SOIL INTERPRETATIONS FOR SELECTED COMPONENTS OF COMMUNITY DEVELOPMENT ADJACENT TO MORINVILLE, ALBERTA

by: M.D. Scheelar

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for

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Adjacent to

Morinville, Alberta

Prepared for: *Edmonton Regional Planning Commission*

Prepared by: *Soils Division, Alberta Research Council*

Co-ordinated by: *Alberta Institute of Pedology*

M.D. Scheelar
Alberta Research Council

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INTRODUCTION

For more than three decades planners and engineers have used reconnaissance soil survey maps for information concerning the soils of their particular area. These maps were designed primarily for inventory purposes and as guides for determining land capability for agriculture (1). The soil properties affecting agricultural uses of soil are similar to those affecting urban uses. Detailed soil surveys (3,6) give users more information and thus are useful guides in developing comprehensive land use plans for urban development.

This report describes a detailed soil survey and soil interpretations of approximately 650 acres in selected areas adjacent to the town of Morinville, Alberta. Morinville is located in Townships 55 and 56, Range 25, west of the 4th meridian. It is approximately 15 miles north of the city of Edmonton and is accessible by Highway 2.

The map, printed at a scale of 420 feet to the inch, shows the location and extent of the soil areas. The legend included with the map indicates the classification of the soils.

The report describes the cultural and physical features of the area, classification of the soils, and some of the physical properties of the soils. A list of limiting soil properties and a table of soil interpretations are also included. The soil interpretations indicate the degree of limitation (slight, moderate or severe) that each of the soils have for designated uses.

A glossary of the more frequently used terms is included in an appendix to this report.

CULTURAL AND PHYSICAL FEATURES OF THE AREA

At present the land in the map area is used for agricultural cropland and hay. The terrain is composed of a large, poorly drained lowland area and undulating to gently rolling upland knolls.

The soils of the lowland are developed mainly from fine textured lacustrine material. Soils of the upland are developed from medium to moderately coarse textured till that sometimes contains a high content of the underlying local sandy bedrock.

The area is drained by tributaries of the North Saskatchewan River drainage system.

A fairly high salinity is associated with most of the soils in the lowland area. This is the result of groundwater carrying salts to the surface.

THE SOILS

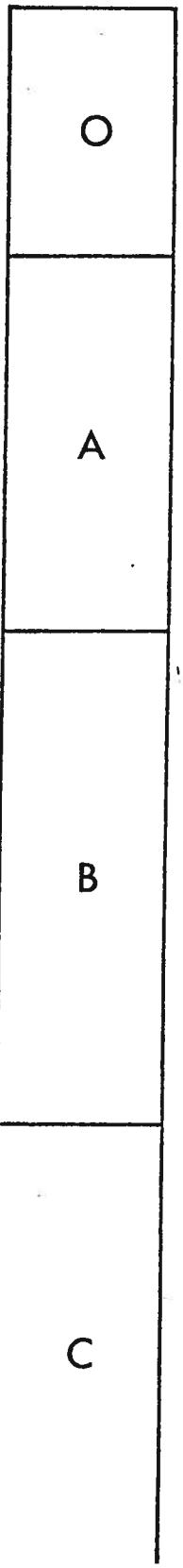
I SOIL DEVELOPMENT

Soil is an organic or mineral layer (other than consolidated bedrock) thicker than 4 inches occurring naturally on the earth's surface. This layer has been subjected to the factors of soil development - climate, vegetation, living organisms, topography and the properties of its parent material over a sufficient period of time to cause changes in its chemical and physical composition. These changes are reflected in the development of a sequence of horizons as indicated in Figure 1. The recognition of differences in the properties of each horizon permits the classification of soils.

II SOIL CLASSIFICATION AND MAPPING

The legend shown on the accompanying map indicates the classification of soils in the map area. The soils were mapped and classified according to the System of Soil Classification for Canada (2).

Figure 1. A sketch of a soil profile showing major soil horizons and a brief outline of difference in properties.



O - An organic horizon at the surface. May be further subdivided with respect to degree of decomposition. Characteristic of peaty phase of soils of Gleysolic Order. Absent in soils of Chernozemic and Solonetzic Orders. May be thin or absent in Orthic, Saline or Carbonated Humic Gleysols.

A - A dark colored mineral horizon at or near the surface in which there is accumulation of organic matter. Present in all soils in map area. May be lighter colored in lower portion due to leaching of clay in Eluviated Black, Solodic Black, Black Solod, and Black Solonetz soils. May be dull in color due to gleying in soils of Gleysolic Order and in gleyed intergrades. May be saline or carbonated as in Saline Humic Gleysols., Carbonated Black, and Carbonated Humic Gleysols.

B - A mineral horizon below the A in which there is no appreciable amount of organic matter but which is affected by other soil processes. Absent in Rego Humic Gleysols (Saline and Carbonated.) There may be a change in color or structure as in Orthic Black soils or an accumulation of clays as in Eluviated Black, Solodic Black, Black Solod and Black Solonetz soils. A strong or weak columnar structure with dark coatings is typical of Solonetzic and Solodic Black soils. May be dull in color and mottled due to gleying as in Orthic Humic Gleysols. Peaty Orthic Humic Gleysols and gleyed intergrades or may be carbonated as in Carbonated Black soils.

C - A mineral horizon below the B horizon which is comparatively unaffected by soil forming processes except for gleying and accumulation of salts and carbonates. Has electrical conductivity of more than 4 mmhos/cm^2 in soils of Solonetzic Order and Saline Humic Gleysols.

Ten soil associations were mapped - four on medium textured till, one on moderately coarse textured till with high sandstone content, and five on lacustrine parent material.

Due to soil variability, mapping was carried out on a soil association basis. Each association may contain one or more subgroups; the dominant subgroup representing 60 per cent or more of the soils in the association and the significant less than 40 per cent. Each mapping unit of an association contains unique parent material, terrain and soil characteristics.

The use of soil associations is not regarded as a shortcoming of the mapping procedure because most of the inseparable units, although of significance taxonomically, are not sufficiently different in regard to soil properties to affect their use for urban development.

In the following section a generalized description of the soil associations used in the Morinville area is presented. A detailed listing of the mapping units within each soil association is shown in the legend of the soil map.

III SOIL ASSOCIATIONS

Beaumont Soil Association

The Beaumont association consists of Black Chernozemic soils developed from glacial till. They are well drained soils that occur on gently undulating topography in the southern portion of the area.

The topsoil (A horizon) is slightly acid to neutral in reaction, ranges in texture from fine sandy loam to loam, and is 12 to 18 inches thick.

The slightly hard B horizon is weak blocky in structure, slightly acid to neutral in reaction, ranges in texture from loam to clay loam and is 16 to 24 inches thick.

The weakly calcareous C horizon is mildly to moderately alkaline in reaction and ranges in texture from loam to clay loam. Stones occur throughout the profile.

Gwynne Soil Association

The Gwynne association consists of moderately well to imperfectly drained Black Solonetzic soils developed from glacial till. They occur on level to gently undulating topography in the northeastern and southwestern portions of the area.

The topsoil (A horizon) is slightly acid to neutral in reaction, ranges in texture from fine sandy loam to loam, and is 6 to 10 inches thick.

The B horizon is strong blocky to columnar in structure, extremely hard when dry, and has dark organic coatings on its ped surfaces. It is neutral to mildly alkaline in reaction, ranges in texture from loam to clay loam and is 16 to 24 inches thick. The B horizon of Black Solonetz soils is impermeable to air, water and roots while in Black Solods it is somewhat more permeable in its upper portion.

The C horizon is moderately saline, mildly to moderately alkaline in reaction and ranges in texture from loam to clay loam.

Edberg Soil Association

The Edberg association consists mainly of Black Chernozemic soils that have salts within 12 to 16 inches of the surface. Black Solonetz and Black Solod soils with comparatively thin, impermeable B horizons, are of significant occurrence in this association. Edberg soils are imperfectly drained and developed from glacial till. They occur in the southern portion of the area on level to gently undulating topography.

The topsoil (A horizon) may or may not be saline and is neutral to moderately alkaline in reaction. It ranges in texture from fine sandy loam to loam and is 8 to 16 inches thick.

The B horizon is either very thin or absent and the C horizon is similar to that of the Gwynne soil association except for moderate gleying.

Stoney Soil Association

The Stoney association consists of poorly drained Gleysolic soils developed from glacial till. They occur in depressional positions in the southern portion of the area.

The topsoil (A horizon) may or may not be saline and is 6 to 10 inches thick. It is neutral to moderately alkaline in reaction and ranges in texture from fine sandy loam to loam.

The subsoil (B and C horizons) is moderately to strongly gleyed and may or may not be saline. It is mildly to moderately alkaline in reaction and ranges in texture from loam to clay loam. Stones occur throughout the profile.

Morinville Soil Association

The Morinville association consists of well drained Black Chernozemic soils developed from glacial till that has a high content of weathered sandstone bedrock. They occur on undulating to gently rolling topography in the eastern and southwestern portions of the area.

The topsoil (A horizon) is slightly acid to neutral in reaction, ranges in texture from sandy loam to loam and is 6 to 10 inches thick.

The subsoil (B and C horizons) consists of varying amounts of weathered sandstone and till. It is neutral to moderately alkaline in reaction, may occasionally be weakly saline, and ranges in texture from coarse sand to clay loam. Stones occur throughout the profile.

Ellerslie Soil Association

The Ellerslie association consists dominantly of Black Chernozemic soils with a significant occurrence of Black Solonetzic soils. They are moderately well to imperfectly drained soils developed from stratified, fine textured lacustrine deposits that are generally stone-free. These soils occur in the northwestern, eastern and southwestern portions of the area on level to gently undulating topography.

The topsoil (A horizon) is slightly acid to neutral in reaction, ranges in texture from very fine sandy loam to silt loam and is 12 to 18 inches thick.

The B horizon is weak to strong blocky, has slightly hard to hard consistency when dry and may or may not have occasional dark organic coatings on its ped surfaces. It is neutral to mildly alkaline in reaction, may be moderately gleyed and ranges in texture from silty clay loam to heavy clay.

The C horizon may or may not be weakly saline, ranges in texture from silt loam to heavy clay and is mildly to moderately alkaline in reaction. It may be moderately gleyed.

Mill Woods Soil Association

The Mill Woods association consists of Black Solonetzic soils developed from stone-free stratified fine textured lacustrine deposits. They are moderately well to imperfectly drained soils that occur on level to gently undulating topography through the area.

The topsoil (A horizn) is neutral to mildly alkaline in reaction, ranges in texture from fine sandy loam to loam and is 6 to 10 inches thick.

The B horizon is neutral to moderately alkaline in reaction, may be moderately gleyed and ranges in texture from silty clay loam to heavy clay. In Black Solonetz soils, this horizon is extremely hard when dry, has strong blocky to columnar structure and dark organic coatings on its ped surfaces.

It is impermeable to air, water and roots. In Black Solods, the B horizon is slightly more permeable in its upper portion but resembles the former in its lower portion.

The C horizon is weakly saline and may be moderately gleyed. It is moderately alkaline in reaction and ranges in texture from very fine sandy loam to heavy clay in variable strata.

Argyll Soil Association

The Argyll association consists of imperfectly drained Gleyed Alkaline soils developed from stone-free, stratified lacustrine deposits. They have more definite solonetzic characteristics than soils of the Mill Woods association due mainly to a higher concentration of salts in the C horizon. A relatively small acreage of these soils occurs on level topography in the southern portion of the area.

The topsoil (A horizon) is dense and impermeable and is extremely hard when dry. It is mildly to moderately alkaline in reaction and ranges in texture from clay loam to clay.

The B and C horizons resemble those of the Black Solonetz soils in the Mill Woods association except the C horizon is moderately to strongly saline and is gleyed.

Ohaton Soil Association

The Ohaton association consists dominantly of well to moderately well drained Black Chernozemic soils with a significant occurrence of Black Solonetzic soils in locations where salts have been brought relatively near the surface by groundwater effects. Ohaton soils are developed from shallow deposits of medium textured lacustrine sediments. They occur in the northeastern portion of the area on gently undulating topography.

The surface soil (A horizon) is slightly acid to neutral in reaction, ranges in texture from loam to silt loam and is 6 to 18 inches thick.

Depending on the depth to soluble salts, the B horizon is slightly hard to very hard in consistency. It ranges in texture from silty clay loam to silty clay, is neutral to mildly alkaline in reaction and is 8 to 20 inches thick.

The C horizon is weakly to moderately calcareous, moderately alkaline in reaction and ranges in texture from very fine sandy loam to silt loam. It may or may not be saline.

Hercules Soil Association

The Hercules association consists of poorly to very poorly drained Gleysols developed from fine textured stratified lacustrine deposits. Saline Humic Gleysols of this association constitute greater than 60 per cent of the area mapped. Orthic Humic Gleysols occur only in the northern portion of the area. Hercules soils occur on level and depressional terrain and may have up to 16 inches of peat at the surface.

The surface soil (A horizon) is moderately gleyed, neutral to moderately alkaline in reaction and ranges in texture from clay loam to clay. It may or may not be saline.

The B horizon is either very thin or absent. The C horizon is calcareous, moderately alkaline in reaction and ranges in texture from silt loam to heavy clay in variable strata. It is usually weakly to moderately saline in Orthic Humic Gleysols of mapping unit 1.

Miscellaneous Land Types

Areas disturbed by man's activities have simply been delineated as Disturbed Land on the soils map. Such areas have been excluded from detailed inspection in the soil survey and require on-site investigation where development is anticipated.

ENGINEERING PROPERTIES OF THE SOILS

Samples were taken from representative soil horizons in the area. Engineering tests were carried out on the samples and the results are shown in Table 1. A brief description of the significance of each analytical parameter is given as follows:

1. Mechanical Analyses

The mechanical analysis was made by combined sieve and hydrometer analysis. The data shows the particle size distribution within the soils; the amounts of the gravel and sand fractions are determined by sieving while the silt and clay are determined by sedimentation techniques. The amount of each soil separate contained in a soil determines its texture. Where texture is known, approximations and estimates can be made of many soil properties, such as bearing value, water-holding capacity, liability to frost-heave, adaptability to soil-cement construction, etc.

2. Plasticity

In soil mechanics, plasticity is defined as that property of a material which allows it to be deformed rapidly, without rupture, without elastic rebound, and without volume change (5).

Tests have been devised to determine the moisture content of a soil when it changes from one major physical condition to another. These tests conducted on the minus No. 40 sieve-size material, have been used as key factors in

Table 1. Engineering Test Data of Representative Soil Samples of the Morinville Area

apping ssocia-ions	Mapping Units	Depth From Surface in inches	Elect. Cond. mmhos/cm	% Sul-phate	Grain Size Analysis: Per Cent Passing Sieve 1"	3/4"	5/8"	No.4	No.10	No.40	No.200	Per Cent Smaller Than .05mm	.005mm	.002mm	.001mm	Atterberg Limits: Liquid Limit	Plastic Limit	Plasti-city Index	Textural Classification: AASHO	Unified	USDA
eaumont	Bmt 1	24-69	1.3	.03	100	100	100	100	99	94	72	70	42	33	28	34	22	12	A6 (8)	CL	CL
		69-100	1.2	.02	100	100	100	100	99	93	68	67	40	32	29	33	20	13	A6 (8)	CL	CL
Wynne	Gw 2	18-60	6.5	.29	100	100	100	99	98	93	27	70	44	36	32	35	22	13	A6 (8)	CL	CL
		60-100	4.6	.16	100	100	100	100	99	94	67	66	38	30	26	30	19	11	A6 (6)	CL	CL
	Mv 1	24-54	3.0	.11	100	100	100	99	98	91	71	68	41	35	30	33	20	13	A6 (8)	CL	CL
Morinville		54-62 78-92	0.5	.00	100	100	100	100	100	97	27	23	10	9	8	non plastic			A2-4 (0)	SMd	LS
		62-78	3.0	.09	100	100	100	99	98	93	72	70	36	30	24	30	20	10	A4 (7)	CL	CL
Edberg	Edg 1	16-76	5.0	.21	100	100	100	100	99	93	67	65	40	31	27	34	21	13	A6 (7)	CL	CL
	Ell 2/t	32-62	2.7	.12	100	100	100	100	100	100	100	99	75	48	35	51	31	20	A7-5 (14)	MH	SiC
		62-98	-	-	100	100	100	99	99	93	60	57	]]	17	14	22	16	6	A4 (5)	CL-ML	L
Ellerslie	Ell 2	44-72	0.8	.01	100	100	100	100	100	100	98	97	80	68	59	61	33	28	A7-5 (19)	MH	HC
		96-120	1.3	.03	100	100	100	100	100	100	100	100	85	57	40	54	32	22	A7-5 (16)	MH	SiC
Mill Woods	Ms 3	12-48	9.9	.45	100	100	100	100	100	100	100	100	90	76	66	73	37	36	A7-5 (20)	MH	HC
		48-84	9.0	.41	100	100	100	100	100	100	100	100	90	62	48	53	34	19	A7-5 (15)	MH	HC
	Hrl 2	8-48	4.4	.24	100	100	100	100	100	100	100	100	88	72	57	65	36	29	A7-5 (20)	MH	HC
Hercules		48-80	4.3	.33	100	100	100	100	100	100	100	100	75	50	38	53	32	21	A7-5 (15)	MH	SiC
	Hrl 2/t	24-72	8.1	.35	100	100	100	100	100	99	62	60	38	30	26	36	22	14	A6 (9)	CL	CL
	Hrl 2	20-70	4.1	.22	100	100	100	100	100	100	100	100	86	74	63	69	32	37	A7-5 (20)	CH	HC

The tests used for estimating plasticity are plastic limit, liquid limit and plasticity index. The plastic limit is the moisture content at which the soil passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the soil passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. This parameter gives the range in moisture contents at which a soil is in a plastic condition. A small plasticity index, such as 5, indicates that a small change in moisture content will change the soil from a semisolid to a liquid condition whereas a large plasticity index, such as 20, shows that considerable water can be added before a soil becomes liquid.

3. Activity Number

Activity is a term applied to plastic soils in reference to a change in volume that takes place in the presence of varying moisture conditions. The more active a soil, the greater in general, will be its change in volume when passing, for example, from the liquid limit to the shrinkage limit. The activity number is defined as the plasticity index divided by the per cent by weight of clay size particles. Clays for which the activity number is less than .75 are considered relatively inactive; normal activity is associated with values between .75 and 1.5; while values greater than 1.5 indicate progressively more active clays (4).

4. Soil Classification

A. AASHO Classification System

The American Association of State Highway Officials system is an engineering property classification based on field performance of highways. In the AASHO system soil material is classified into seven groups. Each group has about the same general load-carrying capacity. The groups are designated A-1 to A-7; the

best soils for road subgrades are classified as A-1, with the poorest soils classified as A-7. In recent years these seven basic groups have been divided into subgroups with a group index that was devised to approximate within group evaluations. Group indexes range from 0 for the best subgrades to 20 for the poorest.

B. Unified Soil Classification System

In the Unified Soil Classification System the soils are identified according to their textures and plasticity and are grouped according to their performance as engineering construction materials. In this system, soil materials are divided into coarse grained, fine grained, and highly organic soils. The coarse grained are subdivided into eight classes, the fine grained into six classes, and there is one class of highly organic soils.

Coarse grained soils are those having 50 per cent or less of material passing the No. 200 sieve; fine grained have more than 50 per cent material passing the No. 200 sieve. The letters G, S, C, M, and O stand for gravel, sand, clay, silt, and organic material respectively. The designation CL, for example,, indicates silts mixed with clays whereas SC shows sands with an appreciable amount of fines. Also recognized in the Unified System are organic silts (OL), organic clays (OH), and peat or other highly organic soils (PT).

C. United States Department of Agriculture System

The system of textural classification used by Canadian soil scientists is known as the USDA system. There is some variation in the size limits of the particles between the USDA system and the two engineering systems but the differences are not great. A comparison of the different systems is given in the PCA Soil Primer (6).

SOIL SURVEY INTERPRETATIONS

During the course of a soil survey pedologists make numerous soil observations and descriptions to assist with the compilation of the soils map and report. The soils map, as a result, may appear complex to people not familiar with pedology. Soil survey interpretations are therefore included with the report in order that the soils information may be more easily understood.

Soil survey interpretations should be treated as evaluations of soil performance not as recommendations for the use of soils. They are useful in aiding site selection and assisting the planner, engineer or developer. However, the interpretations are not intended to eliminate on-site investigations for specific structures but are intended to be an aid in planning these investigations to reduce their number and minimize cost.

For each use the soils are rated in terms of degree of limitation - slight, moderate or severe. These categories are defined as follows: Slight - soils with few known limitations for the use indicated. Moderate - soils having one or more properties limiting their use. Correcting these factors will increase construction costs but if not corrected, maintenance costs will increase. Severe - soils having one or more properties that seriously limit their use. The cost of development may be very high but using these soils without employing corrective measures could result in failure. The decision as to whether or not a soil will be used for a specific purpose, regardless of the soil limitation, is beyond the scope of this report.

The four main components of community development considered most important to this study are: (1) lawns and landscaping, (2) sewage disposal, (3) homesite locations with basements, and (4) streets and roads.

Soil properties and landscape features that appear important in affecting the designated uses of the soils in the Morinville area are presented in Table 2.

Table 2. Limiting Properties of Soils

1. Seasonal or permanent high water table
2. Subsoil salinity
3. High shrink-swell potential
4. Low permeability
5. Topsoil salinity
6. Requires on-site inspections
7. Low bearing strength when wet
8. High elastic properties
9. Thin topsoil

The suitability of various mapping units for the selected uses are shown in Table 3. These ratings - slight, moderate and severe - are determined on the basis of the properties listed in Table 2. The principal limiting properties are shown by figures that correspond to the numbers in Table 2.

LAWNS AND LANDSCAPING

The soils are rated for this use assuming they will be used for growing turf, shrubs and/or trees. Suitable soils are those capable of supporting a turf that can withstand traffic and control erosion. Soil properties considered in rating the soils for this use in the area are depth to a seasonal or permanent high water table, permeability, topsoil salinity, and thickness of topsoil. Soils with the highest potential for this use are those of the Beaumont, Morinville and Ohaton associations and mapping units 1 and 2 of the Ellerslie association. Those with the lowest potential are those of the Stoney, Argyll and Hercules associations. The rating of the mapping units for this use are shown in Table 3.

Table 3. Soil Suitability for Selected Uses

il Association	Mapping Units	Soil Limitation For: Lawns and Landscaping	Sewage Disposal	Homesite Locations	Streets, Roads and Parking Lots
aumont	Bmt 1	S	S	S	S
	Gw 2	M4	M4	M2	S
ynne	Gw 3	M1,4	M1,4	M1,2	S
	Sv 1	V1	V1	V1	V1
oney	Sy 2	V1,5	V1	V1,2	V1
berg	Edg 1	M1,5	M1	M2	S
rinville	Mv 1, 2	S	S	S	S
	Ell 1, Ell 2 Ell 2/t	S	M4	M3	V3,7,8
llerslie	Ell 3	M1,4	M1,4	M1,3	V1,3,7,8
	Ms 1	M4	V4	V-M 2,3	V3,7,8
ill Woods	Ms 2	M4	V4	V-M 2,3	V3,7,8
	Ms 3, Ms 3/t	M1,4	V1,4	V1,2,3	V1,3,7,8
rgyll	Ag 3/t	V1,4,5,9	V1,4	V1,2,3	V1,3,7,8
haton	Oht 2	S6	S6	S-M 6	S-M 6
	Hrl 1, Hrl 1p	V1	V1	V1,3	V1,3,7,8
ercules	Hrl 2, Hrl 2/t, Hrl 2p	V1,5	V1	V1,2,3	V1,3,7,8

; - Slight
4 - Moderate
V - Severe
p - Peaty phase
t - Overlying till

1. Seasonal or permanent high water table
2. Subsoil salinity
3. High shrink-swell potential
4. Low permeability
5. Topsoil salinity
6. Requires on-site inspection
7. Low bearing strength when wet
8. High elastic properties
9. Thin topsoil

SEWAGE DISPOSAL

The successful operation of a septic tank tile disposal field depends upon the ability of the soil to absorb and filter the effluent that passes through the field. Soil rating properties considered for this use in this area are depth to a seasonal or permanent high water table and permeability.

Soils considered to have only a slight limitation for this use are those of the Beaumont, Morinville and Ohaton associations. The rating of the mapping units for this use are shown in Table 3.

HOMESITE LOCATIONS WITH BASEMENTS

The soil properties having the greatest significance for this use are depth to a seasonal or permanent high water table, subsoil salinity, and high shrink-swell potential.

A major concern in this area is the potential corrosion of concrete because of high soluble sulfate concentration in the soil solution. The mechanisms of the destructive action of the sulfate ion is well documented (7).

The Concrete Manual of the United States Bureau of Reclamation (8) recognizes the following concrete corrosion categories for per cent sulfate in soil: negligible attack - less than 0.10 per cent; mild but positive attack - 0.10 to 0.20 per cent; considerable attack - 0.20 to 0.50 per cent; and severe attack - greater than 0.50 per cent.

Soils of the Gwynne, Stoney, Edberg, Argyll, Mill Woods and Hercules associations can be expected to have a relatively high content of sulfate ion. Data on Table 1 indicates that the sulfate content ranges from 0.16 to 0.45 per cent for some of these soils and so there may be considerable attack on concrete by sulfate ion. Soils with the highest potential for homesite locations are those of the Beaumont and Morinville associations. The ratings of the other soils are shown in Table 3.

STREETS, ROADS AND PARKING LOT LOCATIONS

The soil properties considered in rating the soils for this use include texture as it relates to bearing strength when wet and elasticity, seasonal or permanent high water table, and shrink-swell potential.

Soils of the Ellerslie, Mill Woods, Argyll and Hercules associations generally have subsoils which are classified in Table 1 as A-7-5 according to the AASHO system (5). These soils have considerable volume change with moisture changes, low bearing value when wet and are elastic i.e. they rebound appreciably when load is removed which makes them difficult to compact properly. They make particularly undesirable subgrades for flexible pavements. Soils of the Stoney and Hercules associations are wet soils that require special engineering practices. Soils of the Beaumont, Gwynne, Morinville and Edberg associations have only slight limitations for this use.

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APPENDIX

Aeolian material - material deposited by wind.

Alluvial material - material deposited by water.

Association, Soil - a group of soils geographically associated in a characteristic repeating pattern in the landscape.

Calcareous material - material containing free carbonates which effervesces visibly when treated with dilute hydrochloric acid.

Cation - an ion carrying a positive charge of electricity. The common soil cations are calcium, magnesium, potassium, sodium and hydrogen.

Eluviation - the removal of soil material in suspension or in solution from a layer or layers of a soil.

Field capacity - the amount of moisture held in a soil after the free water has been drained away into drier soil material below.

Gleying - a reduction process that takes place in soils that are saturated with water for long periods of time.

Horizon - a layer in the soil profile approximately parallel to the land surface with more or less well-defined characteristics that have been produced through the operation of soil-forming processes.

Illuviation - the process of deposition of soil material from an upper to a lower horizon in the soil profile.

Intergrade - a soil that possesses moderately well-developed distinguishing characteristics of two or more soil Orders.

Lacustrine materials - material deposited in lake water and later exposed by a lowering of the water or uplift of the land.

Liquid limit - the water content at which a pat of soil, cut by a groove of standard dimensions, will flow together for a distance of 12 mm. under the impact of 25 blows in a standard liquid limit apparatus.

Peat - unconsolidated soil material consisting largely of undecomposed to partially decomposed organic matter accumulated under conditions of excessive moisture.

Ped - a unit of soil structure such as a prism, block or granule formed by natural processes (in contrast to a clod which is formed artifically).

Pedology - those aspects of soil science involving the constitution, distribution, genesis and classification of soils.

Permeability - the ease with which gases, liquids or plant roots penetrate or pass through a bulk mass of soil or a layer of soil.

pH - a notation used to designate the relative acidity or alkalinity of soils and other materials. A pH of 7.0 indicates neutrality, high values indicate alkalinity, lower values acidity.

Plastic limit - water content at which a soil will just begin to crumble when rolled into a thread approximately 3 mm. in diameter.

Plasticity index - the numerical difference between the liquid and plastic limits.

Profile - a vertical section of the soil throughout all its horizons and extending into the parent material.

Saline material - material whose saturated extract has an electrical conductivity greater than 4 mmhos/cm. The grades of salinity are: weakly saline - 4 to 8 mmhos/cm., moderately saline - 8 to 15 mmhos/cm., and strongly saline - over 15 mmhos/cm.

Soil moisture classes - defined in terms of (a) actual moisture in excess of field capacity and (b) the extent of the period during which excess water is present in the plant root zone.

(1) Rapidly drained - soil moisture content seldom exceeds field capacity except immediately after water additions.

(2) Well drained - soil moisture content does not normally exceed field capacity in any horizon, except possibly the C horizon, for a significant part of the year.

(3) Moderately well drained - soil moisture in excess of field capacity remains for a small but significant part of the year.

(4) Imperfectly drained - soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods of the year.

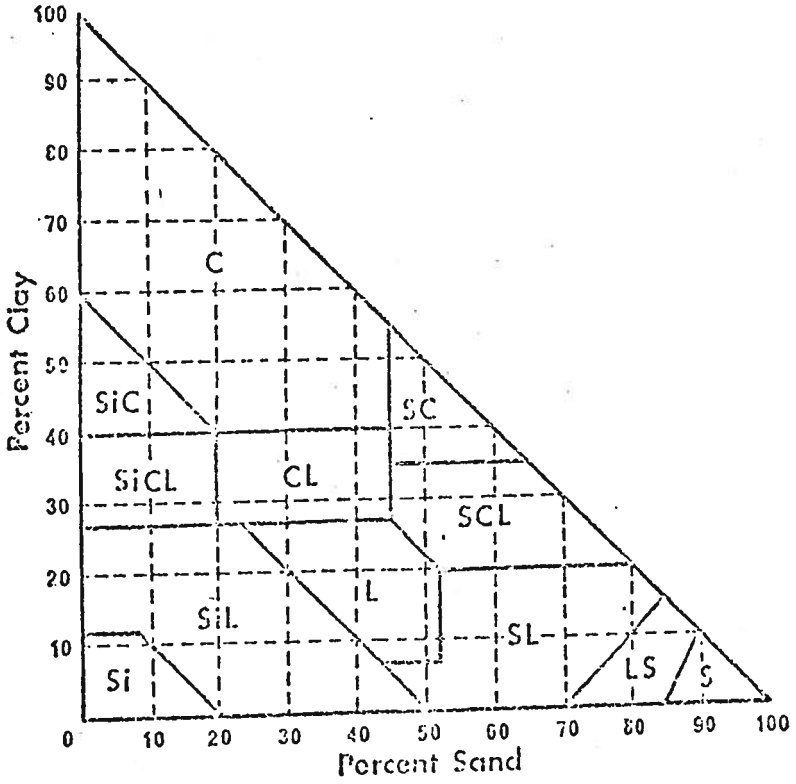
(5) Poorly drained - soil moisture in excess of field capacity remains in all horizons for a large part of the year.

(6) Very poorly drained - free water remains at or within 12 inches of the surface most of the year.

Texture - the composition of the soil on the basis of the per cent of the different soil separates. The soil separates or particle sizes on which textural classes are based are:

Separates	Diam. in mm.*
Gravel (G)	more than 2.0
Very coarse sand (VCS)	2.0 - 1.0
Coarse sand (CS)	1.0 - 0.5
Medium sand (MS)	0.5 - 0.25
Fine sand (FS)	0.25 - 0.10
Very fine sand (VFS)	0.10 - 0.05
Silt (Si)	0.05 - 0.002
Clay (C)	less than 0.002
Fine clay (FC)	less than 0.0002

* USDA Classification



The various textures are grouped as follows: coarse textured - sands (S) and loamy sands (LS); moderately coarse textured - sandy loams (SL) and fine sandy loams (FSL); medium textured - loams (L), very fine sandy loams (VFSL), silt loams (SiL), and silts (Si); moderately fine textured - sandy clay loam (SCL), clay loam (CL), and silty clay loams (SiCL); fine textured - sandy clays (SC), clays (C), and silty clays (SiC); very fine textured - heavy clays (HC)

Topographic classes and symbols -

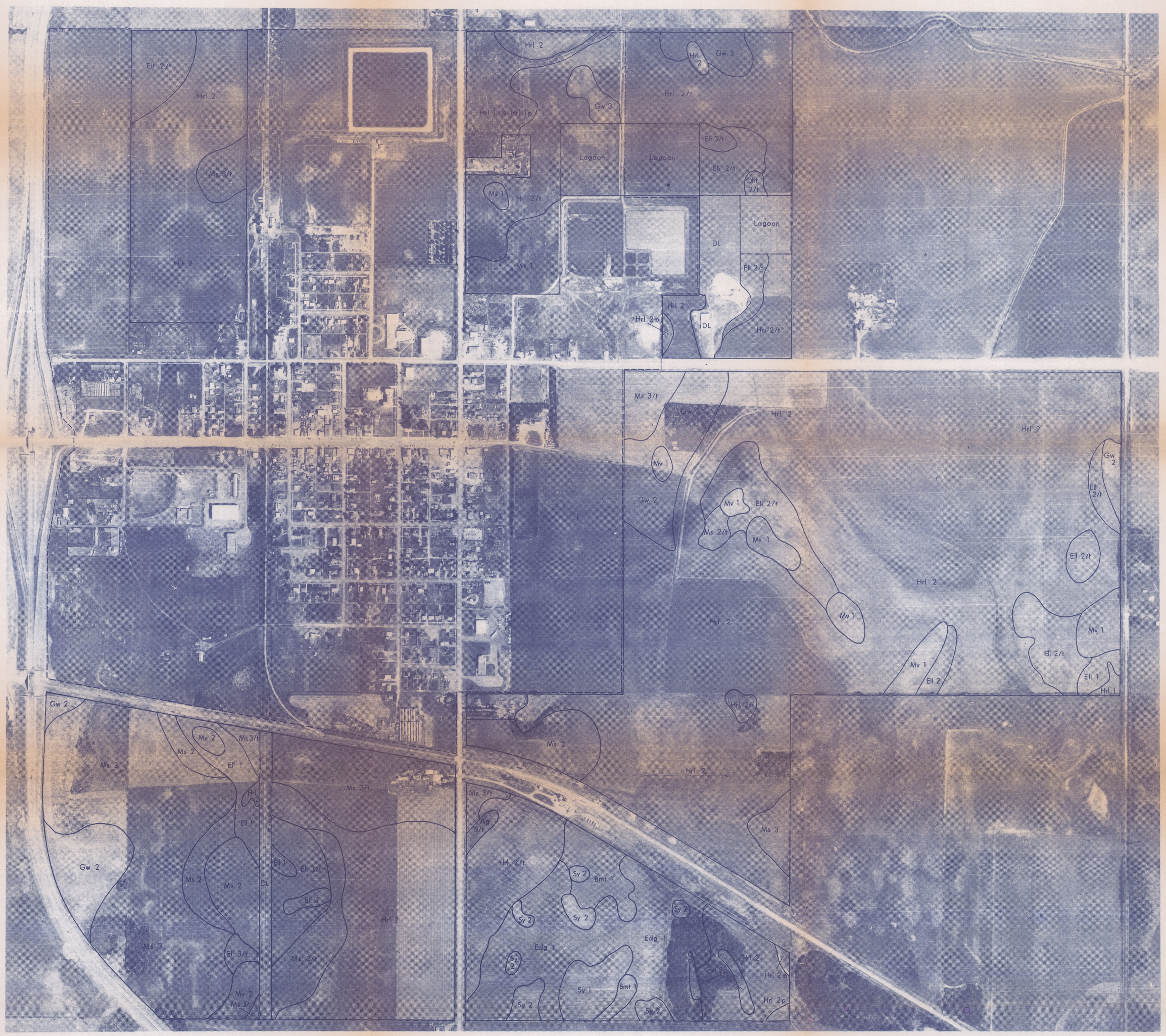
Simple Topography Single Slopes (regular surface)		Complex Topography Multiple Slopes (irregular surface)		Slope (%)
A	depressional to level	a	nearly level	0 to 0.5
B	very gently sloping	b	gently undulating	0.5+ to 2
C	gently sloping	c	undulating	2+ to 5
D	moderately sloping	d	gently rolling	5+ to 9
E	strongly sloping	e	moderately rolling	9+ to 15
F	steeply sloping	f	strongly rolling	15+ to 30
G	very steeply sloping	g	hilly	30+ to 60
H	extremely sloping	h	very hilly	over 60

Water holding capacity - the ability of a soil to hold water.

Water table - the upper limit of that part of the soil that is wholly saturated with water.

SOIL SURVEY OF SELECTED AREAS ADJACENT TO THE TOWN OF MORINVILLE

1972



Soils Legend:

Parent Material	Soil Association	Mapping Unit	Surface Texture	% Slope	Dominant Subgroup	Significant Subgroups
Till	Beaumont	Bmt 1	L	0 - 2	Eluviated Black	Orthic Black
	Gwynne	Gw 2	L	0 - 2	Black Solod	Black Solonetz, Saline Black
		Gw 3	L	0 - 2	Gleyed Black Solod	Gleyed Black Solonetz, Gleyed Saline Black
	Stoney	Sy 1	L	0	Orthic Humic Gleysol	
		Sy 2	L	0	Saline Humic Gleysol	
	Edberg	Edg 1	L	0 - 2	Saline Black	Black Solonetz, Black Solod
Till - Residual	Morinville	Mv 1	L	2 - 5	Eluviated Black	Orthic Black
		Mv 2	L	5 - 9	Eluviated Black	Orthic Black
Lacustrine	Ellerslie	Ell 1	SiL	0 - 2	Eluviated Black	Orthic Black
		Ell 2	SiL	0 - 2	Solodic Black	Black Solod, Eluviated Black
		Ell 3	SiL	0 - 2	Gleyed Eluviated Black	
	Mill Woods	Ms 1	SiL	0 - 2	Black Solonetz	Black Solod, Saline Black
		Ms 2	SiL	0 - 2	Black Solod	Black Solonetz, Saline Black
		Ms 3	SiL	0 - 2	Gleyed Black Solod	Gleyed Black Solonetz, Saline Black
	Argyll	Ag 3	CL	0 - 1	Gleyed Alkaline Solonetz	
	Ohaton	Oht 2	SiL	0 - 2	Orthic Black	Saline Black, Black Solod
	Hercules	Hrl 1	CL	0	Orthic Humic Gleysol	
		Hrl 2	CL	0	Saline Humic Gleysol	

DL - Disturbed Land
/t - overlying till
p - peaty phase
Soil line
Town limits

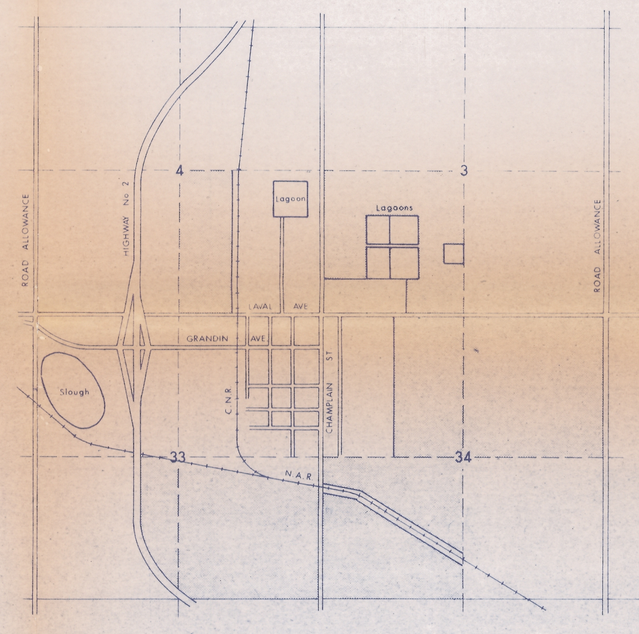
SCALE:

420 0 420 840 1260 1680 2100 FEET

Mapped and Compiled by: M.D. Scheelar
Soils Division
RESEARCH COUNCIL OF ALBERTA
1972

Town of Morinville

Tp. 55 and 56; R. 25
W-4



Location Map