

ENGINEERING INDEX PROPERTIES
Cowley County, Kansas

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
Cowley County, Kansas

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

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct					Pct	
015CS: Clime-----	0-9	Silty clay	CH	A-7-6	0	0-5	90-100	90-100	85-100	80-95	50-60	25-35
	9-33	Silty clay	CH, CL	A-7	0	0	95-100	95-100	95-100	85-95	45-65	20-40
	33-37	Unweathered bedrock			---	---	---	---	---	---	---	---
Sogn-----	0-7	Silty clay loam	CH, CL, MH, ML	A-6, A-7	0	0-10	85-100	85-100	85-100	70-100	25-55	10-25
	7-11	Unweathered bedrock			---	---	---	---	---	---	---	---
015FC: Florence-----	0-14	Gravelly silt loam	CL, GC, SC	A-2-7, A-7, A-7-6	0	0-10	30-90	20-75	20-75	20-70	40-50	20-30
	14-22	Very gravelly silty clay	GC, SC	A-2-7, A-7	0	10-20	30-70	20-50	20-50	15-40	50-70	30-45
	22-45	Very gravelly clay	CH, GC, SC	A-2-7, A-7	0	10-40	30-90	20-75	20-75	15-70	65-75	40-50
	45-49	Unweathered bedrock			---	---	---	---	---	---	---	---
015LC: Labette-----	0-13	Silty clay loam	CL	A-6, A-7	0	0	85-100	85-100	75-100	68-95	35-50	15-25
	13-38	Silty clay	CH, CL, GC, SC	A-7-6	0	0-20	55-80	50-75	50-75	45-70	45-60	20-35
	38-42	Unweathered bedrock			---	---	---	---	---	---	---	---
015LS: Ladysmith-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	85-95	30-45	15-25
	7-15	Silty clay	CH	A-7-6	0	0	100	100	95-100	85-95	50-70	30-50
	15-30	Clay	CH	A-7-6	0	0	100	100	95-100	85-95	50-70	30-50
	30-38	Clay	CH	A-7-6	0	0	100	100	95-100	85-95	50-70	30-50
	38-60	Silty clay	CH, CL	A-7-6	0	0	100	100	95-100	85-95	40-65	25-45
015NS: Norge-----	0-9	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	65-97	22-37	2-14
	9-72	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
015NT: Norge, eroded--	0-5	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
	5-72	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
015ON: Olpe-----	0-10	Gravelly silty clay loam	CL, GC, SC	A-2, A-4, A-6	0	0	60-80	50-75	40-75	30-70	20-40	7-20
	10-14	Gravelly silty clay loam	CH, CL, GC, SC	A-2, A-6, A-7	0	0	20-80	10-75	10-75	10-70	35-55	15-30
	14-60	Extremely gravelly silty clay	GC, GP-GC	A-2, A-7	0	0	20-60	10-50	10-45	10-40	40-65	25-40
Norge-----	0-9	Silt loam	ML, CL, CL-ML	A-4, A-6	0	0	100	100	96-100	65-97	22-37	2-14
	9-72	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
015VE: Verdigris-----	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	65-100	22-35	2-13
	8-57	Silty clay loam	CL	A-6, A-7, A-4	0	0	100	100	95-100	80-100	30-45	8-23
019MB: Martin-----	0-12	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	43-56	22-33
	12-18	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	43-56	22-33
	18-54	Silty clay	CH, CL	A-7	0	0	100	100	95-100	80-100	56-71	33-45
	54-58	Unweathered bedrock			---	---	---	---	---	---	---	---
049FM: Florence-----	0-6	Gravelly silt loam	CL, GC, SC	A-2-7, A-7, A-7-6	0	0-10	30-90	20-75	20-75	20-70	40-50	20-30
	6-12	Gravelly silt loam	CL, GC, SC	A-2-7, A-7, A-7-6	0	5-20	30-75	20-70	15-70	15-65	40-50	20-30
	12-32	Extremely gravelly silty clay	GC, SC	A-2-7, A-7	0	10-20	30-70	20-50	20-50	15-40	50-70	30-45
	32-49	Extremely cobble clay	CH, GC, SC	A-2-7, A-7	0	10-40	30-90	20-75	20-75	15-70	65-75	40-50
	49-53	Unweathered bedrock			---	---	---	---	---	---	---	---
Martin-----	0-9	Silty clay loam	CL, CH, MH	A-7	0	0	100	100	95-100	80-100	43-56	22-33
	9-60	Silty clay	CH, CL, MH	A-7	0	0	100	100	95-100	80-100	51-71	29-45
049IV: Ivan-----	0-33	Silt loam	CL	A-4, A-6	0	0	95-100	95-100	90-100	70-100	25-40	7-20
	33-60	Silt loam	CL	A-4, A-6, A-7	0	0	95-100	95-100	90-100	65-100	25-45	7-25
191MB: Milan-----	0-10	Loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	95-100	65-85	20-35	5-15
	10-70	Clay loam	CH, CL, MH, SC	A-6, A-7-6	0	0	95-100	95-100	65-100	45-80	35-55	11-25
191MC: Milan-----	0-10	Loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	95-100	65-85	20-35	5-15
	10-70	Clay loam	CH, CL, MH, SC	A-6, A-7-6	0	0	95-100	95-100	65-100	45-80	35-55	11-25
191PX: Pratt-----	0-12	Loamy fine sand	SM	A-2	0	0	100	95-100	70-100	15-35	---	NP
	12-40	Loamy fine sand	SC-SM, SM	A-2, A-4	0	0	100	95-100	90-100	15-40	15-20	NP-6
	40-60	Fine sand	SM, SP-SM	A-2, A-3	0	0	100	95-100	80-100	5-35	---	NP

ENGINEERING INDEX PROPERTIES--Continued
Cowley County, Kansas

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

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct					Pct	
191RO: Rosehill-----	In											
	0-9	Clay loam			0	0	100	100	90-100	70-80	50-55	30-35
	9-36	Clay	CH	A-7	0	0	100	100	90-100	75-95	55-75	35-50
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
191RS: Rosehill-----	0-9	Clay loam			0	0	100	100	90-100	70-80	50-55	30-35
	9-36	Clay	CH	A-7	0	0	100	100	90-100	75-95	55-75	35-50
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
191TV: Tivoli-----	0-7	Fine sand	SM, SP-SM	A-2, A-3	0	0	100	95-100	80-100	5-25	---	NP
	7-60	Fine sand	SM, SP-SM	A-2, A-3	0	0	100	95-100	80-100	5-25	---	NP
191US: Ustifluvents---	---	---	---	---	---	---	---	---	---	---	---	---
Aa: Attica-----	0-9	Loamy fine sand	SM, SP-SM	A-2	0	0	100	95-100	70-100	10-35	---	NP
	9-20	Fine sandy loam	CL-ML, ML, SC-SM, SM	A-2, A-4	0	0	100	95-100	75-100	30-55	15-26	NP-7
	20-60	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	85-100	80-100	70-100	20-50	15-26	NP-7
Ab: Attica-----	0-9	Loamy fine sand	SM, SP-SM	A-2	0	0	100	95-100	70-100	10-35	---	NP
	9-20	Fine sandy loam	CL-ML, ML, SC-SM, SM	A-2, A-4	0	0	100	95-100	75-100	30-55	15-26	NP-7
	20-60	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	85-100	80-100	70-100	20-50	15-26	NP-7
Tivoli-----	0-7	Loamy fine sand	SM	A-2	0	0	100	95-100	90-100	15-35	---	NP
	7-60	Fine sand	SM, SP-SM	A-2, A-3	0	0	100	95-100	80-100	5-25	---	NP
AED: Arents, Earthen Dam-----	---	---	---	---	---	---	---	---	---	---	---	---
Ba: Bethany-----	0-9	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	80-98	21-37	2-13
	9-16	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-50	15-26
	16-60	Silty clay	CH, CL, MH	A-6, A-7	0	0	100	96-100	96-100	90-99	37-60	15-33
Bb: Bethany-----	0-9	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	80-98	21-37	2-13
	9-16	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-50	15-26
	16-60	Silty clay	CH, CL, MH	A-6, A-7	0	0	100	96-100	96-100	90-99	37-60	15-33
Bc: Brewer-----	0-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	98-100	90-98	37-45	15-22
	15-42	Silty clay	CH, CL, MH	A-6, A-7	0	0	100	100	96-100	80-99	37-70	16-38
	42-60	Silty clay loam	CH, CL, MH	A-4, A-6, A-7	0	0	100	100	96-100	80-98	30-70	8-38
Ca: Canadian-----	0-28	Fine sandy loam	CL-ML, ML, SC-SM, SM	A-4	0	0	100	98-100	94-100	36-65	15-26	NP-7
	28-36	Fine sandy loam	CL, ML, SC, SM, CL-ML	A-4	0	0	100	98-100	94-100	36-85	15-31	NP-10
	36-60	Fine sandy loam	CL, ML, SC, SM, CL-ML	A-2, A-4	0	0	100	98-100	90-100	15-85	15-31	NP-10
Cb: Clime-----	0-8	Silty clay	CH	A-7-6	0	0-5	90-100	90-100	85-100	80-95	50-60	25-35
	8-20	Silty clay	CH, CL, MH	A-7	0	0	95-100	95-100	95-100	85-95	45-65	20-40
	20-36	Silty clay	CH, CL, MH	A-7	0	0	95-100	95-100	95-100	85-95	45-60	20-30
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock Outcrop---	---	---	---	---	---	---	---	---	---	---	---	---
Cc: Clime-----	0-8	Silty clay	CH	A-7-6	0	0-5	90-100	90-100	85-100	80-95	50-60	25-35
	8-20	Silty clay	CH, CL, MH	A-7	0	0	95-100	95-100	95-100	85-95	45-65	20-40
	20-36	Silty clay	CH, CL, MH	A-7	0	0	95-100	95-100	95-100	85-95	45-60	20-30
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
Sogn-----	0-10	Silty clay loam	CH, CL, MH, ML	A-6, A-7	0	0-10	85-100	85-100	85-100	70-100	25-55	10-25
	10-14	Unweathered bedrock			---	---	---	---	---	---	---	---
Da: Dale-----	0-42	Silt loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	90-100	65-98	24-35	5-15
	42-60	Loam	CL	A-4, A-6, A-7	0	0	95-100	95-100	90-100	65-98	30-43	8-20
Db: Dwight-----	0-5	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-15
	5-28	Silty clay	CH, MH	A-7	0	0	100	100	95-100	90-100	50-70	25-40
	28-54	Silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	45-60	25-40
	54-58	Unweathered bedrock			---	---	---	---	---	---	---	---

ENGINEERING INDEX PROPERTIES--Continued
Cowley County, Kansas

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

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
Fa: Florence-----	0-14	Gravelly silt loam	CL, GC, SC	A-2-7, A-7, A-7-6	0	0-10	30-90	20-75	20-75	20-70	40-50	20-30
	14-17	Very gravelly silty clay loam	GC, SC	A-2-7, A-7	0	10-20	30-70	20-50	20-50	15-40	50-70	30-45
	17-45	Extremely cobbly clay	CH, GC, SC	A-2-7, A-7	0	10-40	30-90	20-75	20-75	15-70	65-75	40-50
	45-49	Unweathered bedrock			---	---	---	---	---	---	---	---
Florence-----	0-14	Gravelly silt loam	CL, GC, SC	A-2-7, A-7, A-7-6	0	0-10	30-90	20-75	20-75	20-70	40-50	20-30
	14-22	Very gravelly silty clay	GC, SC	A-2-7, A-7	0	10-20	30-70	20-50	20-50	15-40	50-70	30-45
	22-45	Very gravelly clay	CH, GC, SC	A-2-7, A-7	0	10-40	30-90	20-75	20-75	15-70	65-75	40-50
	45-49	Unweathered bedrock			---	---	---	---	---	---	---	---
Ia: Irwin-----	0-13	Silty clay loam	CL	A-6, A-7-6	0	0	100	95-100	90-100	80-95	35-45	15-20
	13-40	Silty clay	CH	A-7-6	0	0	100	95-100	95-100	85-95	50-60	25-30
	40-60	Silty clay	CH, CL, MH	A-7-6	0	0	100	100	95-100	80-95	40-60	20-30
Ib: Ivan-----	0-28	Silt loam	CL	A-4, A-6	0	0	95-100	95-100	90-100	70-100	25-40	7-20
	28-60	Silt loam	CL	A-4, A-6, A-7	0	0	95-100	95-100	90-100	65-100	25-45	7-25
INT: Aquolls-----	0-72	Variable			---	---	---	---	---	---	---	---
La: Labette-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	85-100	85-100	75-100	68-95	35-50	15-25
	7-36	Silty clay	CH, CL, GC, SC, MH	A-7-6	0	0-20	55-80	50-75	50-75	45-70	45-60	20-35
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
Lb: Labette-----	0-6	Silty clay loam	CL	A-6, A-7	0	0	85-100	85-100	75-100	68-95	35-50	15-25
	6-36	Silty clay	CH, CL, GC, SC	A-7-6	0	0-20	55-80	50-75	50-75	45-70	45-60	20-35
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
Lc: Labette, eroded	0-7	Silty clay loam	CL	A-6, A-7	0	0	85-100	85-100	75-100	68-95	35-50	15-25
	7-36	Silty clay	CH, CL, GC, SC	A-7-6	0	0-20	55-80	50-75	50-75	45-70	45-60	20-35
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
Ld: Labette-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	85-100	85-100	75-100	68-95	35-50	15-25
	7-36	Silty clay	CH, CL, GC, SC, MH	A-7-6	0	0-20	55-80	50-75	50-75	45-70	45-60	20-35
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
Dwight-----	0-5	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-15
	5-28	Silty clay	CH	A-7	0	0	100	100	95-100	90-100	50-70	25-40
	28-54	Silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	45-60	25-40
	54-58	Unweathered bedrock			---	---	---	---	---	---	---	---
Le: Labette-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	85-100	85-100	75-100	68-95	35-50	15-25
	7-36	Silty clay	CH, CL, GC, SC	A-7-6	0	0-20	55-80	50-75	50-75	45-70	45-60	20-35
	36-40	Unweathered bedrock			---	---	---	---	---	---	---	---
Sogn-----	0-10	Silty clay loam	CH, CL, MH, ML	A-6, A-7	0	0-10	85-100	85-100	85-100	70-100	25-55	10-25
	10-14	Unweathered bedrock			---	---	---	---	---	---	---	---
Lf: Lesho-----	0-17	Clay loam	CL	A-6, A-7-6	0	0	100	100	95-100	65-85	35-45	15-22
	17-24	Loam	CL	A-4, A-6, A- 7-6	0	0	100	100	85-100	65-95	25-45	7-22
	24-60	Fine sand	SM, SP-SM	A-1, A-2, A- 3, A-4	0	0	100	95-100	30-85	5-45	2-6	NP
Lg: Lincoln-----	0-9	Fine sandy loam	CL-ML, ML, SC-SM, SM	A-4	0	0	100	98-100	94-100	36-60	15-24	NP-7
	9-60	Stratified fine sand to clay loam	SM, SP-SM	A-2, A-3	0	0	100	98-100	82-100	5-35	---	NP
Tivoli-----	0-7	Loamy fine sand	SM	A-2	0	0	100	95-100	90-100	15-35	---	NP
	7-60	Fine sand	SM, SP-SM	A-2, A-3	0	0	100	95-100	80-100	5-25	---	NP
M-W: Miscellaneous Water-----	---	---	---	---	---	---	---	---	---	---	---	---
Ma: Martin-----	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	9-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	15-60	Silty clay	CH, CL	A-7	0	0	100	100	95-100	80-100	40-70	25-40

ENGINEERING INDEX PROPERTIES--Continued
Cowley County, Kansas

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

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
Mb:												
Martin-----	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	8-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	15-60	Silty clay	CH, CL	A-7	0	0	100	100	95-100	80-100	40-70	25-40
Mc:												
Martin, eroded-	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	9-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	15-60	Silty clay	CH, CL	A-7	0	0	100	100	95-100	80-100	40-70	25-40
MCC:												
Martin-----	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	9-60	Silty clay	CH, CL	A-7	0	0	100	100	95-100	80-100	40-70	25-40
Md:												
Florence-----	0-14	Gravelly silt loam	CL, GC, SC	A-2-7, A-7, A-7-6	0	0-10	30-90	20-75	20-75	20-70	40-50	20-30
	14-22	Very gravelly silty clay	GC, SC	A-2-7, A-7	0	10-20	30-70	20-50	20-50	15-40	50-70	30-45
	22-45	Very gravelly clay	CH, GC, SC	A-2-7, A-7	0	10-40	30-90	20-75	20-75	15-70	65-75	40-50
	45-49	Unweathered bedrock			---	---	---	---	---	---	---	---
Martin-----	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	9-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-100	35-45	15-25
	15-60	Silty clay	CH, CL	A-7	0	0	100	100	95-100	80-100	40-70	25-40
Florence-----	0-14	Gravelly silt loam	CL, GC, SC, MH	A-2-7, A-7, A-7-6	0	0-10	30-90	20-75	20-75	20-70	40-50	20-30
	14-17	Gravelly silty clay loam	GC, SC	A-2-7, A-7	0	10-20	30-70	20-50	20-50	15-40	50-70	30-45
	17-45	Very gravelly clay	GC, SC, CH	A-7, A-2-7	0	10-40	30-90	20-75	20-75	15-70	65-75	40-50
	45-49				---	---	---	---	---	---	---	---
Me:												
Milan-----	0-9	Fine sandy loam	CL-ML, ML, SC-SM, SM	A-4	0	0	95-100	95-100	80-100	35-55	15-26	NP-5
	9-60	Sandy clay loam	CH, CL, MH, SC	A-6, A-7-6	0	0	95-100	95-100	65-100	45-80	35-55	11-25
Mf:												
Minco-----	0-42	Silt loam	CL, CL-ML, ML	A-4	0	0	100	100	94-100	51-97	15-31	NP-10
	42-60	Silt loam	CL, ML, SC, SM	A-4	0	0	100	98-100	94-100	36-97	15-31	NP-10
Mg:												
Minco-----	0-42	Silt loam	CL, CL-ML, ML	A-4	0	0	100	100	94-100	51-97	15-31	NP-10
	42-60	Silt loam	CL, ML, SC, SM	A-4	0	0	100	98-100	94-100	36-97	15-31	NP-10
Na:												
Norge-----	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	65-97	22-37	2-14
	8-18	Silty clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	96-100	65-98	22-43	2-20
	18-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
Nb:												
Norge-----	0-7	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	65-97	22-37	2-14
	7-18	Silty clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	96-100	65-98	22-43	2-20
	18-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
Nc:												
Norge, eroded--	0-6	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
	6-18	Silty clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	96-100	65-98	22-43	2-20
	18-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
Oa:												
Olpe-----	0-10	Gravelly silt loam	CL, GC, SC	A-2, A-4, A-6	0	0	60-80	50-75	40-75	30-70	20-40	7-20
	10-22	Very gravelly silty clay loam	CH, CL, GC, SC	A-2, A-6, A-7	0	0	20-80	10-75	10-75	10-70	35-55	15-30
	22-60	Extremely gravelly silty clay	GC, GP-GC	A-2, A-7	0	0	20-60	10-50	10-45	10-40	40-65	25-40
Ob:												
Osage-----	0-18	Silty clay	CH, MH	A-7	0	0	100	100	100	95-100	50-75	30-55
	18-60	Silty clay	CH, CL, MH	A-7	0	0	100	100	100	95-100	40-80	20-50
Ra:												
Reading-----	0-14	Silt loam	CL	A-6	0	0	100	100	90-100	80-90	30-35	10-15
	14-50	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	85-95	35-45	15-20
	50-60	Silty clay loam	CL, MH	A-6, A-7	0	0	100	100	95-100	80-95	40-50	20-30
Rb:												
Rosehill-----	0-8	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	55-75	35-50
	8-37	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	55-75	35-50
	37-41	Unweathered bedrock			---	---	---	---	---	---	---	---
Rc:												
Rosehill-----	0-8	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	55-75	35-50
	8-37	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	55-75	35-50
	37-41	Unweathered bedrock			---	---	---	---	---	---	---	---
Sa:												
Smolan-----	0-8	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	42-50	22-28
	8-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-50	15-28
	15-40	Silty clay	CH	A-7	0	0	100	100	95-100	90-100	50-65	28-40
	40-60	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	42-50	22-28

ENGINEERING INDEX PROPERTIES--Continued
Cowley County, Kansas

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

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
Sb:												
Smolan-----	0-8	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	42-50	22-28
	8-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-50	15-28
	15-40	Silty clay	CH	A-7	0	0	100	100	95-100	90-100	50-65	28-40
	40-60	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	42-50	22-28
Sc:												
Smolan, eroded-	0-6	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	42-50	22-28
	6-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-50	15-28
	15-40	Silty clay	CH	A-7	0	0	100	100	95-100	90-100	50-65	28-40
	40-60	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	42-50	22-28
Sd:												
Sogn-----	0-10	Silty clay loam	CH, CL, MH, ML	A-6, A-7	0	0-10	85-100	85-100	85-100	70-100	25-55	10-25
	10-14	Unweathered bedrock			---	---	---	---	---	---	---	---
Ta:												
Tabler-----	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	32-43	11-20
	8-48	Silty clay	CH, CL	A-7	0	0	100	100	96-100	90-99	41-65	18-35
	48-60	Silty clay	CH, CL	A-6, A-7	0	0	96-100	96-100	92-100	80-99	38-60	15-35
Tb:												
Tabler-----	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	32-43	11-20
	8-48	Silty clay	CH, CL	A-7	0	0	100	100	96-100	90-99	41-65	18-35
	48-60	Silty clay	CH, CL	A-6, A-7	0	0	96-100	96-100	92-100	80-99	38-60	15-35
Va:												
Vanoss-----	0-12	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	65-95	22-37	2-14
	12-38	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
	38-60	Silt loam	CL	A-4, A-6, A-7	0	0	100	100	96-100	65-98	30-43	8-20
Vb:												
Vanoss-----	0-12	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	65-95	22-37	2-14
	12-38	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
	38-60	Silt loam	CL	A-4, A-6, A-7	0	0	100	100	96-100	65-98	30-43	8-20
Vc:												
Vanoss-----	0-12	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	96-100	65-95	22-37	2-14
	12-38	Silty clay loam	CL	A-6, A-7	0	0	100	100	96-100	80-98	33-43	12-20
	38-60	Silt loam	CL	A-4, A-6, A-7	0	0	100	100	96-100	65-98	30-43	8-20
Vd:												
Verdigris-----	0-38	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	65-100	22-35	2-13
	38-60	Silty clay loam	CL	A-4, A-6, A-7	0	0	100	100	95-100	80-100	30-45	8-23
W:												
Water Areas----	---	---	---	---	---	---	---	---	---	---	---	---
Wa:												
Waurika-----	0-12	Silt loam	CL	A-4, A-6	0	0	100	100	96-100	80-95	30-37	9-14
	12-37	Silty clay	CH, CL, MH	A-7	0	0	95-100	95-100	90-100	80-98	41-66	20-40
	37-60	Silty clay loam	CH, CL	A-6, A-7	0	0	90-100	90-100	85-100	80-98	38-55	16-30
	60-64	Silty clay loam	CL	A-6, A-7	0	0	90-100	90-100	80-100	70-98	33-43	12-20

