

LITTLE TOBACCO INTERCOUNTY DRAIN

SOILS INFORMATION

SOIL BORING DATA

USDA SOIL SURVEY OF CLARE AND ISABELLA COUNTIES

INTERCOUNTY DRAIN BOARD  
 AUGUST 6, 2014 (JEM)  
 NOT TO SCALE

Little Tobacco Drain Soil Boring Reference Map



SB Location	Depth (FT)
1 HSE# 608 Dunlop Rd. 75' NE Covered Bridge (access on west property line)	10'
2 Dunlop Rd. 40' E of bridge on S road shoulder	22'
3 Maple St. NW Corner 25' N of drain between sidewalk and drain	14'
4 McEwan St. South side of drain West of road between sidewalk and street curb	14'
5 4th Street 25' West of Drain South Side of Road 5' South Curb	14'
6 5th Street East Side of Drain 15' South of Sidewalk	14'
7 6th Street 20' East of Drain and 25' South of edge of sidewalk (in yard) Remove and Replace Bird Bath	10'
8 125' North of edge of Blacktop at Cleveland Street	10'
9 300' North of Edgewood Dr. cul-de-sac at SE corner of footbridge	8'
10 25' South of Drain on West Shoulder of Eberhart Ave	14'



# BORING LOG TERMINOLOGY

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
<b>COARSE-GRAINED SOIL</b> (more than 50% of material is larger than No. 200 sieve size.)		
Clean Gravel (Less than 5% fines)		
<b>GRAVEL</b> More than 50% of coarse fraction larger than No. 4 sieve size		Well-graded gravel; gravel-sand mixtures, little or no fines
		Poorly-graded gravel; gravel-sand mixtures, little or no fines
Gravel with fines (More than 12% fines)		
		Silty gravel; gravel-sand-silt mixtures
		Clayey gravel; gravel-sand-clay mixtures
Clean Sand (Less than 5% fines)		
<b>SAND</b> 50% or more of coarse fraction smaller than No. 4 sieve size		Well-graded sand; sand-gravel mixtures, little or no fines
		Poorly graded sand; sand-gravel mixtures, little or no fines
Sand with fines (More than 12% fines)		
		Silty sand; sand-silt-gravel mixtures
		Clayey sand; sand-clay-gravel mixtures
<b>FINE-GRAINED SOIL</b> (50% or more of material is smaller than No. 200 sieve size)		
<b>SILT AND CLAY</b> Liquid limit less than 50%		Inorganic silt; sandy silt or gravelly silt with slight plasticity
		Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay
		Organic silt and organic clay of low plasticity
<b>SILT AND CLAY</b> Liquid limit 50% or greater		Inorganic silt of high plasticity, elastic silt
		Inorganic clay of high plasticity, fat clay
		Organic silt and organic clay of high plasticity
<b>HIGHLY ORGANIC SOIL</b>		Peat and other highly organic soil

OTHER MATERIAL SYMBOLS		

LABORATORY CLASSIFICATION CRITERIA	
GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3
GP	Not meeting all gradation requirements for GW
GM	Atterberg limits below "A" line or PI less than 4
GC	Atterberg limits above "A" line with PI greater than 7
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3
SP	Not meeting all gradation requirements for SW
SM	Atterberg limits below "A" line or PI less than 4
SC	Atterberg limits above "A" line with PI greater than 7

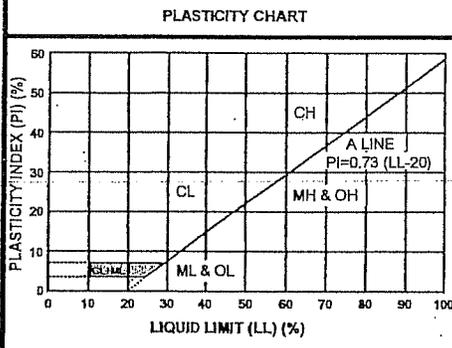
Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent.....GW, GP, SW, SP  
More than 12 percent.....GM, GC, SM, SC  
5 to 12 percent.....Cases requiring dual symbols

- SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel)
- SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel)
- GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand)
- GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand)

- If the fines are CL-ML:
- SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel)
  - SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel)
  - GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)
  - GM-GC (CLAYEY SILTY GRAVEL or CLAYEY SILTY GRAVEL with Sand)

PARTICLE SIZES	
Boulders	- Greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel- Coarse	- 3/4 inches to 3 inches
Gravel- Fine	- No. 4 to 3/4 inches
Sand- Coarse	- No. 10 to No. 4
Sand- Medium	- No. 40 to No. 10
Sand- Fine	- No. 200 to No. 40
Silt and Clay	- Less than (0.0074 mm)



VISUAL MANUAL PROCEDURE	
When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows:	
For soils where it is difficult to distinguish if it is a coarse or fine grained soil:	
<ul style="list-style-type: none"> <li>• SC/CL (CLAYEY SAND to Sandy LEAN CLAY)</li> <li>• SM/ML (SILTY SAND to Sandy SILT)</li> <li>• GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY)</li> <li>• GM/ML (SILTY GRAVEL to Gravelly SILT)</li> </ul>	
For soils where it is difficult to distinguish if it is sand or gravel poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay:	
<ul style="list-style-type: none"> <li>• SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand)</li> <li>• SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand)</li> <li>• SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand)</li> <li>• SW/SP (SAND or SAND with Gravel)</li> <li>• GP/GW (GRAVEL or GRAVEL with Sand)</li> <li>• SC/SM (CLAYEY to SILTY SAND)</li> <li>• GM/GC (SILTY to CLAYEY GRAVEL)</li> <li>• CL/ML (SILTY CLAY)</li> <li>• ML/CL (CLAYEY SILT)</li> <li>• CH/MH (FAT CLAY to ELASTIC SILT)</li> <li>• CL/CH (LEAN to FAT CLAY)</li> <li>• MH/ML (ELASTIC SILT to SILT)</li> <li>• OL/OH (ORGANIC SILT or ORGANIC CLAY)</li> </ul>	

DRILLING AND SAMPLING ABBREVIATIONS	
2ST	- Shelby Tube - 2" O.D.
3ST	- Shelby Tube - 3" O.D.
AS	- Auger Sample
GS	- Grab Sample
LS	- Liner Sample
NR	- No Recovery
PM	- Pressure Meter
RC	- Rock Core diamond bit. NX size, except where noted
SB	- Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted
VS	- Vane Shear
WS	- Wash Sample

OTHER ABBREVIATIONS	
WOH	- Weight of Hammer
WOR	- Weight of Rods
SP	- Soil Probe
PID	- Photo Ionization Device
FID	- Flame Ionization Device

DEPOSITIONAL FEATURES	
Parting	- as much as 1/16 inch thick
Seam	- 1/16 inch to 1/2 inch thick
Layer	- 1/2 inch to 12 inches thick
Stratum	- greater than 12 inches thick
Pocket	- deposit of limited lateral extent
Lens	- lenticular deposit
Hardpan/Till	- an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely
Lacustrine	- soil deposited by lake water
Mottled	- soil irregularly marked with spots of different colors that vary in number and size
Varved	- alternating partings or seams of silt and/or clay
Occasional	- one or less per foot of thickness
Frequent	- more than one per foot of thickness
Interbedded	- strata of soil or beds of rock lying between or alternating with other strata of a different nature

CLASSIFICATION TERMINOLOGY AND CORRELATIONS		
<b>Cohesionless Soils</b>		
<b>Relative Density</b>	<b>N-Value</b> (Blows per foot)	
Very Loose	0 to 4	
Loose	4 to 10	
Medium Dense	10 to 30	
Dense	30 to 50	
Very Dense	50 to 80	
Extremely Dense	Over 80	
<b>Cohesive Soils</b>		
<b>Consistency</b>	<b>N-Value</b> (Blows per foot)	<b>Undrained Shear Strength</b> (kips/ft <sup>2</sup> )
Very Soft	0 - 2	0.25 or less
Soft	2 - 4	0.25 to 0.50
Medium	4 - 8	0.50 to 1.0
Stiff	8 - 15	1.0 to 2.0
Very Stiff	15 - 30	2.0 to 4.0
Hard	> 30	4.0 or greater

Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted.



PROJECT NAME: Little Tobacco Drain Improvements

PROJECT NUMBER: 070546.00

CLIENT: Isabella County Drain Commission

PROJECT LOCATION: Clare, Michigan

DATE STARTED: 8/27/14

COMPLETED: 8/27/14

BORING METHOD: Solid-stem Augers

DRILLER: JB

RIG NO.: 281

LOGGED BY: JLN

CHECKED BY: JLN

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	NORTHING: 843481.3 FT EASTING: 13015144 FT OFFSET: 21' West due to trees SURFACE ELEVATION: 829.3 FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE - O	DRY DENSITY (pcf) - ■				MOISTURE & ATTERBERG LIMITS (%)				REMARKS
								90	100	110	120	PL	MC	LL	SH	
0	0.8		10 inches of TOPSOIL													
825	4.5		PEAT with Sand- Little Gravel- Black- Moist to Wet (Pt)	SB1	16	0 1 0										
820	10.0		Fine to Medium SAND- Little Silt and Gravel- Occasional Lean Clay Seams and Partings- Gray- Wet- Loose (SP)	SB2 SB3 SB4	16 16 16	1 1 5 2 2 3 2 3 4										
END OF BORING AT 10.0 FEET.																
815	15															
810	20															
805	25															
800	30															

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	2.0	827.3
▽ AT END OF BORING:	2.0	827.3

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.



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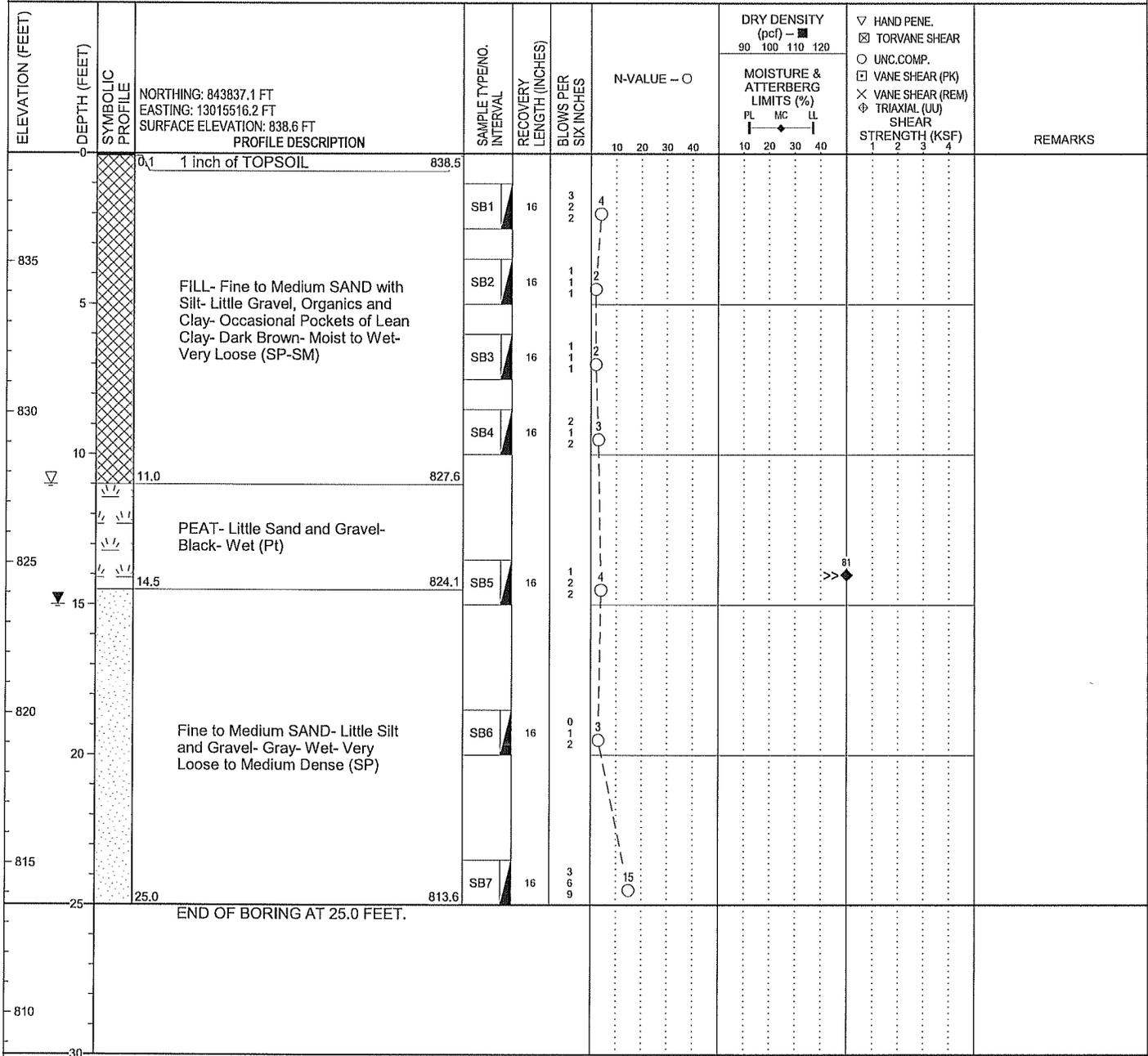
BORING METHOD: Solid-stem Augers

DRILLER: JB

RIG NO.: 281

LOGGED BY: JLN

CHECKED BY: JLN



GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	11.0	827.6
▽ AT END OF BORING:	15.0	823.6
BACKFILL METHOD: Auger Cuttings		

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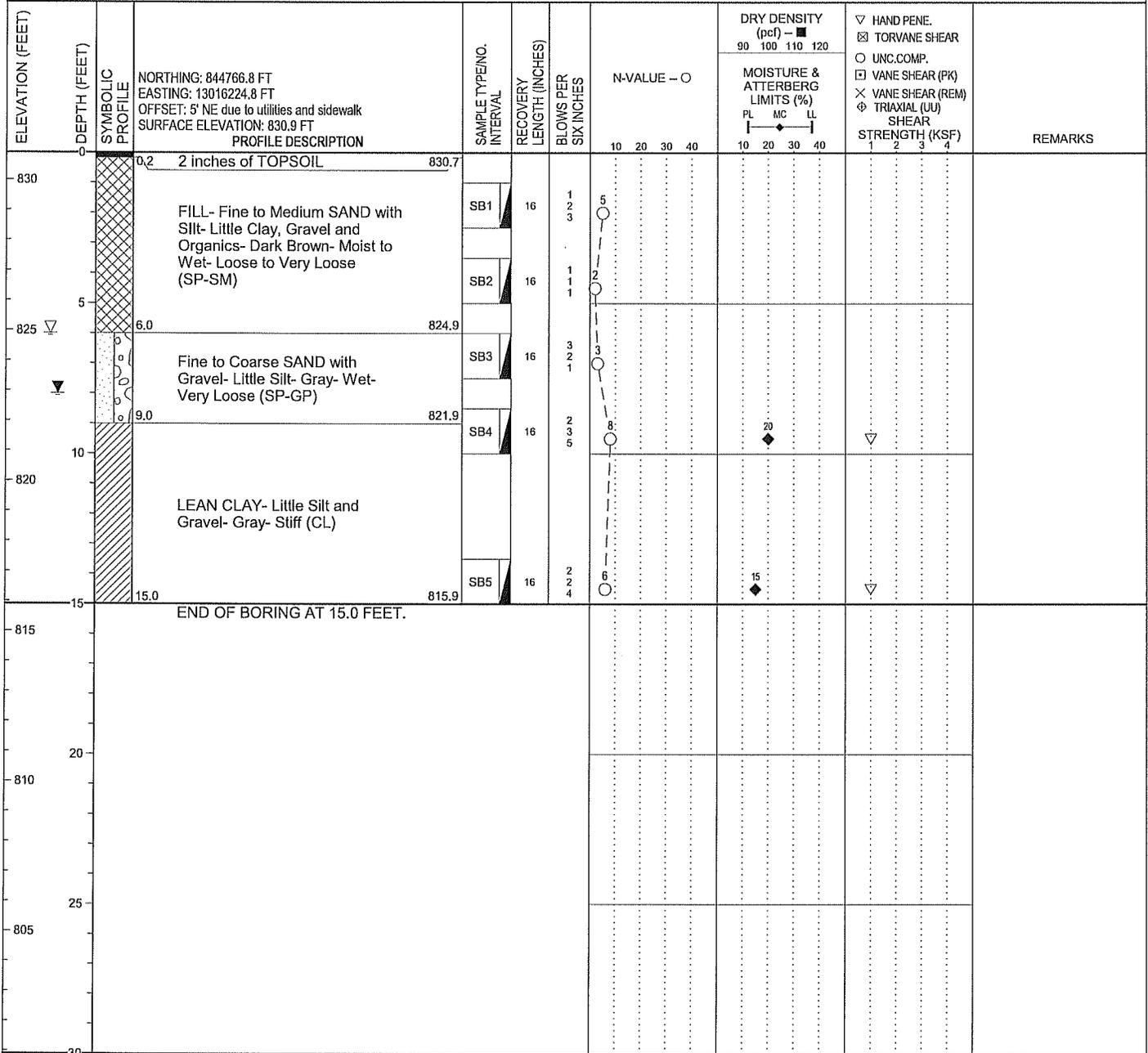
BORING METHOD: Solid-stem Augers

DRILLER: JB

RIG NO.: 281

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CHECKED BY: JLN



GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	6.0	824.9
▽ AT END OF BORING:	8.0	822.9
BACKFILL METHOD: Auger Cuttings		

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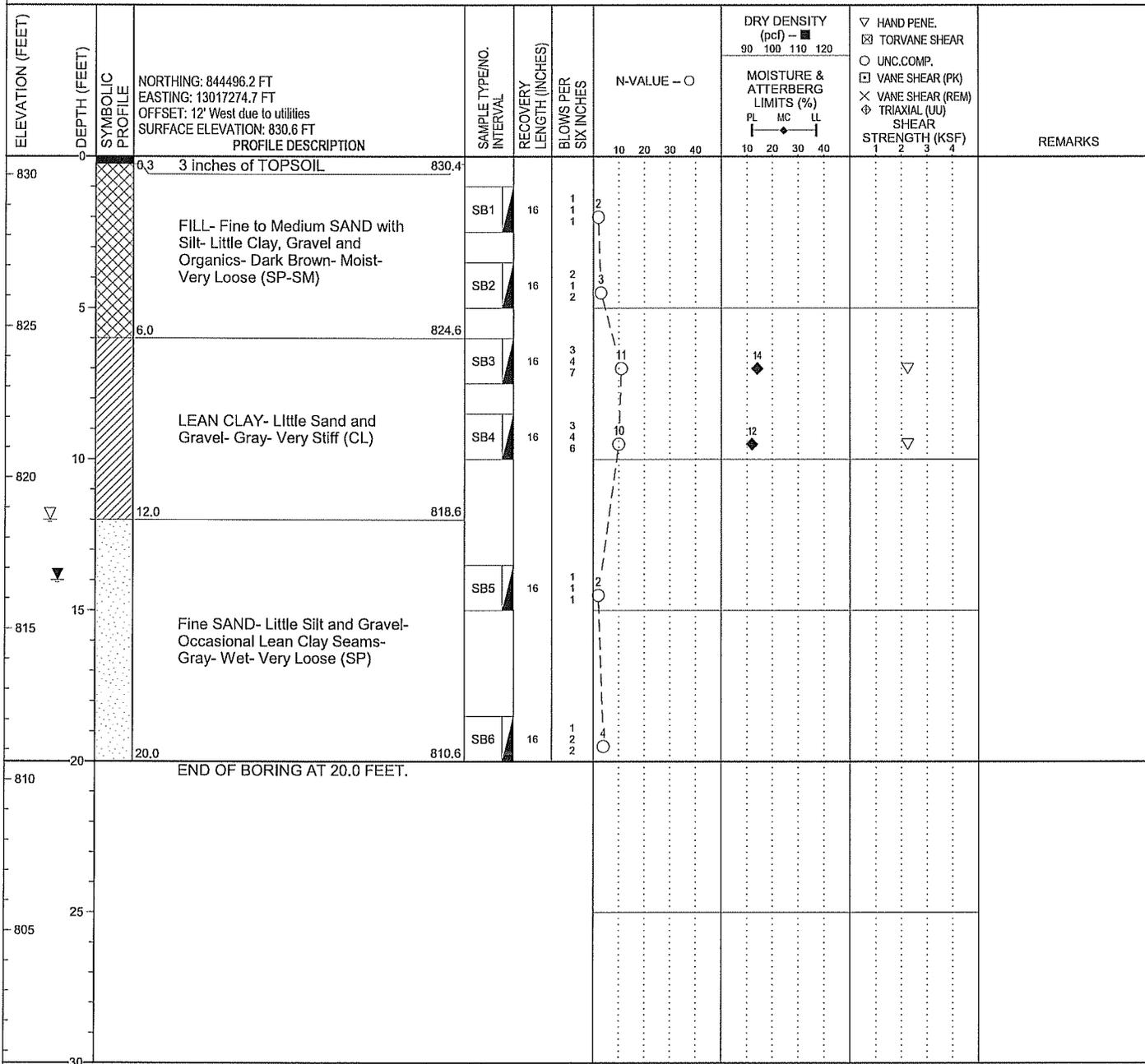
**BORING METHOD:** Solid-stem Augers

**DRILLER:** JB

**RIG NO.:** 281

**LOGGED BY:** JLN

**CHECKED BY:** JLN



**GROUNDWATER & BACKFILL INFORMATION**

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	12.0	818.6
▽ AT END OF BORING:	14.0	816.6

**BACKFILL METHOD:** Auger Cuttings

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DRILLER: JB

RIG NO.: 281

LOGGED BY: JLN

CHECKED BY: JLN

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	NORTHING: 845308.4 FT EASTING: 13018627.3 FT OFFSET: 5' North due to overhead line and utilities SURFACE ELEVATION: 829.1 FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE - O	DRY DENSITY (pcf) - ■				MOISTURE & ATTERBERG LIMITS (%)				STRENGTH (KSF)				REMARKS
								90	100	110	120	PL	MC	LL	1	2	3	4		
0	0.3	[Cross-hatched]	4 inches of TOPSOIL																	
825	5	[Dotted]	FILL- Fine SAND with Silt- Little Gravel and Organics- Dark Brown- Moist to Wet- Medium Dense to Loose (SP-SM)	SB1	16	3 4 6	10													
	6.0	[Dotted]		2	16	4 3 3	6													
820	10	[Dotted]	Fine to Medium SAND- Little Silt and Gravel- Brown turning Gray- Wet- Loose (SP)	3	16	2 3 4	7													
		[Dotted]		4	16	3 3 3	6													
815	15	[Dotted]		5	16	2 3 4	7													
	15.0	[Dotted]	END OF BORING AT 15.0 FEET.																	
810	20	[Dotted]																		
805	25	[Dotted]																		
800	30	[Dotted]																		

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	6.0	823.1
▽ AT END OF BORING:	6.0	823.1

BACKFILL METHOD: Auger Cuttings

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**DRILLER:** JB

**RIG NO.:** 281

**LOGGED BY:** JLN

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ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	NORTHING: 845599.9 FT EASTING: 13018916.7 FT OFFSET: 8' SE due to overhead lines SURFACE ELEVATION: 829.3 FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE - O	DRY DENSITY (pcf) - ■				MOISTURE & ATTERBERG LIMITS (%)				STRENGTH (KSF)				REMARKS
								90	100	110	120	PL	MC	LL	1	2	3	4		
829.1	0.2	[Cross-hatched]	3 inches of TOPSOIL																	
825	5	[Dotted]	FILL- Fine SAND with Silt- Little Gravel- Clay and Organics- Dark Brown- Moist to Wet- Loose (SP-SM)	SB1	12	2 2 3	5													
823.3	6.0	[Dotted]		SB2	16	1 2 2	4													
820	10	[Dotted]	Fine to Medium SAND- Little Silt and Gravel- Brown Turning Gray- Wet- Loose to Medium Dense (SP)	SB3	16	3 4 4	8													
815	15	[Dotted]		SB4	16	6 6 7	13													
814.3	15.0	[Dotted]	END OF BORING AT 15.0 FEET.	SB5	16	3 5 5	10													
810	20																			
805	25																			
800	30																			

GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	6.0	823.3
▽ AT END OF BORING:	7.0	822.3
<b>BACKFILL METHOD:</b> Auger Cuttings		

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DRILLER: JB

RIG NO.: 281

LOGGED BY: JLN

CHECKED BY: JLN

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	NORTHING: 845936.3 FT EASTING: 13019012.1 FT SURFACE ELEVATION: 826.7 FT	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE - O	DRY DENSITY (pcf) - ■				MOISTURE & ATTERBERG LIMITS (%)				REMARKS
									90	100	110	120	PL	MC	LL	SH	
826.7	0.0		4 inches of TOPSOIL	826.4													
825	3.5		FILL- Fine SAND with Silt and Organics- Little Gravel- Dark Brown and Black- Moist- Loose (SP-SM)	823.2	SB1	16	3 4 4	8									
820	6.0		Fine to Coarse SAND with Silt and Gravel- Little Clay- Brown- Moist to Wet- Medium Dense (SM-GP)	820.7	SB2	16	6 10 9	19									
816.7	10.0		Fine to Medium SAND- Little Silt and Gravel- Gray- Wet- Loose (SP)	816.7	SB3	16	3 3 4	7									
			END OF BORING AT 10.0 FEET.		SB4	16	2 3 3	6									

GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.0	821.7
▽ AT END OF BORING:	5.0	821.7
BACKFILL METHOD: Auger Cuttings		

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DRILLER: JB

RIG NO.: 281

LOGGED BY: JLN

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ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE - O	DRY DENSITY (pcf) - ■	MOISTURE & ATTERBERG LIMITS (%)	▽ HAND PENE. ☒ TORVANE SHEAR ○ UNC.COMP. ☐ VANE SHEAR (PK) × VANE SHEAR (REM) ⊕ TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
								90 100 110 120			
0	0.2		2 inches of Brown Fine SAND FILL								
	2.0		TOPSOIL- CLAYEY SAND with Organics and Silt- Little Gravel- Black- Moist- Very Loose (SC-SM)	SB1	16	1 1 1	2				
820	4.0		FILL- Fine SAND with Silt- Little Gravel- Brown- Moist to Wet- Loose (SP)	SB2	16	5 4 4	8	24		▽	
			LEAN CLAY- Little Sand and Gravel- Occasional Wet Fine to Medium Sand Seams- Gray- Stiff to Very Stiff (CL)	SB3	16	3 6 8	14	12		▽	
815				SB4	16	7 9 16	25	13		▽	
10	10.0		END OF BORING AT 10.0 FEET.								
810											
15											
805											
20											
800											
25											
795											
30											

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	4.0	819.6
▽ AT END OF BORING:	7.0	816.6

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RIG NO.: 281

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ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	NORTHING: 846929.7 FT EASTING: 13021320.9 FT OFFSET: 10' W due to overhead lines SURFACE ELEVATION: 816.7 FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE - O	DRY DENSITY (pcf) - ■				MOISTURE & ATTERBERG LIMITS (%)				REMARKS
								90	100	110	120	PL	MC	LL	SH	
816.7	0		2 inches of TOPSOIL													
815.2	1.5		FILL- CLAYEY SAND with Silt- Little Gravel- Dark Brown- Moist- Very Loose (SC-SM)	SB1	16	1 1 1								44	0.8	
813.2	3.5		ORGANIC LEAN CLAY- Little Sand and Gravel- Dark Brown and Black- Medium (OL)	SB2	16	1 1 1										
810	5		Fine SAND with Silt- Little Gravel- Frequent Peat Seams and Partings- Gray and Black- Wet- Very Loose (SP-SM)	SB3	5	0 1 1										
808.2	8.5		Fine SAND with Silt- Little Gravel- Gray- Wet- Medium Dense (SP)	SB4	15	2 4 6										
806.7	10.0		END OF BORING AT 10.0 FEET.													

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	2.5	814.2
▽ AT END OF BORING:	3.0	813.7

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DRILLER: JB

RIG NO.: 281

LOGGED BY: JLN

CHECKED BY: JLN

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	NORTHING: 846485.5 FT EASTING: 13022589.2 FT OFFSET: 5' East of stake SURFACE ELEVATION: 815.9 FT PROFILE DESCRIPTION	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE - O	DRY DENSITY (pcf) - ■			MOISTURE & ATTERBERG LIMITS (%)				STRENGTH (KSF)				REMARKS
								90	100	110	120	PL	MC	LL	1	2	3	4	
815	0.2	[Cross-hatched]	2 inches of Hot Mix ASPHALT (HMA) Pavement																
810	5	[Dotted]	FILL- Fine SAND with Silt- Little Gravel- Occasional Pockets of Lean Clay and Coarse Gravel- Brown- Moist- Loose to Medium Dense (SP-SM)	SB1	16	7 5 4	9												
				SB2	16	3 4 4	8												
				SB3	5	3 2 2	4												
				SB4	16	3 12 13	25												
805	12.0	[Dotted]	Fine to Medium SAND- Little Silt and Gravel- Brown- Wet- Loose (SP)																
				SB5	16	2 4 4	8												
800	15.0	[Dotted]	END OF BORING AT 15.0 FEET.																

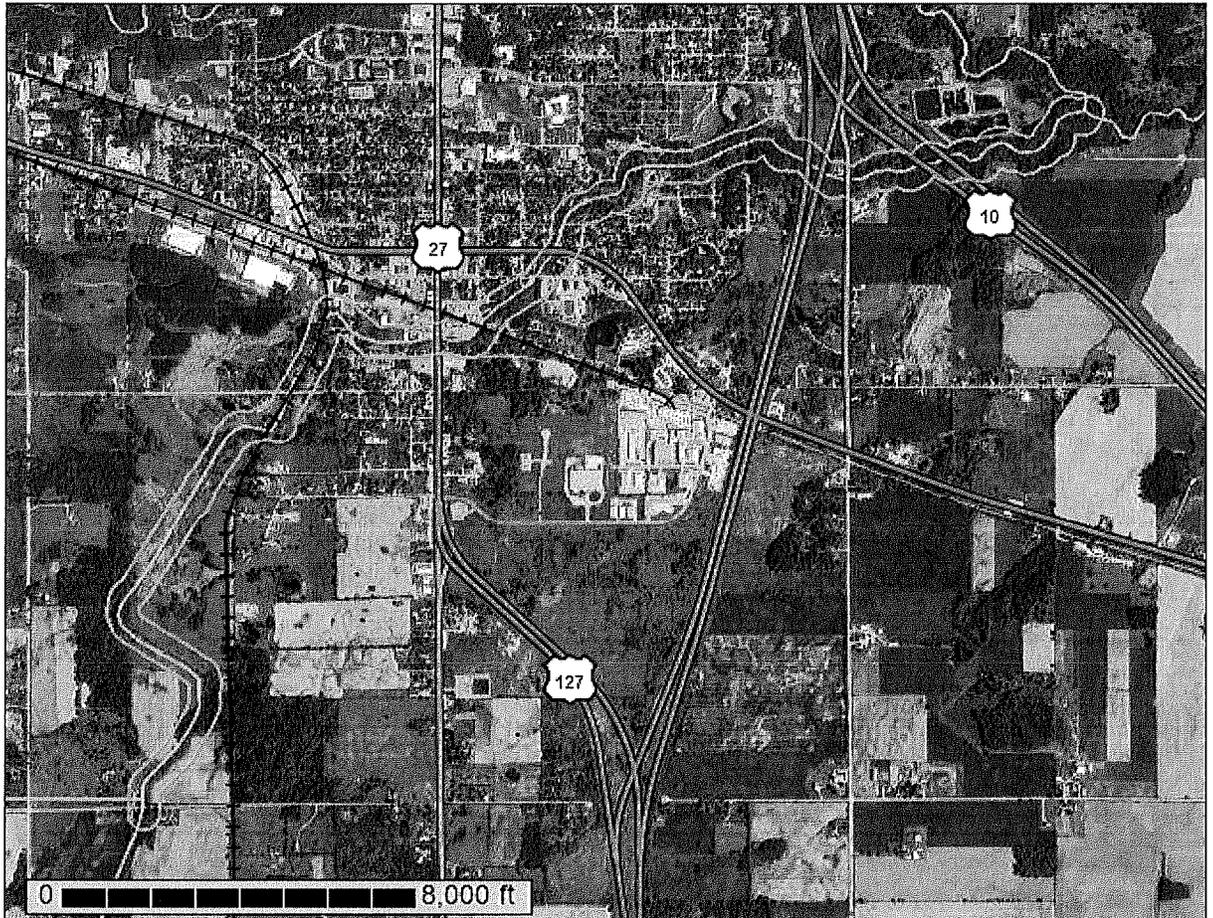
GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	7.5	808.4
▽ AT END OF BORING:	8.0	807.9

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.

# Custom Soil Resource Report for Clare County, Michigan, and Isabella County, Michigan



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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

# Soil Map

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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

## MAP LEGEND

	Area of Interest (AOI)		Spoil Area
	Soils		Stony Spot
	Soil Map Unit Polygons		Very Stony Spot
	Soil Map Unit Lines		Wet Spot
	Soil Map Unit Points		Other
	Special Point Features		Special Line Features
	Blowout		
	Borrow Pit	<b>Water Features</b>	
	Clay Spot		Streams and Canals
	Closed Depression	<b>Transportation</b>	
	Gravel Pit		Rails
	Gravelly Spot		Interstate Highways
	Landfill		US Routes
	Lava Flow		Major Roads
	Marsh or swamp		Local Roads
	Mine or Quarry	<b>Background</b>	
	Miscellaneous Water		Aerial Photography
	Perennial Water		
	Rock Outcrop		
	Saline Spot		
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800. Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clare County, Michigan  
 Survey Area Data: Version 12, Sep 15, 2014

Soil Survey Area: Isabella County, Michigan  
 Survey Area Data: Version 8, Sep 16, 2014

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 20, 2010—May 25, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Custom Soil Resource Report

Isabella County, Michigan (MI073)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
35B	Metea loamy sand, 1 to 6 percent slopes	0.6	0.3%
36	Adrian muck, 0 to 1 percent slopes	0.4	0.2%
42	Edwards muck, 0 to 1 percent slopes	1.1	0.6%
61A	Selfridge sand, 0 to 3 percent slopes	6.6	3.3%
<b>Subtotals for Soil Survey Area</b>		<b>68.5</b>	<b>34.8%</b>
<b>Totals for Area of Interest</b>		<b>197.0</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If

## Clare County, Michigan

### Co—Colonville fine sandy loam

#### Map Unit Setting

*National map unit symbol:* 6c9h  
*Elevation:* 600 to 1,400 feet  
*Mean annual precipitation:* 22 to 44 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 70 to 140 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Colonville and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Colonville

##### Setting

*Landform:* Flood plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Loamy over stratified sandy and silty alluvium

##### Typical profile

*H1 - 0 to 17 inches:* fine sandy loam  
*H2 - 17 to 60 inches:* sand

##### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat poorly drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)  
*Depth to water table:* About 12 to 24 inches  
*Frequency of flooding:* Frequent  
*Frequency of ponding:* None  
*Available water storage in profile:* Low (about 5.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4w  
*Hydrologic Soil Group:* A/D

#### Minor Components

##### Evert

*Percent of map unit:* 5 percent  
*Landform:* Flood plains  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

## Custom Soil Resource Report

*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)  
*Depth to water table:* About 6 to 18 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 20 percent  
*Available water storage in profile:* Low (about 3.5 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3w  
*Hydrologic Soil Group:* A/D

### Minor Components

#### Wheatley

*Percent of map unit:* 5 percent  
*Landform:* Depressions on outwash plains, depressions on lake plains  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### losco

*Percent of map unit:* 5 percent  
*Landform:* Outwash plains, lake plains, till plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### Mancelona

*Percent of map unit:* 5 percent  
*Landform:* Outwash plains, lake plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

## IkA—losco-Kawkawlin complex, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 6c9t  
*Elevation:* 600 to 1,600 feet  
*Mean annual precipitation:* 27 to 32 inches  
*Mean annual air temperature:* 41 to 46 degrees F  
*Frost-free period:* 70 to 140 days  
*Farmland classification:* Prime farmland if drained

### Map Unit Composition

*losco and similar soils:* 55 percent  
*Kawkawlin and similar soils:* 35 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Custom Soil Resource Report

*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 30 percent  
*Available water storage in profile:* High (about 9.2 inches)

### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2w  
*Hydrologic Soil Group:* C/D

### **Minor Components**

#### **Brevort**

*Percent of map unit:* 4 percent  
*Landform:* Depressions on lake plains, depressions on till plains  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### **Sims**

*Percent of map unit:* 3 percent  
*Landform:* Depressions on moraines, depressions on till plains  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### **Menominee**

*Percent of map unit:* 3 percent  
*Landform:* Moraines, outwash plains, till plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

## **Lu—Lupton muck, 0 to 1 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 2qz6h  
*Elevation:* 690 to 1,460 feet  
*Mean annual precipitation:* 28 to 36 inches  
*Mean annual air temperature:* 41 to 48 degrees F  
*Frost-free period:* 90 to 160 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Lupton and similar soils:* 92 percent  
*Minor components:* 8 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Custom Soil Resource Report

*Down-slope shape:* Concave  
*Across-slope shape:* Linear, concave

### **Au gres**

*Percent of map unit:* 1 percent  
*Landform:* Drainageways, swales  
*Landform position (two-dimensional):* Toeslope, footslope  
*Landform position (three-dimensional):* Base slope, side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex, concave

## **MaB—Mancelona loamy sand, 0 to 6 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 6c9y  
*Elevation:* 600 to 1,800 feet  
*Mean annual precipitation:* 27 to 34 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 80 to 150 days  
*Farmland classification:* Farmland of local importance

### **Map Unit Composition**

*Mancelona and similar soils:* 94 percent  
*Minor components:* 6 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Mancelona**

#### **Setting**

*Landform:* Lake plains, outwash plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* 18 to 40 inches of sandy and/or gravelly material over calcareous sandy and gravelly glaciofluvial deposits

#### **Typical profile**

*H1 - 0 to 3 inches:* loamy sand  
*H2 - 3 to 18 inches:* gravelly loamy sand  
*H3 - 18 to 27 inches:* gravelly sandy loam  
*H4 - 27 to 60 inches:* gravelly sand

#### **Properties and qualities**

*Slope:* 0 to 6 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None

## Custom Soil Resource Report

*H2 - 11 to 14 inches: loamy sand*

*H3 - 14 to 23 inches: loamy sand*

*H4 - 23 to 46 inches: clay loam*

*H5 - 46 to 60 inches: clay loam*

### Properties and qualities

*Slope: 0 to 6 percent*

*Depth to restrictive feature: More than 80 inches*

*Natural drainage class: Well drained*

*Runoff class: Low*

*Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Calcium carbonate, maximum in profile: 30 percent*

*Available water storage in profile: Moderate (about 8.0 inches)*

### Interpretive groups

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 3s*

*Hydrologic Soil Group: C*

### Minor Components

#### Nester

*Percent of map unit: 5 percent*

*Landform: Till plains, moraines*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Montcalm

*Percent of map unit: 3 percent*

*Landform: Till plains, outwash plains, moraines*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Iosco

*Percent of map unit: 3 percent*

*Landform: Outwash plains, till plains, lake plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Kawkawlin

*Percent of map unit: 2 percent*

*Landform: Moraines, till plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Mancelona

*Percent of map unit: 2 percent*

*Landform: Outwash plains, lake plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

## Custom Soil Resource Report

*Landform:* Till plains, moraines, outwash plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

### **Nester**

*Percent of map unit:* 5 percent  
*Landform:* Moraines, till plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

### **Melita**

*Percent of map unit:* 5 percent  
*Landform:* Till plains, lake plains, moraines, outwash plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

## **MtC—Montcalm loamy sand, 6 to 12 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 6cb8  
*Elevation:* 600 to 1,400 feet  
*Mean annual precipitation:* 27 to 32 inches  
*Mean annual air temperature:* 41 to 46 degrees F  
*Frost-free period:* 90 to 140 days  
*Farmland classification:* Farmland of local importance

### **Map Unit Composition**

*Montcalm and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Montcalm**

#### **Setting**

*Landform:* Moraines, outwash plains, till plains  
*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Interfluvium, head slope, nose slope, side slope, base slope, crest  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear, convex  
*Parent material:* Sandy and loamy glaciofluvial deposits and/or drift

#### **Typical profile**

*H1 - 0 to 7 inches:* loamy sand  
*H2 - 7 to 21 inches:* loamy sand  
*H3 - 21 to 60 inches:* stratified sand to sandy loam

## Custom Soil Resource Report

*Minor components: 13 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Nester

#### Setting

*Landform: Till plains, moraines*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Parent material: 20 to 36 inches of loamy and clayey material over calcareous loamy and clayey till*

#### Typical profile

*H1 - 0 to 7 inches: loam*

*H2 - 7 to 14 inches: loam*

*H3 - 14 to 25 inches: clay loam*

*H4 - 25 to 60 inches: clay loam*

#### Properties and qualities

*Slope: 2 to 6 percent*

*Depth to restrictive feature: More than 80 inches*

*Natural drainage class: Well drained*

*Runoff class: High*

*Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Calcium carbonate, maximum in profile: 30 percent*

*Available water storage in profile: High (about 9.2 inches)*

#### Interpretive groups

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 2e*

*Hydrologic Soil Group: C*

### Minor Components

#### Kawkawlin

*Percent of map unit: 7 percent*

*Landform: Moraines, till plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Menominee

*Percent of map unit: 3 percent*

*Landform: Outwash plains, moraines, till plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Montcalm

*Percent of map unit: 3 percent*

*Landform: Till plains, moraines, outwash plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

## Custom Soil Resource Report

*Land capability classification (nonirrigated): 3e*  
*Hydrologic Soil Group: C*

### Minor Components

#### Montcalm

*Percent of map unit: 5 percent*  
*Landform: Outwash plains, moraines, till plains*  
*Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope*  
*Landform position (three-dimensional): Interfluvium, head slope, nose slope, side slope, base slope, crest*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear, convex*

#### Menominee

*Percent of map unit: 5 percent*  
*Landform: Till plains, moraines, outwash plains*  
*Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope*  
*Landform position (three-dimensional): Interfluvium, head slope, nose slope, side slope, base slope, crest*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear, convex*

#### Kawkawlin

*Percent of map unit: 3 percent*  
*Landform: Moraines, till plains*  
*Landform position (two-dimensional): Toeslope, footslope*  
*Landform position (three-dimensional): Base slope*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*

#### Iosco

*Percent of map unit: 2 percent*  
*Landform: Outwash plains, till plains, lake plains*  
*Landform position (two-dimensional): Toeslope, footslope*  
*Landform position (three-dimensional): Base slope*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*

### NeD—Nester loam, 12 to 18 percent slopes

#### Map Unit Setting

*National map unit symbol: 6cbf*  
*Elevation: 600 to 1,400 feet*  
*Mean annual precipitation: 27 to 32 inches*  
*Mean annual air temperature: 41 to 46 degrees F*  
*Frost-free period: 90 to 140 days*  
*Farmland classification: Farmland of local importance*

## Custom Soil Resource Report

*Landform:* Till plains, moraines, outwash plains

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Interfluve, head slope, nose slope, side slope, base slope, crest

*Down-slope shape:* Linear, convex

*Across-slope shape:* Convex, concave

### SI—Sewage lagoon

#### Map Unit Composition

*Sewage lagoon:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### W—Water

#### Map Unit Composition

*Water:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Wh—Wheatley loamy sand

#### Map Unit Setting

*National map unit symbol:* 6cbs

*Elevation:* 600 to 1,400 feet

*Mean annual precipitation:* 22 to 44 inches

*Mean annual air temperature:* 39 to 46 degrees F

*Frost-free period:* 80 to 140 days

*Farmland classification:* Farmland of local importance

#### Map Unit Composition

*Wheatley and similar soils:* 85 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Wheatley

##### Setting

*Landform:* Depressions on lake plains, depressions on outwash plains

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy and gravelly glaciofluvial deposits

##### Typical profile

*H1 - 0 to 8 inches:* loamy sand

*H2 - 8 to 29 inches:* sand

## Isabella County, Michigan

### 10—Pinnebog muck

#### Map Unit Setting

*National map unit symbol:* 6852  
*Elevation:* 600 to 1,000 feet  
*Mean annual precipitation:* 30 to 36 inches  
*Mean annual air temperature:* 45 to 48 degrees F  
*Frost-free period:* 140 to 150 days  
*Farmland classification:* Farmland of local importance

#### Map Unit Composition

*Pinnebog and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Pinnebog

##### Setting

*Landform:* Outwash plains  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Herbaceous organic material

##### Typical profile

*Oa - 0 to 18 inches:* muck  
*Oe - 18 to 26 inches:* mucky peat  
*O'a - 26 to 60 inches:* muck

##### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Very poorly drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.20 to 5.95 in/hr)  
*Depth to water table:* About 0 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* Frequent  
*Available water storage in profile:* Very high (about 24.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 5w  
*Hydrologic Soil Group:* A/D

### 11C—Spinks sand, 6 to 12 percent slopes

#### Map Unit Setting

*National map unit symbol:* 6854

## 12B—Coloma sand, 0 to 6 percent slopes

### Map Unit Setting

*National map unit symbol:* 6856  
*Elevation:* 580 to 1,360 feet  
*Mean annual precipitation:* 28 to 37 inches  
*Mean annual air temperature:* 45 to 54 degrees F  
*Frost-free period:* 120 to 180 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Coloma and similar soils:* 95 percent  
*Minor components:* 5 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Coloma

#### Setting

*Landform:* Moraines  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Sandy glaciofluvial deposits

#### Typical profile

*Ap - 0 to 11 inches:* sand  
*E and Bt - 11 to 60 inches:* sand

#### Properties and qualities

*Slope:* 0 to 6 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Excessively drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water storage in profile:* Low (about 5.2 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 4s  
*Hydrologic Soil Group:* A

### Minor Components

#### Thetford

*Percent of map unit:* 3 percent

## Custom Soil Resource Report

### Minor Components

#### Shoals

*Percent of map unit:* 2 percent  
*Landform:* Flood plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### Adrian

*Percent of map unit:* 2 percent  
*Landform:* Depressions  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave

#### Alganssee

*Percent of map unit:* 2 percent  
*Landform:* Flood plains  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### Pinnebog

*Percent of map unit:* 2 percent  
*Landform:* Depressions  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave

## 19—Gilford fine sandy loam

### Map Unit Setting

*National map unit symbol:* 685m  
*Elevation:* 50 to 1,100 feet  
*Mean annual precipitation:* 30 to 36 inches  
*Mean annual air temperature:* 45 to 48 degrees F  
*Frost-free period:* 140 to 150 days  
*Farmland classification:* Prime farmland if drained

### Map Unit Composition

*Gilford and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Gilford

#### Setting

*Landform:* Glacial drainage channels  
*Landform position (three-dimensional):* Talf

## Custom Soil Resource Report

*Minor components: 13 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Pipestone

#### Setting

*Landform: Outwash plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Parent material: Sandy outwash*

#### Typical profile

*A - 0 to 2 inches: sand*

*E - 2 to 4 inches: sand*

*Bh - 4 to 11 inches: sand*

*C - 11 to 60 inches: sand*

#### Properties and qualities

*Slope: 0 to 3 percent*

*Depth to restrictive feature: More than 80 inches*

*Natural drainage class: Somewhat poorly drained*

*Runoff class: Negligible*

*Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)*

*Depth to water table: About 6 to 18 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Available water storage in profile: Low (about 3.8 inches)*

#### Interpretive groups

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 4w*

*Hydrologic Soil Group: A/D*

### Minor Components

#### Kingsville

*Percent of map unit: 4 percent*

*Landform: Depressions*

*Landform position (three-dimensional): Talf*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Wixom

*Percent of map unit: 3 percent*

*Landform: Beach ridges*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

#### Minoa

*Percent of map unit: 3 percent*

*Landform: Wave-worked till plains*

*Landform position (three-dimensional): Rise*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

## Custom Soil Resource Report

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 2e

*Hydrologic Soil Group:* C/D

### Minor Components

#### Ziegenfuss

*Percent of map unit:* 5 percent

*Landform:* Depressions

#### Perrinton

*Percent of map unit:* 5 percent

## 35B—Metea loamy sand, 1 to 6 percent slopes

### Map Unit Setting

*National map unit symbol:* 6863

*Elevation:* 250 to 1,200 feet

*Mean annual precipitation:* 30 to 36 inches

*Mean annual air temperature:* 45 to 48 degrees F

*Frost-free period:* 140 to 150 days

*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Metea and similar soils:* 88 percent

*Minor components:* 12 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Metea

#### Setting

*Landform:* Moraines

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy and/or loamy till

#### Typical profile

*Ap - 0 to 9 inches:* loamy sand

*Bw - 9 to 22 inches:* loamy sand

*2Bt - 22 to 28 inches:* loam

*2C - 28 to 60 inches:* loam

#### Properties and qualities

*Slope:* 1 to 6 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Very low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.57 to 1.98 in/hr)

## Custom Soil Resource Report

### Typical profile

*Oa1 - 0 to 12 inches:* muck  
*Oa2 - 12 to 34 inches:* muck  
*Cg - 34 to 80 inches:* sand

### Properties and qualities

*Slope:* 0 to 1 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Very poorly drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to very high (0.14 to 14.17 in/hr)  
*Depth to water table:* About 0 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* Frequent  
*Calcium carbonate, maximum in profile:* 15 percent  
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 0.4  
*Available water storage in profile:* Very high (about 15.1 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 5w  
*Hydrologic Soil Group:* B/D

### Minor Components

#### Kingsville

*Percent of map unit:* 3 percent  
*Landform:* Outwash plains, nearshore zones (relict)  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### Edwards

*Percent of map unit:* 2 percent  
*Landform:* Depressions on outwash plains, depressions on moraines on outwash plains  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Base slope, dip  
*Down-slope shape:* Concave, linear  
*Across-slope shape:* Linear

#### Houghton

*Percent of map unit:* 2 percent  
*Landform:* Depressions on outwash plains, depressions on moraines on outwash plains  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Base slope, dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear

#### Gilford

*Percent of map unit:* 1 percent  
*Landform:* Lakebeds (relict) on moraines, lakebeds (relict) on glacial drainage channels, lakebeds (relict) on outwash plains  
*Landform position (two-dimensional):* Toeslope

## Custom Soil Resource Report

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 5w

*Hydrologic Soil Group:* C/D

### Minor Components

#### Adrian

*Percent of map unit:* 3 percent

*Landform:* Lakebeds (relict) on moraines, lakebeds (relict) on glacial drainage channels, lakebeds (relict) on outwash plains

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Base slope, dip

*Down-slope shape:* Concave

*Across-slope shape:* Linear

#### Houghton

*Percent of map unit:* 3 percent

*Landform:* Lakebeds (relict) on glacial drainage channels, lakebeds (relict) on outwash plains, lakebeds (relict) on moraines

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Base slope, dip

*Down-slope shape:* Concave

*Across-slope shape:* Linear

#### Gilford

*Percent of map unit:* 2 percent

*Landform:* Lakebeds (relict) on moraines, lakebeds (relict) on glacial drainage channels, lakebeds (relict) on outwash plains

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Base slope, talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

#### Palms

*Percent of map unit:* 2 percent

*Landform:* Drainageways on moraines, drainageways on glacial drainage channels, drainageways on moraines, drainageways on outwash plains, depressions on moraines, depressions on outwash plains, depressions on outwash plains

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Base slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

## 61A—Selfridge sand, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 684g

*Elevation:* 600 to 1,200 feet

*Mean annual precipitation:* 30 to 36 inches

## Custom Soil Resource Report

### **Londo**

*Percent of map unit:* 2 percent

*Landform:* Till plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

### **Corunna**

*Percent of map unit:* 2 percent

*Landform:* Depressions

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

### **Parkhill**

*Percent of map unit:* 2 percent

*Landform:* Depressions

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

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