

ENGINEERING INDEX PROPERTIES  
Emmons County, North Dakota

Engineering Index Properties table gives the engineering classifications and the range of index properties for the layers of each soil in the survey area. Depth to the upper and lower boundaries of each layer is indicated. Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. Loam, for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, gravelly. Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1998) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1998). The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in Engineering Index Properties table.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
3: Regan-----	0-35 35-60	Silt loam Stratified sandy loam to silty clay loam	CL, CL-ML CL, ML, SC, SM	A-4, A-6 A-4, A-6, A-7	0 0	0 0	100 100	100 100	95-100 65-100	70-95 35-95	20-40 15-50	5-20 NP-30
6B: Niobell-----	0-10 10-23 23-60	Loam Clay loam, loam Loam, clay loam	CL, CL-ML, ML CH, CL CL, CL-ML, ML	A-4, A-6 A-6, A-7 A-4, A-6	0 0 0	0 0-1 0-1	95-100 95-100 95-100	95-100 95-100 95-100	85-95 90-100 85-95	60-75 70-80 60-75	25-38 30-60 25-40	3-15 15-35 3-18
8: Heil-----	0-3 3-35 35-60	Silt loam Silty clay, clay Silty clay, silty clay loam, loam	CL CH CH, CL	A-6, A-7 A-7 A-6, A-7	0 0 0	0 0 0	100 100 100	100 100 100	90-100 90-100 85-100	70-100 75-100 60-100	25-45 50-75 25-75	10-25 25-45 11-45
9: Tonka-----	0-18 18-39 39-60	Silt loam Silty clay loam, clay loam, clay Silty clay loam, loam	CL, CL-ML CH, CL CL, CL-ML	A-4, A-6 A-6, A-7 A-4, A-6, A-7	0-1 0-1 0-1	0-2 0-2 0-3	100 100 90-100	95-100 95-100 85-100	90-100 90-100 60-100	70-90 75-95 50-90	20-35 35-55 25-50	5-15 15-35 5-30
10: Parnell-----	0-9 9-39 39-60	Silt loam Clay loam, silty clay loam, silty clay Clay loam, silty clay loam, silty clay	CL, OL CH, CL CH, CL	A-6, A-7-6 A-7 A-7	0 0 0	0-1 0-2 0-2	100 100 95-100	100 95-100 90-100	90-100 90-100 80-95	70-90 70-100 70-95	40-45 50-75 50-60	20-25 30-50 30-40
11: Straw-----	0-24 24-60	Silt loam Loam, silt loam, clay loam	CL, CL-ML CL, CL-ML, SC, SM	A-4 A-2, A-4, A-6	0 0	0 0	95-100 90-100	90-100 80-100	85-100 60-100	60-90 25-60	20-30 15-40	5-10 3-20
Channeled-----	---	---	---	---	---	---	---	---	---	---	---	---
12: Neché Variant--	0-7 7-60	Loam Loam, silt loam	CL, ML CL, ML	A-4, A-6 A-4, A-6	0 0	0 0	100 100	100 100	85-100 85-100	60-75 60-90	25-40 25-40	3-15 3-15
13: Arnegard-----	0-15 15-32 32-60	Loam Loam, silt loam, clay loam Loam, clay loam, fine sandy loam	CL, CL-ML CL CL, ML, SC, SM	A-6, A-4 A-6 A-4, A-6	0 0 0	0 0 0	100 100 100	100 100 100	85-95 85-100 70-100	60-85 50-85 40-80	20-35 25-40 15-40	5-20 12-25 NP-15
13B: Arnegard-----	0-15 15-32 32-60	Loam Loam, silt loam, clay loam Loam, clay loam, fine sandy loam	CL, CL-ML CL CL, ML, SC, SM	A-4, A-6 A-6 A-4, A-6	0 0 0	0 0 0	100 100 100	100 100 100	85-95 85-100 70-100	60-85 50-85 40-80	20-35 25-40 15-40	5-20 12-25 NP-15
15D: Cabba-----	0-10 10-17 17-60	Loam Loam, silt loam, silty clay loam Weathered bedrock	CL, CL-ML, ML CL, CL-ML ---	A-4 A-4, A-6 ---	0 0 ---	0-5 0-5 ---	90-100 95-100 ---	85-100 90-100 ---	70-90 85-100 ---	60-80 80-95 ---	20-30 25-35 ---	NP-10 5-15 ---
Amor-----	0-6 6-19 19-29 29-60	Loam Loam, clay loam Clay loam, loam, fine sandy loam Weathered bedrock	CL, CL-ML, ML CL, CL-ML CL, CL-ML, ML ---	A-4, A-6 A-4, A-6 A-4, A-6, A-7 ---	0 0 0 ---	0 0 0 ---	100 100 100 ---	95-100 95-100 95-100 ---	85-90 90-100 75-100 ---	60-70 65-85 50-80 ---	25-40 20-45 20-45 ---	3-18 5-25 2-25 ---

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
15E: Cabba-----	0-10	Loam	CL, CL-ML, ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	10-17	Loam, silt loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	17-60	Weathered bedrock			---	---	---	---	---	---	---	---
Amor-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-90	60-70	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
17: Stady-----	0-7	Loam	CL, ML	A-4, A-6	0	0	100	95-100	85-95	55-80	30-40	7-15
	7-22	Loam, clay loam	CL, ML	A-4, A-6	0	0	95-100	90-100	70-95	50-75	30-40	8-15
	22-26	Gravelly loam, sandy loam, loam	CL-ML, ML, SC-SM, SM	A-2, A-4	0	0	90-100	80-100	60-95	30-60	25-35	5-10
	26-60	Very gravelly sand, gravelly loamy sand, very gravelly loamy sand	SM, SP-SM, SW-SM	A-1, A-2	---	0-5	60-95	50-85	25-50	5-30	0-30	NP-5
Lehr-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	95-100	95-100	85-95	60-80	20-40	3-15
	6-15	Loam, clay loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0-2	0-5	90-100	80-100	75-95	40-75	25-40	5-15
	15-19	Gravelly coarse sandy loam, gravelly loamy coarse sand	SM, SP-SM	A-1	0-2	0-5	65-90	50-75	30-50	5-15	0-14	NP
	19-60	Gravelly loamy sand, gravelly sand, very gravelly coarse sand	GM, GP, SM, SP	A-1	0-2	0-5	40-80	25-60	10-35	2-15	0-14	NP
17B: Stady-----	0-7	Loam	CL, ML	A-4, A-6	0	0	100	95-100	85-95	55-80	30-40	7-15
	7-22	Loam, clay loam	CL, ML	A-4, A-6	0	0	95-100	90-100	70-95	50-75	30-40	8-15
	22-26	Gravelly loam, sandy loam, loam	CL-ML, ML, SC-SM, SM	A-2, A-4	0	0	90-100	80-100	60-95	30-60	25-35	5-10
	26-60	Very gravelly sand, gravelly loamy sand, very gravelly loamy sand	SM, SP-SM, SW-SM	A-1, A-2	---	0-5	60-95	50-85	25-50	5-30	0-30	NP-5
Lehr-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	95-100	95-100	85-95	60-80	20-40	3-15
	6-15	Loam, clay loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0-2	0-5	90-100	80-100	75-95	40-75	25-40	5-15
	15-19	Gravelly coarse sandy loam, gravelly loamy coarse sand	SM, SP-SM	A-1	0-2	0-5	65-90	50-75	30-50	5-15	0-14	NP
	19-60	Gravelly loamy sand, gravelly sand, very gravelly coarse sand	SP, GM, GP, SM	A-1	0-2	0-5	40-80	25-60	10-35	2-15	0-14	NP

ENGINEERING INDEX PROPERTIES--Continued  
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Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
17C: Stady-----	0-7	Loam	CL, ML	A-4, A-6	0	0	100	95-100	85-95	55-80	30-40	7-15
	7-22	Loam, clay loam	CL, ML	A-6, A-4	0	0	95-100	90-100	70-95	50-75	30-40	8-15
	22-26	Gravelly loam, sandy loam, loam	CL-ML, ML, SC-SM, SM	A-2, A-4	0	0	90-100	80-100	60-95	30-60	25-35	5-10
	26-60	Very gravelly sand, gravelly loamy sand, very gravelly loamy sand	SM, SP-SM, SW-SM	A-1, A-2	---	0-5	60-95	50-85	25-50	5-30	0-30	NP-5
Lehr-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	95-100	95-100	85-95	60-80	20-40	3-15
	6-15	Loam, clay loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0-2	0-5	90-100	80-100	75-95	40-75	25-40	5-15
	15-19	Gravelly coarse sandy loam, gravelly loamy coarse sand	SM, SP-SM	A-1	0-2	0-5	65-90	50-75	30-50	5-15	0-14	NP
	19-60	Gravelly loamy sand, gravelly sand, very gravelly coarse sand	GM, GP, SM, SP	A-1	0-2	0-5	40-80	25-60	10-35	2-15	0-14	NP
18B: Reeder-----	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	65-85	20-40	5-20
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
Rhoades-----	0-4	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	4-24	Clay loam, silty clay, clay	CL, CH	A-7	0	0	100	100	90-100	80-95	40-75	20-45
	24-48	Silty clay, clay loam, loam	CH, CL	A-6, A-7	0	0	100	100	85-100	75-95	35-70	20-40
	48-60	Weathered bedrock			---	---	---	---	---	---	---	---
18C: Reeder-----	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	65-85	20-40	5-20
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
Rhoades-----	0-4	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	4-24	Clay loam, silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-95	40-75	20-45
	24-48	Silty clay, clay loam, loam	CH, CL	A-6, A-7	0	0	100	100	85-100	75-95	35-70	20-40
	48-60	Weathered bedrock			---	---	---	---	---	---	---	---
19: Straw-----	0-24	Silt loam	CL, CL-ML	A-4	0	0	95-100	90-100	85-100	60-90	20-30	5-10
	24-60	Loam, silt loam, clay loam	CL, CL-ML, SC, SM	A-2, A-4, A-6	0	0	90-100	80-100	60-100	25-60	15-40	3-20
21: Shambo-----	0-5	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-35	3-13
	5-14	Loam, silt loam, clay loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-40	3-18
	14-31	Loam, silt loam, clay loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-40	3-18
	31-60	Loam, silt loam, clay loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-40	3-18

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
21B: Shambo-----	0-5	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-35	3-13
	5-14	Loam, silt loam, clay loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-40	3-18
	14-31	Loam, silt loam, clay loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-40	3-18
	31-60	Loam, silt loam, clay loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-75	25-40	3-18
22: Belfield-----	0-14	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	14-43	Silty clay, silty clay loam, clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-100	35-65	15-40
	43-60	Silty clay, silty clay loam, clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-100	30-55	10-30
Daglum-----	0-7	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	7-27	Clay, silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-95	35-75	15-45
	27-46	Clay, silty clay, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	65-95	35-50	20-30
	46-60	Weathered bedrock			---	---	---	---	---	---	---	---
22B: Belfield-----	0-14	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	14-43	Silty clay, silty clay loam, clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-100	35-65	15-40
	43-60	Silty clay, silty clay loam, clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-100	30-55	10-30
Daglum-----	0-7	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	7-27	Clay, silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-95	35-75	15-45
	27-46	Clay, silty clay, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	65-95	35-50	20-30
	46-60	Weathered bedrock			---	---	---	---	---	---	---	---
23D: Vebar-----	0-7	Fine sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	7-23	Fine sandy loam, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	23-30	Fine sandy loam, loamy fine sand, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	30-60	Weathered bedrock			---	---	---	---	---	---	---	---
Cohagen-----	0-16	Fine sandy loam	SM	A-2, A-4	0	0	100	95-100	60-85	30-50	---	NP
	16-60	Weathered bedrock			---	---	---	---	---	---	---	---
23E: Vebar-----	0-7	Fine sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	7-23	Fine sandy loam, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	23-30	Fine sandy loam, loamy fine sand, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	30-60	Weathered bedrock			---	---	---	---	---	---	---	---
Cohagen-----	0-16	Fine sandy loam	SM	A-2, A-4	0	0	100	95-100	60-85	30-50	---	NP
	16-60	Weathered bedrock			---	---	---	---	---	---	---	---
24: Grassna-----	0-18	Silt loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	90-100	70-100	20-45	3-25
	18-60	Silt loam, silty clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	90-100	70-100	25-45	3-23

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Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
24B: Grassna-----	0-18	Silt loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	90-100	70-100	20-45	3-25
	18-60	Silt loam, silty clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	90-100	70-100	25-45	3-23
25B: Flaxton-----	0-26	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	40-55	0-30	NP-5
	26-38	Fine sandy loam, loamy fine sand	SM	A-2, A-4	0	0	100	100	60-95	25-45	0-30	NP-5
	38-60	Clay loam, loam	CL, CL-ML, ML	A-4, A-6, A-7	---	0-5	85-100	80-100	75-95	60-80	25-45	5-25
25C: Flaxton-----	0-26	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	40-55	0-30	NP-5
	26-38	Fine sandy loam, loamy fine sand	SM	A-2, A-4	0	0	100	100	60-95	25-45	0-30	NP-5
	38-60	Clay loam, loam	CL, CL-ML, ML	A-4, A-6, A-7	---	0-5	85-100	80-100	75-95	60-80	25-45	5-25
25D: Flaxton-----	0-26	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	40-55	0-30	NP-5
	26-38	Fine sandy loam, loamy fine sand	SM	A-2, A-4	0	0	100	100	60-95	25-45	0-30	NP-5
	38-60	Clay loam, loam	CL, CL-ML, ML	A-4, A-6, A-7	---	0-5	85-100	80-100	75-95	60-80	25-45	5-25
26B: Krem-----	0-27	Loamy fine sand	SM	A-2	---	0-1	95-100	95-100	50-75	15-30	0-14	NP
	27-60	Clay loam, loam, sandy clay loam	CL, CL-ML, ML	A-4, A-6, A-7	---	0-5	95-100	95-100	85-95	60-80	25-50	3-28
26C: Krem-----	0-27	Loamy fine sand	SM	A-2	---	0-1	95-100	95-100	50-75	15-30	0-14	NP
	27-60	Clay loam, loam, sandy clay loam	CL, CL-ML, ML	A-4, A-6, A-7	---	0-5	95-100	95-100	85-95	60-80	25-50	3-28
28: Grail-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	95-100	85-95	30-50	10-30
	7-34	Silty clay, silty clay loam, clay	CH, CL, MH, ML	A-6, A-7	0	0	100	95-100	95-100	70-95	35-60	10-35
	34-60	Loam, silty clay loam, clay	CH, CL	A-6, A-7	0	0	100	95-100	85-100	60-95	30-55	10-35
29: Harriet-----	0-3	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-20
	3-18	Clay loam, silty clay loam, silty clay	CH, CL	A-6, A-7	0	0	100	100	90-100	70-100	35-70	20-40
31: Parnell, PONDED	18-60	Loam, silty clay loam, clay loam	CH, CL	A-6	0	0	100	100	90-100	60-100	25-55	10-30
	0-9	Silty clay loam	CH, CL, OL	A-7	0	0	100	95-100	90-100	80-100	40-55	20-35
	9-39	Silty clay, clay, silty clay loam	CH, CL	A-7	0	0	100	95-100	90-100	85-100	50-65	30-40
32B: Lihen-----	39-60	Silty clay, silty clay loam, loam	CH, CL, CL-ML	A-6, A-7	0	0-1	100	95-100	85-100	60-100	35-65	15-40
	0-23	Loamy fine sand	SM	A-2	0	0	100	100	50-90	15-35	0-14	NP
	23-60	Loamy fine sand, loamy sand, fine sand	SM	A-2	0	0	100	100	50-90	15-35	0-25	NP-5
32C: Lihen-----	0-23	Loamy fine sand	SM	A-2	0	0	100	100	50-90	15-35	0-14	NP
	23-60	Loamy fine sand, loamy sand, fine sand	SM	A-2	0	0	100	100	50-90	15-35	0-25	NP-5
	33B: Parshall-----	0-21	Fine sandy loam	CL-ML, ML, SM	A-2, A-4	0	0	100	100	60-85	30-55	15-25
21-30		Fine sandy loam	CL-ML, ML, SM	A-2, A-4	0	0	100	100	60-85	30-55	15-25	NP-10
30-60		Fine sandy loam, sandy loam, loamy sand	CL-ML, ML, SM	A-2, A-4	0	0	100	100	60-100	25-55	15-25	NP-10
Lihen-----	0-23	Fine sandy loam	ML, SM	A-2, A-4	0	0	100	100	60-90	30-55	0-14	NP
	23-60	Loamy fine sand, loamy sand, fine sand	SM	A-2	0	0	100	100	50-90	15-35	0-25	NP-5

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
33C: Parshall-----	0-21	Fine sandy loam	CL-ML, ML, SM	A-2, A-4	0	0	100	100	60-85	30-55	15-25	NP-10
	21-30	Fine sandy loam	CL-ML, ML, SM	A-2, A-4	0	0	100	100	60-85	30-55	15-25	NP-10
	30-60	Fine sandy loam, sandy loam, loamy sand	CL-ML, ML, SM	A-2, A-4	0	0	100	100	60-100	25-55	15-25	NP-10
Lihen-----	0-23	Fine sandy loam	ML, SM	A-2, A-4	0	0	100	100	60-90	30-55	0-14	NP
	23-60	Loamy fine sand, loamy sand, fine sand	SM	A-2	0	0	100	100	50-90	15-35	0-25	NP-5
35C: Sutley-----	0-4	Silt loam	CL, CL-ML, ML	A-4	0	0	100	100	90-100	70-100	25-35	5-10
	4-60	Silt loam, very fine sandy loam	ML	A-4	0	0	100	100	90-100	80-100	20-35	NP-8
35E: Sutley-----	0-4	Silt loam	CL, CL-ML, ML	A-4	0	0	100	100	90-100	70-100	25-35	5-10
	4-60	Silt loam, very fine sandy loam	ML	A-4	0	0	100	100	90-100	80-100	20-35	NP-8
36B: Bryant-----	0-8	Silt loam	CL	A-6, A-7	0	0	100	100	90-100	85-100	30-45	10-20
	8-22	Clay loam, silt loam, silty clay loam	CL, ML	A-6, A-7	0	0	100	100	85-100	70-100	30-49	10-20
	22-60	Clay loam, loam, silt loam	CL	A-6, A-7	0	0	100	100	85-100	70-100	30-45	10-20
36C: Bryant-----	0-8	Silt loam	CL	A-6, A-7	0	0	100	100	90-100	85-100	30-45	10-20
	8-22	Clay loam, silt loam, silty clay loam	CL, ML	A-6, A-7	0	0	100	100	85-100	70-100	30-49	10-20
	22-60	Clay loam, loam, silt loam	CL	A-6, A-7	0	0	100	100	85-100	70-100	30-45	10-20
40C: Amor-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-90	60-70	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
Cabba-----	0-10	Loam	CL, CL-ML, ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	10-17	Loam, silt loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	17-60	Weathered bedrock			---	---	---	---	---	---	---	---
40D: Amor-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-90	60-70	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
Cabba-----	0-10	Loam	CL, CL-ML, ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	10-17	Loam, silt loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	17-60	Weathered bedrock			---	---	---	---	---	---	---	---
41: Reeder-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	85-90	60-70	20-40	5-15
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
41B: Reeder-----	0-6	Loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	85-90	60-70	20-40	5-15
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
41C: Reeder-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	85-90	60-70	20-40	5-15
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
41D: Reeder-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	85-90	60-70	20-40	5-15
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
43D: Reeder, EXTREMELY STON	0-6	Extremely stony loam	CL, CL-ML	A-4, A-6	1-15	1-20	100	100	90-100	65-85	20-40	5-20
	6-20	Clay loam, loam	CL, CL-ML	A-4, A-6, A- 7-6	0	0-5	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock			---	---	---	---	---	---	0-14	---
44: Daglum-----	0-7	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	7-27	Clay, silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-95	35-75	15-45
	27-46	Clay, silty clay, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	65-95	35-50	20-30
	46-60	Weathered bedrock			---	---	---	---	---	---	---	---
Rhoades-----	0-4	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	4-24	Clay loam, silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-95	40-75	20-45
	24-48	Silty clay, clay loam, loam	CH, CL	A-6, A-7	0	0	100	100	85-100	75-95	35-70	20-40
	48-60	Weathered bedrock			---	---	---	---	---	---	---	---
44C: Daglum-----	0-7	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	7-27	Clay, silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-95	35-75	15-45
	27-46	Clay, silty clay, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	65-95	35-50	20-30
	46-60	Weathered bedrock			---	---	---	---	---	---	---	---
Rhoades-----	0-4	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	4-24	Clay loam, silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-95	40-75	20-45
	24-48	Silty clay, clay loam, loam	CH, CL	A-6, A-7	0	0	100	100	85-100	75-95	35-70	20-40
	48-60	Weathered bedrock			---	---	---	---	---	---	---	---

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
46B: Regent-----	0-7	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	80-100	40-55	20-35
	7-31	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-45
	31-60	Weathered bedrock			---	---	---	---	---	---	---	---
Daglum-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	70-85	30-45	15-25
	7-27	Clay, silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-95	35-75	15-45
	27-46	Clay, silty clay, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	65-95	35-50	20-30
	46-60	Weathered bedrock			---	---	---	---	---	---	---	---
46C: Regent-----	0-7	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	80-100	40-55	20-35
	7-31	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-45
	31-60	Weathered bedrock			---	---	---	---	---	---	---	---
Daglum-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	70-85	30-45	15-25
	7-27	Clay, silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	100	100	90-100	70-95	35-75	15-45
	27-46	Clay, silty clay, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	65-95	35-50	20-30
	46-60	Weathered bedrock			---	---	---	---	---	---	---	---
47B: Manning-----	0-7	Fine sandy loam	SM	A-2, A-4	0	0	95-100	95-100	60-85	30-50	0-14	NP
	7-28	Fine sandy loam, loam	CL, ML, SC, SM	A-2, A-4, A-6	0	0-3	85-100	80-100	60-95	30-70	0-35	NP-15
	28-60	Sand and gravel	GM, GP-GM, SM, SP-SM	A-1, A-2	0	0-5	25-75	15-65	10-40	5-35	0-14	NP
49B: Telfer-----	0-15	Loamy fine sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
	15-60	Fine sand, loamy fine sand, loamy sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
51B: Noonan-----	0-9	Loam	CL, CL-ML	A-4, A-6	0-1	0-1	95-100	95-100	80-95	55-75	20-38	5-20
	9-16	Clay loam	CH, CL	A-6, A-7	0-1	0-1	95-100	95-100	85-95	65-85	25-60	10-35
	16-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-1	0-1	90-100	85-100	75-95	60-85	25-50	5-30
53: Bearpaw-----	0-3	Silt loam	CL	A-6	0-1	0-5	95-100	90-100	90-100	70-90	30-40	10-20
	3-14	Clay loam, clay	CH, CL	A-7	0-1	0-5	95-100	90-100	85-100	60-90	40-65	15-40
	14-33	Clay loam, silty clay loam, clay	CH, CL	A-6, A-7	0	0-5	95-100	90-100	85-100	55-85	35-60	15-35
	33-60	Clay loam, silty clay loam, clay	CH, CL	A-6, A-7	0	0-5	95-100	90-100	85-100	55-85	35-60	15-35
53B: Bearpaw-----	0-3	Silt loam	CL	A-6	0-1	0-5	95-100	90-100	90-100	70-90	30-40	10-20
	3-14	Clay loam, clay	CH, CL	A-7	0-1	0-5	95-100	90-100	85-100	60-90	40-65	15-40
	14-33	Clay loam, silty clay loam, clay	CH, CL	A-6, A-7	0	0-5	95-100	90-100	85-100	55-85	35-60	15-35
	33-60	Clay loam, silty clay loam, clay	CH, CL	A-6, A-7	0	0-5	95-100	90-100	85-100	55-85	35-60	15-35
53C: Bearpaw-----	0-3	Silt loam	CL	A-6	0-1	0-5	95-100	90-100	90-100	70-90	30-40	10-20
	3-14	Clay loam, clay	CH, CL	A-7	0-1	0-5	95-100	90-100	85-100	60-90	40-65	15-40
	14-33	Clay loam, silty clay loam, clay	CH, CL	A-6, A-7	0	0-5	95-100	90-100	85-100	55-85	35-60	15-35
	33-60	Clay loam, silty clay loam, clay	CH, CL	A-6, A-7	0	0-5	95-100	90-100	85-100	55-85	35-60	15-35
54: Regent-----	0-9	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	80-100	40-55	20-35
	9-39	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-45
	39-60	Weathered bedrock			---	---	---	---	---	---	---	---

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
54B: Regent-----	0-6	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	80-100	40-55	20-35
	6-31	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-45
	31-60	Weathered bedrock			---	---	---	---	---	---	---	---
54C: Regent-----	0-6	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	80-100	40-55	20-35
	6-31	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-45
	31-60	Weathered bedrock			---	---	---	---	---	---	---	---
54D: Regent-----	0-6	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	80-100	40-55	20-35
	6-31	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	90-100	80-100	45-70	25-45
	31-60	Weathered bedrock			---	---	---	---	---	---	---	---
55C: Rhoades-----	0-4	Silt loam	CL	A-6	0	0	100	100	85-100	60-90	20-40	10-25
	4-24	Clay loam, silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	80-95	40-75	20-45
	24-48	Silty clay, clay loam, loam	CH, CL	A-6, A-7	0	0	100	100	85-100	75-95	35-70	20-40
	48-60	Weathered bedrock			---	---	---	---	---	---	---	---
58: Bowdle-----	0-6	Loam	CL, ML	A-4, A-6	0	0-1	95-100	95-100	85-95	60-75	25-40	3-15
	6-19	Loam	CL, ML	A-4, A-6	0	0-1	95-100	95-100	85-95	60-75	25-40	3-15
	19-32	Loam, gravelly loam	CL, ML	A-4, A-6	0	0-1	80-100	80-100	75-95	55-75	25-40	3-15
	32-60	Sand and gravel	GM, GP, SM, SP	A-1	0	0-1	50-100	50-95	10-30	2-15	0-14	NP
58B: Bowdle-----	0-6	Loam	CL, ML	A-4, A-6	0	0-1	95-100	95-100	85-95	60-75	25-40	3-15
	6-19	Loam	CL, ML	A-4, A-6	0	0-1	95-100	95-100	85-95	60-75	25-40	3-15
	19-32	Loam, gravelly loam	CL, ML	A-4, A-6	0	0-1	80-100	80-100	75-95	55-75	25-40	3-15
	32-60	Sand and gravel	GM, GP, SM, SP	A-1	0	0-1	50-100	50-95	10-30	2-15	0-14	NP
60B: Farland-----	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	70-90	20-40	5-20
	6-15	Silty clay loam, clay loam	CH, CL	A-7	0	0	100	100	90-100	80-95	40-60	15-35
	15-29	Loam, silt loam, silty clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	85-100	80-90	25-50	5-20
	29-60	Stratified very fine sand to silty clay	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	75-100	50-95	20-50	3-25
62: Amor-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-90	60-70	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
62B: Amor-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-90	60-70	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
62C: Amor-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-90	60-70	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
62D: Amor-----	0-6	Loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-90	60-70	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
63D: Wabek-----	0-6	Loam	ML	A-4	0	0-1	90-100	90-100	75-90	50-70	25-40	NP-10
	6-9	Gravelly sandy loam, gravelly loam, gravelly coarse sandy loam	GM, SM	A-1-b, A-2, A-4	0	0-1	50-80	50-80	30-60	20-40	0-14	NP
	9-60	Sand and gravel	GM, SM, SP, SW	A-1	0	0-1	25-90	10-65	5-35	0-25	0-14	NP
64: Wilton-----	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	90-100	70-90	20-35	3-15
	8-23	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	90-100	70-90	25-40	4-15
	23-60	Loam, clay loam	CL, ML	A-4, A-6, A-7	---	0-5	90-100	85-100	80-95	60-80	30-50	5-25
64B: Temvik-----	0-7	Silt loam	ML	A-4	0	0	100	100	90-100	60-90	25-40	2-10
	7-24	Silt loam, silty clay loam, clay loam	CL	A-6	0	0	100	100	90-100	80-90	25-40	10-19
	24-60	Clay loam, loam	CL	A-6	---	0-5	95-100	95-100	80-100	55-80	25-40	10-19
64C: Temvik-----	0-7	Silt loam	ML	A-4	0	0	100	100	90-100	60-90	25-40	2-10
	7-24	Silt loam, silty clay loam, clay loam	CL	A-6	0	0	100	100	90-100	80-90	25-40	10-19
	24-60	Clay loam, loam	CL	A-6	---	0-5	95-100	95-100	80-100	55-80	25-40	10-19
66C: Seroco-----	0-4	Fine sand	SM	A-2	0	0	100	100	65-80	20-35	---	NP
	4-60	Fine sand, loamy fine sand, loamy sand	SM	A-2	0	0	100	100	65-80	20-35	---	NP
66E: Seroco-----	0-4	Fine sand	SM	A-2	0	0	100	100	65-80	20-35	---	NP
	4-60	Fine sand, loamy fine sand, loamy sand	SM	A-2	0	0	100	100	65-80	20-35	---	NP
67B: Vebar-----	0-7	Fine sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	7-23	Fine sandy loam, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	23-30	Fine sandy loam, loamy fine sand, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	30-60	Weathered bedrock			---	---	---	---	---	---	---	---
67C: Vebar-----	0-7	Fine sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	7-23	Fine sandy loam, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	23-30	Fine sandy loam, loamy fine sand, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	30-60	Weathered bedrock			---	---	---	---	---	---	---	---
67D: Vebar-----	0-7	Fine sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	7-23	Fine sandy loam, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	23-30	Fine sandy loam, loamy fine sand, sandy loam	ML, SM	A-2, A-4	0	0	95-100	90-100	60-100	30-55	0-14	NP
	30-60	Weathered bedrock			---	---	---	---	---	---	---	---

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
70: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Bowbells-----	0-7	Loam	CL	A-4, A-6	0	0-5	95-100	90-100	85-95	60-90	28-37	9-16
	7-38	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	20-45	10-25
	38-60	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	20-45	10-25
70B: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Bowbells-----	0-7	Loam	CL	A-4, A-6	0	0-5	95-100	90-100	85-95	60-90	28-37	9-16
	7-38	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	20-45	10-25
	38-60	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	20-45	10-25
70C: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
72: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Reeder-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	85-90	60-70	20-40	5-15
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
72B: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Reeder-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	85-90	60-70	20-40	5-15
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
72C: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Reeder-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	85-90	60-70	20-40	5-15
	6-20	Clay loam, loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	60-80	25-50	5-30
	20-25	Loam, clay loam, sandy loam	CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	65-100	45-80	25-40	5-20
	25-60	Weathered bedrock		A-4, A-6, A-7	---	---	---	---	---	---	0-14	---
73C: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Zahl-----	0-6	Loam	CL	A-6	0	0-1	95-100	95-100	80-95	55-75	25-40	10-20
	6-22	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30
	22-60	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30
73E: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Zahl-----	0-6	Loam	CL	A-6	0	0-1	95-100	95-100	80-95	55-75	25-40	10-20
	6-22	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30
	22-60	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
79D: Telfer-----	0-15	Loamy fine sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
	15-60	Fine sand, loamy fine sand, loamy sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
Flasher-----	0-5	Loamy fine sand	SM	A-2	0	0-5	85-100	85-100	50-100	15-35	---	NP
	5-14	Loamy sand, loamy fine sand, fine sand	SM	A-2	0	0-5	85-100	85-100	50-100	15-35	---	NP
	14-60	Weathered bedrock			---	---	---	---	---	---	---	---
79E: Flasher-----	0-5	Loamy fine sand	SM	A-2	0	0-5	85-100	85-100	50-100	15-35	---	NP
	5-14	Loamy sand, loamy fine sand, fine sand	SM	A-2	0	0-5	85-100	85-100	50-100	15-35	---	NP
	14-60	Weathered bedrock			---	---	---	---	---	---	---	---
Telfer-----	0-15	Loamy fine sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
	15-60	Fine sand, loamy fine sand, loamy sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
82: Arveson-----	0-14	Loam	ML	A-4	---	0-1	100	95-100	85-90	50-80	25-40	NP-10
	14-26	Fine sandy loam, sandy loam, loam	SC-SM, SM	A-4	0	0	100	95-100	60-85	35-50	0-20	NP-5
	26-47	Fine sand, loamy sand, fine sandy loam	SC-SM, SM, SP-SM	A-2, A-3, A-4	0	0	100	95-100	50-85	5-50	0-20	NP-5
	47-60	Clay loam	CL	A-7	0	0	100	90-100	75-95	50-75	40-50	15-25
84: Havrelon, VARIANT-----	0-21	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-100	60-95	20-40	3-15
	21-60	Stratified silty clay loam to very fine sandy loam	CL	A-6, A-7	0	0	100	100	85-100	60-80	25-45	10-25
85: Hamerly-----	0-8	Loam	CL, CL-ML	A-4, A-6	---	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	8-13	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	13-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	90-100	75-95	55-75	20-45	5-25
88: Lallie-----	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-100	60-90	20-40	3-20
	8-60	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	95-100	90-100	85-100	40-95	20-60
93B: Ekalaka-----	0-16	Fine sandy loam	ML, SM	A-2, A-4	0	0	100	100	70-85	30-60	20-35	NP-10
	16-29	Fine sandy loam, sandy loam, loamy fine sand	ML, SM	A-2, A-4	0	0	100	100	70-100	30-70	20-35	NP-10
	29-60	Fine sandy loam, loamy fine sand, fine sand	SC, SC-SM, SM	A-2, A-4, A-6	0	0	100	100	50-100	30-40	20-40	NP-15
98: Banks, VARIANT-	0-7	Very fine sandy loam	ML, SM	A-4	0	0	100	100	80-95	45-75	20-40	NP-10
	7-60	Loamy very fine sand, fine sand, fine sandy loam	SM, SP-SM	A-2	0	0	100	100	50-70	10-25	0-14	NP
162: Omio-----	0-12	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	85-100	20-40	5-20
	12-38	Silt loam, loam, fine sandy loam	CL-ML, ML, SC-SM, SM	A-4	0	0	100	100	70-95	40-75	15-30	NP-10
	38-60	Weathered bedrock			---	---	---	---	---	---	---	---
Grassna-----	0-18	Silt loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	90-100	70-100	20-45	3-25
	18-60	Silt loam, silty clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	90-100	70-100	25-45	3-23

ENGINEERING INDEX PROPERTIES--Continued  
Emmons County, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth  In	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit  Pct	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
162B: Omio-----	0-12	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	85-100	20-40	5-20
	12-38	Silt loam, loam, fine sandy loam	CL-ML, ML, SC-SM, SM	A-4	0	0	100	100	70-95	40-75	15-30	NP-10
	38-60	Weathered bedrock			---	---	---	---	---	---	---	---
Amor-----	0-6	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	90-100	65-85	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
162C: Omio-----	0-12	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	85-100	20-40	5-20
	12-38	Silt loam, loam, fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	0	100	100	70-95	40-75	15-30	NP-10
	38-60	Weathered bedrock			---	---	---	---	---	---	---	---
Amor-----	0-6	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	90-100	65-85	25-40	3-18
	6-19	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-85	20-45	5-25
	19-29	Clay loam, loam, fine sandy loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	95-100	75-100	50-80	20-45	2-25
	29-60	Weathered bedrock			---	---	---	---	---	---	---	---
164: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Falkirk-----	0-7	Loam	ML	A-4	0	0	100	100	85-95	60-75	20-40	NP-10
	7-22	Loam	ML	A-4	0	0	100	100	85-95	60-75	20-40	NP-10
	22-31	Gravelly loam, loamy fine sand	GM, ML, SM	A-4	---	0-5	65-95	65-90	55-80	40-70	20-40	NP-10
	31-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	---	0-5	90-100	85-100	80-95	60-80	25-50	5-30
164B: Williams-----	0-5	Loam	CL, ML	A-4, A-6, A-7	0-2	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	5-14	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	14-60	Clay loam, loam	CL	A-6, A-7	0-2	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Falkirk-----	0-7	Loam	ML	A-4	0	0	100	100	85-95	60-75	20-40	NP-10
	7-22	Loam	ML	A-4	0	0	100	100	85-95	60-75	20-40	NP-10
	22-31	Gravelly loam, loamy fine sand	GM, ML, SM	A-4	---	0-5	65-95	65-90	55-80	40-70	20-40	NP-10
	31-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	---	0-5	90-100	85-100	80-95	60-80	25-50	5-30
W: Water-----	---	---	---	---	---	---	---	---	---	---	---	---

