144.0	130.7		
I Moisture Loss = G - H	grams	8.9	9.8	12.1	12.0		
J Tare Weight of Container	grams	37.4	37.4	37.3	38.0		
K Dry Soil = H - J	grams	112.8	104.0	106.7	92.7		
L %Moisture = (I / K) x 100	%	**7.9%**	**9.4%**	**11.3%**	**12.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

121.2 lbs./cu.ft.

Optimum Moisture

11.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/20/2015**		**1170**

Density

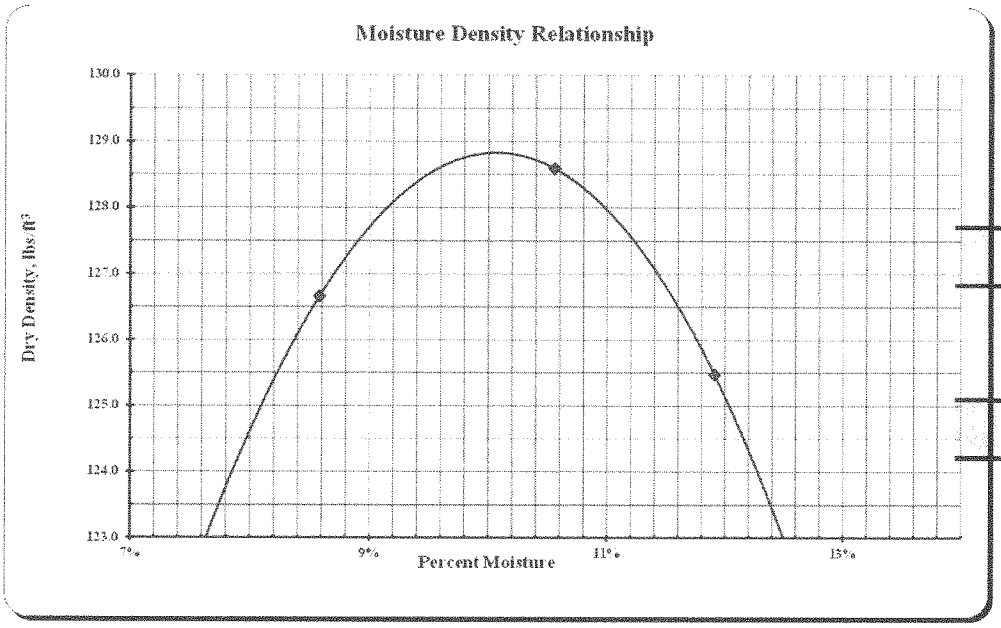
		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.97	9.12	9.06			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.57	4.72	4.66			
E Wet Density = D / A	lbs./cu.ft.	137.5	142.2	140.4			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**126.7**	**128.6**	**125.5**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	77	78	79			
G	Wet Weight / Container grams	153.2	152.4	150.8			
H	Dry Weight / Container grams	144.0	141.4	138.7			
I	Moisture Loss = G - H grams	9.2	11.0	12.1			
J	Tare Weight of Container grams	36.8	37.2	37.1			
K	Dry Soil = H - J grams	107.2	104.2	101.6			
L	%Moisture = (I / K) x 100 %	**8.6%**	**10.6%**	**11.9%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

128.8 lbs./cu.ft.

Optimum Moisture

10.1%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/20/2015**		**1171**

Density

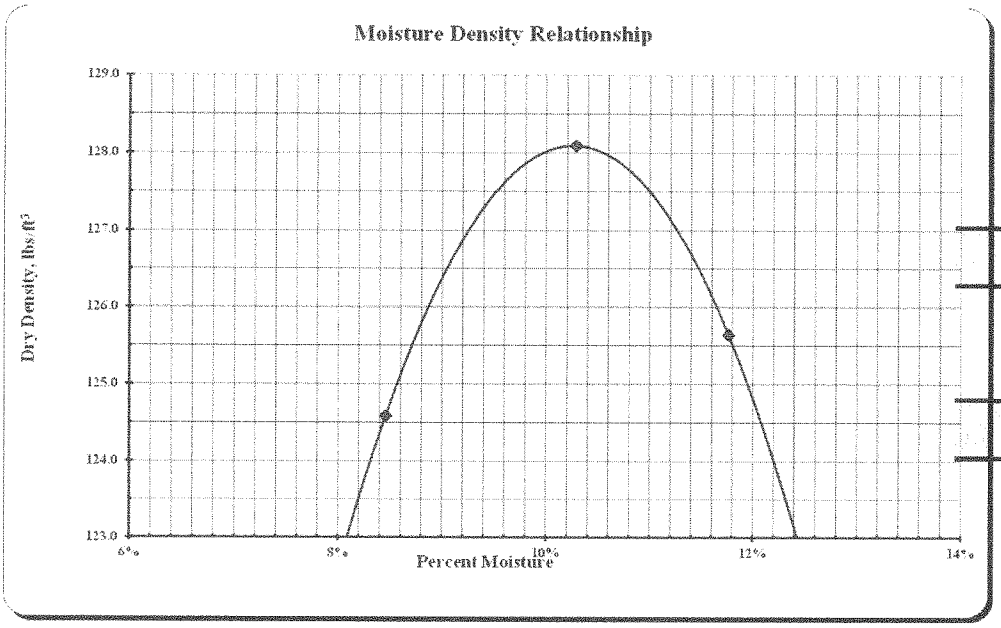
		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.89	9.09	9.06			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.49	4.69	4.66			
E Wet Density = D / A	lbs./cu.ft.	135.1	141.3	140.4			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**124.6**	**128.1**	**125.6**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		44	45	46			
G Wet Weight / Container	grams	153.7	157.7	160.6			
H Dry Weight / Container	grams	144.6	146.5	147.6			
I Moisture Loss = G - H	grams	9.1	11.2	13.0			
J Tare Weight of Container	grams	37.0	37.6	37.1			
K Dry Soil = H - J	grams	107.6	108.9	110.5			
L %Moisture = (I / K) x 100	%	**8.5%**	**10.3%**	**11.8%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

128.1 lbs./cu.ft.

Optimum Moisture

10.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

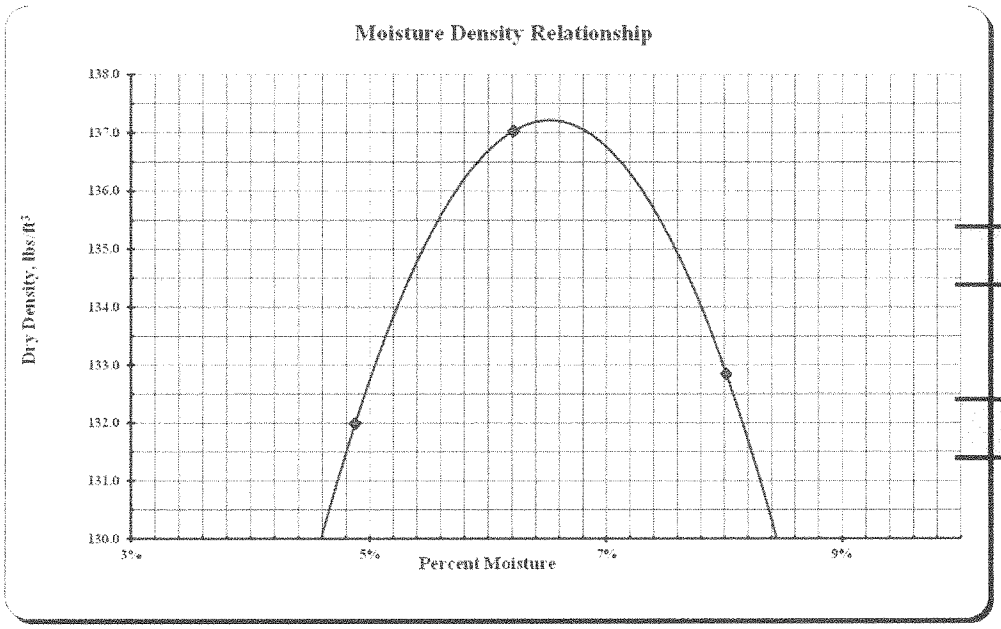
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/20/2015**		**1172**

Density		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	9.00	9.23	9.16			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.60	4.83	4.76			
E Wet Density = D / A	lbs./cu.ft.	138.4	145.5	143.5			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**132.0**	**137.0**	**132.8**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		47	48	49			
G Wet Weight / Container	grams	148.8	156.8	159.9			
H Dry Weight / Container	grams	143.6	149.8	150.8			
I Moisture Loss = G - H	grams	5.2	7.0	9.1			
J Tare Weight of Container	grams	37.0	37.1	37.3			
K Dry Soil = H - J	grams	106.6	112.7	113.5			
L %Moisture = (I / K) x 100	%	**4.9%**	**6.2%**	**8.0%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

137.2 lbs./cu.ft.

Optimum Moisture

6.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/20/2015**		**1173**

Density

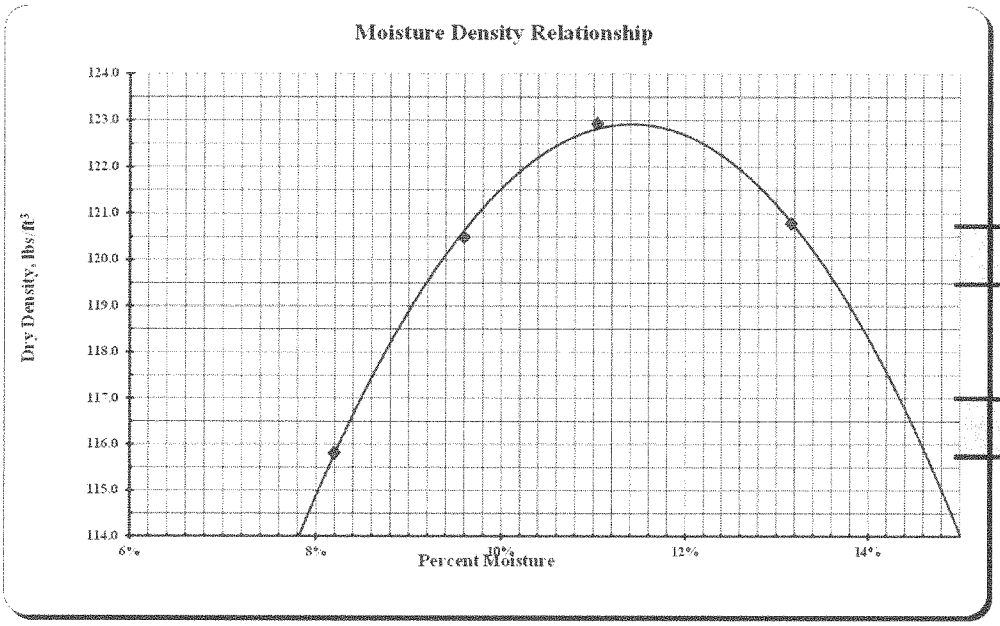
		Test Count	4				
	Determination No.	1	2	3	4	5	6
A	Volume of Mold cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.56	8.78	8.93	8.94		
C	Weight of Mold lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C lbs.	4.16	4.38	4.53	4.54		
E	Wet Density = D / A lbs./cu.ft.	125.3	132.0	136.5	136.7		
F	Dry Density = (E x 100) / (100 + L) lbs./cu.ft.	**115.8**	**120.5**	**122.9**	**120.8**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	50	51	52	53		
G	Wet Weight / Container grams	159.8	158.3	157.0	154.9		
H	Dry Weight / Container grams	150.5	147.7	145.1	141.2		
I	Moisture Loss = G - H grams	9.3	10.6	11.9	13.7		
J	Tare Weight of Container grams	37.0	37.2	37.3	37.1		
K	Dry Soil = H - J grams	113.5	110.5	107.8	104.1		
L	%Moisture = (I / K) x 100 %	**8.2%**	**9.6%**	**11.0%**	**13.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

122.9 lbs./cu.ft.

Optimum Moisture

11.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/20/2015**		**1174**

Density

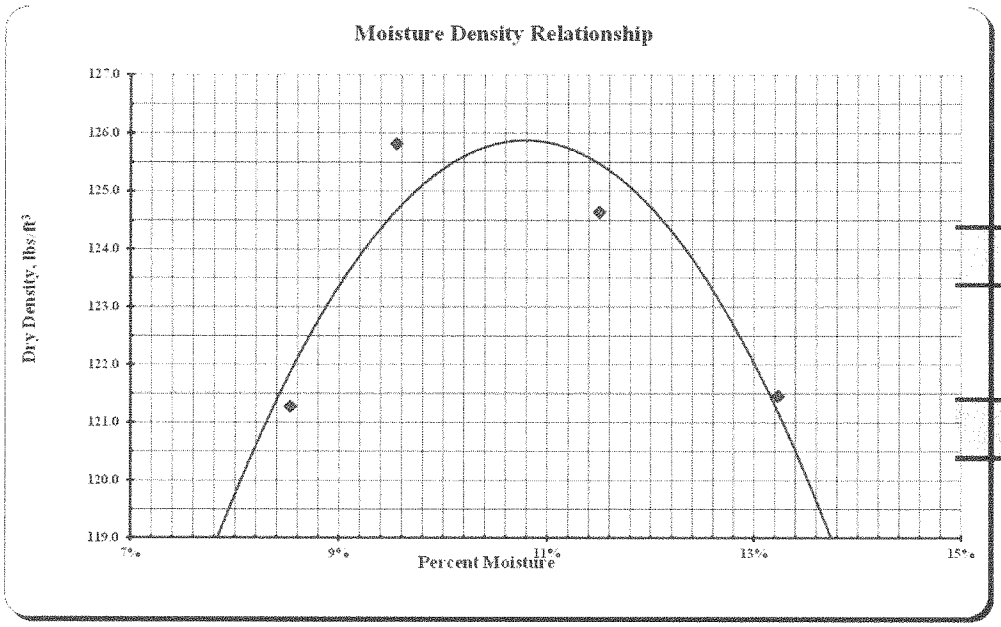
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.77	8.98	9.01	8.97		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.37	4.58	4.61	4.57		
E	Wet Density = D / A	lbs./cu.ft.	131.6	137.8	139.0	137.5		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**121.3**	**125.8**	**124.6**	**121.5**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		54	55	56	57		
G	Wet Weight / Container	grams	155.3	155.9	147.8	155.4		
H	Dry Weight / Container	grams	146.0	145.5	136.4	141.6		
I	Moisture Loss = G - H	grams	9.3	10.4	11.4	13.8		
J	Tare Weight of Container	grams	37.0	36.6	37.3	37.3		
K	Dry Soil = H - J	grams	109.0	108.9	99.1	104.3		
L	%Moisture = (I / K) x 100	%	**8.5%**	**9.6%**	**11.5%**	**13.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.9 lbs./cu.ft.

Optimum Moisture

10.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/20/2015**		**1175**

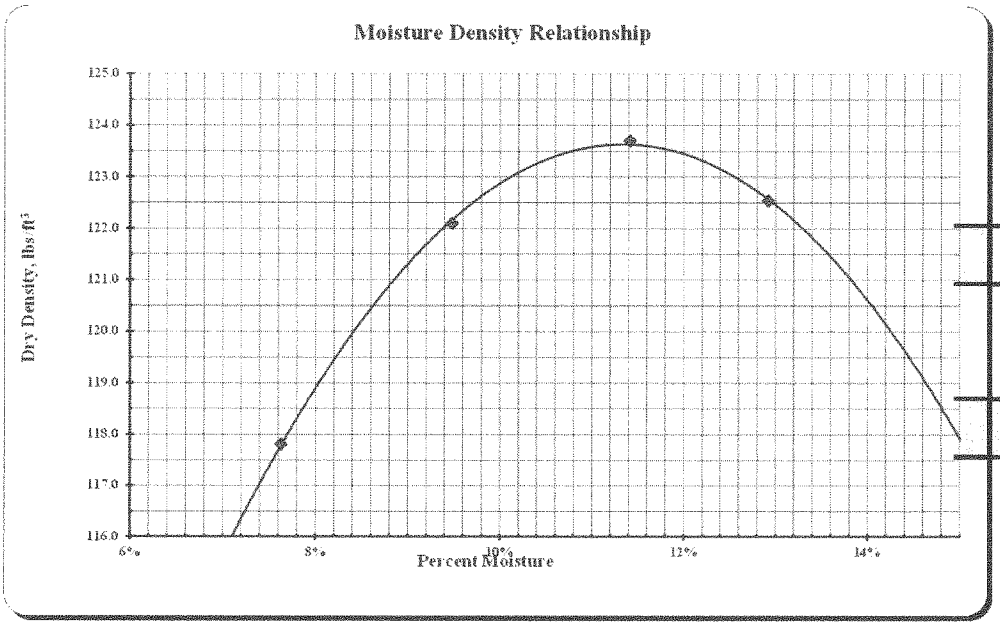
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.61	8.84	8.98	9.00		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.21	4.44	4.58	4.59		
E Wet Density = D / A	lbs./cu.ft.	126.8	133.7	137.8	138.4		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**117.8**	**122.1**	**123.7**	**122.5**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		80	81	82	83		
G Wet Weight / Container	grams	162.6	155.6	158.4	151.7		
H Dry Weight / Container	grams	153.7	145.4	146.0	138.6		
I Moisture Loss = G - H	grams	8.9	10.2	12.4	13.1		
J Tare Weight of Container	grams	37.1	37.8	37.4	37.2		
K Dry Soil = H - J	grams	116.6	107.6	108.6	101.4		
L %Moisture = (I / K) x 100	%	**7.6%**	**9.5%**	**11.4%**	**12.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

123.6 lbs./cu.ft.

Optimum Moisture

11.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/20/2015**		**1176**

Density

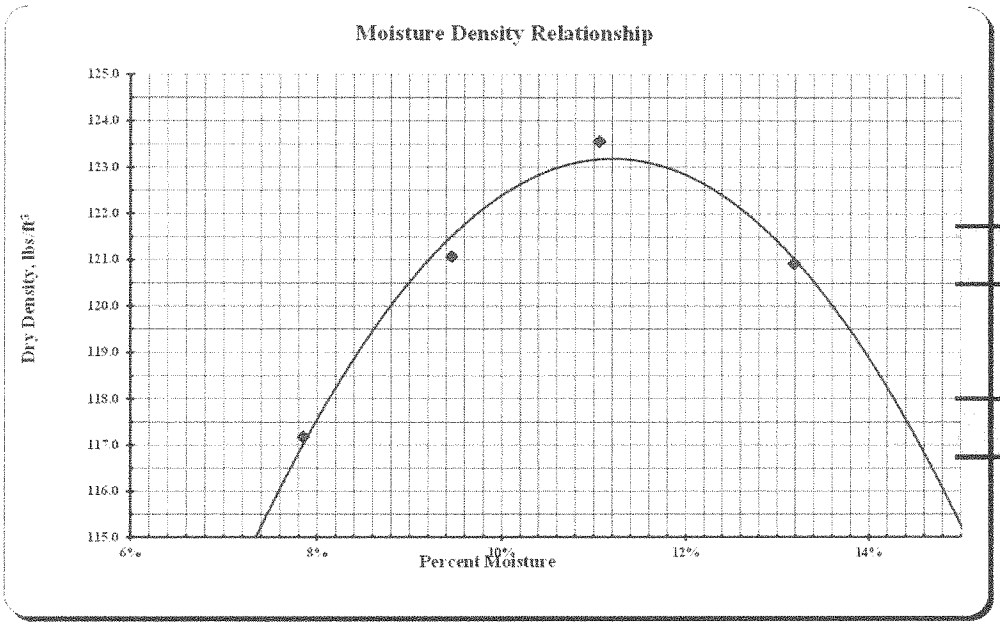
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.60	8.80	8.96	8.94		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.20	4.40	4.56	4.54		
E	Wet Density = D / A	lbs./cu.ft.	126.4	132.5	137.2	136.9		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**117.2**	**121.1**	**123.6**	**120.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		35	37	38	39		
G	Wet Weight / Container	grams	159.7	150.7	159.4	156.8		
H	Dry Weight / Container	grams	150.8	140.9	147.2	142.9		
I	Moisture Loss = G - H	grams	8.9	9.8	12.2	13.9		
J	Tare Weight of Container	grams	37.5	37.3	36.9	37.5		
K	Dry Soil = H - J	grams	113.3	103.6	110.3	105.4		
L	%Moisture = (I / K) x 100	%	**7.9%**	**9.5%**	**11.1%**	**13.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

123.2 lbs./cu.ft.

Optimum Moisture

11.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/20/2015**		**1177**

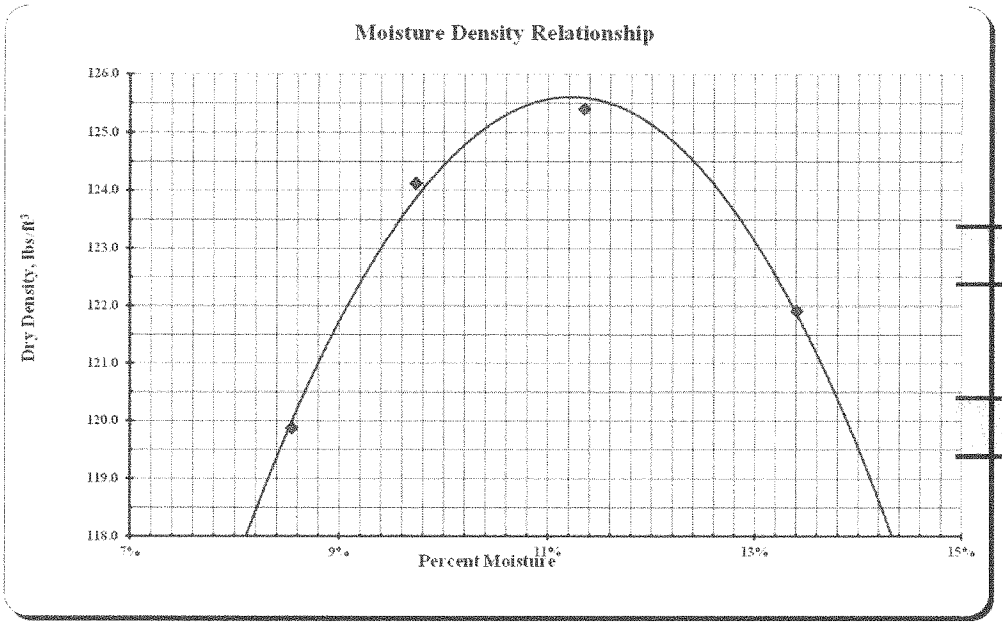
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.72	8.92	9.04	8.99		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.32	4.52	4.64	4.59		
E Wet Density = D / A	lbs./cu.ft.	130.1	136.2	139.6	138.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.9**	**124.1**	**125.4**	**121.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		40	41	42	43		
G Wet Weight / Container	grams	156.5	147.7	156.4	154.6		
H Dry Weight / Container	grams	147.1	137.9	144.2	140.7		
I Moisture Loss = G - H	grams	9.4	9.8	12.2	13.9		
J Tare Weight of Container	grams	37.1	37.2	36.7	37.0		
K Dry Soil = H - J	grams	110.0	100.7	107.5	103.7		
L %Moisture = (I / K) x 100	%	**8.5%**	**9.7%**	**11.3%**	**13.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.6 lbs./cu.ft.

Optimum Moisture

11.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1178**

Density

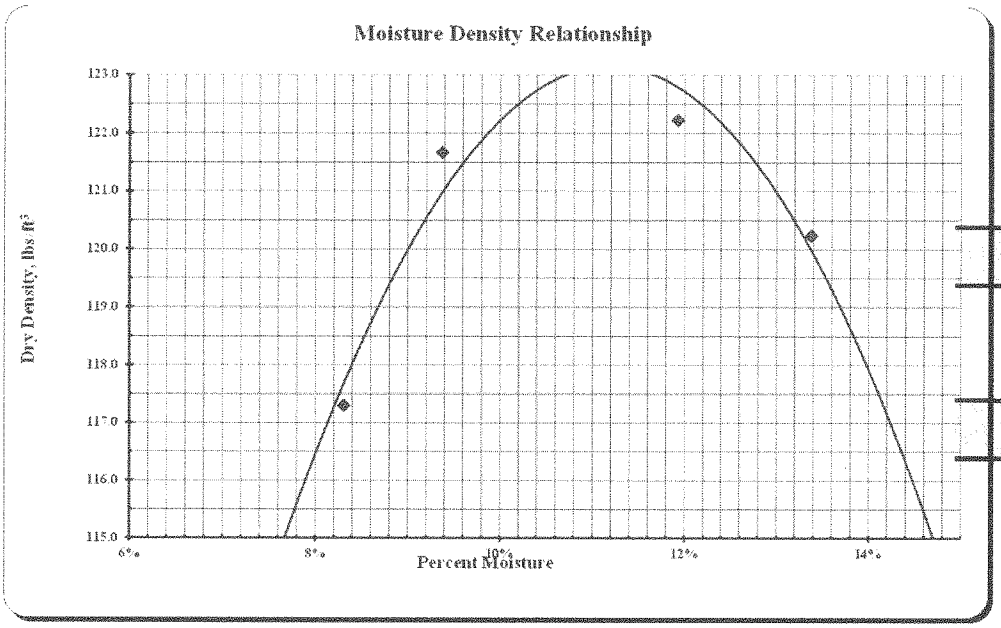
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.62	8.82	8.94	8.93		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.22	4.42	4.54	4.53		
E	Wet Density = D / A	lbs./cu.ft.	127.0	133.1	136.8	136.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**117.3**	**121.7**	**122.2**	**120.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		84	85	86	87		
G	Wet Weight / Container	grams	150.3	151.0	159.6	157.0		
H	Dry Weight / Container	grams	141.6	141.3	146.6	142.9		
I	Moisture Loss = G - H	grams	8.7	9.7	13.0	14.1		
J	Tare Weight of Container	grams	36.9	37.8	37.6	37.5		
K	Dry Soil = H - J	grams	104.7	103.5	109.0	105.4		
L	%Moisture = (I / K) x 100	%	**8.3%**	**9.4%**	**11.9%**	**13.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

123.2 lbs./cu.ft.

Optimum Moisture

11.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1179**

Density

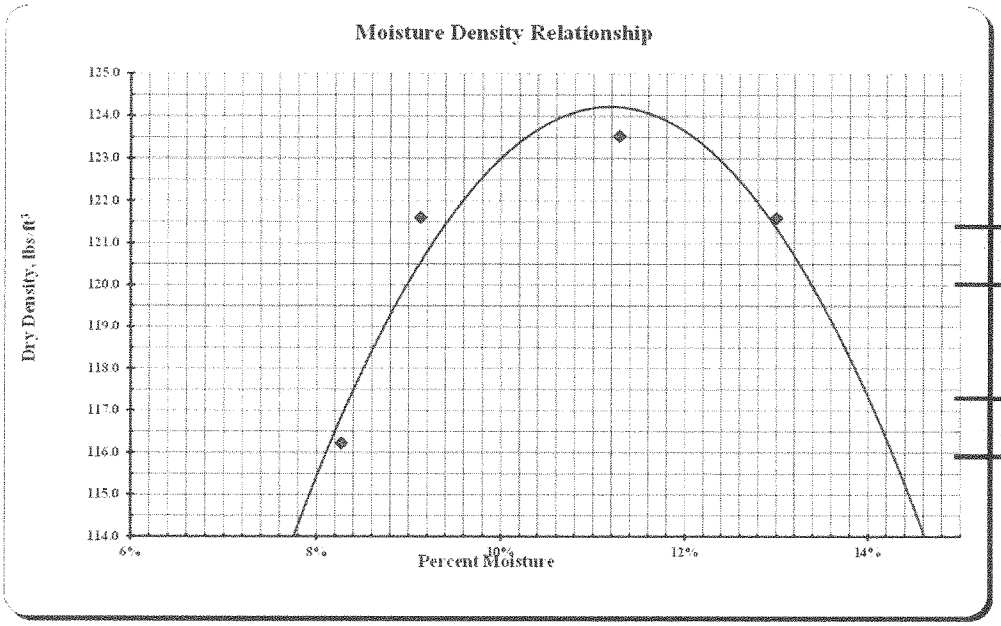
		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.58	8.81	8.96	8.96		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.18	4.41	4.56	4.56		
E Wet Density = D / A	lbs./cu.ft.	125.8	132.7	137.5	137.4		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**116.2**	**121.6**	**123.5**	**121.6**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	1	2	3	4		
G Wet Weight / Container	grams	153.1	153.3	156.4	154.9		
H Dry Weight / Container	grams	144.2	143.6	144.3	141.3		
I Moisture Loss = G - H	grams	8.9	9.7	12.1	13.6		
J Tare Weight of Container	grams	36.6	37.3	37.1	36.7		
K Dry Soil = H - J	grams	107.6	106.3	107.2	104.6		
L %Moisture = (I / K) x 100	%	**8.3%**	**9.1%**	**11.3%**	**13.0%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

124.2 lbs./cu.ft.

Optimum Moisture

11.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1180**

Density

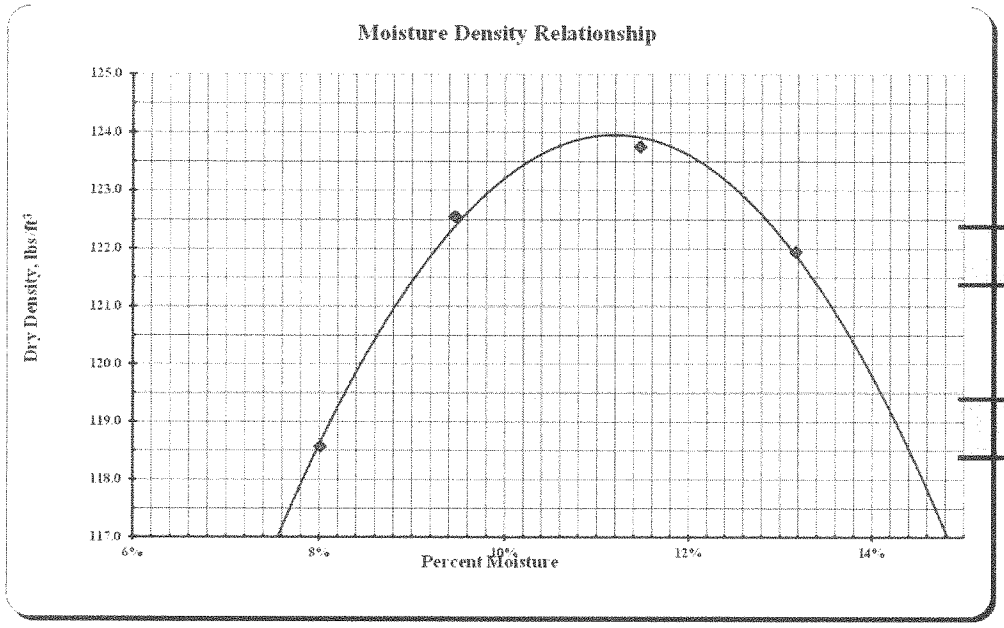
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.65	8.86	8.98	8.98		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.25	4.45	4.58	4.58		
E	Wet Density = D / A	lbs./cu.ft.	128.1	134.2	138.0	138.0		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**118.6**	**122.6**	**123.8**	**122.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		88	89	90	91		
G	Wet Weight / Container	grams	144.3	145.2	158.4	153.6		
H	Dry Weight / Container	grams	136.4	135.9	146.0	140.1		
I	Moisture Loss = G - H	grams	7.9	9.3	12.4	13.5		
J	Tare Weight of Container	grams	37.8	37.6	37.9	37.6		
K	Dry Soil = H - J	grams	98.6	98.3	108.1	102.5		
L	%Moisture = (I / K) x 100	%	**8.0%**	**9.5%**	**11.5%**	**13.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

124.0 lbs./cu.ft.

Optimum Moisture

11.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1181**

Density

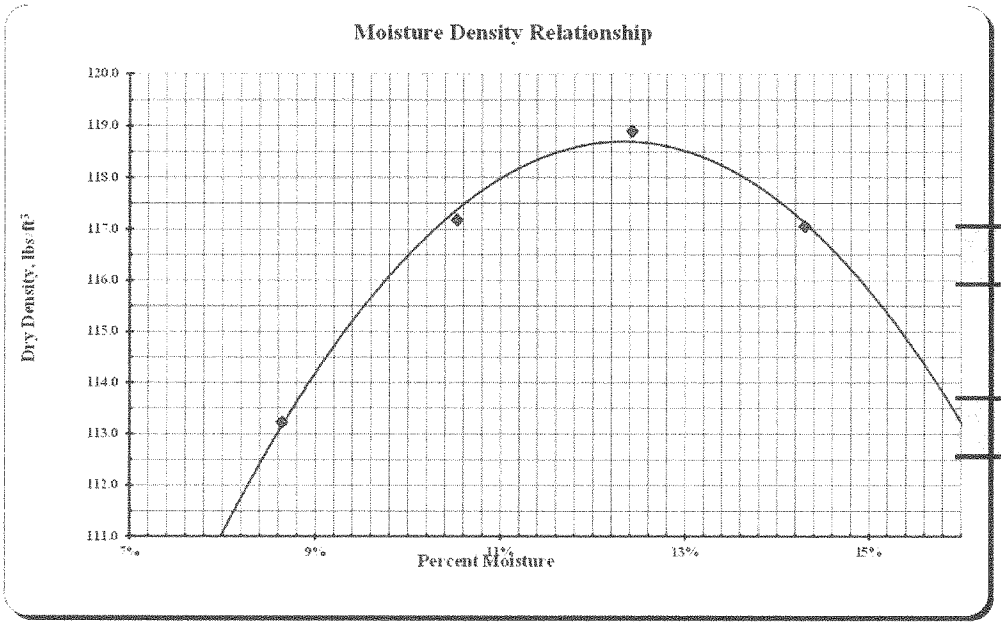
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.48	8.70	8.84	8.84		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.08	4.30	4.44	4.44		
E	Wet Density = D / A	lbs./cu.ft.	123.0	129.5	133.7	133.8		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.2**	**117.2**	**118.9**	**117.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		5	6	7	8		
G	Wet Weight / Container	grams	149.0	155.7	148.5	147.3		
H	Dry Weight / Container	grams	140.1	144.4	136.1	133.5		
I	Moisture Loss = G - H	grams	8.9	11.3	12.4	13.8		
J	Tare Weight of Container	grams	37.1	37.1	36.3	37.0		
K	Dry Soil = H - J	grams	103.0	107.3	99.8	96.5		
L	%Moisture = (I / K) x 100	%	**8.6%**	**10.5%**	**12.4%**	**14.3%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

118.7 lbs./cu.ft.

Optimum Moisture

12.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1182**

Density

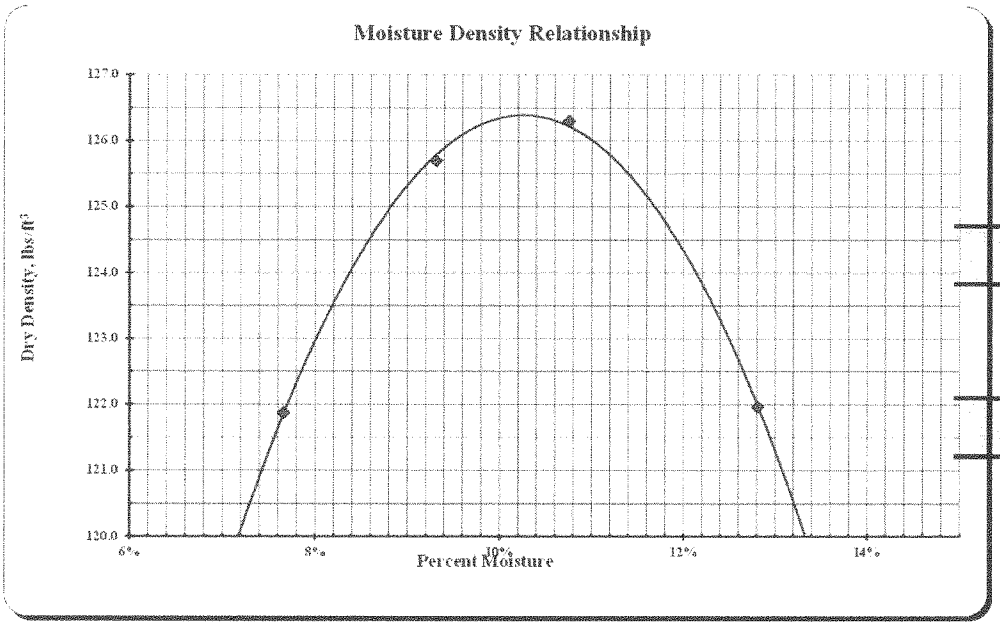
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.76	8.96	9.04	8.97		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.36	4.56	4.64	4.57		
E	Wet Density = D / A	lbs./cu.ft.	131.2	137.4	139.9	137.6		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**121.9**	**125.7**	**126.3**	**122.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		9	10	11	12		
G	Wet Weight / Container	grams	158.1	149.4	153.6	150.5		
H	Dry Weight / Container	grams	149.5	139.8	142.3	137.6		
I	Moisture Loss = G - H	grams	8.6	9.6	11.3	12.9		
J	Tare Weight of Container	grams	37.2	36.7	37.2	36.9		
K	Dry Soil = H - J	grams	112.3	103.1	105.1	100.7		
L	%Moisture = (I / K) x 100	%	**7.7%**	**9.3%**	**10.8%**	**12.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

126.4 lbs./cu.ft.

Optimum Moisture

10.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1183**

Density

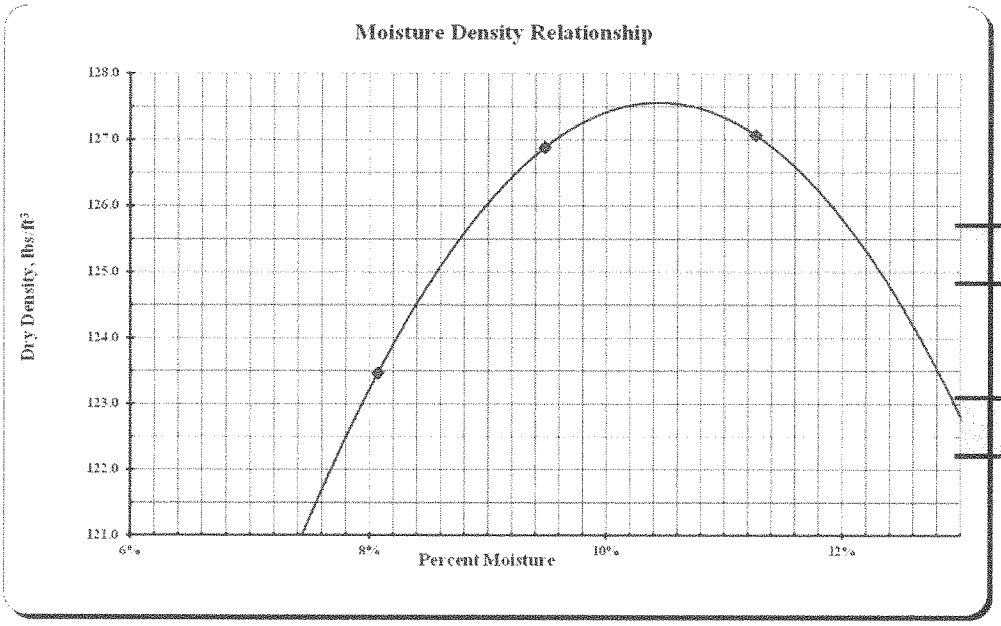
			Test Count	3				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.83	9.01	9.10			
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.43	4.61	4.69			
E	Wet Density = D / A	lbs./cu.ft.	133.4	138.9	141.4			
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**123.5**	**126.9**	**127.1**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		92	93	94			
G	Wet Weight / Container	grams	160.6	157.7	149.3			
H	Dry Weight / Container	grams	151.4	147.3	138.0			
I	Moisture Loss = G - H	grams	9.2	10.4	11.3			
J	Tare Weight of Container	grams	37.4	37.6	37.7			
K	Dry Soil = H - J	grams	114.0	109.7	100.3			
L	%Moisture = (I / K) x 100	%	**8.1%**	**9.5%**	**11.3%**			

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

127.6 lbs./cu.ft.

Optimum Moisture

10.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1184**

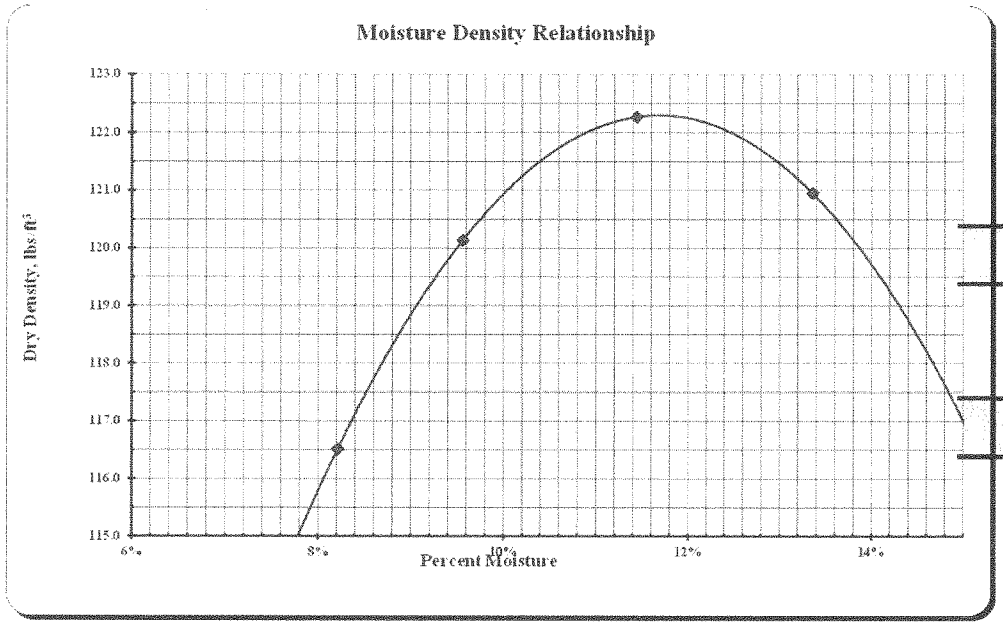
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.59	8.77	8.93	8.95		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.19	4.37	4.52	4.55		
E Wet Density = D / A	lbs./cu.ft.	126.1	131.6	136.3	137.1		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**116.5**	**120.1**	**122.3**	**121.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		95	96	97	98		
G Wet Weight / Container	grams	157.4	149.5	156.5	152.9		
H Dry Weight / Container	grams	148.3	139.7	144.3	139.3		
I Moisture Loss = G - H	grams	9.1	9.8	12.2	13.6		
J Tare Weight of Container	grams	37.5	37.2	37.7	37.5		
K Dry Soil = H - J	grams	110.8	102.5	106.6	101.8		
L %Moisture = (I / K) x 100	%	**8.2%**	**9.6%**	**11.4%**	**13.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

122.3 lbs./cu.ft.

Optimum Moisture

11.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1185**

Density

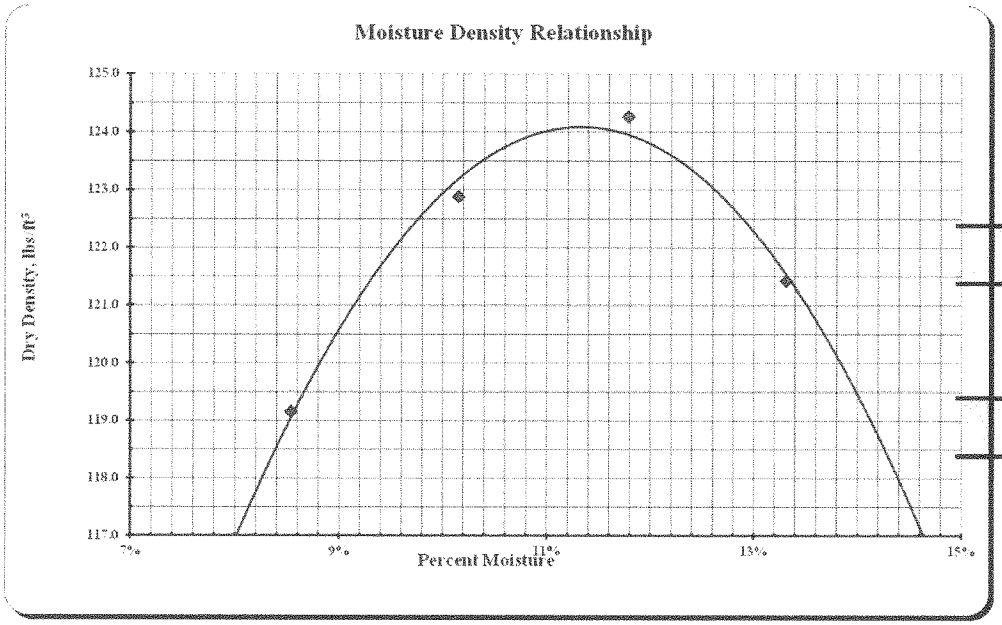
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.69	8.89	9.01	8.97		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.29	4.49	4.61	4.57		
E	Wet Density = D / A	lbs./cu.ft.	129.3	135.4	138.9	137.6		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.2**	**122.9**	**124.3**	**121.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		13	14	15	16		
G	Wet Weight / Container	grams	155.3	161.6	156.8	152.1		
H	Dry Weight / Container	grams	146.0	150.2	144.2	138.6		
I	Moisture Loss = G - H	grams	9.3	11.4	12.6	13.5		
J	Tare Weight of Container	grams	37.1	37.9	37.3	37.2		
K	Dry Soil = H - J	grams	108.9	112.3	106.9	101.4		
L	%Moisture = (I / K) x 100	%	**8.5%**	**10.2%**	**11.8%**	**13.3%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

124.1 lbs./cu.ft.

Optimum Moisture

11.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1186**

Density

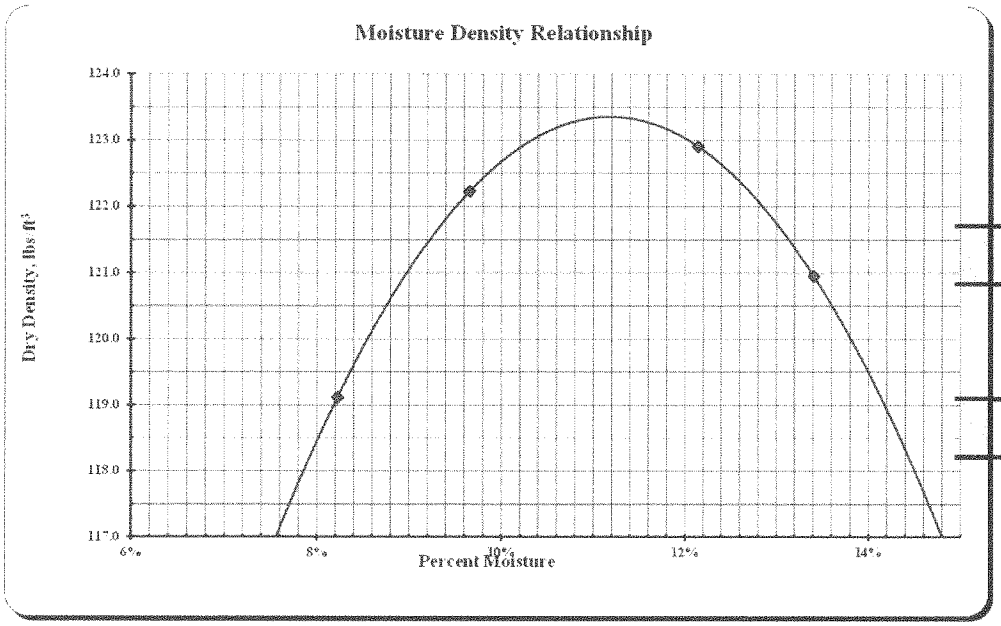
		Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.68	8.85	8.98	8.96		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.28	4.45	4.58	4.55		
E	Wet Density = D / A	lbs./cu.ft.	128.9	134.0	137.8	137.2		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.1**	**122.2**	**122.9**	**121.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		99	100	101	102		
G	Wet Weight / Container	grams	145.5	158.7	158.6	159.5		
H	Dry Weight / Container	grams	137.3	148.0	145.5	145.1		
I	Moisture Loss = G - H	grams	8.2	10.7	13.1	14.4		
J	Tare Weight of Container	grams	37.6	37.2	37.6	37.7		
K	Dry Soil = H - J	grams	99.7	110.8	107.9	107.4		
L	%Moisture = (I / K) x 100	%	**8.2%**	**9.7%**	**12.1%**	**13.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

123.4 lbs./cu.ft.

Optimum Moisture

11.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1187**

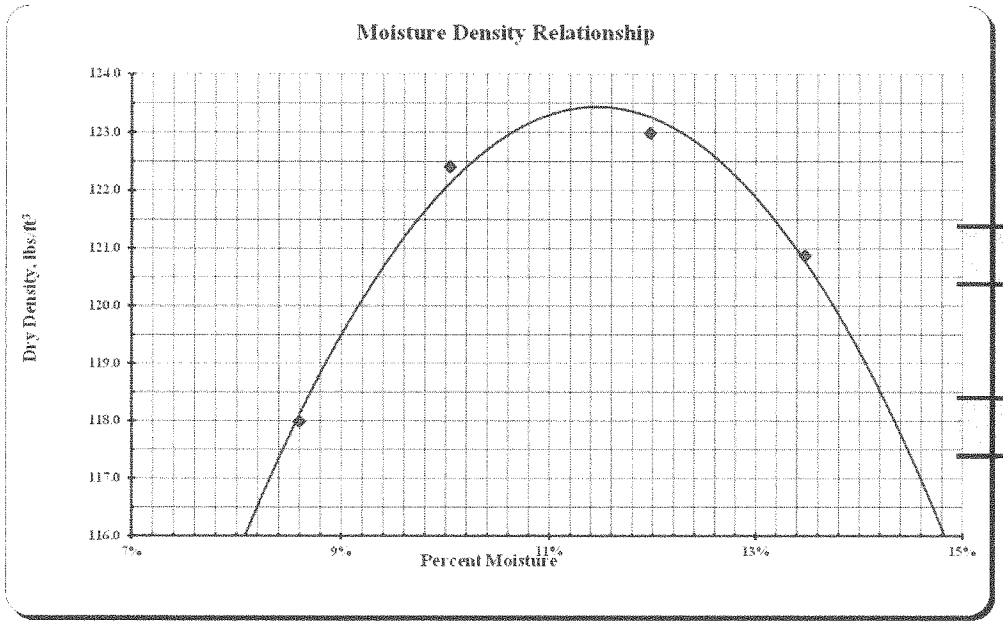
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.65	8.87	8.97	8.95		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.25	4.47	4.57	4.55		
E Wet Density = D / A	lbs./cu.ft.	128.1	134.7	137.7	137.2		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**118.0**	**122.4**	**123.0**	**120.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		17	18	19	20		
G Wet Weight / Container	grams	156.8	148.9	151.2	152.7		
H Dry Weight / Container	grams	147.3	138.7	139.0	138.9		
I Moisture Loss = G - H	grams	9.5	10.2	12.2	13.8		
J Tare Weight of Container	grams	36.8	37.1	37.1	36.5		
K Dry Soil = H - J	grams	110.5	101.6	101.9	102.4		
L %Moisture = (I / K) x 100	%	**8.6%**	**10.0%**	**12.0%**	**13.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

123.4 lbs./cu.ft.

Optimum Moisture

11.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1188**

Density

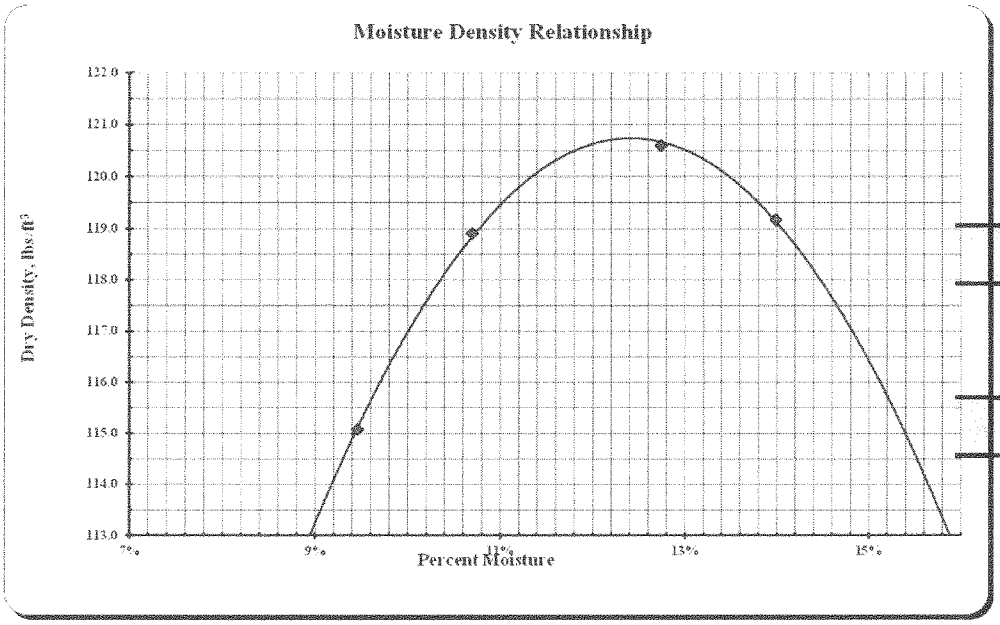
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.58	8.77	8.92	8.91		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.18	4.37	4.51	4.51		
E	Wet Density = D / A	lbs./cu.ft.	126.0	131.6	136.0	135.8		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**115.1**	**118.9**	**120.6**	**119.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		103	104	105	106		
G	Wet Weight / Container	grams	148.3	140.7	155.2	158.1		
H	Dry Weight / Container	grams	138.7	130.7	141.9	143.3		
I	Moisture Loss = G - H	grams	9.6	10.0	13.3	14.8		
J	Tare Weight of Container	grams	37.2	37.2	37.5	37.5		
K	Dry Soil = H - J	grams	101.5	93.5	104.4	105.8		
L	%Moisture = (I / K) x 100	%	**9.5%**	**10.7%**	**12.7%**	**14.0%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

120.7 lbs./cu.ft.

Optimum Moisture

12.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1189**

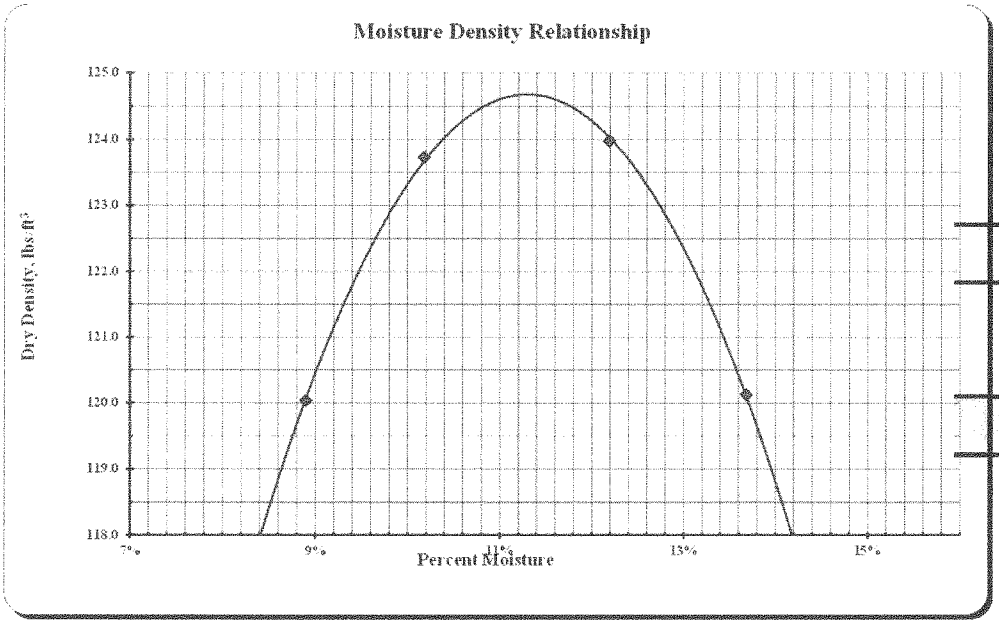
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.74	8.93	9.02	8.93		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.34	4.53	4.62	4.53		
E Wet Density = D / A	lbs./cu.ft.	130.7	136.3	139.1	136.6		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.0**	**123.7**	**124.0**	**120.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		21	22	23	24		
G Wet Weight / Container	grams	150.9	148.5	146.9	145.2		
H Dry Weight / Container	grams	141.6	138.2	135.0	132.2		
I Moisture Loss = G - H	grams	9.3	10.3	11.9	13.0		
J Tare Weight of Container	grams	37.1	37.0	37.4	37.2		
K Dry Soil = H - J	grams	104.5	101.2	97.6	95.0		
L %Moisture = (I / K) x 100	%	**8.9%**	**10.2%**	**12.2%**	**13.7%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

124.7 lbs./cu.ft.

Optimum Moisture

11.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1190**

Density

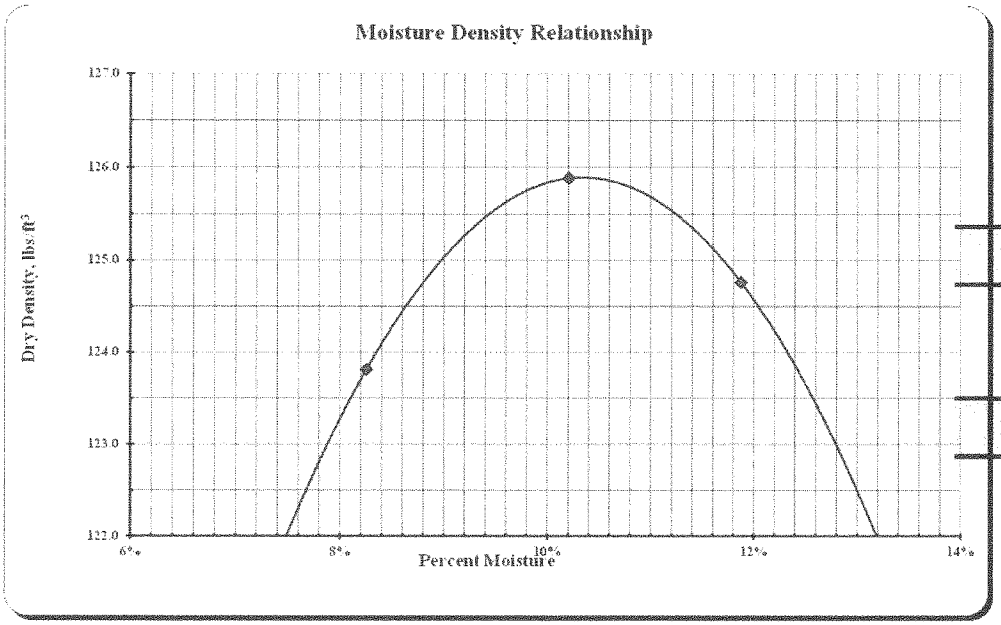
			Test Count	3				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.85	9.01	9.04			
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.45	4.61	4.63			
E	Wet Density = D / A	lbs./cu.ft.	134.0	138.7	139.6			
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**123.8**	**125.9**	**124.8**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		107	108	109			
G	Wet Weight / Container	grams	152.5	153.7	145.2			
H	Dry Weight / Container	grams	143.7	142.9	133.8			
I	Moisture Loss = G - H	grams	8.8	10.8	11.4			
J	Tare Weight of Container	grams	37.1	37.1	37.8			
K	Dry Soil = H - J	grams	106.6	105.8	96.0			
L	%Moisture = (I / K) x 100	%	**8.3%**	**10.2%**	**11.9%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.9 lbs./cu.ft.

Optimum Moisture

10.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1191**

Density

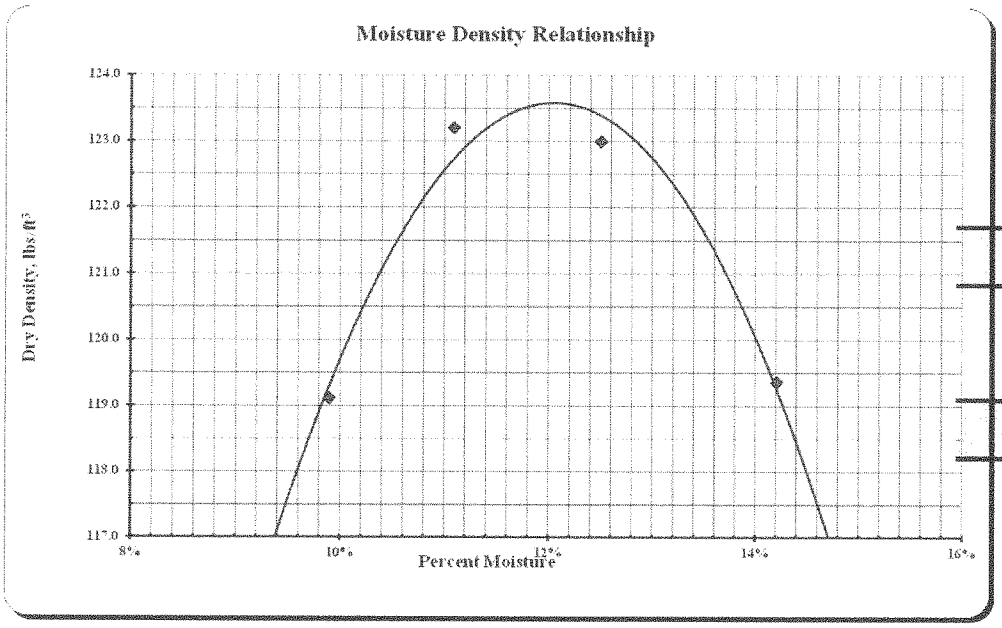
		Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.75	8.94	8.99	8.93		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.35	4.54	4.59	4.53		
E	Wet Density = D / A	lbs./cu.ft.	130.9	136.9	138.4	136.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.1**	**123.2**	**123.0**	**119.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		25	26	27	28		
G	Wet Weight / Container	grams	153.8	154.1	152.8	161.0		
H	Dry Weight / Container	grams	143.3	142.4	139.9	145.6		
I	Moisture Loss = G - H	grams	10.5	11.7	12.9	15.4		
J	Tare Weight of Container	grams	37.2	36.9	36.7	37.2		
K	Dry Soil = H - J	grams	106.1	105.5	103.2	108.4		
L	%Moisture = (I / K) x 100	%	**9.9%**	**11.1%**	**12.5%**	**14.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

123.6 lbs./cu.ft.

Optimum Moisture

12.1%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1192**

Density

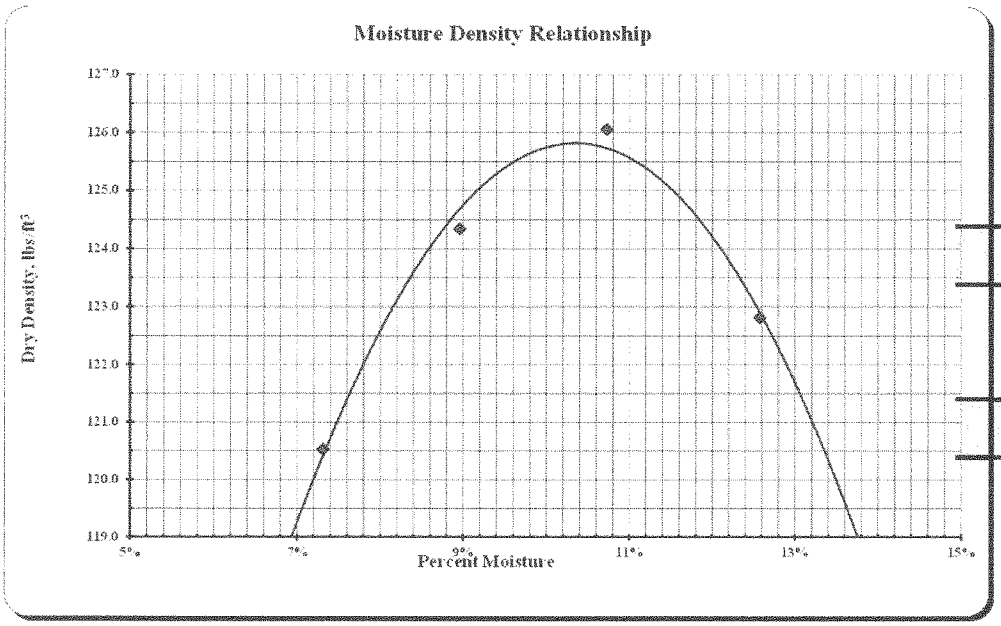
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.70	8.90	9.04	8.99		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.29	4.50	4.63	4.59		
E	Wet Density = D / A	lbs./cu.ft.	129.3	135.5	139.6	138.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.5**	**124.3**	**126.1**	**122.8**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		110	111	112	113		
G	Wet Weight / Container	grams	153.1	155.9	142.8	157.1		
H	Dry Weight / Container	grams	145.2	146.2	132.6	143.8		
I	Moisture Loss = G - H	grams	7.9	9.7	10.2	13.3		
J	Tare Weight of Container	grams	37.1	37.9	37.5	38.0		
K	Dry Soil = H - J	grams	108.1	108.3	95.1	105.8		
L	%Moisture = (I / K) x 100	%	**7.3%**	**9.0%**	**10.7%**	**12.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.8 lbs./cu.ft.

Optimum Moisture

10.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

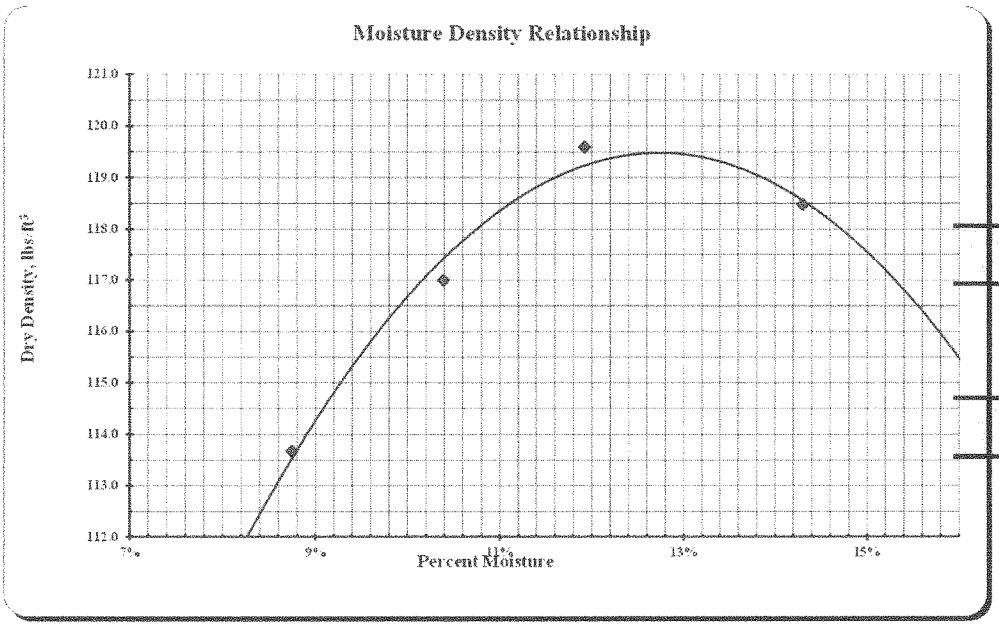
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1193**

Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.51	8.69	8.85	8.90		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.10	4.29	4.44	4.50		
E Wet Density = D / A	lbs./cu.ft.	123.6	129.2	133.9	135.4		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.7**	**117.0**	**119.6**	**118.5**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		114	115	116	117		
G Wet Weight / Container	grams	149.3	155.7	161.3	158.0		
H Dry Weight / Container	grams	140.3	144.5	148.1	142.9		
I Moisture Loss = G - H	grams	9.0	11.2	13.2	15.1		
J Tare Weight of Container	grams	37.4	36.7	37.4	37.3		
K Dry Soil = H - J	grams	102.9	107.8	110.7	105.6		
L %Moisture = (I / K) x 100	%	**8.7%**	**10.4%**	**11.9%**	**14.3%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

119.5 lbs./cu.ft.

Optimum Moisture

12.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1194**

Density

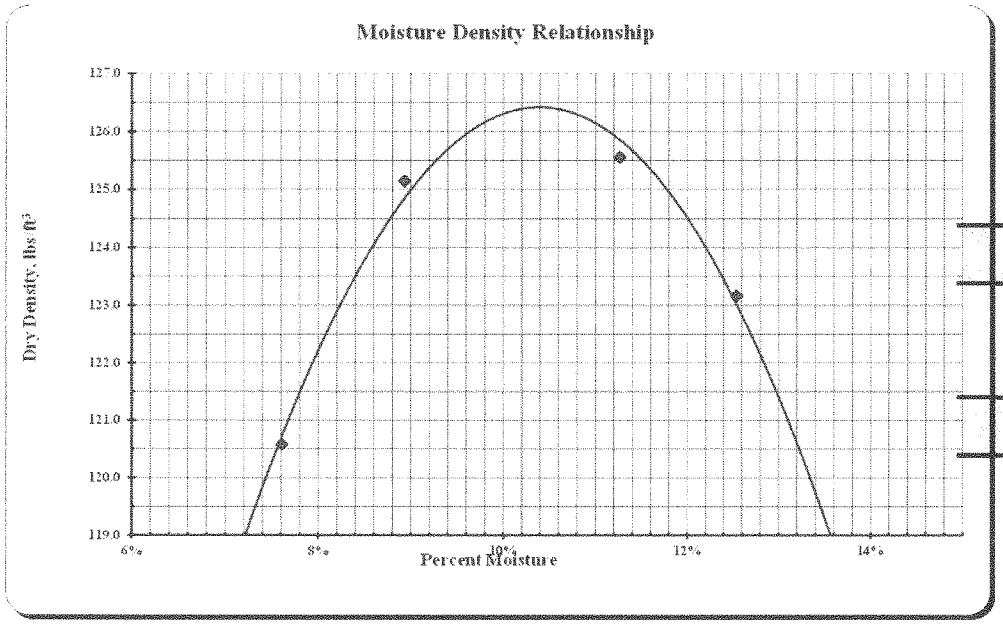
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.71	8.93	9.04	9.00		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.31	4.53	4.64	4.60		
E	Wet Density = D / A	lbs./cu.ft.	129.8	136.3	139.7	138.6		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.6**	**125.1**	**125.6**	**123.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		61	62	63	64		
G	Wet Weight / Container	grams	146.2	148.6	158.8	145.9		
H	Dry Weight / Container	grams	138.5	139.5	146.5	133.8		
I	Moisture Loss = G - H	grams	7.7	9.1	12.3	12.1		
J	Tare Weight of Container	grams	37.3	37.6	37.3	37.3		
K	Dry Soil = H - J	grams	101.2	101.9	109.2	96.5		
L	%Moisture = (I / K) x 100	%	**7.6%**	**8.9%**	**11.3%**	**12.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

126.4 lbs./cu.ft.

Optimum Moisture

10.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1195**

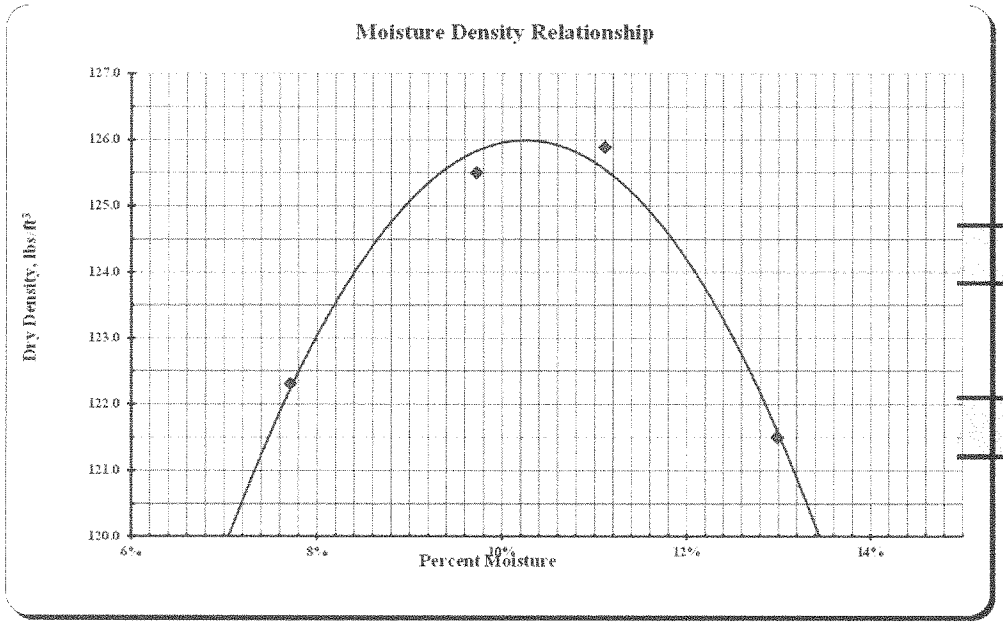
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.77	8.97	9.04	8.96		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.37	4.57	4.64	4.56		
E Wet Density = D / A	lbs./cu.ft.	131.7	137.7	139.9	137.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**122.3**	**125.5**	**125.9**	**121.5**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		29	30	31	32		
G Wet Weight / Container	grams	154.5	152.2	159.0	156.1		
H Dry Weight / Container	grams	146.1	142.0	146.8	142.4		
I Moisture Loss = G - H	grams	8.4	10.2	12.2	13.7		
J Tare Weight of Container	grams	37.2	37.1	37.0	36.9		
K Dry Soil = H - J	grams	108.9	104.9	109.8	105.5		
L %Moisture = (I / K) x 100	%	**7.7%**	**9.7%**	**11.1%**	**13.0%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

126.0 lbs./cu.ft.

Optimum Moisture

10.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1196**

Density

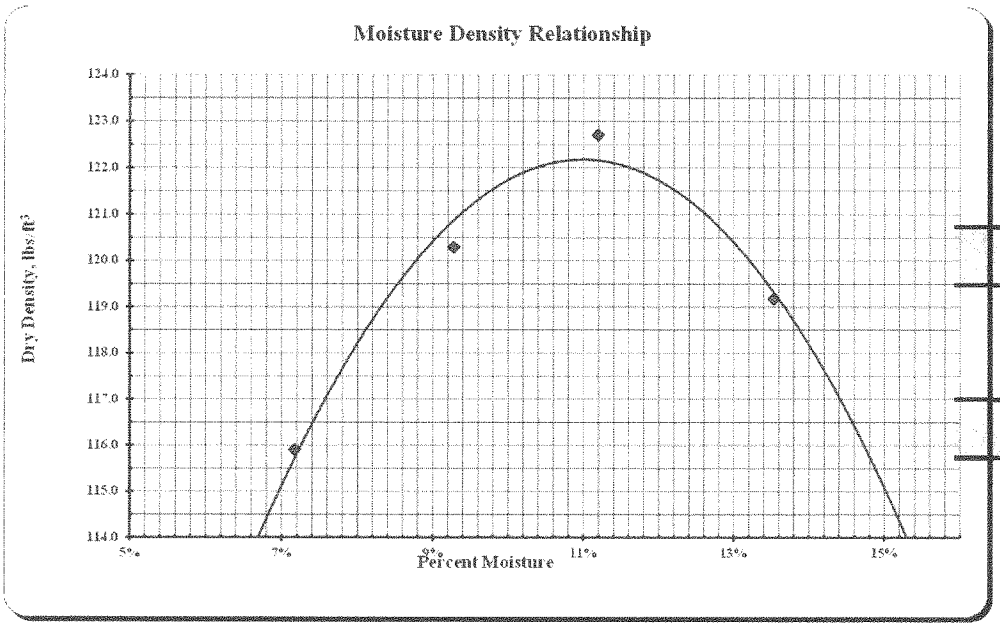
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.53	8.77	8.93	8.89		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.12	4.36	4.53	4.49		
E	Wet Density = D / A	lbs./cu.ft.	124.2	131.4	136.4	135.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**115.9**	**120.3**	**122.7**	**119.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		65	66	67	68		
G	Wet Weight / Container	grams	143.9	152.0	157.4	148.6		
H	Dry Weight / Container	grams	136.8	142.3	145.3	135.3		
I	Moisture Loss = G - H	grams	7.1	9.7	12.1	13.3		
J	Tare Weight of Container	grams	37.8	37.7	37.2	37.0		
K	Dry Soil = H - J	grams	99.0	104.6	108.1	98.3		
L	%Moisture = (I / K) x 100	%	**7.2%**	**9.3%**	**11.2%**	**13.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

122.2 lbs./cu.ft.

Optimum Moisture

11.0%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1197**

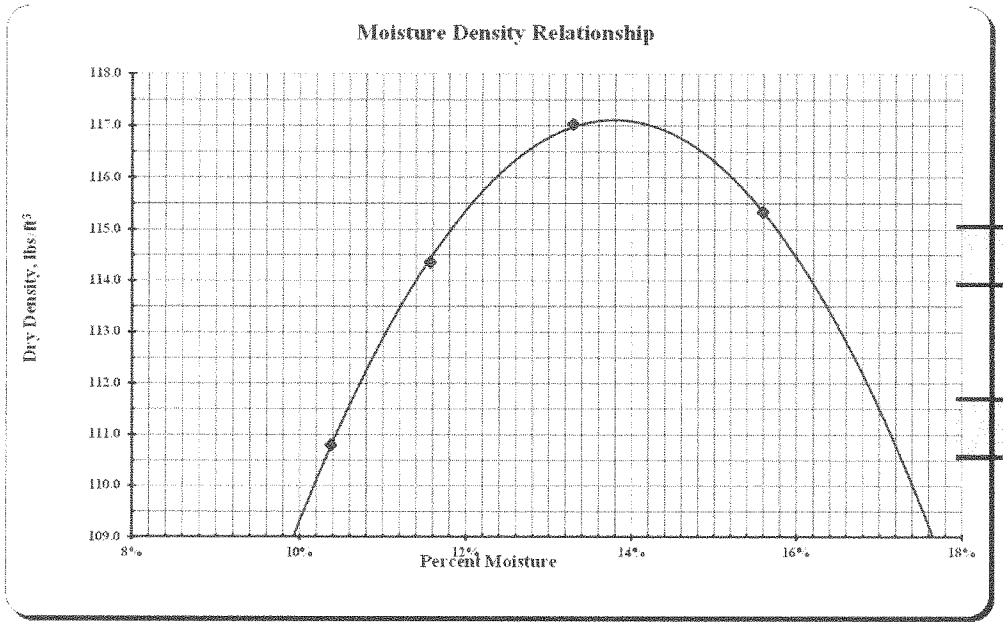
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.46	8.64	8.80	8.83		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.06	4.24	4.40	4.43		
E Wet Density = D / A	lbs./cu.ft.	122.3	127.6	132.6	133.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**110.8**	**114.4**	**117.0**	**115.3**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		33	34	35	36		
G Wet Weight / Container	grams	149.9	159.5	153.4	153.6		
H Dry Weight / Container	grams	139.3	146.9	139.8	137.9		
I Moisture Loss = G - H	grams	10.6	12.6	13.6	15.7		
J Tare Weight of Container	grams	37.1	38.0	37.5	37.2		
K Dry Soil = H - J	grams	102.2	108.9	102.3	100.7		
L %Moisture = (I / K) x 100	%	**10.4%**	**11.6%**	**13.3%**	**15.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

117.1 lbs./cu.ft.

Optimum Moisture

13.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1198**

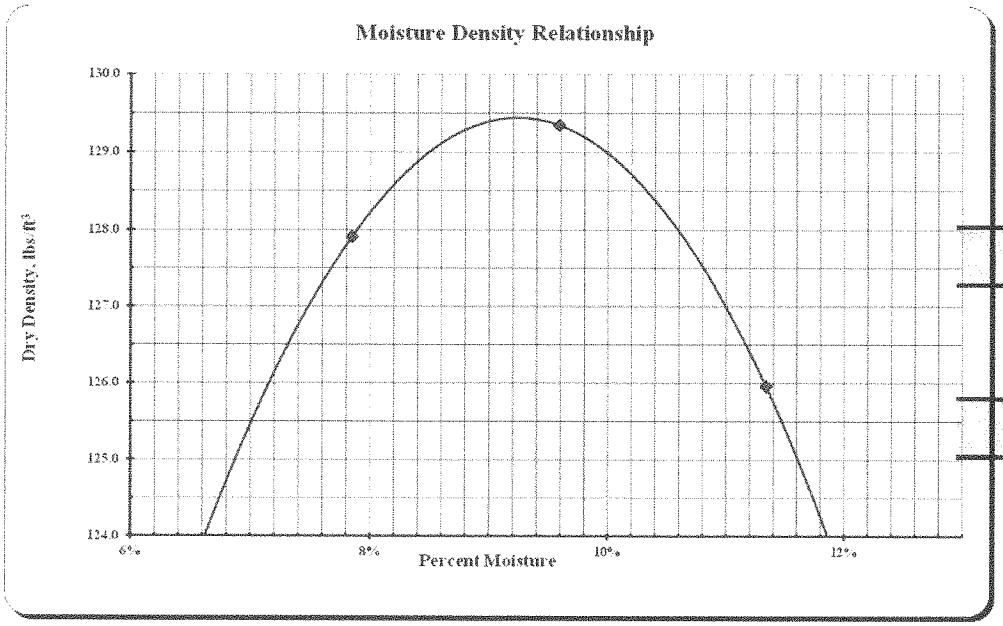
Density		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.98	9.11	9.06			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.58	4.71	4.66			
E Wet Density = D / A	lbs./cu.ft.	138.0	141.7	140.2			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**127.9**	**129.3**	**126.0**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		37	38	39			
G Wet Weight / Container	grams	152.7	153.5	157.3			
H Dry Weight / Container	grams	144.3	143.3	145.1			
I Moisture Loss = G - H	grams	8.4	10.2	12.2			
J Tare Weight of Container	grams	37.3	36.9	37.5			
K Dry Soil = H - J	grams	107.0	106.4	107.6			
L %Moisture = (I / K) x 100	%	**7.9%**	**9.6%**	**11.3%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

129.4 lbs./cu.ft.

Optimum Moisture

9.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1199**

Density

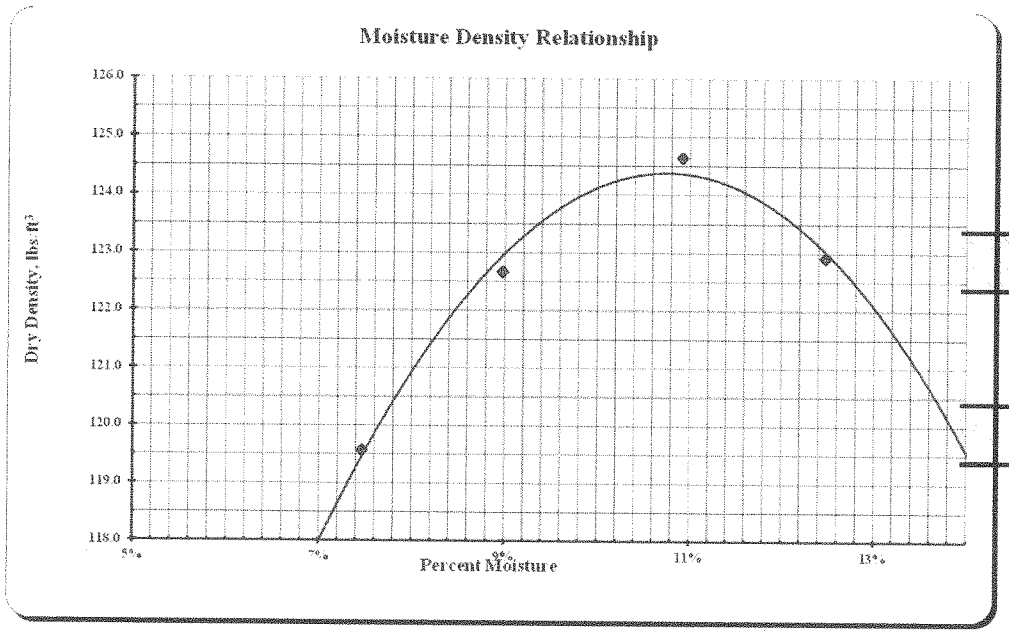
		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.67	8.84	8.99	8.99		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.27	4.44	4.59	4.59		
E Wet Density = D / A	lbs./cu.ft.	128.5	133.7	138.3	138.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.6**	**122.7**	**124.6**	**122.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	69	70	71	72		
G Wet Weight / Container	grams	164.4	150.5	152.0	148.5		
H Dry Weight / Container	grams	155.6	141.2	140.7	136.1		
I Moisture Loss = G - H	grams	8.8	9.3	11.3	12.4		
J Tare Weight of Container	grams	37.7	37.6	37.2	36.7		
K Dry Soil = H - J	grams	117.9	103.6	103.5	99.4		
L %Moisture = (I / K) x 100	%	**7.5%**	**9.0%**	**10.9%**	**12.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

124.4 lbs./cu.ft.

Optimum Moisture

10.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1201**

Density

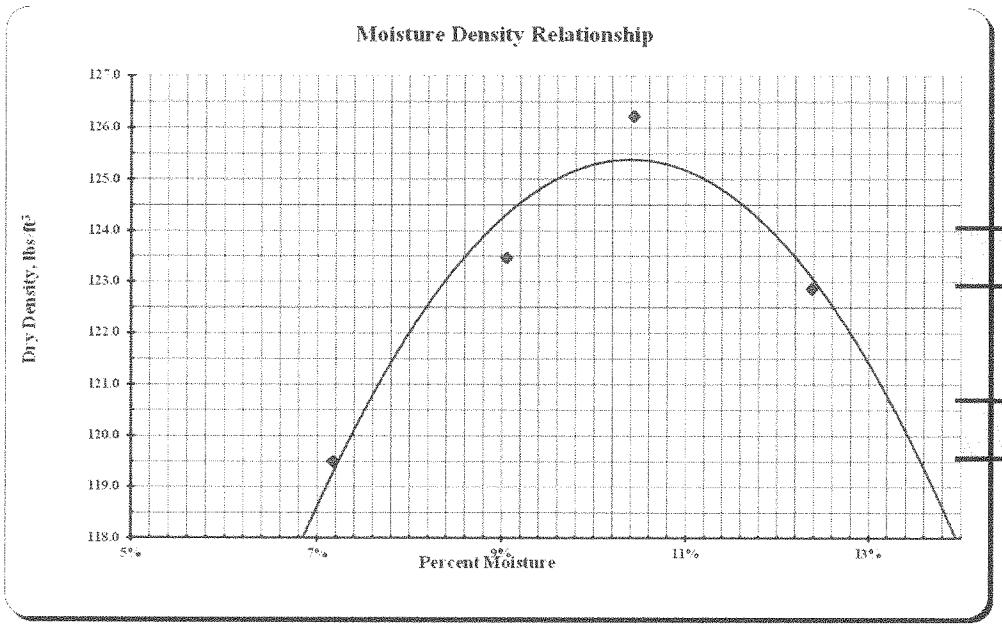
		Test Count	4					
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.65	8.87	9.03	8.99		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.25	4.47	4.63	4.58		
E	Wet Density = D / A	lbs./cu.ft.	128.1	134.6	139.4	138.1		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.5**	**123.5**	**126.2**	**122.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		73	74	75	76		
G	Wet Weight / Container	grams	151.0	159.1	146.3	153.3		
H	Dry Weight / Container	grams	143.4	149.0	136.0	140.6		
I	Moisture Loss = G - H	grams	7.6	10.1	10.3	12.7		
J	Tare Weight of Container	grams	37.4	37.4	37.3	38.0		
K	Dry Soil = H - J	grams	106.0	111.6	98.7	102.6		
L	%Moisture = (I / K) x 100	%	**7.2%**	**9.1%**	**10.4%**	**12.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.4 lbs./cu.ft.

Optimum Moisture

10.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1202**

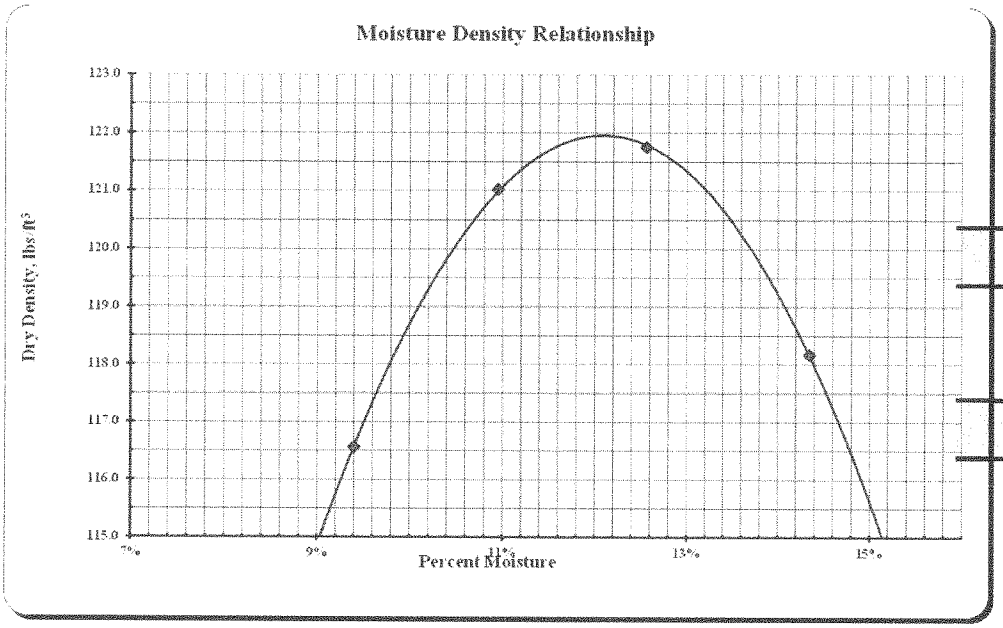
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.63	8.86	8.95	8.89		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.23	4.46	4.55	4.49		
E Wet Density = D / A	lbs./cu.ft.	127.5	134.3	137.0	135.1		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**116.6**	**121.0**	**121.8**	**118.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		44	45	46	47		
G Wet Weight / Container	grams	158.0	151.1	154.5	147.8		
H Dry Weight / Container	grams	147.6	139.9	141.4	133.9		
I Moisture Loss = G - H	grams	10.4	11.2	13.1	13.9		
J Tare Weight of Container	grams	37.0	37.6	37.1	37.0		
K Dry Soil = H - J	grams	110.6	102.3	104.3	96.9		
L %Moisture = (I / K) x 100	%	**9.4%**	**10.9%**	**12.6%**	**14.3%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

122.0 lbs./cu.ft.

Optimum Moisture

12.1%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1203**

Density

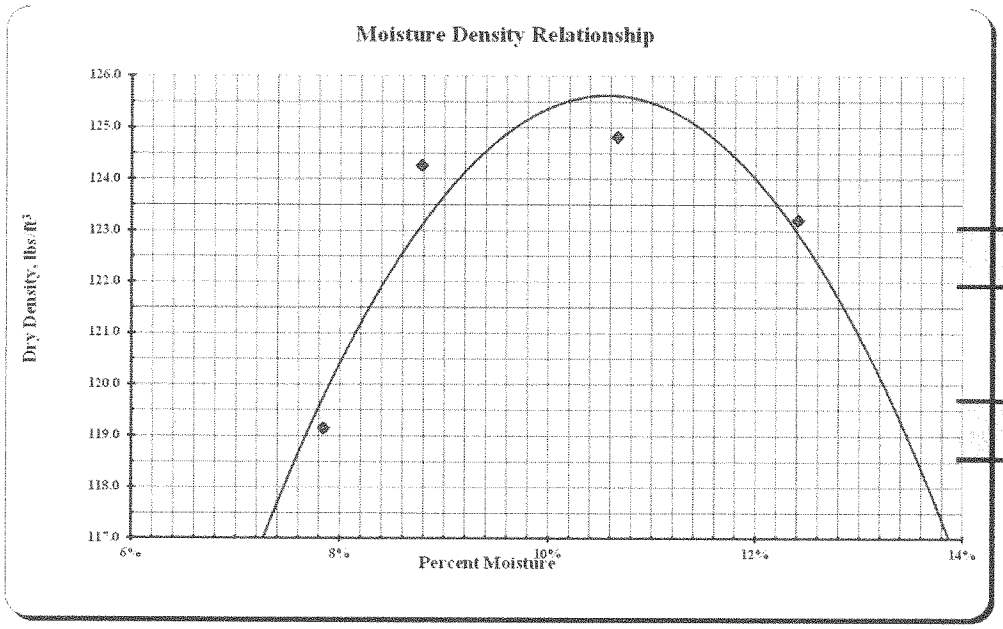
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.67	8.89	8.99	9.00		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.27	4.49	4.59	4.60		
E	Wet Density = D / A	lbs./cu.ft.	128.5	135.2	138.1	138.5		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.1**	**124.3**	**124.8**	**123.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		77	78	79	80		
G	Wet Weight / Container	grams	157.8	153.6	141.9	144.9		
H	Dry Weight / Container	grams	149.0	144.2	131.8	133.0		
I	Moisture Loss = G - H	grams	8.8	9.4	10.1	11.9		
J	Tare Weight of Container	grams	36.8	37.2	37.1	37.1		
K	Dry Soil = H - J	grams	112.2	107.0	94.7	95.9		
L	%Moisture = (I / K) x 100	%	**7.8%**	**8.8%**	**10.7%**	**12.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

125.6 lbs./cu.ft.

Optimum Moisture

10.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1204**

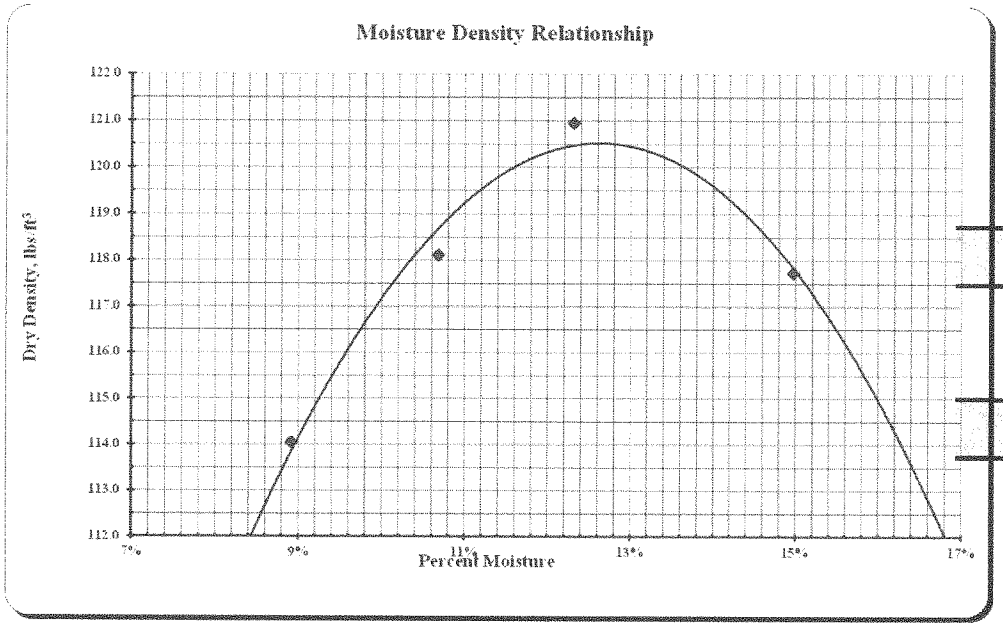
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.52	8.74	8.91	8.89		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.12	4.34	4.51	4.49		
E Wet Density = D / A	lbs./cu.ft.	124.2	130.7	135.8	135.4		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**114.0**	**118.1**	**121.0**	**117.7**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		48	49	50	51		
G Wet Weight / Container	grams	156.8	156.5	154.7	159.3		
H Dry Weight / Container	grams	147.0	145.0	141.8	143.4		
I Moisture Loss = G - H	grams	9.8	11.5	12.9	15.9		
J Tare Weight of Container	grams	37.1	37.3	37.0	37.2		
K Dry Soil = H - J	grams	109.9	107.7	104.8	106.2		
L %Moisture = (I / K) x 100	%	**8.9%**	**10.7%**	**12.3%**	**15.0%**		

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

120.5 lbs./cu.ft.

Optimum Moisture

12.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1205**

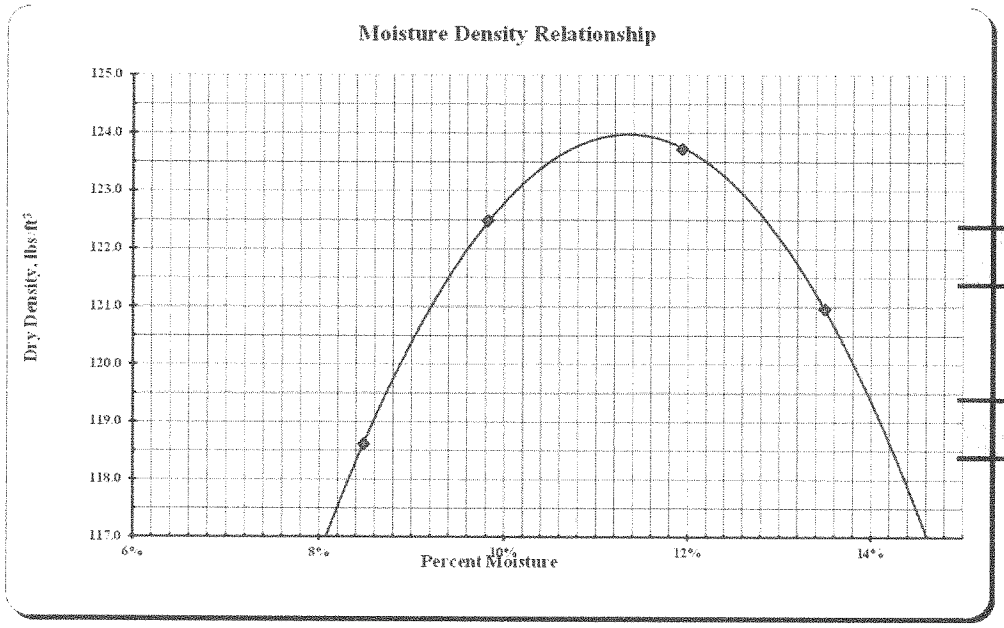
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.67	8.87	9.00	8.96		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.27	4.47	4.60	4.56		
E Wet Density = D / A	lbs./cu.ft.	128.7	134.5	138.5	137.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**118.6**	**122.5**	**123.7**	**121.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		57	58	59	60		
G Wet Weight / Container	grams	158.8	159.8	150.7	140.0		
H Dry Weight / Container	grams	149.3	148.8	138.6	127.8		
I Moisture Loss = G - H	grams	9.5	11.0	12.1	12.2		
J Tare Weight of Container	grams	37.3	36.8	37.2	37.4		
K Dry Soil = H - J	grams	112.0	112.0	101.4	90.4		
L %Moisture = (I / K) x 100	%	**8.5%**	**9.8%**	**11.9%**	**13.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ml



Max Dry Density

124.0 lbs./cu.ft.

Optimum Moisture

11.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1206**

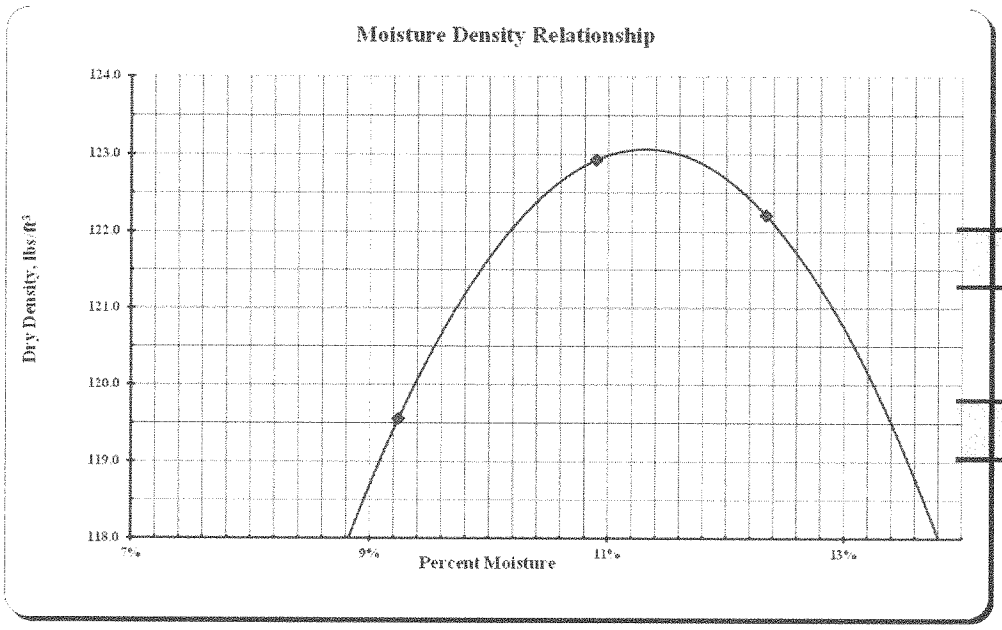
Density		Test Count	3				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.74	8.93	8.96			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.34	4.53	4.56			
E Wet Density = D / A	lbs./cu.ft.	130.6	136.3	137.3			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.6**	**122.9**	**122.2**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		52	53	54			
G Wet Weight / Container	grams	149.6	159.2	156.3			
H Dry Weight / Container	grams	140.1	147.2	143.2			
I Moisture Loss = G - H	grams	9.5	12.0	13.1			
J Tare Weight of Container	grams	37.3	37.1	37.0			
K Dry Soil = H - J	grams	102.8	110.1	106.2			
L %Moisture = (I / K) x 100	%	**9.2%**	**10.9%**	**12.3%**			

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

123.1 lbs./cu.ft.

Optimum Moisture

11.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1207**

Density

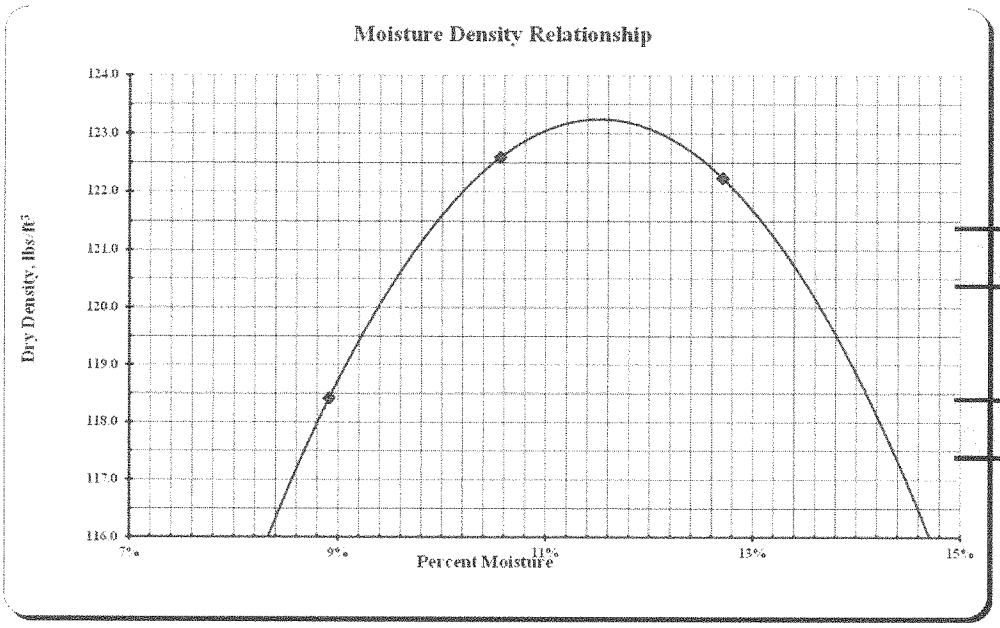
		Test Count	3				
	Determination No.	1	2	3	4	5	6
A	Volume of Mold cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.68	8.90	8.98			
C	Weight of Mold lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C lbs.	4.28	4.50	4.57			
E	Wet Density = D / A lbs./cu.ft.	129.0	135.5	137.8			
F	Dry Density = (E x 100) / (100 + L) lbs./cu.ft.	**118.4**	**122.6**	**122.2**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.	55	56	81			
G	Wet Weight / Container grams	149.0	153.5	160.2			
H	Dry Weight / Container grams	139.8	142.4	146.4			
I	Moisture Loss = G - H grams	9.2	11.1	13.8			
J	Tare Weight of Container grams	36.6	37.3	37.8			
K	Dry Soil = H - J grams	103.2	105.1	108.6			
L	%Moisture = (I / K) x 100 %	**8.9%**	**10.6%**	**12.7%**			

ASTM D4643 AASHTO T217 or T265 Tested by: BU



Max Dry Density

123.2 lbs./cu.ft.

Optimum Moisture

11.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/27/2015**		**1208**

Density

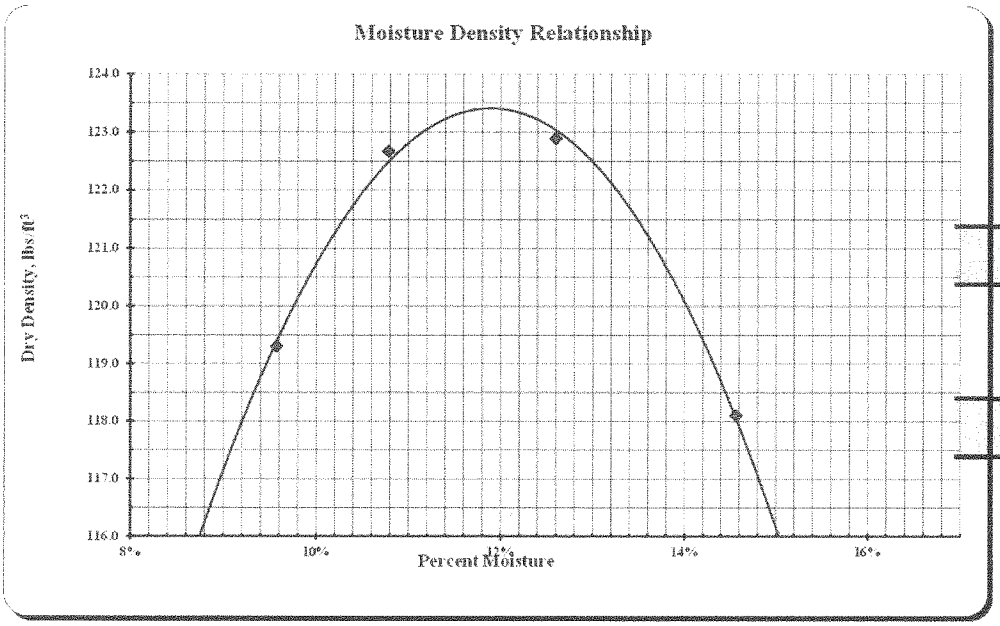
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.74	8.91	8.99	8.89		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.34	4.51	4.59	4.49		
E	Wet Density = D / A	lbs./cu.ft.	130.7	135.9	138.4	135.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**119.3**	**122.7**	**122.9**	**118.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		1	2	3	4		
G	Wet Weight / Container	grams	152.2	149.3	155.1	160.2		
H	Dry Weight / Container	grams	142.1	138.4	141.9	144.5		
I	Moisture Loss = G - H	grams	10.1	10.9	13.2	15.7		
J	Tare Weight of Container	grams	36.6	37.3	37.1	36.7		
K	Dry Soil = H - J	grams	105.5	101.1	104.8	107.8		
L	%Moisture = (I / K) x 100	%	**9.6%**	**10.8%**	**12.6%**	**14.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

123.4 lbs./cu.ft.

Optimum Moisture

11.9%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1210**

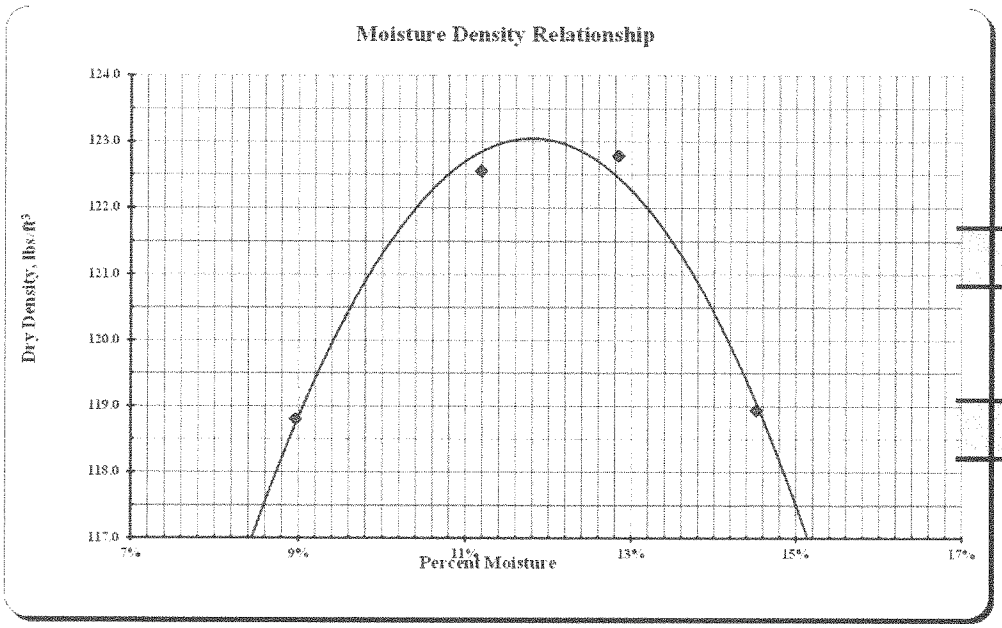
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.70	8.92	9.00	8.92		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.30	4.52	4.60	4.52		
E Wet Density = D / A	lbs./cu.ft.	129.5	136.3	138.6	136.2		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**118.8**	**122.6**	**122.8**	**118.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		61	62	63	64		
G Wet Weight / Container	grams	155.2	155.9	157.7	158.0		
H Dry Weight / Container	grams	145.5	144.0	144.0	142.7		
I Moisture Loss = G - H	grams	9.7	11.9	13.7	15.3		
J Tare Weight of Container	grams	37.3	37.6	37.3	37.3		
K Dry Soil = H - J	grams	108.2	106.4	106.7	105.4		
L %Moisture = (I / K) x 100	%	**9.0%**	**11.2%**	**12.8%**	**14.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

123.0 lbs./cu.ft.

Optimum Moisture

11.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/27/2015**		**1212**

Density

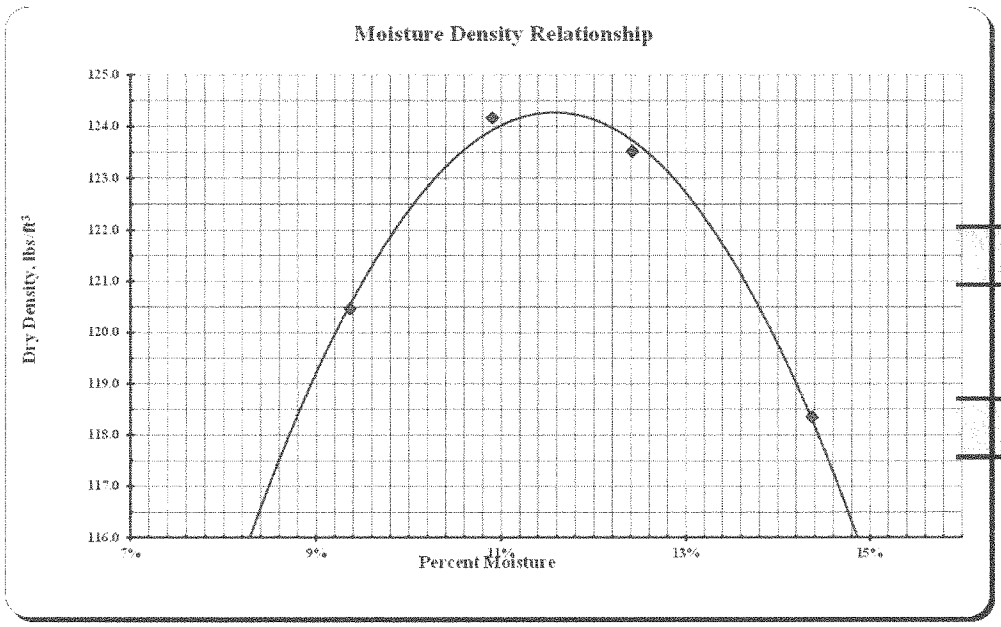
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.77	8.97	9.01	8.89		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.37	4.57	4.61	4.49		
E	Wet Density = D / A	lbs./cu.ft.	131.7	137.7	138.9	135.4		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.5**	**124.2**	**123.5**	**118.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		5	6	7	8		
G	Wet Weight / Container	grams	149.2	157.1	154.0	150.8		
H	Dry Weight / Container	grams	139.6	145.3	141.0	136.5		
I	Moisture Loss = G - H	grams	9.6	11.8	13.0	14.3		
J	Tare Weight of Container	grams	37.1	37.1	36.3	37.0		
K	Dry Soil = H - J	grams	102.5	108.2	104.7	99.5		
L	%Moisture = (I / K) x 100	%	**9.4%**	**10.9%**	**12.4%**	**14.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

124.3 lbs./cu.ft.

Optimum Moisture

11.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/21/2015**		**1214**

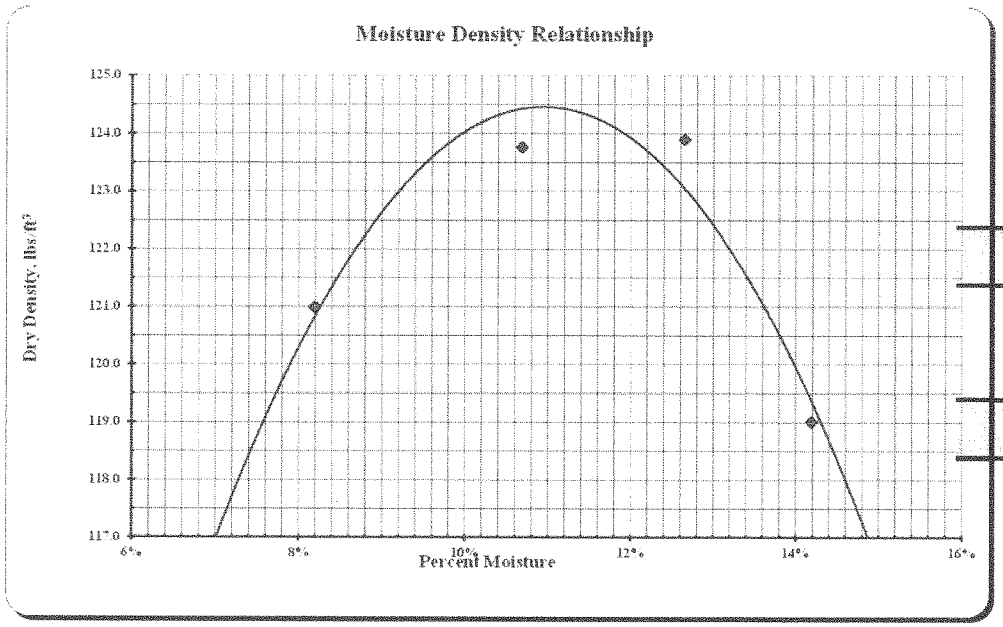
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.74	8.95	9.03	8.91		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.35	4.55	4.63	4.51		
E Wet Density = D / A	lbs./cu.ft.	130.9	137.0	139.6	135.9		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**121.0**	**123.8**	**123.9**	**119.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		65	66	67	68		
G Wet Weight / Container	grams	159.3	158.9	158.3	157.7		
H Dry Weight / Container	grams	150.1	147.2	144.7	142.7		
I Moisture Loss = G - H	grams	9.2	11.7	13.6	15.0		
J Tare Weight of Container	grams	37.8	37.7	37.2	37.0		
K Dry Soil = H - J	grams	112.3	109.5	107.5	105.7		
L %Moisture = (I / K) x 100	%	**8.2%**	**10.7%**	**12.7%**	**14.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

124.5 lbs./cu.ft.

Optimum Moisture

10.9%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/27/2015**		**1216**

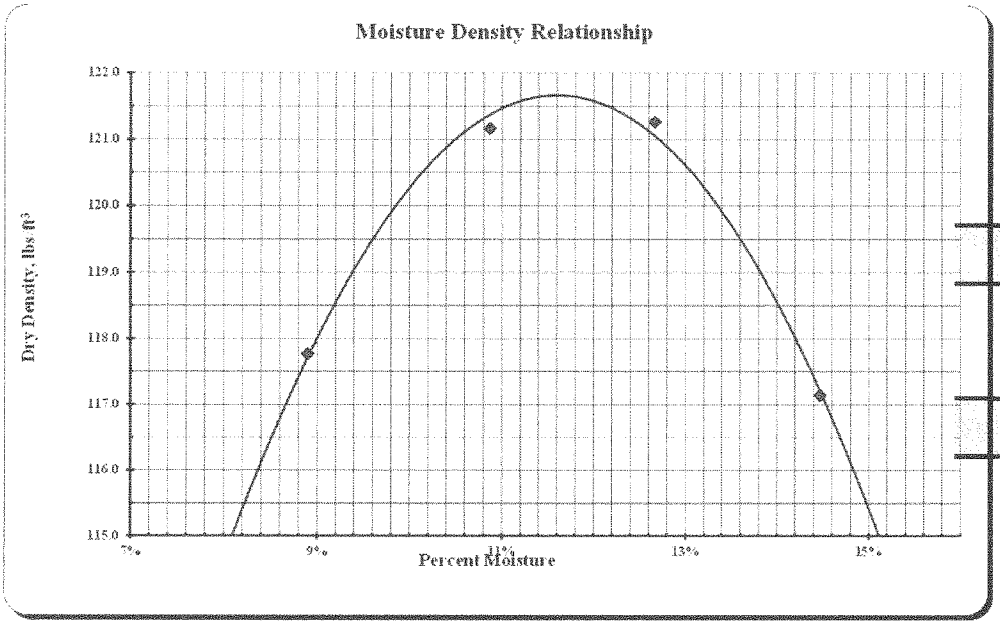
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.66	8.86	8.94	8.85		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.26	4.46	4.54	4.45		
E Wet Density = D / A	lbs./cu.ft.	128.3	134.3	136.6	134.1		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**117.8**	**121.2**	**121.3**	**117.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		9	10	11	12		
G Wet Weight / Container	grams	160.8	158.1	157.3	152.4		
H Dry Weight / Container	grams	150.7	146.2	143.8	137.8		
I Moisture Loss = G - H	grams	10.1	11.9	13.5	14.6		
J Tare Weight of Container	grams	37.2	36.7	37.2	36.9		
K Dry Soil = H - J	grams	113.5	109.5	106.6	100.9		
L %Moisture = (I / K) x 100	%	**8.9%**	**10.9%**	**12.7%**	**14.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

121.7 lbs./cu.ft.

Optimum Moisture

11.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/21/2015**		**1218**

Density

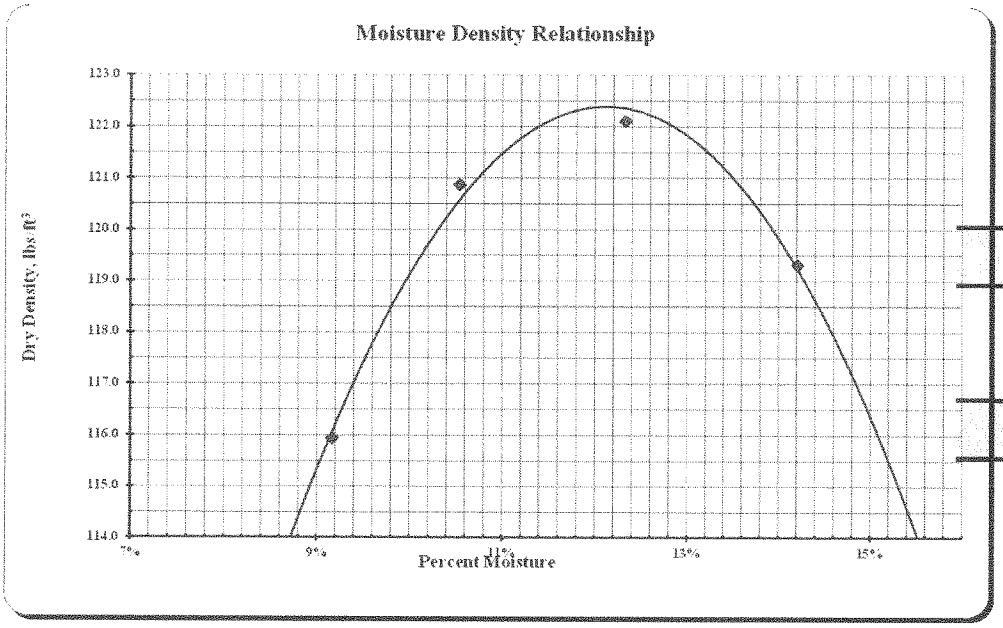
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.60	8.83	8.95	8.92		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.20	4.44	4.55	4.52		
E	Wet Density = D / A	lbs./cu.ft.	126.6	133.6	137.2	136.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**115.9**	**120.9**	**122.1**	**119.3**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		69	70	71	72		
G	Wet Weight / Container	grams	154.4	158.2	162.0	160.5		
H	Dry Weight / Container	grams	144.6	146.7	148.3	145.1		
I	Moisture Loss = G - H	grams	9.8	11.5	13.7	15.4		
J	Tare Weight of Container	grams	37.7	37.6	37.2	36.7		
K	Dry Soil = H - J	grams	106.9	109.1	111.1	108.4		
L	%Moisture = (I / K) x 100	%	**9.2%**	**10.5%**	**12.3%**	**14.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

122.4 lbs./cu.ft.

Optimum Moisture

12.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

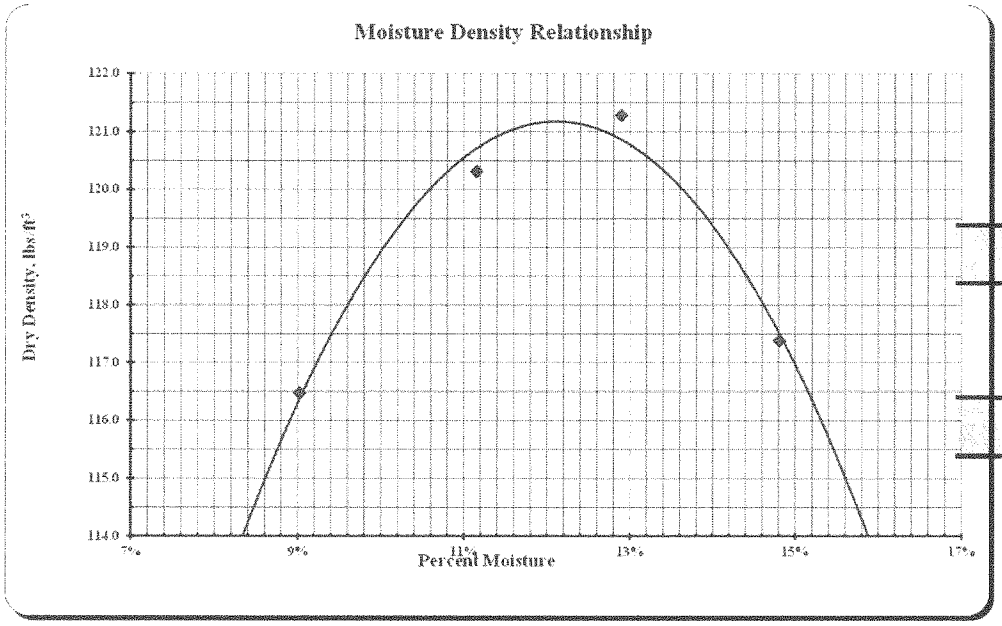
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/27/2015**		**1220**

Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.61	8.84	8.94	8.87		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.22	4.44	4.55	4.47		
E Wet Density = D / A	lbs./cu.ft.	127.0	133.7	136.9	134.8		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**116.5**	**120.3**	**121.3**	**117.4**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		73	74	75	76		
G Wet Weight / Container	grams	153.4	159.0	151.1	158.2		
H Dry Weight / Container	grams	143.8	146.8	138.1	142.7		
I Moisture Loss = G - H	grams	9.6	12.2	13.0	15.5		
J Tare Weight of Container	grams	37.4	37.4	37.3	38.0		
K Dry Soil = H - J	grams	106.4	109.4	100.8	104.7		
L %Moisture = (I / K) x 100	%	**9.0%**	**11.2%**	**12.9%**	**14.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

121.2 lbs./cu.ft.

Optimum Moisture

12.1%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/27/2015**		**1222**

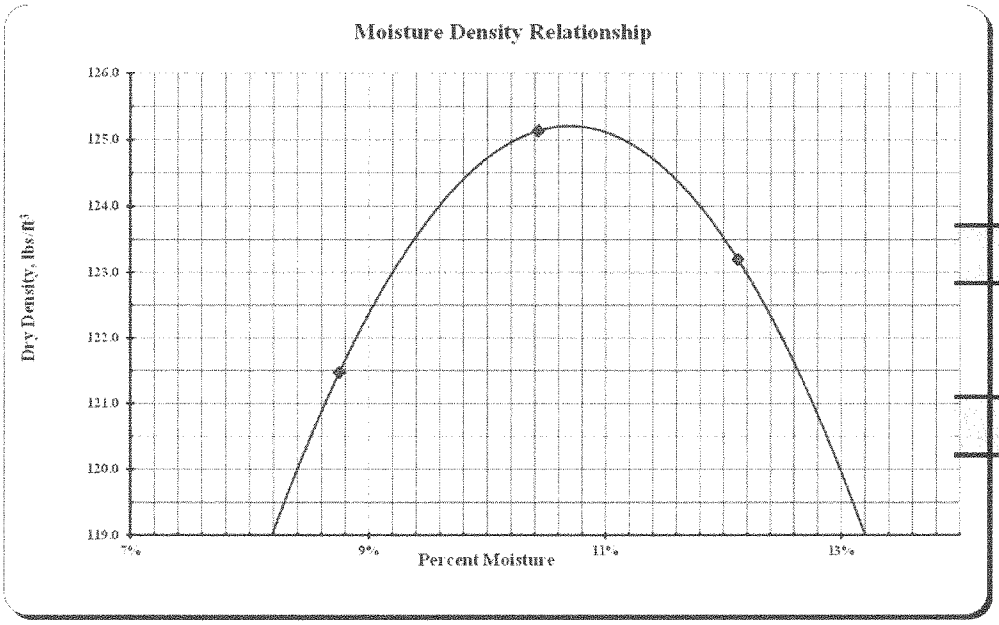
Density		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.79	8.99	8.99			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.39	4.59	4.59			
E Wet Density = D / A	lbs./cu.ft.	132.1	138.2	138.1			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**121.5**	**125.1**	**123.2**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		13	14	15			
G Wet Weight / Container	grams	156.4	148.0	148.3			
H Dry Weight / Container	grams	146.8	137.6	136.3			
I Moisture Loss = G - H	grams	9.6	10.4	12.0			
J Tare Weight of Container	grams	37.1	37.9	37.3			
K Dry Soil = H - J	grams	109.7	99.7	99.0			
L %Moisture = (I / K) x 100	%	**8.8%**	**10.4%**	**12.1%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

125.2 lbs./cu.ft.

Optimum Moisture

10.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/27/2015**		**1224**

Density

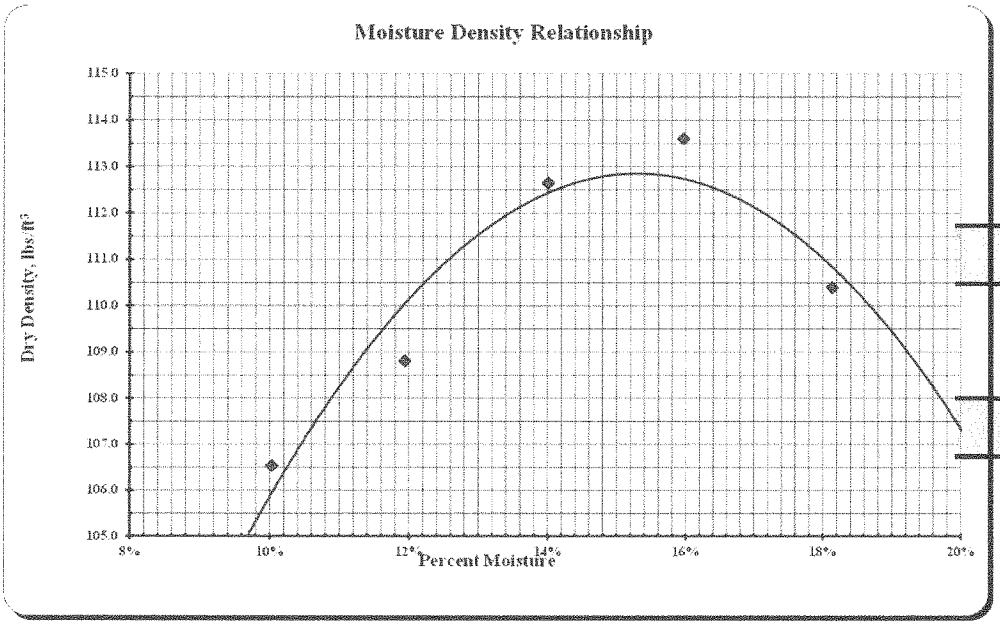
			Test Count	5				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.29	8.44	8.66	8.77	8.73	
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	3.89	4.04	4.26	4.37	4.33	
E	Wet Density = D / A	lbs./cu.ft.	117.2	121.8	128.4	131.7	130.4	
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**106.5**	**108.8**	**112.7**	**113.6**	**110.4**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		16	17	18	19	20	
G	Wet Weight / Container	grams	149.1	159.6	148.6	148.2	157.0	
H	Dry Weight / Container	grams	138.9	146.5	134.9	132.9	138.5	
I	Moisture Loss = G - H	grams	10.2	13.1	13.7	15.3	18.5	
J	Tare Weight of Container	grams	37.2	36.8	37.1	37.1	36.5	
K	Dry Soil = H - J	grams	101.7	109.7	97.8	95.8	102.0	
L	%Moisture = (I / K) x 100	%	**10.0%**	**11.9%**	**14.0%**	**16.0%**	**18.1%**	

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

112.9 lbs./cu.ft.

Optimum Moisture

15.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/27/2015**		**1226**

Density

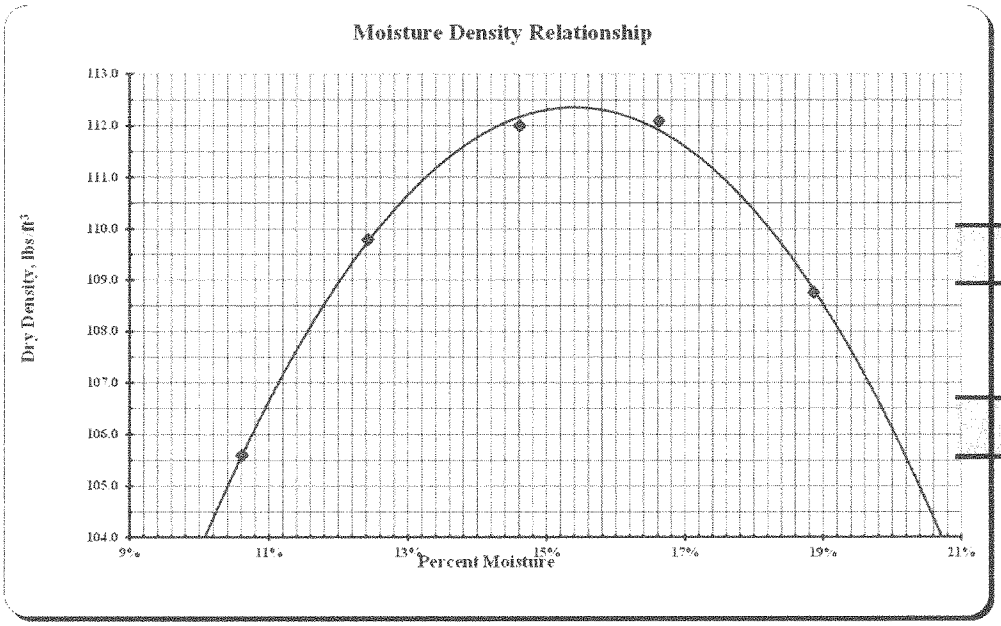
			Test Count	5				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.28	8.50	8.66	8.74	8.69	
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	3.88	4.10	4.26	4.34	4.29	
E	Wet Density = D / A	lbs./cu.ft.	116.8	123.4	128.4	130.7	129.3	
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**105.6**	**109.8**	**112.0**	**112.1**	**108.8**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		77	78	79	80	81	
G	Wet Weight / Container	grams	150.4	152.1	151.6	162.0	155.0	
H	Dry Weight / Container	grams	139.5	139.4	137.0	144.2	136.4	
I	Moisture Loss = G - H	grams	10.9	12.7	14.6	17.8	18.6	
J	Tare Weight of Container	grams	36.8	37.2	37.1	37.1	37.8	
K	Dry Soil = H - J	grams	102.7	102.2	99.9	107.1	98.6	
L	%Moisture = (I / K) x 100	%	**10.6%**	**12.4%**	**14.6%**	**16.6%**	**18.9%**	

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

112.4 lbs./cu.ft.

Optimum Moisture

15.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/29/2015**		**1228**

Density

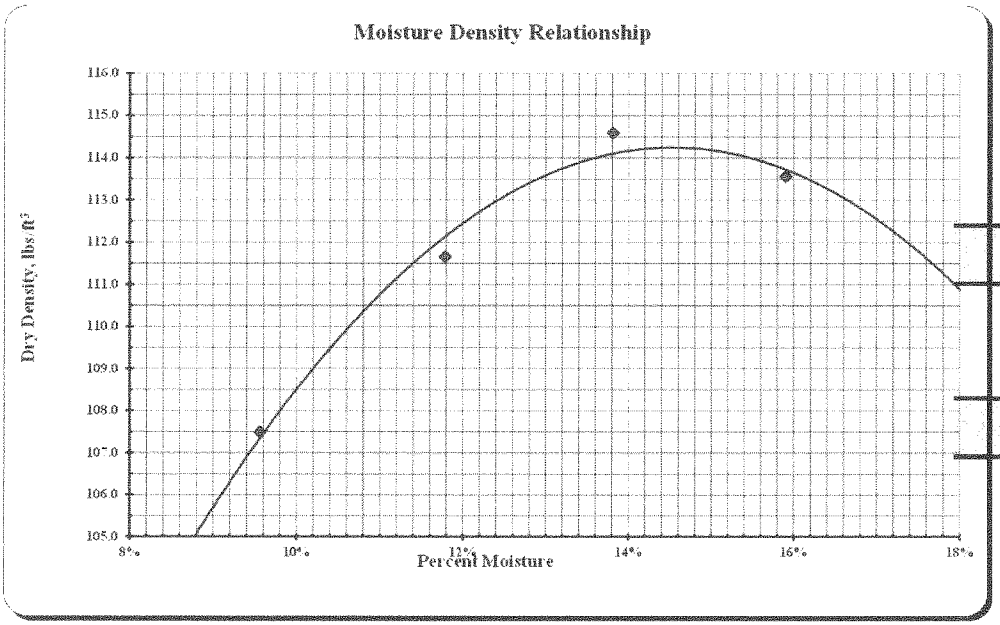
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.31	8.54	8.73	8.77		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	3.91	4.14	4.33	4.37		
E	Wet Density = D / A	lbs./cu.ft.	117.8	124.8	130.4	131.6		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**107.5**	**111.7**	**114.6**	**113.6**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		21	22	23	24		
G	Wet Weight / Container	grams	147.1	153.7	157.7	153.1		
H	Dry Weight / Container	grams	137.5	141.4	143.1	137.2		
I	Moisture Loss = G - H	grams	9.6	12.3	14.6	15.9		
J	Tare Weight of Container	grams	37.1	37.0	37.4	37.2		
K	Dry Soil = H - J	grams	100.4	104.4	105.7	100.0		
L	%Moisture = (I / K) x 100	%	**9.6%**	**11.8%**	**13.8%**	**15.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

114.3 lbs./cu.ft.

Optimum Moisture

14.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

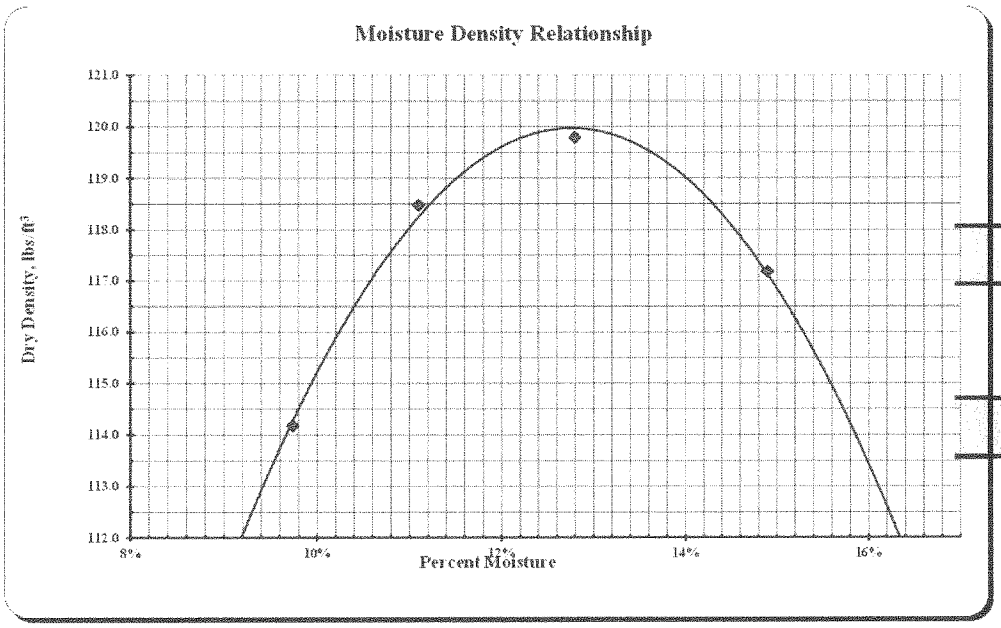
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/29/2015**		**1230**

Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.56	8.77	8.88	8.87		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.16	4.37	4.49	4.47		
E Wet Density = D / A	lbs./cu.ft.	125.3	131.6	135.1	134.6		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**114.2**	**118.5**	**119.8**	**117.2**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		82	83	84	85		
G Wet Weight / Container	grams	146.7	154.3	155.9	158.9		
H Dry Weight / Container	grams	137.0	142.6	142.4	143.2		
I Moisture Loss = G - H	grams	9.7	11.7	13.5	15.7		
J Tare Weight of Container	grams	37.4	37.2	36.9	37.8		
K Dry Soil = H - J	grams	99.6	105.4	105.5	105.4		
L %Moisture = (I / K) x 100	%	**9.7%**	**11.1%**	**12.8%**	**14.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

120.0 lbs./cu.ft.

Optimum Moisture

12.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1232**

Density

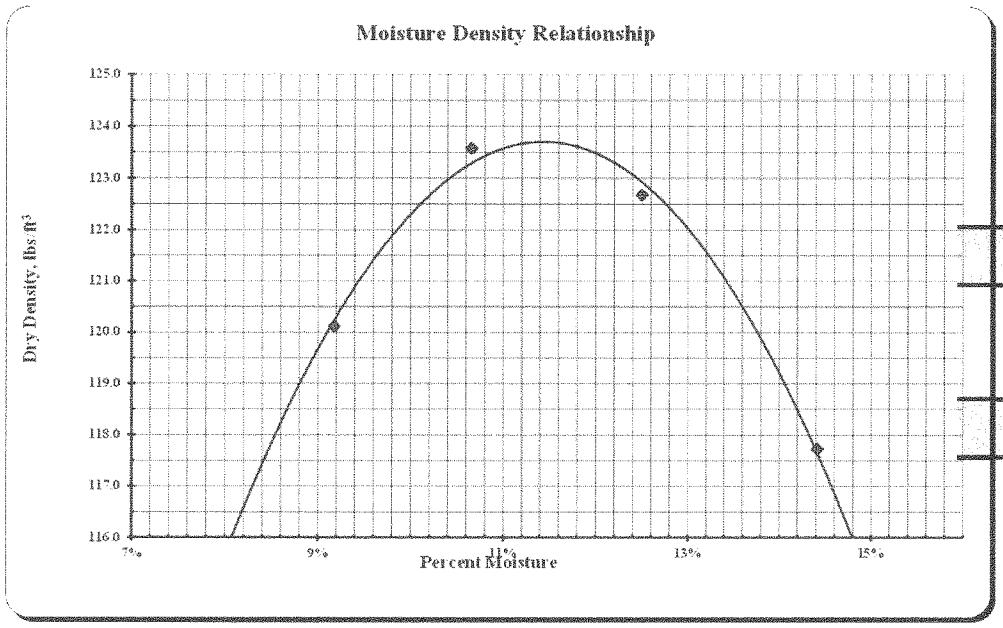
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.75	8.94	8.98	8.87		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.35	4.54	4.58	4.47		
E	Wet Density = D / A	lbs./cu.ft.	131.1	136.7	138.0	134.7		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.1**	**123.6**	**122.7**	**117.7**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		25	26	27	28		
G	Wet Weight / Container	grams	151.4	161.5	160.9	165.0		
H	Dry Weight / Container	grams	141.8	149.5	147.1	148.9		
I	Moisture Loss = G - H	grams	9.6	12.0	13.8	16.1		
J	Tare Weight of Container	grams	37.2	36.9	36.7	37.2		
K	Dry Soil = H - J	grams	104.6	112.6	110.4	111.7		
L	%Moisture = (I / K) x 100	%	**9.2%**	**10.7%**	**12.5%**	**14.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

123.7 lbs./cu.ft.

Optimum Moisture

11.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

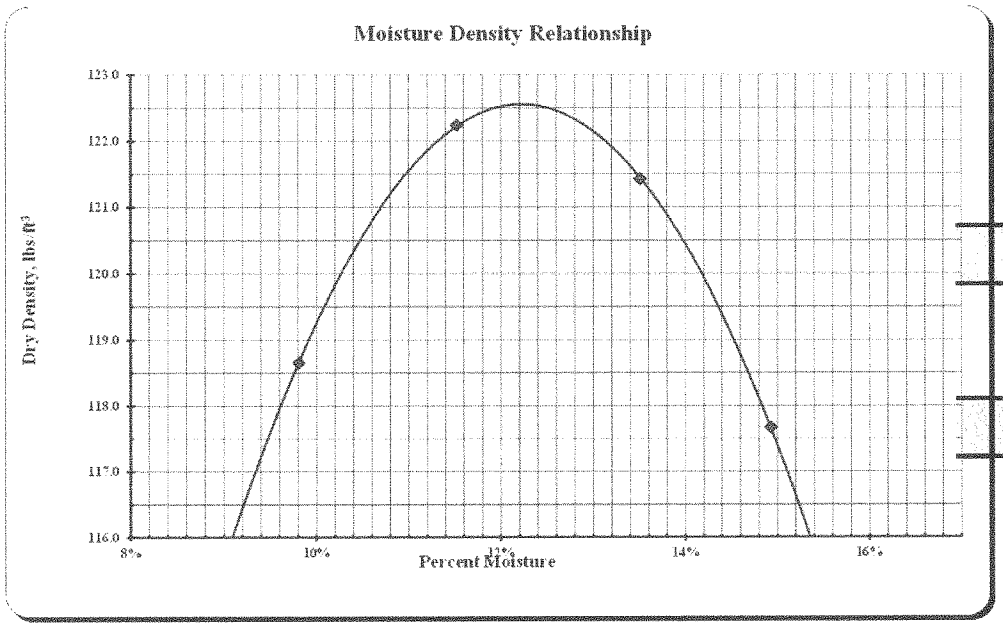
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1234**

Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.72	8.92	8.97	8.89		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.33	4.53	4.58	4.49		
E Wet Density = D / A	lbs./cu.ft.	130.3	136.3	137.8	135.2		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**118.7**	**122.2**	**121.4**	**117.7**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		86	87	88	89		
G Wet Weight / Container	grams	154.0	158.5	152.9	165.4		
H Dry Weight / Container	grams	143.6	146.0	139.2	148.8		
I Moisture Loss = G - H	grams	10.4	12.5	13.7	16.6		
J Tare Weight of Container	grams	37.6	37.5	37.8	37.6		
K Dry Soil = H - J	grams	106.0	108.5	101.4	111.2		
L %Moisture = (I / K) x 100	%	**9.8%**	**11.5%**	**13.5%**	**14.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

122.6 lbs./cu.ft.

Optimum Moisture

12.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

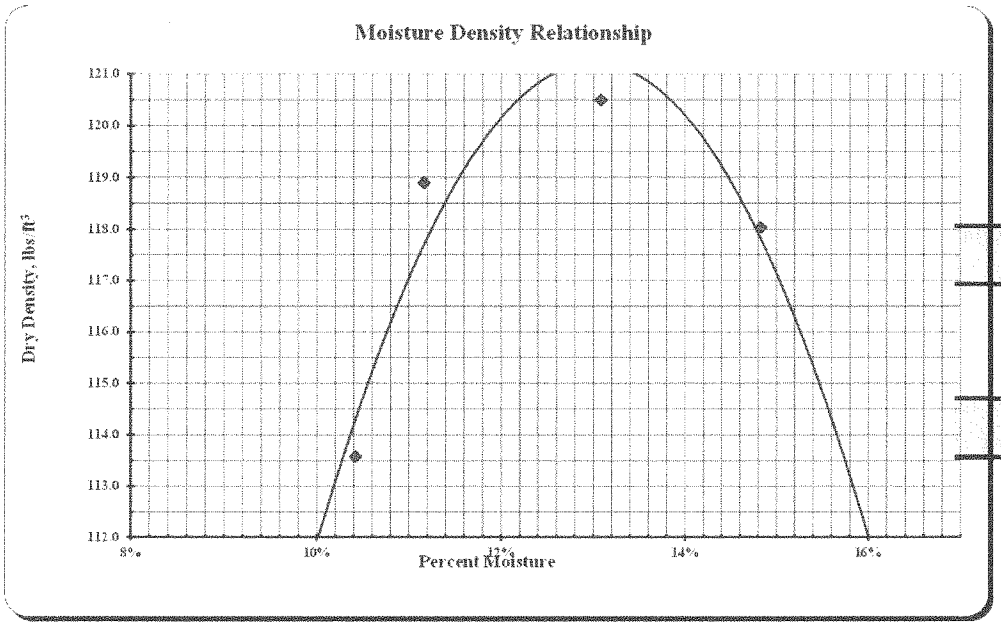
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/29/2015**		**1235**

Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.56	8.79	8.92	8.90		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.16	4.39	4.52	4.50		
E Wet Density = D / A	lbs./cu.ft.	125.4	132.2	136.3	135.5		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.6**	**118.9**	**120.5**	**118.0**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		29	30	31	32		
G Wet Weight / Container	grams	142.1	160.6	152.8	160.8		
H Dry Weight / Container	grams	132.2	148.2	139.4	144.8		
I Moisture Loss = G - H	grams	9.9	12.4	13.4	16.0		
J Tare Weight of Container	grams	37.2	37.1	37.0	36.9		
K Dry Soil = H - J	grams	95.0	111.1	102.4	107.9		
L %Moisture = (I / K) x 100	%	**10.4%**	**11.2%**	**13.1%**	**14.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

121.2 lbs./cu.ft.

Optimum Moisture

13.0%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

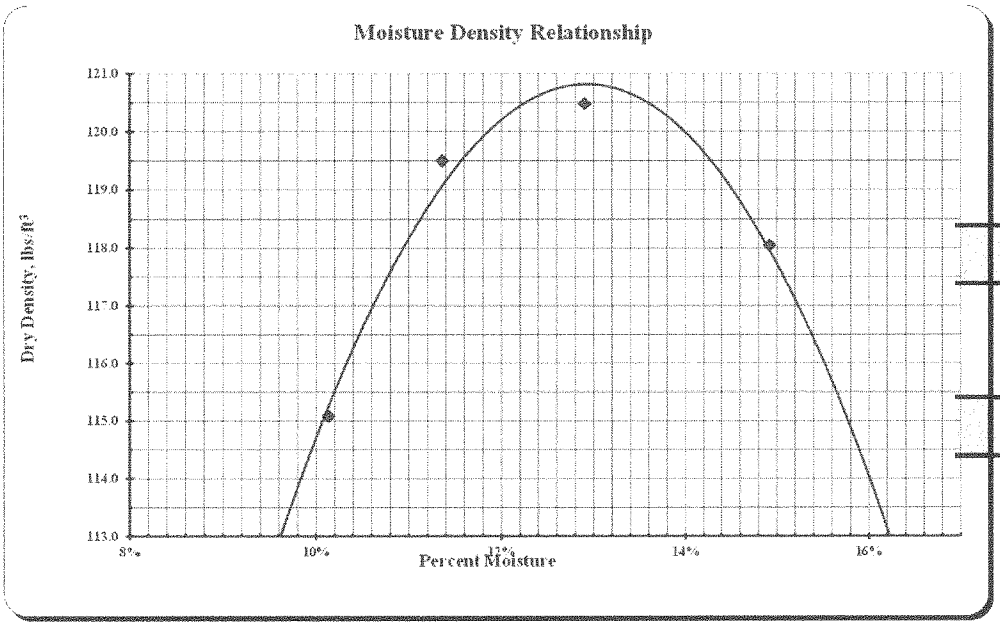
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/29/2015**		**1236**

Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.61	8.82	8.91	8.90		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.21	4.42	4.52	4.50		
E Wet Density = D / A	lbs./cu.ft.	126.7	133.1	136.0	135.7		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**115.1**	**119.5**	**120.5**	**118.0**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		90	91	92	93		
G Wet Weight / Container	grams	150.9	152.3	149.4	159.3		
H Dry Weight / Container	grams	140.5	140.6	136.6	143.5		
I Moisture Loss = G - H	grams	10.4	11.7	12.8	15.8		
J Tare Weight of Container	grams	37.9	37.6	37.4	37.6		
K Dry Soil = H - J	grams	102.6	103.0	99.2	105.9		
L %Moisture = (I / K) x 100	%	**10.1%**	**11.4%**	**12.9%**	**14.9%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

120.8 lbs./cu.ft.

Optimum Moisture

12.9%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1237**

Density

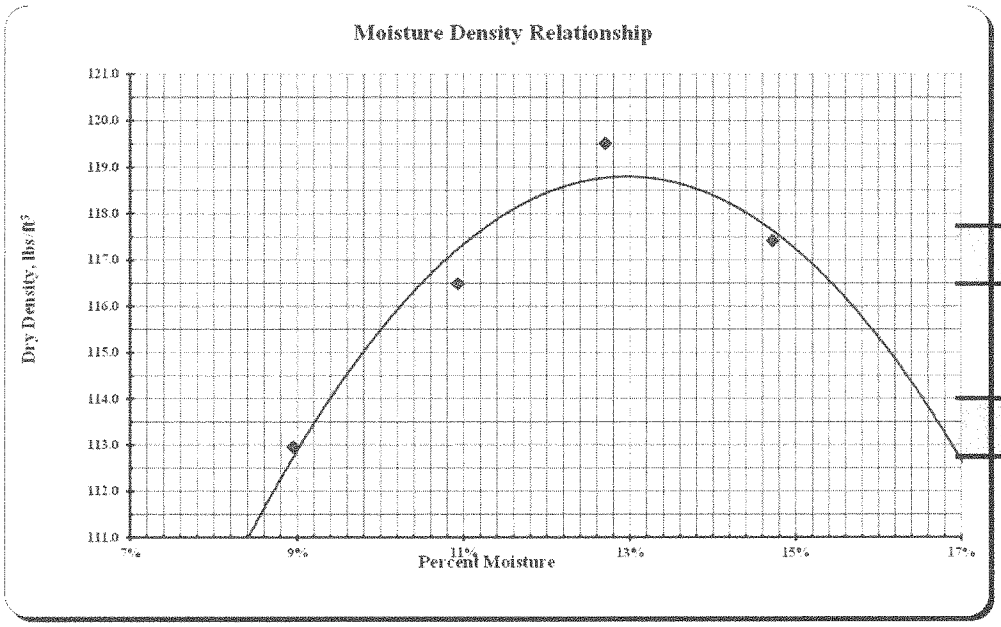
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.49	8.69	8.87	8.87		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.09	4.29	4.47	4.47		
E	Wet Density = D / A	lbs./cu.ft.	123.1	129.2	134.7	134.7		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.0**	**116.5**	**119.5**	**117.4**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		33	34	35	36		
G	Wet Weight / Container	grams	141.8	150.7	155.5	158.0		
H	Dry Weight / Container	grams	133.2	139.6	142.2	142.5		
I	Moisture Loss = G - H	grams	8.6	11.1	13.3	15.5		
J	Tare Weight of Container	grams	37.1	38.0	37.5	37.2		
K	Dry Soil = H - J	grams	96.1	101.6	104.7	105.3		
L	%Moisture = (I / K) x 100	%	**8.9%**	**10.9%**	**12.7%**	**14.7%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

118.8 lbs./cu.ft.

Optimum Moisture

12.9%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1238**

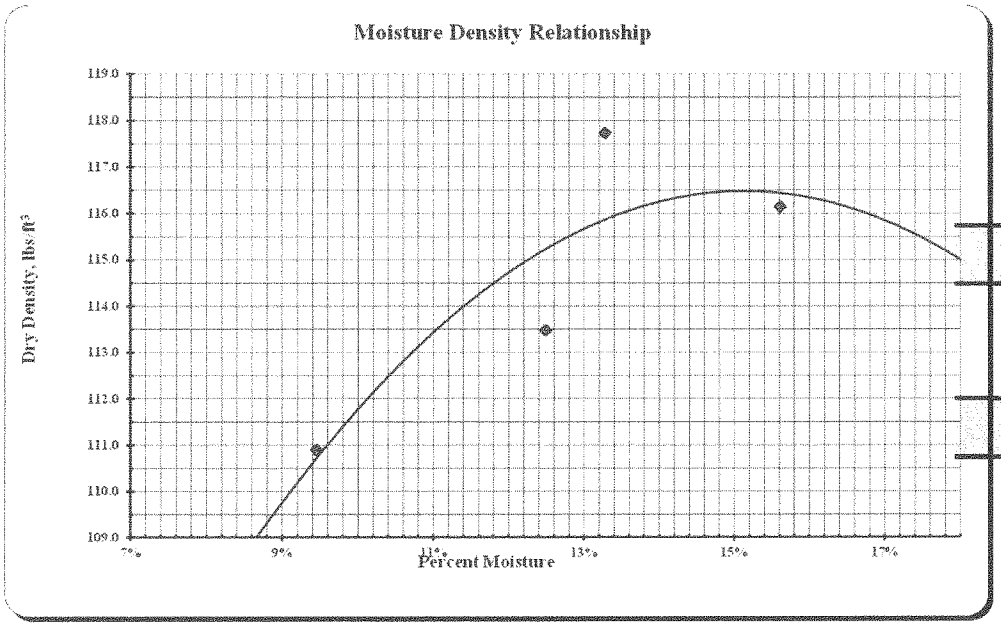
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.43	8.64	8.83	8.86		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.03	4.24	4.43	4.46		
E Wet Density = D / A	lbs./cu.ft.	121.4	127.7	133.4	134.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**110.9**	**113.5**	**117.7**	**116.1**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		94	95	96	97		
G Wet Weight / Container	grams	147.7	153.7	154.9	162.1		
H Dry Weight / Container	grams	138.2	140.8	141.1	145.3		
I Moisture Loss = G - H	grams	9.5	12.9	13.8	16.8		
J Tare Weight of Container	grams	37.7	37.5	37.2	37.7		
K Dry Soil = H - J	grams	100.5	103.3	103.9	107.6		
L %Moisture = (I / K) x 100	%	**9.5%**	**12.5%**	**13.3%**	**15.6%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

116.5 lbs./cu.ft.

Optimum Moisture

15.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

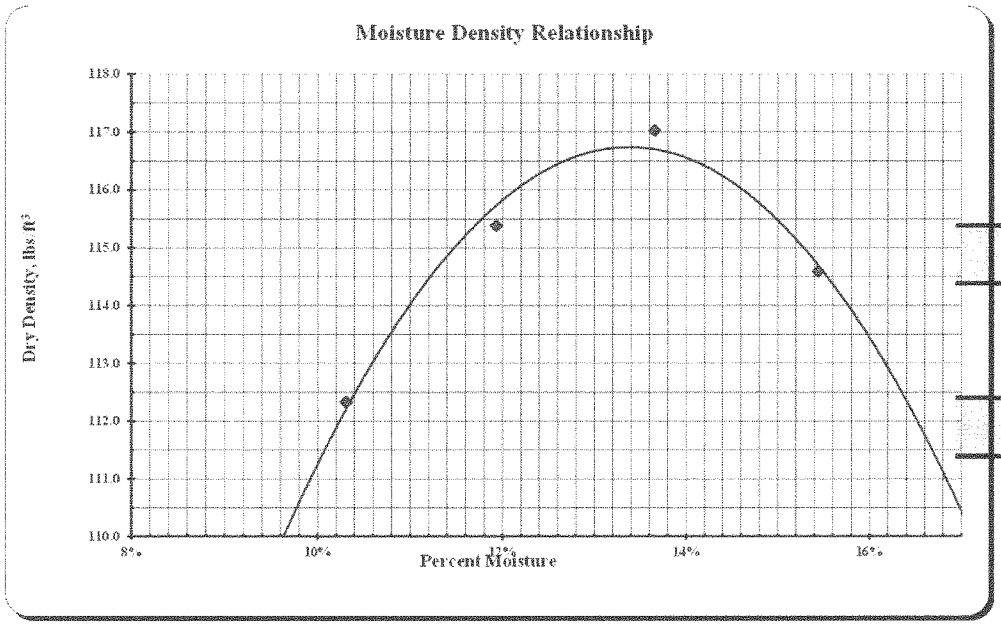
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/29/2015**		**1240**

Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.51	8.69	8.82	8.79		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.11	4.29	4.42	4.39		
E Wet Density = D / A	lbs./cu.ft.	123.9	129.2	133.0	132.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**112.3**	**115.4**	**117.0**	**114.6**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		37	38	39	40		
G Wet Weight / Container	grams	155.0	159.8	148.2	159.7		
H Dry Weight / Container	grams	144.0	146.7	134.9	143.3		
I Moisture Loss = G - H	grams	11.0	13.1	13.3	16.4		
J Tare Weight of Container	grams	37.3	36.9	37.5	37.1		
K Dry Soil = H - J	grams	106.7	109.8	97.4	106.2		
L %Moisture = (I / K) x 100	%	**10.3%**	**11.9%**	**13.7%**	**15.4%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

116.7 lbs./cu.ft.

Optimum Moisture

13.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1242**

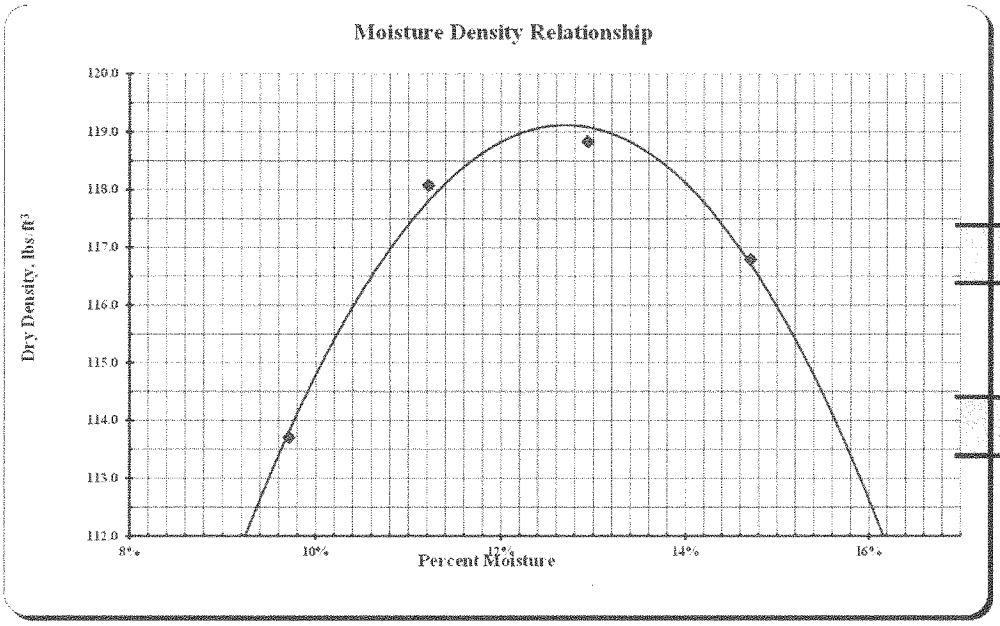
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.54	8.76	8.85	8.85		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.14	4.36	4.46	4.45		
E Wet Density = D / A	lbs./cu.ft.	124.8	131.3	134.2	134.0		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.7**	**118.1**	**118.8**	**116.8**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		98	99	100	101		
G Wet Weight / Container	grams	152.7	154.6	152.4	156.9		
H Dry Weight / Container	grams	142.5	142.8	139.2	141.6		
I Moisture Loss = G - H	grams	10.2	11.8	13.2	15.3		
J Tare Weight of Container	grams	37.5	37.6	37.2	37.6		
K Dry Soil = H - J	grams	105.0	105.2	102.0	104.0		
L %Moisture = (I / K) x 100	%	**9.7%**	**11.2%**	**12.9%**	**14.7%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

119.1 lbs./cu.ft.

Optimum Moisture

12.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1244**

Density

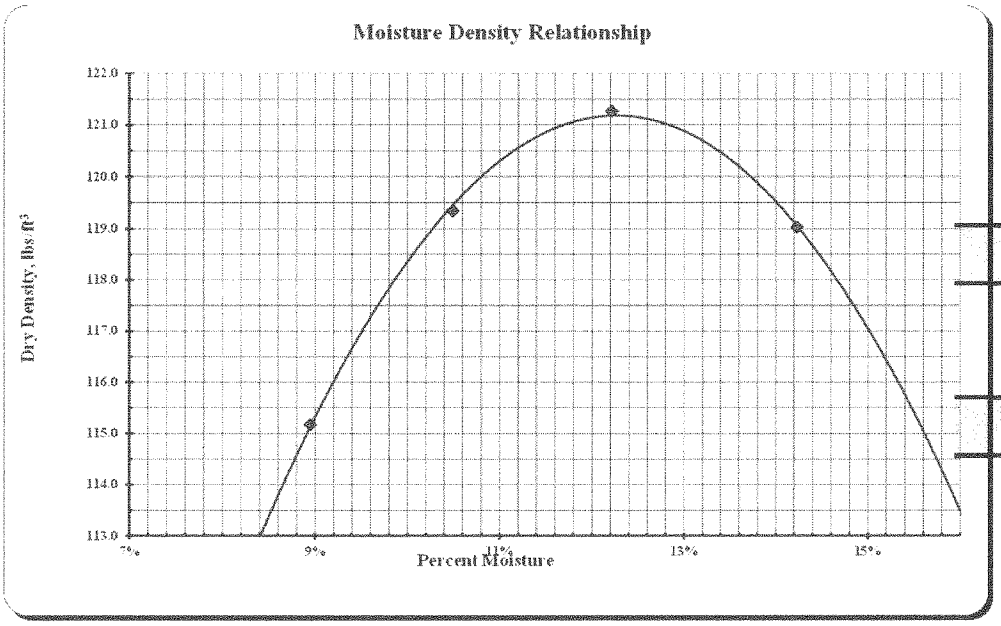
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.56	8.78	8.92	8.91		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.17	4.38	4.52	4.51		
E	Wet Density = D / A	lbs./cu.ft.	125.5	131.9	136.1	136.0		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**115.2**	**119.3**	**121.3**	**119.0**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		41	42	43	44		
G	Wet Weight / Container	grams	150.4	153.6	150.0	149.4		
H	Dry Weight / Container	grams	141.1	142.5	137.7	135.4		
I	Moisture Loss = G - H	grams	9.3	11.1	12.3	14.0		
J	Tare Weight of Container	grams	37.2	36.7	37.0	37.0		
K	Dry Soil = H - J	grams	103.9	105.8	100.7	98.4		
L	%Moisture = (I / K) x 100	%	**9.0%**	**10.5%**	**12.2%**	**14.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

121.2 lbs./cu.ft.

Optimum Moisture

12.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1246**

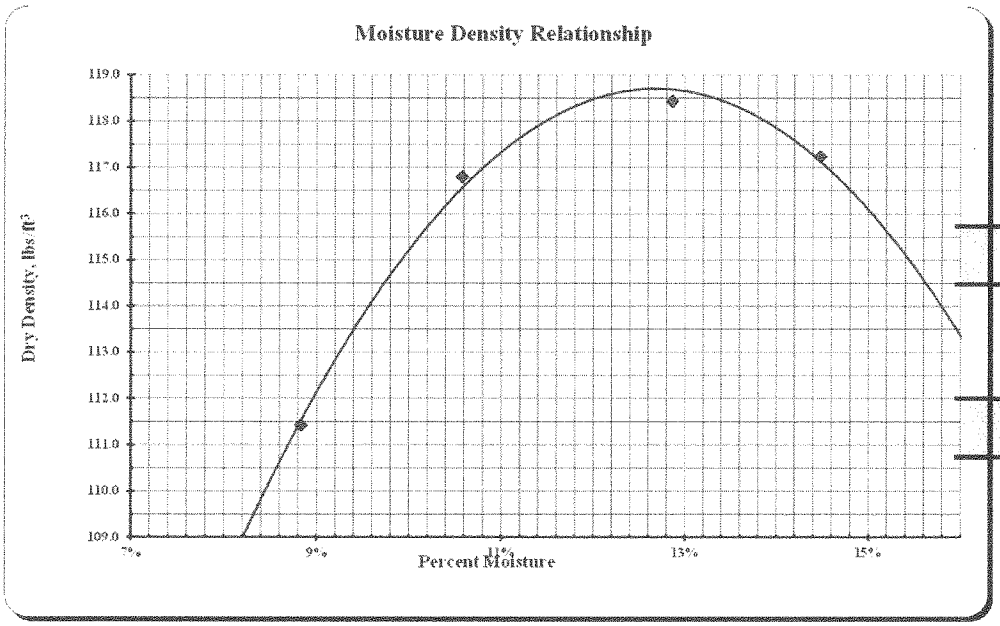
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.42	8.69	8.84	8.85		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.03	4.29	4.44	4.46		
E Wet Density = D / A	lbs./cu.ft.	121.3	129.2	133.7	134.2		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**111.4**	**116.8**	**118.4**	**117.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		101	102	103	104		
G Wet Weight / Container	grams	155.9	148.5	149.5	155.0		
H Dry Weight / Container	grams	146.3	137.9	136.7	140.1		
I Moisture Loss = G - H	grams	9.6	10.6	12.8	14.9		
J Tare Weight of Container	grams	37.6	37.7	37.2	37.2		
K Dry Soil = H - J	grams	108.7	100.2	99.5	102.9		
L %Moisture = (I / K) x 100	%	**8.8%**	**10.6%**	**12.9%**	**14.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

118.7 lbs./cu.ft.

Optimum Moisture

12.6%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1248**

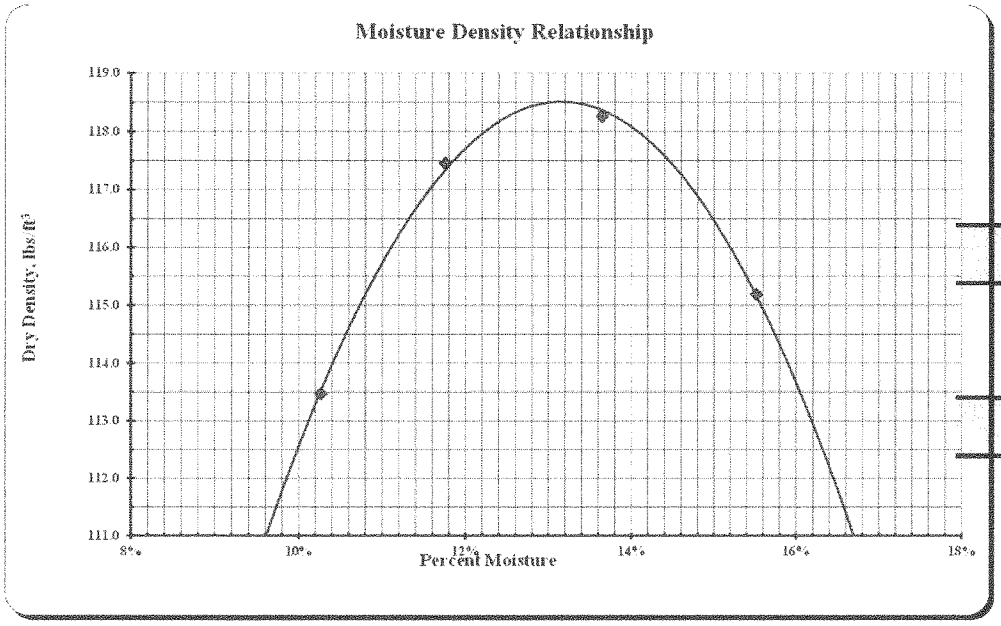
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.55	8.76	8.86	8.82		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.15	4.36	4.46	4.42		
E Wet Density = D / A	lbs./cu.ft.	125.1	131.3	134.4	133.1		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**113.5**	**117.5**	**118.3**	**115.2**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		45	46	47	48		
G Wet Weight / Container	grams	153.6	151.2	151.1	154.7		
H Dry Weight / Container	grams	142.8	139.2	137.4	138.9		
I Moisture Loss = G - H	grams	10.8	12.0	13.7	15.8		
J Tare Weight of Container	grams	37.6	37.1	37.0	37.1		
K Dry Soil = H - J	grams	105.2	102.1	100.4	101.8		
L %Moisture = (I / K) x 100	%	**10.3%**	**11.8%**	**13.6%**	**15.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

118.5 lbs./cu.ft.

Optimum Moisture

13.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

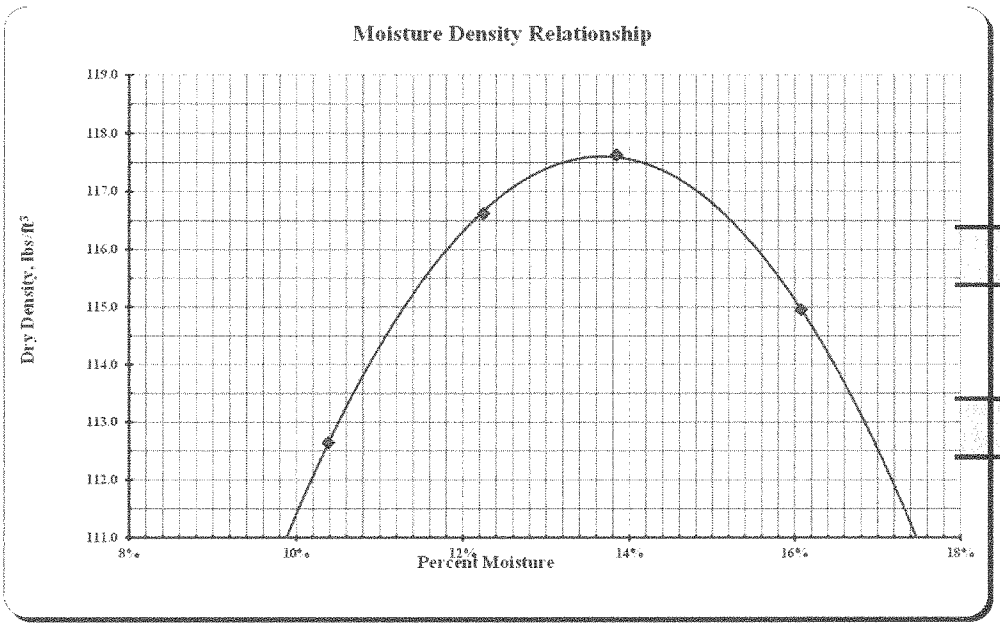
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**10/29/2015**		**1250**

Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.53	8.74	8.84	8.83		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.13	4.35	4.45	4.43		
E Wet Density = D / A	lbs./cu.ft.	124.3	130.9	133.9	133.4		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**112.6**	**116.6**	**117.6**	**115.0**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		105	106	107	108		
G Wet Weight / Container	grams	150.2	147.5	150.6	151.2		
H Dry Weight / Container	grams	139.6	135.5	136.8	135.4		
I Moisture Loss = G - H	grams	10.6	12.0	13.8	15.8		
J Tare Weight of Container	grams	37.5	37.5	37.1	37.1		
K Dry Soil = H - J	grams	102.1	98.0	99.7	98.3		
L %Moisture = (I / K) x 100	%	**10.4%**	**12.2%**	**13.8%**	**16.1%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

117.6 lbs./cu.ft.

Optimum Moisture

13.7%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1252**

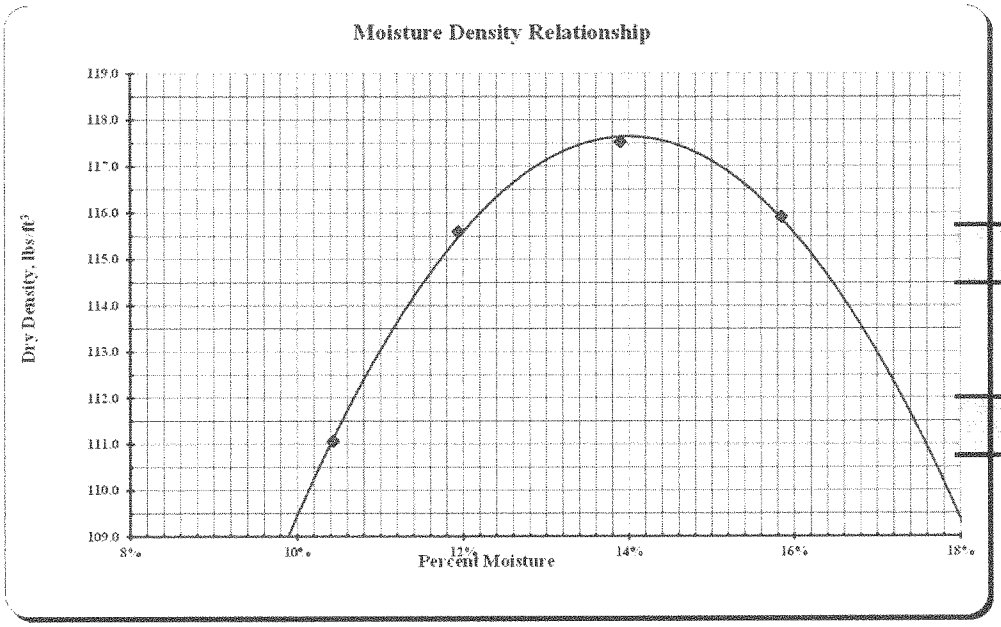
Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.47	8.69	8.84	8.86		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.07	4.30	4.44	4.46		
E Wet Density = D / A	lbs./cu.ft.	122.7	129.4	133.9	134.3		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**111.1**	**115.6**	**117.5**	**115.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		49	50	51	52		
G Wet Weight / Container	grams	145.3	148.6	157.7	159.4		
H Dry Weight / Container	grams	135.1	136.7	143.0	142.7		
I Moisture Loss = G - H	grams	10.2	11.9	14.7	16.7		
J Tare Weight of Container	grams	37.3	37.0	37.2	37.3		
K Dry Soil = H - J	grams	97.8	99.7	105.8	105.4		
L %Moisture = (I / K) x 100	%	**10.4%**	**11.9%**	**13.9%**	**15.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

117.6 lbs./cu.ft.

Optimum Moisture

14.0%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

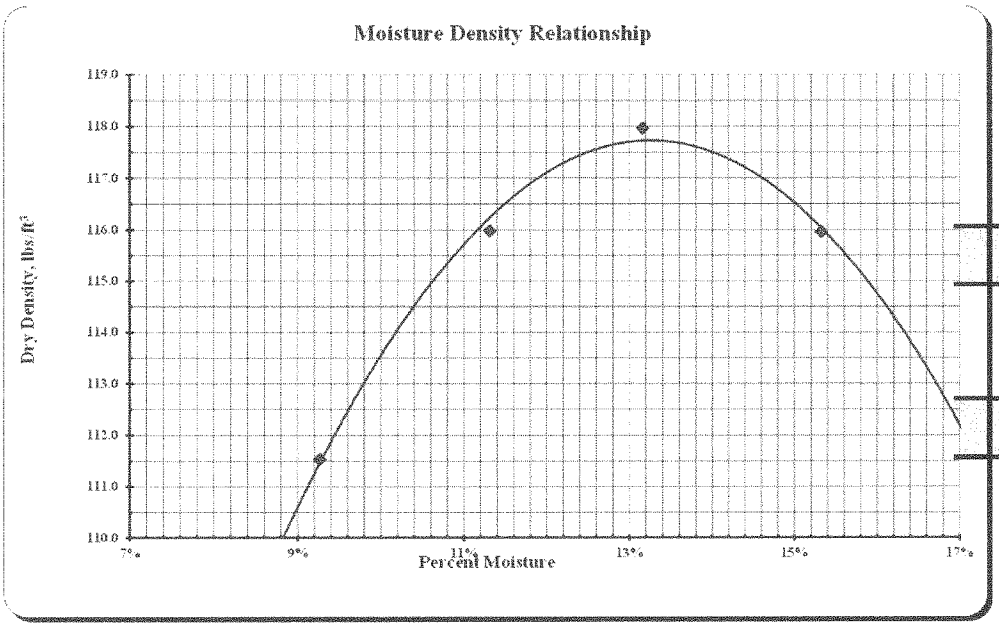
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **10/29/2015**		**1254**

Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.44	8.68	8.83	8.84		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.05	4.29	4.43	4.44		
E Wet Density = D / A	lbs./cu.ft.	121.9	129.1	133.5	133.7		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**111.5**	**116.0**	**118.0**	**116.0**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		109	110	111	112		
G Wet Weight / Container	grams	152.2	150.3	147.1	154.9		
H Dry Weight / Container	grams	142.5	138.8	134.4	139.3		
I Moisture Loss = G - H	grams	9.7	11.5	12.7	15.6		
J Tare Weight of Container	grams	37.8	37.1	37.9	37.5		
K Dry Soil = H - J	grams	104.7	101.7	96.5	101.8		
L %Moisture = (I / K) x 100	%	**9.3%**	**11.3%**	**13.2%**	**15.3%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

117.7 lbs./cu.ft.

Optimum Moisture

13.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1256**

Density

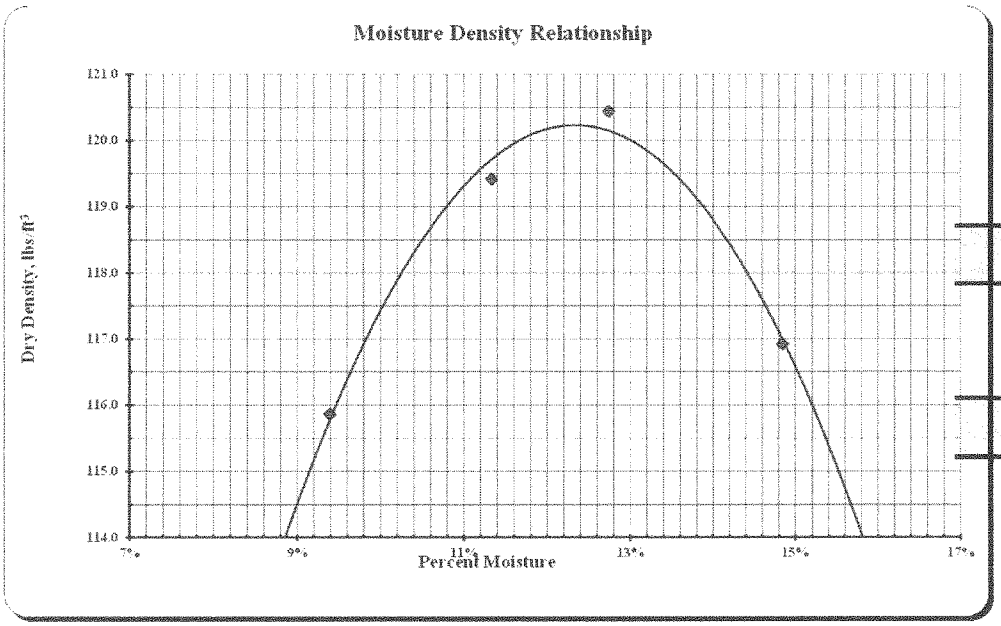
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.61	8.81	8.91	8.86		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.21	4.41	4.51	4.46		
E	Wet Density = D / A	lbs./cu.ft.	126.7	133.0	135.8	134.3		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**115.9**	**119.4**	**120.4**	**116.9**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		53	54	55	56		
G	Wet Weight / Container	grams	145.4	153.9	148.1	160.3		
H	Dry Weight / Container	grams	136.1	142.0	135.5	144.4		
I	Moisture Loss = G - H	grams	9.3	11.9	12.6	15.9		
J	Tare Weight of Container	grams	37.1	37.0	36.6	37.3		
K	Dry Soil = H - J	grams	99.0	105.0	98.9	107.1		
L	%Moisture = (I / K) x 100	%	**9.4%**	**11.3%**	**12.7%**	**14.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

120.2 lbs./cu.ft.

Optimum Moisture

12.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1258**

Density

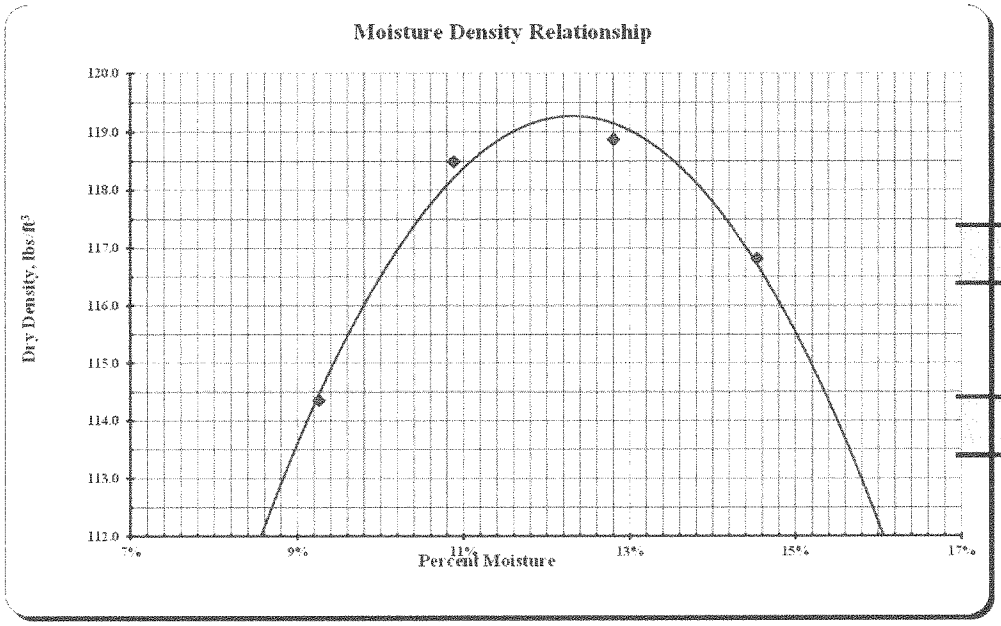
			Test Count	4				
	Determination No.		1	2	3	4	5	6
A	Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
		lbs.	8.55	8.76	8.85	8.84		
C	Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D	Weight of Compacted Soil = B - C	lbs.	4.15	4.36	4.45	4.44		
E	Wet Density = D / A	lbs./cu.ft.	124.9	131.4	134.1	133.8		
F	Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**114.4**	**118.5**	**118.9**	**116.8**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

	Container No.		113	114	115	116		
G	Wet Weight / Container	grams	144.2	148.5	160.9	161.9		
H	Dry Weight / Container	grams	135.2	137.6	146.8	146.1		
I	Moisture Loss = G - H	grams	9.0	10.9	14.1	15.8		
J	Tare Weight of Container	grams	38.0	37.4	36.7	37.4		
K	Dry Soil = H - J	grams	97.2	100.2	110.1	108.7		
L	%Moisture = (I / K) x 100	%	**9.3%**	**10.9%**	**12.8%**	**14.5%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

119.3 lbs./cu.ft.

Optimum Moisture

12.4%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

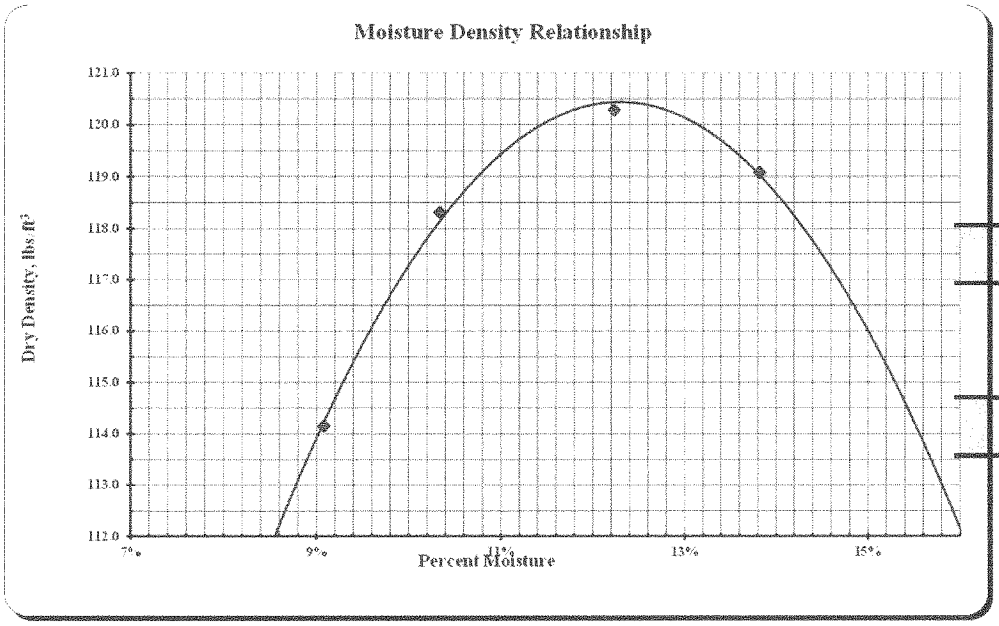
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1260**

Density		Test Count	4				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.53	8.73	8.88	8.90		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.13	4.33	4.48	4.50		
E Wet Density = D / A	lbs./cu.ft.	124.5	130.5	135.0	135.5		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**114.2**	**118.3**	**120.3**	**119.1**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		57	58	59	60		
G Wet Weight / Container	grams	151.4	151.0	152.8	160.1		
H Dry Weight / Container	grams	141.9	140.3	140.2	145.2		
I Moisture Loss = G - H	grams	9.5	10.7	12.6	14.9		
J Tare Weight of Container	grams	37.3	36.8	37.2	37.4		
K Dry Soil = H - J	grams	104.6	103.5	103.0	107.8		
L %Moisture = (I / K) x 100	%	**9.1%**	**10.3%**	**12.2%**	**13.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

120.4 lbs./cu.ft.

Optimum Moisture

12.3%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

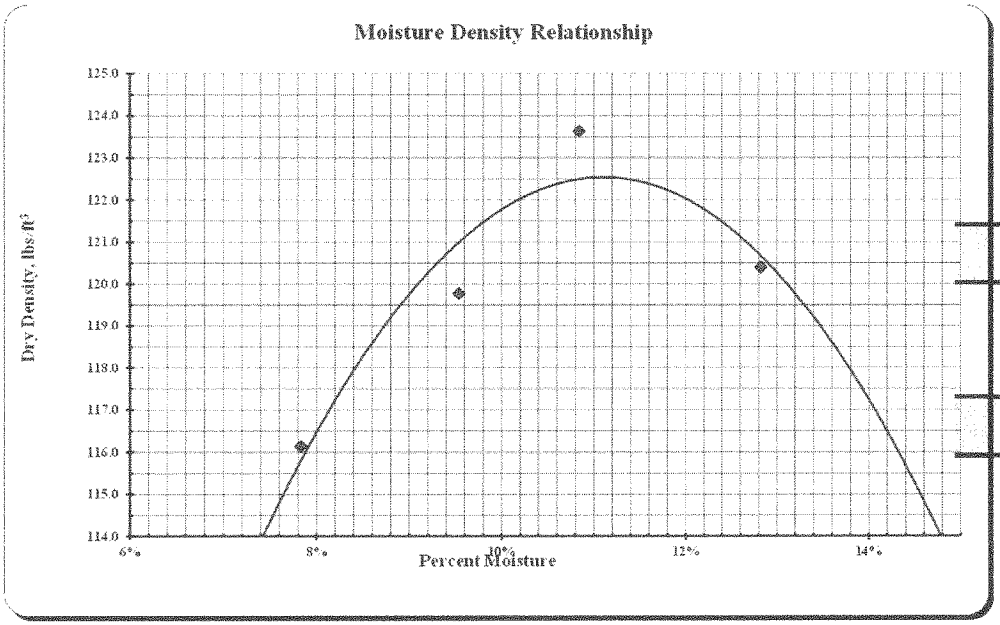
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation	Date		
T-180	**11/2/2015**		**1262**

Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.56	8.75	8.95	8.91		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.16	4.36	4.55	4.51		
E Wet Density = D / A	lbs./cu.ft.	125.2	131.2	137.0	135.8		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**116.1**	**119.8**	**123.6**	**120.4**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

	Container No.	117	118	119	120		
G Wet Weight / Container	grams	155.7	156.2	147.5	155.2		
H Dry Weight / Container	grams	147.1	145.9	136.7	141.8		
I Moisture Loss = G - H	grams	8.6	10.3	10.8	13.4		
J Tare Weight of Container	grams	37.3	37.9	37.1	37.3		
K Dry Soil = H - J	grams	109.8	108.0	99.6	104.5		
L %Moisture = (I / K) x 100	%	**7.8%**	**9.5%**	**10.8%**	**12.8%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

122.5 lbs./cu.ft.

Optimum Moisture

11.1%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

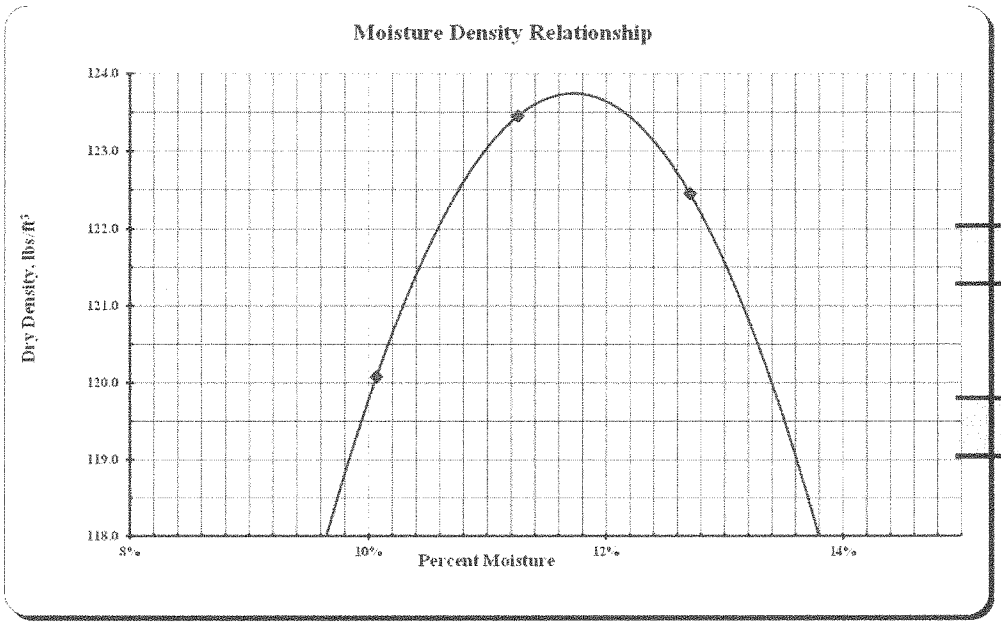
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1264**

Density		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.79	8.96	8.98			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.39	4.56	4.58			
E Wet Density = D / A	lbs./cu.ft.	132.2	137.3	138.0			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**120.1**	**123.5**	**122.5**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		1	2	3			
G Wet Weight / Container	grams	152.5	148.0	146.2			
H Dry Weight / Container	grams	141.9	136.8	133.9			
I Moisture Loss = G - H	grams	10.6	11.2	12.3			
J Tare Weight of Container	grams	36.6	37.3	37.1			
K Dry Soil = H - J	grams	105.3	99.5	96.8			
L %Moisture = (I / K) x 100	%	**10.1%**	**11.3%**	**12.7%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

123.7 lbs./cu.ft.

Optimum Moisture

11.8%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

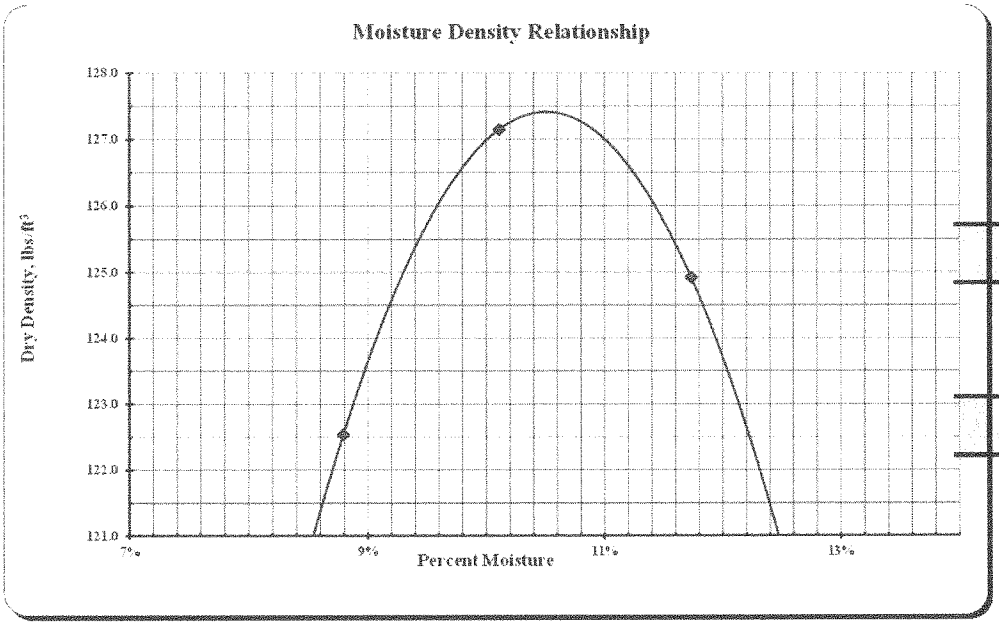
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1266**

Density		Test Count	3				
Determination No.		1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.82	9.05	9.03			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.43	4.65	4.63			
E Wet Density = D / A	lbs./cu.ft.	133.3	140.0	139.6			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**122.5**	**127.1**	**124.9**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		61	62	63			
G Wet Weight / Container	grams	153.6	159.6	157.3			
H Dry Weight / Container	grams	144.2	148.4	144.7			
I Moisture Loss = G - H	grams	9.4	11.2	12.6			
J Tare Weight of Container	grams	37.3	37.6	37.3			
K Dry Soil = H - J	grams	106.9	110.8	107.4			
L %Moisture = (I / K) x 100	%	**8.8%**	**10.1%**	**11.7%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

127.4 lbs./cu.ft.

Optimum Moisture

10.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

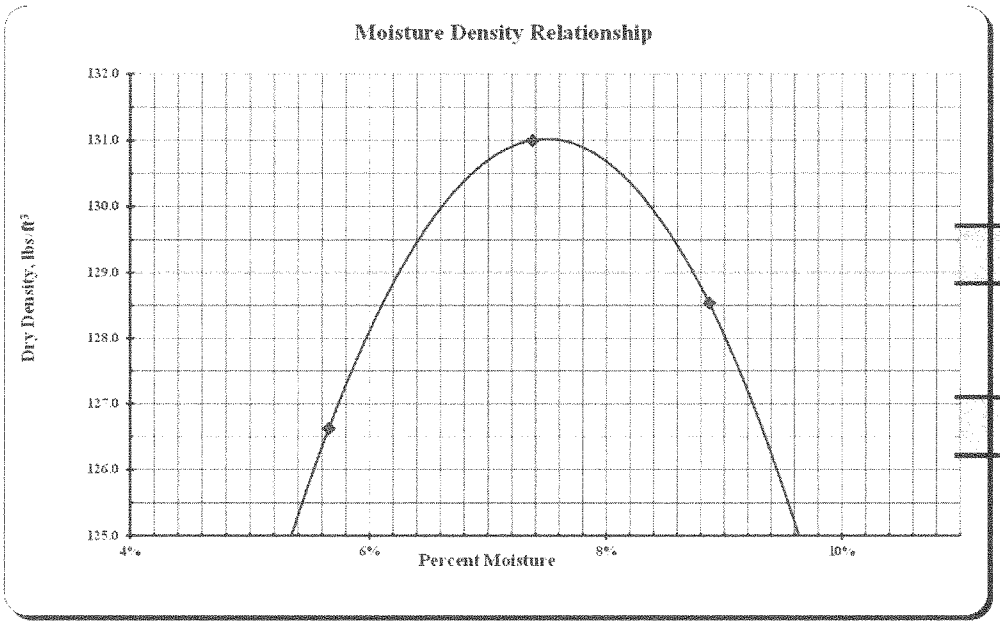
Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1268**

Density		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.84	9.07	9.04			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.44	4.67	4.65			
E Wet Density = D / A	lbs./cu.ft.	133.8	140.7	139.9			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**126.6**	**131.0**	**128.5**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content AASHTO T99 or T180 Tested by:

Container No.		4	5	6			
G Wet Weight / Container	grams	145.0	153.6	157.4			
H Dry Weight / Container	grams	139.2	145.6	147.6			
I Moisture Loss = G - H	grams	5.8	8.0	9.8			
J Tare Weight of Container	grams	36.7	37.1	37.1			
K Dry Soil = H - J	grams	102.5	108.5	110.5			
L %Moisture = (I / K) x 100	%	**5.7%**	**7.4%**	**8.9%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

131.0 lbs./cu.ft.

Optimum Moisture

7.5%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

SFN 10063 (Rev. 03-2006)

Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1270**

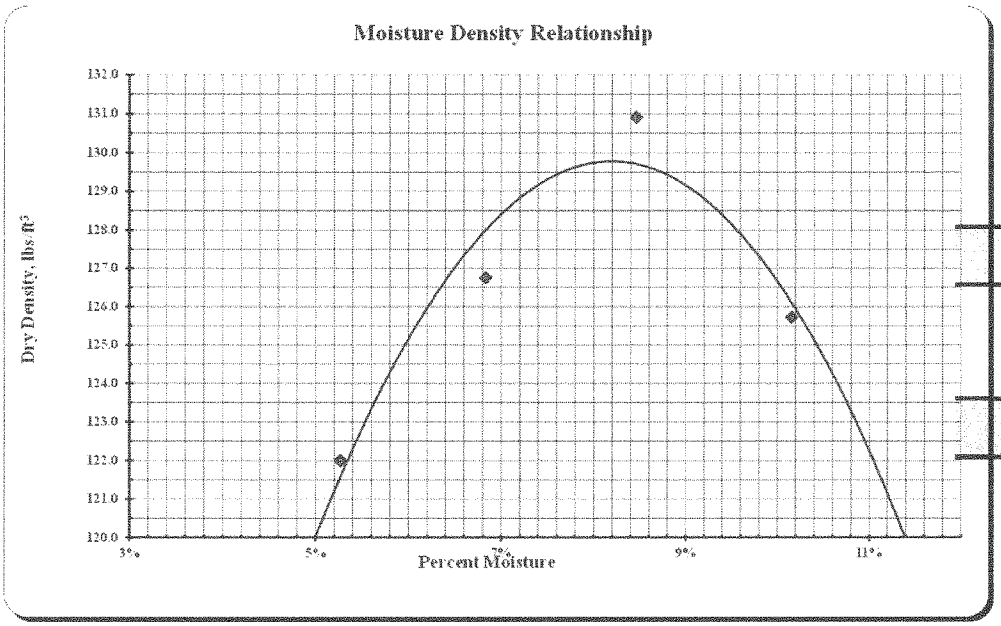
Density		Test Count	4				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.66	8.89	9.11	9.00		
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.26	4.50	4.71	4.60		
E Wet Density = D / A	lbs./cu.ft.	128.4	135.4	142.0	138.5		
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**122.0**	**126.8**	**130.9**	**125.7**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		64	65	66	67		
G Wet Weight / Container	grams	157.2	156.6	158.2	165.2		
H Dry Weight / Container	grams	151.2	149.0	148.8	153.4		
I Moisture Loss = G - H	grams	6.0	7.6	9.4	11.8		
J Tare Weight of Container	grams	37.3	37.8	37.7	37.2		
K Dry Soil = H - J	grams	113.9	111.2	111.1	116.2		
L %Moisture = (I / K) x 100	%	**5.3%**	**6.8%**	**8.5%**	**10.2%**		

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

129.8 lbs./cu.ft.

Optimum Moisture

8.2%

MOISTURE-DENSITY RELATIONS OF SOILS

North Dakota Department Of Transportation, Materials & Research Division

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Project No.	PCN	Station	Depth Below Grade
SS-7-042(014)000			
Offset From Centerline		Type of Soil	
AASTHO Designation **T-180**	Date **11/2/2015**		**1272**

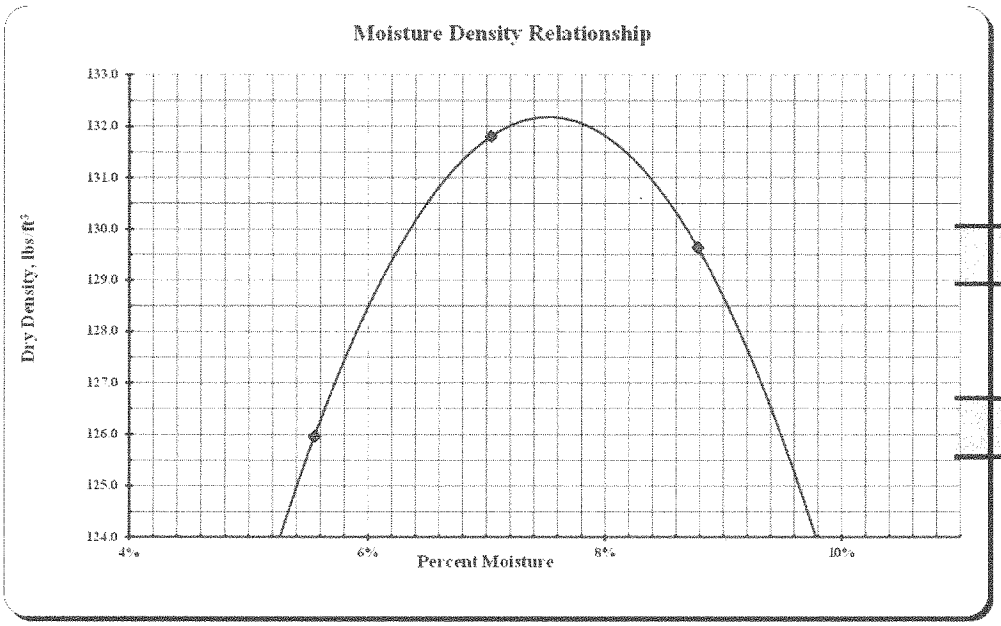
Density		Test Count	3				
	Determination No.	1	2	3	4	5	6
A Volume of Mold	cu. ft.	0.0332	0.0332	0.0332	0.0332	0.0332	0.0332
	lbs.	8.81	9.08	9.08			
C Weight of Mold	lbs.	4.40	4.40	4.40	4.40	4.40	4.40
D Weight of Compacted Soil = B - C	lbs.	4.41	4.68	4.68			
E Wet Density = D / A	lbs./cu.ft.	133.0	141.1	141.0			
F Dry Density = (E x 100) / (100 + L)	lbs./cu.ft.	**126.0**	**131.8**	**129.6**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Moisture Content

AASHTO T99 or T180 Tested by:

Container No.		7	8	9			
G Wet Weight / Container	grams	156.1	146.5	158.6			
H Dry Weight / Container	grams	149.8	139.3	148.8			
I Moisture Loss = G - H	grams	6.3	7.2	9.8			
J Tare Weight of Container	grams	36.3	37.0	37.2			
K Dry Soil = H - J	grams	113.5	102.3	111.6			
L %Moisture = (I / K) x 100	%	**5.6%**	**7.0%**	**8.8%**			

ASTM D4643 AASHTO T217 or T265 Tested by: ML



Max Dry Density

132.2 lbs./cu.ft.

Optimum Moisture

7.6%