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

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STONY PLAIN, ALBERTA

Prepared for: *Edmonton Regional Planning Commission*

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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 (3). The soil properties affecting agricultural uses of soil are similar to those affecting urban uses. Detailed soil surveys (4,7) 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 800 acres in selected areas adjacent to the town of Stony Plain. Stony Plain is located in Township 52, Range 1, west of the 5th meridian and in Township 52, Range 28, west of the 4th meridian. It is approximately 20 miles west of the city of Edmonton and is accessible by Highway 16.

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 degrees of limitations

(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, hay and pasture with a minor amount being used for residential and commercial development.

The terrain is composed of a large lowland area and gently undulating to undulating upland area that has interspersed depressions.

The soils of the upland are developed from variable lacustrine and deltaic material of moderately coarse to medium texture (1). The lowland soils are developed mainly from sedge peat that varies in stages of decomposition and ranges from 2 to 10 feet in thickness.

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

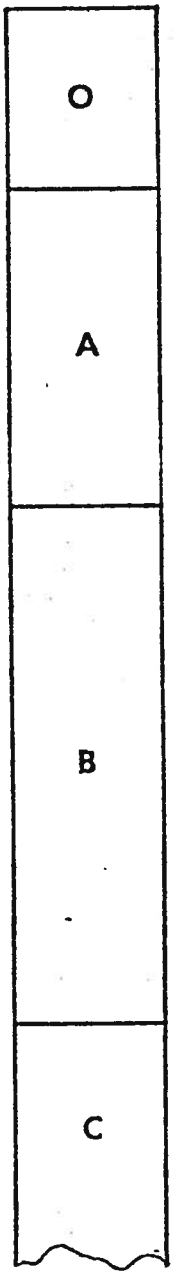
THE SOILS

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.

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 Organic soils and peaty Gleysolic soils. Is either thin or absent in all other soils.

A - A mineral horizon at or near the surface. It may be a dark colored horizon in which there is an accumulation of organic matter or a light colored horizon from which clay has been leached. May be dull in color due to gleying in soils of Gleysolic order and in gleyed intergrades.

B - A mineral horizon below the A horizon in which there is no appreciable amount of organic matter but which is affected by other soil processes. There may be a change in color or structure as in Orthic Dark Gray soils or an accumulation of clays as in Dark Gray Wooded soils. May be dull in color due to gleying in soils of Gleysolic order and in gleyed intergrades.

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.

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).

Seven soil associations were mapped - three on deltaic parent material, two on lacustrine parent material, one on organic material, and one on gravelly outwash.

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 Stony Plain 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

Calahoo Soil Association

The Calahoo association consists of well drained Black Chernozemic soils developed from weakly to moderately calcareous deltaic deposits. They occur in the northern portion of the area on gently undulating topography where slopes

are usually less than two per cent.

The surface soil (A horizon) is comprised of two distinct horizons: the upper horizon is dark colored and granular in structure; the lower horizon is lighter in color and has a weak platy structure. A thin gray leached horizon often occurs below the organic/mineral surface horizon. These horizons are slightly acid to neutral in reaction and range in texture from fine sandy loam to silt loam. The surface soil is from 12 to 20 inches thick.

Subsoil (B and C horizons) is mildly to moderately alkaline in reaction and ranges in texture from fine sand to sandy clay loam.

Manly Soil Association

The Manly association consists of Dark Gray Luvisolic soils with a significant occurrence of Dark Gray Chernozemic soils. The parent material is similar to that of the Calahoo association. Soils of the Manly association are well to imperfectly drained and occur on gently undulating to undulating topography where slopes are usually less than five per cent.

The surface soil (A horizon) of the Luvisols is comprised of two horizons: the upper horizon is darker in color than the lower and has weakly developed platy structure; the lower horizon is light gray and has strong platy structure. The surface soil of the Chernozemic members is somewhat similar to the Calahoo association.

The B horizon of Manly soils consist of moderately fine textured bands, less than 1 inch in thickness, separated by moderately coarse to medium textured interband layers. This horizon is medium to strongly acid in reaction,

ranges in texture from fine sandy loam to clay and varies in thickness from 16 to 30 inches.

The C horizon is mildly to moderately alkaline and ranges in texture from fine sand to very fine sandy loam.

Longhurst Soil Association

The Longhurst association consists of poorly drained Gleysolic soils. These soils are found in the depressional positions in the western portion of the area. The parent material is similar to the Calahoo and Manly associations. A peaty layer up to 16 inches in thickness often occurs at the surface.

The surface soil (A horizon) is neutral to moderately alkaline and ranges in texture from fine sandy loam to silt loam. It varies in thickness from 8 to 12 inches.

The subsoil (B and C horizons) is of similar texture, highly gleyed and mildly to moderately alkaline in reaction.

Tomahawk Soil Association

The Tomahawk association consists dominantly of Dark Gray Luvisolic soils with a significant amount of Dark Gray Chernozemic soil. They are well to imperfectly drained soils developed from calcareous, stratified lacustrine material. Soils of the Tomahawk association occur on gently undulating and undulating topography in the eastern portion of the area. Slopes are usually less than five per cent.

The surface soil (A horizon) usually consists of two distinct horizons. The upper is darker in color and is characterized by weakly developed platy structure. A light gray eluviated layer usually occurs below. The surface

soil is from 8 to 16 inches thick, strongly acid to neutral in reaction and ranges in texture from loam to silty clay loam.

The subsoil (B and C horizons) is mildly alkaline to strongly acid in reaction and ranges in texture from very fine sandy loam to clay.

Hercules Soil Association

The Hercules association consists of poorly drained Gleysolic soils developed from calcareous, stratified lacustrine material. Peaty layers up to 16 inches thick commonly occur at the surface.

The surface soil (A horizon) is moderately to strongly gleyed and neutral to moderately alkaline in reaction. It ranges in texture from very fine sandy loam to silt loam and from 4 to 8 inches in thickness.

The subsoil (B and C horizons) is medium acid to moderately alkaline in reaction and moderately to strongly gleyed. It ranges in texture from very fine sandy loam to clay.

Stony Plain Soil Association

The Stony Plain association consists of very poorly drained Organic soils developed from the remains of rushes, reeds and sedges. The organic material is in various stages of decomposition. The depth to the underlying mineral soil varies from 2 to 10 feet or more.

Pebble Soil Association

The Pebble association consists of Gray Luvisolic soils that are rapidly drained and developed from gravelly outwash materials. The soils occur on gently rolling topography on slopes of 6 to 9 per cent.

The surface soil (A horizon) is slightly to medium acid in reaction, ranges in texture from loamy sand to sandy loam and is from 6 to 10 inches thick. It is comprised of a dark gray upper horizon and a light gray leached lower horizon.

The subsoil (B and C horizons) is medium to strongly acid in reaction and consists primarily of gravel; stones range from 2 to 20 mm. in diameter.

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 classifying soils for structural purposes.

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 (5).

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 having 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, the next best A-2, 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 soils, fine grained soils 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

...pping ...sscie- ...ions	Mapping Units	Depth From Surface (inches)	Grain Size Analysis — Per Cent Passing Sieve							Grain Size Analysis — Per Cent Smaller Than				Atterberg Limits			Activity No. $PI/_C$	Textural Classification		
			1 in.	3/4 in.	5/8 in.	# 4	# 10	# 40	# 200	.05 mm	.005 mm	.002 mm	.001 mm	Liquid Limit	Plastic Limit	Plasticity Index		AASHO	Unified	USDA
alahee	Clh 1	0-18	100	100	100	100	100	100	81	-	-	-	-	45	39	6	-	A-5 (9)	ML	-
		18-60	100	100	100	100	100	100	79	78	34	31	29	29	22	7	0.2	A-4 (8)	CL-ML	CL
		60-96	100	100	100	100	100	100	100	100	50	35	27	36	25	11	0.3	A-6 (8)	ML	SICL
		96-120	100	100	100	100	100	100	100	97	36	25	18	34	25	9	0.4	A-4 (8)	ML	SIL
omahawk	Thk 1	0-24	100	100	100	100	100	100	87	-	-	-	-	38	29	9	-	A-4 (8)	ML	-
		24-48	100	100	100	100	100	100	74	-	-	-	-	34	26	8	-	A-4 (8)	ML	-
		48-84	100	100	100	100	100	100	100	100	70	50	39	48	32	16	0.3	A-7-5 (12)	ML	SIC
omahawk	Thk 1	0-8	100	100	100	100	100	99	80	-	-	-	-	43	30	13	-	A-7-5 (10)	ML	-
		8-42	100	100	100	100	100	98	97	84	65	50	39	46	26	20	0.4	A-7-6 (13)	CL	C
		42-78	100	100	100	100	100	99	100	100	79	53	40	53	34	19	0.4	A-7-5 (15)	MH	SIC
anly	Mly 1	0-10	100	100	100	100	100	100	86	-	-	-	-	39	32	7	-	A-4 (8)	ML	-
		10-34	100	100	100	100	100	100	100	99	54	43	39	40	26	14	0.3	A-6 (10)	ML	SIC
		34-62	100	100	100	100	100	100	72	72	32	27	24	28	20	8	0.3	A-4 (7)	CL	L
		62-84	100	100	100	100	100	100	68	64	30	27	24	26	21	5	0.2	A-4 (7)	CL-ML	-
anly	Mly 1	0-20	100	100	100	100	100	100	100	99	52	42	34	-	-	-	-	-	-	SIC
		20-35	100	100	100	100	100	99	89	87	39	33	30	37	NP	NP	-	A-4 (8)	ML	SICL
		35-57	100	100	100	100	100	100	66	65	28	22	20	27	22	5	0.2	A-4 (7)	CL-ML	L
anly	Mly 1	0-12	100	100	100	100	100	100	84	-	-	-	-	33	26	7	-	A-4 (8)	ML	-
		12-34	100	100	100	100	100	99	77	70	32	28	23	28	19	9	0.3	A-4 (8)	CL	L-CL
		34-56	100	100	100	100	100	99	96	94	66	45	30	45	23	22	0.5	A-7-6 (14)	CL	SIC
		56-74	100	100	100	100	100	100	100	100	49	32	26	38	26	12	0.4	A-6 (9)	ML	SICL
anly	Mly 1/1	0-20	100	100	100	100	100	100	74	-	-	-	-	32	25	7	-	A-4 (8)	ML	-
		20-56	100	100	100	100	100	100	63	62	30	27	22	25	21	4	0.2	A-4 (6)	CL-ML	L-CL
		56-122	100	100	100	100	100	100	100	100	60	47	37	45	24	21	0.5	A-7-6 (13)	CL	SIC
anly	Mly 1/1	0-12	100	100	100	100	100	100	64	-	-	-	-	27	20	7	-	A-4 (6)	CL-ML	-
		12-18	100	100	100	100	100	100	60	59	23	20	19	21	20	1	0.1	A-4 (5)	CL	L
		18-42	100	100	100	100	100	100	66	64	28	27	27	27	20	7	0.3	A-4 (6)	CL-ML	L
		42-86	100	100	100	100	100	100	38	37	22	20	19	22	19	3	0.2	A-4 (1)	SM[d]	SL-SCL
		86-106	100	100	100	100	100	100	100	100	76	55	45	55	35	20	0.4	A-7-5 (15)	MH	SIC

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 that have one or more properties that limit their use. Correcting these factors will increase construction costs but if not corrected maintenance costs

will increase. Severe - soils that have 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 Stony Plain area are presented in Table 2.

Table 2. Limiting Properties of Soils

1. Seasonal or permanent high water table
2. Droughtiness
3. Poor trafficability
4. Steep slopes
5. Groundwater contamination hazard

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.

Table 3. SOIL SUITABILITY FOR SELECTED USES

Soil Association	Mapping Units	SOIL LIMITATION FOR: Lawns and Landscaping	Sewage Disposal	Homesite Locations with Basements	Street, Road and Parking Lot Locations
Calahoo	Clh 1	S	S	S	S
Manly	Mly 1, Mly 1/1	M2	S	S	S
	Mly 2, Mly 2/1	M2	S	S	S
	Mly 3, Mly 3/1	M1	M1	M1	M1
Longhurst	Lgt 1, Lgt 1/1	V1	V1	V1	V1
Tomahawk	Thk 1	S	S	S	S
	Thk 2	S	S	S	S
	Thk 3	M1	M1	M1	M1
Hercules	Hrl 1	V1	V1	V1	V1
Stony Plain	Stp 1	V1	V1	V1	V1, 3
	Stp 2	V1	V1	V1	V1, 3
Pebble	Pbl 4	V2, 3, 4	V5	M4	M4

Slight - S
Moderate - M
Severe - V

1 - Seasonal or permanent high water table
2 - Droughtiness
3 - Poor trafficability
4 - Steep slopes
5 - Groundwater contamination hazard

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 are surface texture as it relates to droughtiness and trafficability, thickness of topsoil, depth to a seasonal high water table, and slope. Soils with the highest potential for this use are those of the Calahoo and Tomahawk associations and mapping units 1 and 2 of the Manly association. Table 3 shows the limitations of each mapping unit for lawns and landscaping.

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. At the same time consideration must be given to the possible contamination of groundwater systems in areas characterized by extremely permeable soils. Soil rating properties considered for this use are depth to a seasonal high water table and the texture as it relates to absorption and groundwater contamination.

Soils considered to have only a slight limitation for this use are those of the Calahoo association, mapping units 1 and 2 of the Manly association, and mapping units 1 and 2 of the Tomahawk association. The rating of the other 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 and degree of slope.

Soils with the highest potential for this use are those of the Calahoo association and mapping units 1 and 2 of the Manly and Tomahawk associations. The ratings of the remaining 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, drainage, depth to the water table, and slope.

Generally, the soils in the Stony Plain area have good bearing strength and are suitable for the construction of streets, roads and parking lots. The soils with major limitations for this use are the poorly and very poorly drained Longhurst, Hercules and Stony Plain associations. These are wet soils and special engineering practices are required where road construction is planned. In particular, the organic soils of the Stony Plain association may present serious problems in drainage and trafficability.

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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.

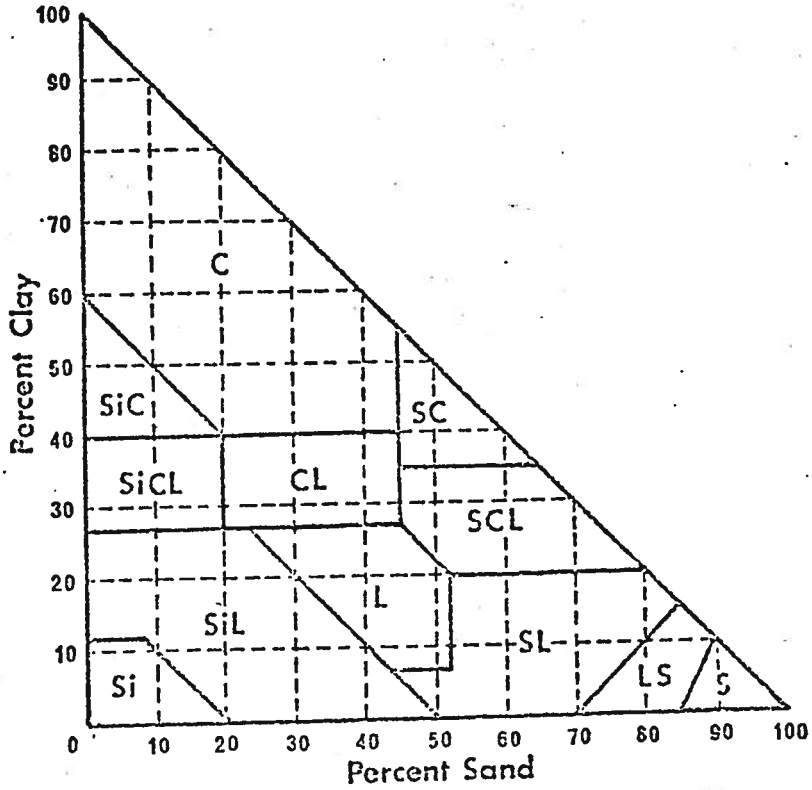
(5) Poorly drained - soil moisture in excess of field capacity remains in all horizons for a large part of the year.

(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.