Soils Report No. D86 1999

SOILS OF THE RURAL MUNICIPALITY OF STRATHCONA

by

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AGRICULTURAL RESOURCES SECTION
MANITOBA AGRICULTURE

in cooperation with

MANITOBA LAND RESOURCE UNIT
AGRICULTURE AND AGRI-FOOD CANADA

and

DEPARTMENT OF SOIL SCIENCE, UNIVERSITY OF MANITOBA

PREFACE

This report and accompanying map provide detailed information on the soil resources of the Rural Municipality of Strathcona. It is one in a new series of such reports providing a more detailed comprehensive soil survey to complement and expand on information contained in the reconnaissance surveys for southern Manitoba. New mapping techniques, more intensive field investigations, use of aerial photographs and topographic maps combined with improved methods of studying soils in the laboratory and accumulated knowledge of the properties and uses of soils over the years have all contributed to the increased information in these reports.

Information in this report is presented in both a descriptive form for users who wish to derive their own interpretations and also in an interpretive form to assist other users who require some initial assessment of soil behaviour under different management systems. Descriptive information is provided for soils that occur in the project area, as well as interpretations for land uses related to agriculture, irrigation farming, engineering and outdoor recreation. Soil map information is provided at a scale of 1:50,000 on a photobase map.

During the course of this resurvey a large volume of site specific soil data was gathered and recorded on field sheet input forms that for practical reasons cannot be included in this report. This data also exists in digital form on PC based software format to permit automated manipulation and statistical evaluation for both map and soil characterization and interpretation. Thematic interpretive maps showing general agricultural land capability or single feature maps showing various soil properties or landscape features such as texture, drainage class, slope, erosion, etc., can be derived from the basic soil maps and other data files. Individual requests for such data should be directed to: the Manitoba Agricultural Resources Section, Department of Soil Science, Room 362, Ellis Building., University of Manitoba, Winnipeg Manitoba, R3T 2N2.

The staff of the Agricultural Resources Section trust that this report and accompanying maps will be of value, in terms of providing a basic inventory of the properties of soils, to all who may be involved in the planning, development and management of the soils in this project area.

ACKNOWLEDGEMENTS

The report on the Soils of the Rural Municipality of Strathcona was conducted as a joint project of the Manitoba Department of Agriculture, Agriculture and Agri-Food Canada and the Soil Science Department, University of Manitoba.

The soils were mapped by G.P. Podolsky.

Laboratory analysis were provided by R. Mirza and E. St. Jacques under the direction of P. Haluschak.

Map and sketch compilation, digitizing in preparation for publication and inputting to the digital files was provided by J. Griffiths and C.L. Aglugub.

Assistance in soil correlation was provided by R.G. Eilers, W. Michalyna and G.F. Mills.

I.G. Podolsky for editing map and report.

C.L. Aglugub for providing computer processing, programming and report formatting.

HOW TO USE THIS SOIL REPORT

This soils report contains considerable information about the soils, their origin and formation, their classification and their potential for various uses such as dryland agriculture and irrigation. The report is divided into four parts: Part 1 provides a general description of the area; Part 2 describes the methodology used in the study; Part 3 discusses the development, scientific classification and morphological characteristics of the soils in the study area, and Part 4 provides an interpretation of soil properties and associated landscape features as they affect soil capability or suitability for various uses.

The accompanying soil map is presented at a 1:50 000 scale on an air photo base to assist the user in locating the soil areas in relation to landscape features, roads and field boundaries. The following steps are suggested to assist the user in retrieving soil information from the map and report:

STEP 1 - Consult the soil map in pocket of report folder. Locate the area(s) of interest on the map and identify the pertinent map unit symbols. Arabic numerals placed as superscripts following map symbols indicate the approximate proportion of each soil type within the map unit.

STEP 2 - Consult the extended legend accompanying the soil map for an alphabetical listing of soil symbols giving the soil name, surface texture, drainage, related information concerning landform and stratigraphy of the soil materials and soil classification.

STEP 3 - For interpretive information on the soil capability for dryland agriculture, water erosion risk, suitability for irrigation, selected engineering and recreation uses consult the appropriate section in Part 4.

STEP 4 - Further information concerning the morphological properties and extent of the soils is presented in Part 3 of the report.

STEP 5 - Additional site specific information not contained in this report is available on request from the Agricultural Resources Section, Manitoba Agriculture, Ellis Bldg., University of Manitoba. Also available on request are:

* Guides for Evaluating Soil Suitability for Selected Uses
* Detailed Soil Descriptions
* Chemical and Physical Soil Analyses
* Engineering Description of Soils
* Glossary of Terms

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PART 1

1 GENERAL DESCRIPTION OF STUDY AREA

1.1 LOCATION AND EXTENT

The Rural Municipality of Strathcona is located in the south-central part of the province, about 50 km. southwest of Glenboro. It is bordered by the municipality of Argyle to the east and by the Pembina Channel to the southwest. The R.M. of Strathcona covers an area of 53,545 hectares as shown in Figure 1. Belmont and Ninette are situated in the study area on highway number 23, which runs east-west through the municipality.

The soil survey project is a semi-detailed resurvey at a scale of 1:50,000 (1 mile = 1.26 inches) of an area formerly covered in the reconnaissance (1:126,720 scale) survey of the South-Central Map Sheet Area, Report No. 4, 1943. Soil mapping from the "Soils of the Pelican-Rock Lake Area" has been incorporated into this R.M. report. The R.M. of Strathcona encompasses an area including Ranges 15W and 16W and Townships 4 to 6.

1.2 LAND USE

Agriculture is the predominant and most significant land use throughout the R.M. of Strathcona. Rural residential, recreational areas, wildlife refuges, wooded areas and aggregate quarries are some of the additional users of the land resource.

The economic livelihood of the study area is based primarily on agricultural production and its service requirements. The three main types of agriculture are grain production, livestock and mixed farming. Wheat, barley and oats are the major cereal crops along with flax and canola. Cattle operations often take advantage of the rougher topography, wooded areas and wet areas adjacent to rivers, creeks and drains for grazing land. Pasture and forages are also more common on the droughty sand and gravel areas or lands of lower capability.

The southwestern limit of the study area is marked by the Pembina Channel, including Pelican, Lorne and Louise Lakes. The contrast and beauty of the lakes and valley afford excellent opportunities for sport, recreation and wildlife. Among the attractions are beaches, picnic sites, water skiing, swimming, golf, hunting, fishing and boating. Consequently, numerous cottages and camps dot the shores and slopes of the valley. Recently the waters of the Pembina River have been diverted through Pelican Lake in order to maintain a more uniform lake level.

1.3 RELIEF AND DRAINAGE

The principal relief and drainage features in the municipality of Strathcona are discussed below. The maximum relief, ranging from a low point of 1350 ft. (412 m) in the channel to a high of 1650 ft. (503m) in the morainic hills, is about 91 meters. The mean altitude of the project area would be in the 1400 to 1550 ft. (427m to 473m) range. Local relief varies considerably in the central and southern portions where bedrock cored hills and end moraines occur. Generally, the northeast segment of the project slopes northeast and the southwest margin slopes toward the Pembina channel. Topography ranges from level to very gently sloping in the lacustrine areas and from gently to strongly sloping in the hummocky till landscapes.

The natural drainage of the R.M. of Strathcona is facilitated by the Pembina River and Assiniboine River systems along with their contributory rivers, creeks and drains. The Darlingford moraine acts as somewhat of a drainage divide in the area. The northern section of the study is drained by Oak Creek with its feeder drains, which empties into the Souris River. Water from the east-central portion moves eastward eventually making its way into the Cypress River. The southwest margin of the municipality

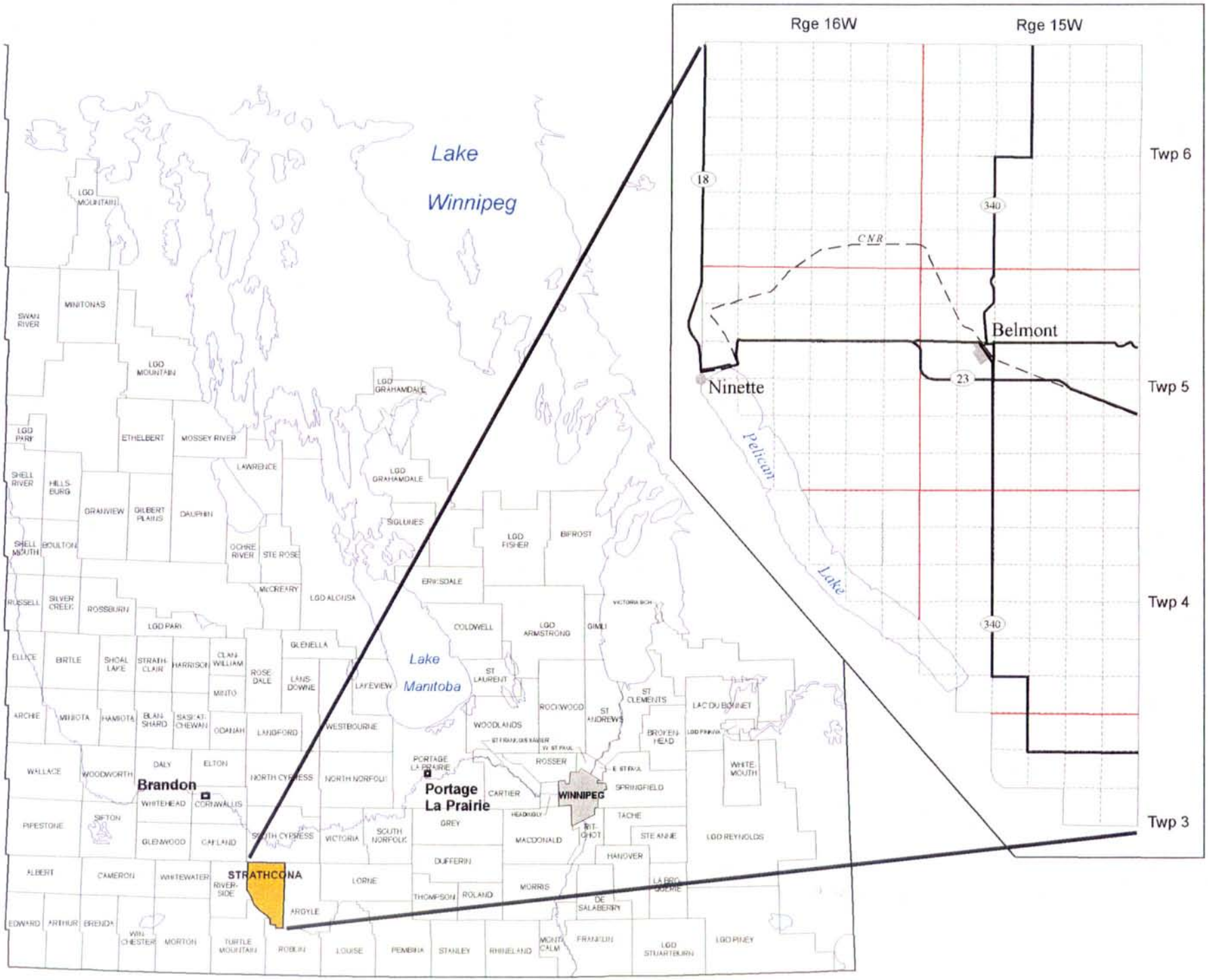


Figure 1. Location of Study Area.

drains into the Pembina channel. Numerous small lakes, sloughs and marshes dot the landscapes, particularly in the morainic Tiger Hills north of highway 23.

In general, surface drainage over much of the municipality is weakly integrated. Intermittent lakes, sloughs and other depressions without outlets are common. The soil drainage data for the map area indicates **57** percent well drained soils, **28** percent imperfectly drained and **8** percent with poor drainage. Soil drainage reflects a combination of surface runoff as well as internal movement.

1.4 PHYSIOGRAPHY

A major portion of the municipality of Strathcona is situated within the Tiger Hills Upland section of the Saskatchewan Plain division (Figure 2). The northeast corner of the project is part of the Brandon Lakes Plain subsection of the Assiniboine River Plain section. The remaining southwest margin of the study, bordering the Pembina channel, belongs to the Boissevain Plain subsection of the Pembina River Plain.

The Tiger Hills Upland section is characterized by an undulating to gently rolling moraine. The areas of ground moraine are smoother and more compact than that of the end moraine deposits which are unsorted, less compact and rougher. The deposits include strongly to extremely calcareous, stony, loamy till and glaciofluvial outwash deposits, often in the form of eskers, e.g., the area east of Belmont. Drumlins occur in the hills about six miles north of Ninette and in the Belmont area. These glacially streamlined features have rock cores of shale which control much of the relief.

The northeast tip of the municipality coincides with the Brandon Lakes Plain physiographic subsection. This level to very gently sloping, lacustrine wave-cut terrace extends along the north face of the Tiger Hills. In many places the till that initially covered the northern slope of the hills was eroded by wave action. The remaining surface is quite stony and the underlying shale, which is often near the surface, contributes significantly to the configuration of the landscape.

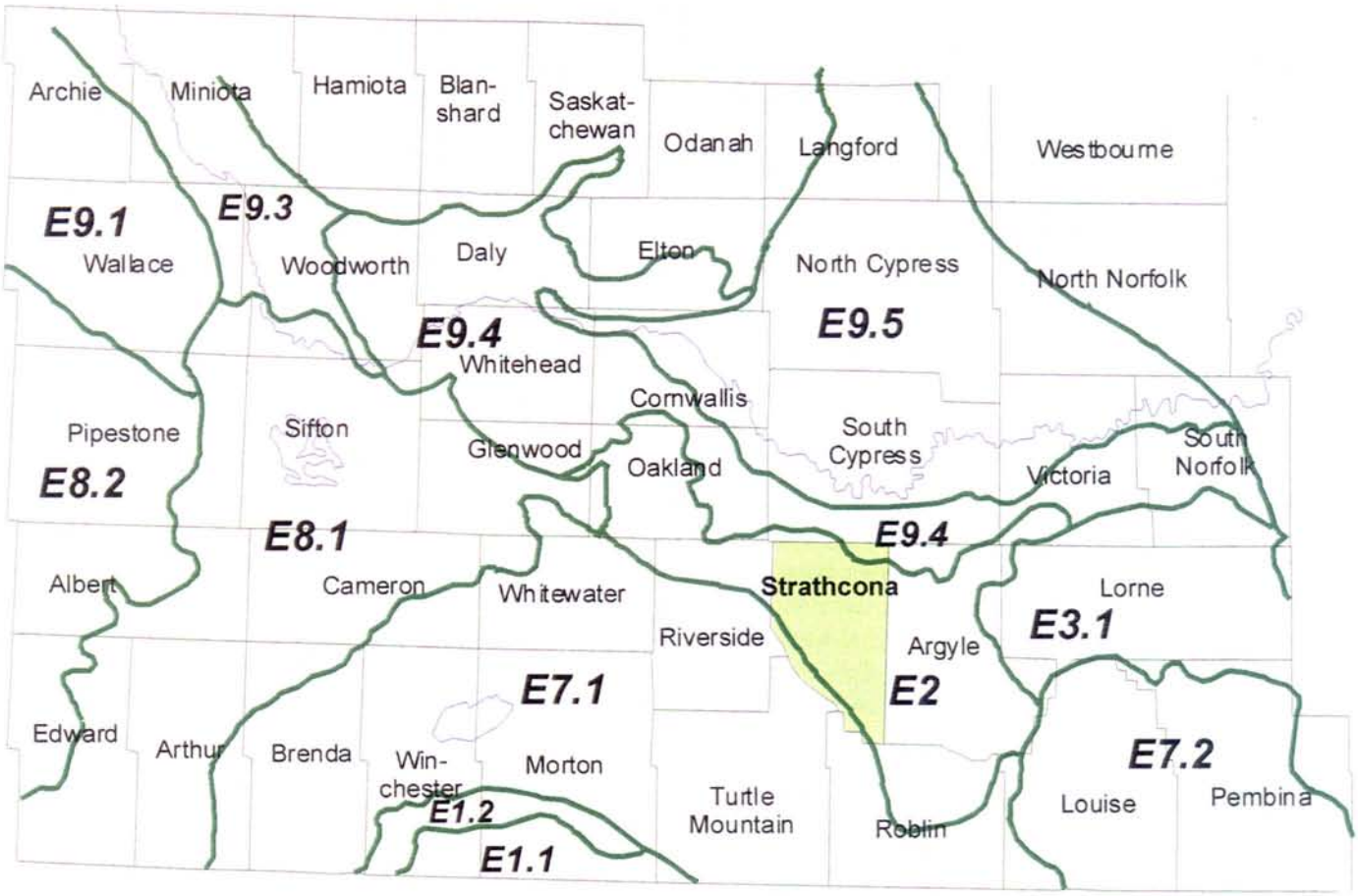
The margin of the area that is covered by the Boissevain Plain subsection may be best described as a level to very gently sloping, terrace-like plain with isolated hillocks. The materials are water deposited sediments over gravelly, stony and/or shaly modified till. A large block of glaciofluvial and outwash gravels occurs immediately north and east of Ninette. Linear ridges typical of gravel beaches are found in the outwash areas. A contrasting feature of this subsection is the presence of the Pembina River channel. This trench is U shaped, about 46 meters deep and 1.6 kilometers wide. At the time the continental ice sheet was melting back, drainage waters from Western Canada flowed down the channel in a mighty river that emptied into Lake Agassiz.

1.5 SURFACE DEPOSITS

Surface deposits in the study area vary in form and properties within each physiographic unit depending largely on the characteristics of the bedrock from which they were derived and the mode of transport and deposition. Glaciation, glacial meltwaters and subsequent laking have resulted in the deposition of variable depths of glacial till, fluvial outwash deposits and lacustrine or water sorted sediments in the project area. Surface deposit or drift thickness over shale bedrock in the area ranges from near surface to 27 metres and averages around 8 metres.

A major portion of the area is covered by glacial deposits of the Tiger Hills Upland section. The soils are developed on strongly to extremely calcareous fine loamy (L,CL,SiCL) boulder till of dominantly limestone and granitic origin. The till is deposited by ice in the form of end or ground moraine which is often stony. A number of glacially streamlined features, mainly shale bedrock cored drumlinoids are also present, having a thin covering of drift.

The Brandon Lakes subsection in the northeast is an eroded lake terrace with variable surface deposits. Shallow lacustrine loam to clay loam sediments overlying residues of boulder till are predominant. A lag of shaly gravel or cobbles is often present at the contact of the overlay and till. In some positions of the terrace, the surface deposits are so thin that the weathered shale below comes close to the surface. The water worked deposits are largely the result of wave action, which has resulted in belts



E. Saskatchewan Plain

E2 Tiger Hills Upland

E7 Pembina River Plain

E9 Assiniboione River Plain

.1 Boissevain Plain

.4 Brandon Lakes Plain

Reference to:
Physiographic Divisions of Manitoba
Agricultural Resources Section
December, 1980

Figure 2. Physiographic Regions of the Study Area.

of very stony land. These stones are a major limitation to land use in this area. In addition, extensive deposits of heavy clay textured solonetzic soils are present in township 6, range 15W. The so-called "gumbo spots" are saline and have very poor structure, making them difficult to manage. Just north of the terrace area on the fringe of the study are deep lacustrine materials.

Surface deposits on the terrace-like plain along the Pembina channel are the result of water action and sorting by the former arm of the glacial Lake Souris outlet. Deposits consist of deep glaciofluvial sand and gravel outwash, and loam to clay loam textured lacustrine materials over boulder till. A modified or reworked contact zone is usually present at the overlay/till contact. Similar deposits to those just described, occur in an area east of Belmont where the modified soils were likewise previously mapped as the "Heaslip Complex".

The floor in the Pembina channel portion of the municipality is covered with loam to clay loam textured, recent alluvium. These alluvial deposits or fill are stratified and frequently have a shaly component to them.

1.6 GEOLOGY

The bedrock geology for the rural municipality of Strathcona is shown in Figure 3. The entire study is underlain by Cretaceous rock of the Riding Mountain formation. Hard grey siliceous shales of the Odanah member cover a major part of the area but grade into soft, greenish bentonitic shale of the Millwood member in the extreme northeast corner of the project. The thickness of the Odanah in the study area is approx. 75 m., while the Millwood is about 25 m. The shales of the Vermilion River formation outcrop just north of the project. The hard siliceous shale of the Odanah member forms a large portion of the glacial drift, fluvial deposits (including eskers) and is the core of drumlinoids and other ridges in the study.

1.7 CLIMATE

Relative to worldwide climatic conditions, the study area occupies a position in the interior of North America beyond the range of the moderating affects of oceans. Its location in mid northern latitudes offers a continental climate with short, cool summers and long cold winters. The climate of the area is influenced mainly by three types of air masses; cold dry air from the continental polar region, cool and moist air from the Pacific and occasionally warm and moist air from the Gulf of Mexico. Frequent changes in these air masses contribute to extreme variability of weather patterns in each season.

Climatic data generated by a local climate station at Ninette is representative of the study area. The climatological data for the station is presented in Table 1. The mean annual temperature at Ninette is 2.6°C. Mean annual precipitation recorded is 512 mm with 383 mm occurring as rainfall. June is the wettest month with 88 mm. Spring and fall precipitation is often uniformly distributed throughout the area. However, in summer when local showers and thunderstorms are frequent, rainfall distribution can be extremely variable from one area to another.

The relationships that exist among climate, vegetation and soil in the study area are reflected in the ecoclimatic map shown in Figure 4. Ecoclimatic Regions cover a continuous geographic area and are characterized by distinctive ecological responses to microclimate as expressed by vegetation, soil, fauna and aquatic systems. Soil types developed on similar parent material and under similar drainage conditions but in different ecoclimatic regions are identified by different series or association names to indicate that many of the associated ecologic conditions are dissimilar. Regions key on soil differences at the Great Group and Order level, while subregions recognize differences described at the Soil Series level.

The R.M. of Strathcona is characterized mainly by conditions typical of the Grassland Transition (Gt) ecoclimatic region. A major part of the study area is covered by the Gt_2 subregion. The cool, subhumid climate which distinguishes this region provides sufficient moisture and length of growing season for persistence of dominantly native grassland vegetation and Chernozemic Black soils. The Gt_2 subregion has a mean annual temperature of 1.6°C, an average frost free period of 111 days and a mean annual precipitation of 488 mm. The southwest edge of the project area falls into the Gt_3 subregion. This slightly warmer and drier subregion has a mean annual temperature of 2.6°C, an average frost free period of

114 days and a mean annual precipitation of 478 mm. A small area northwest of Belmont is in the Low Boreal Subhumid (LBs_2) subregion. This undulating to hummocky upland has slightly cooler temperatures, resulting in a slight increase in available moisture.

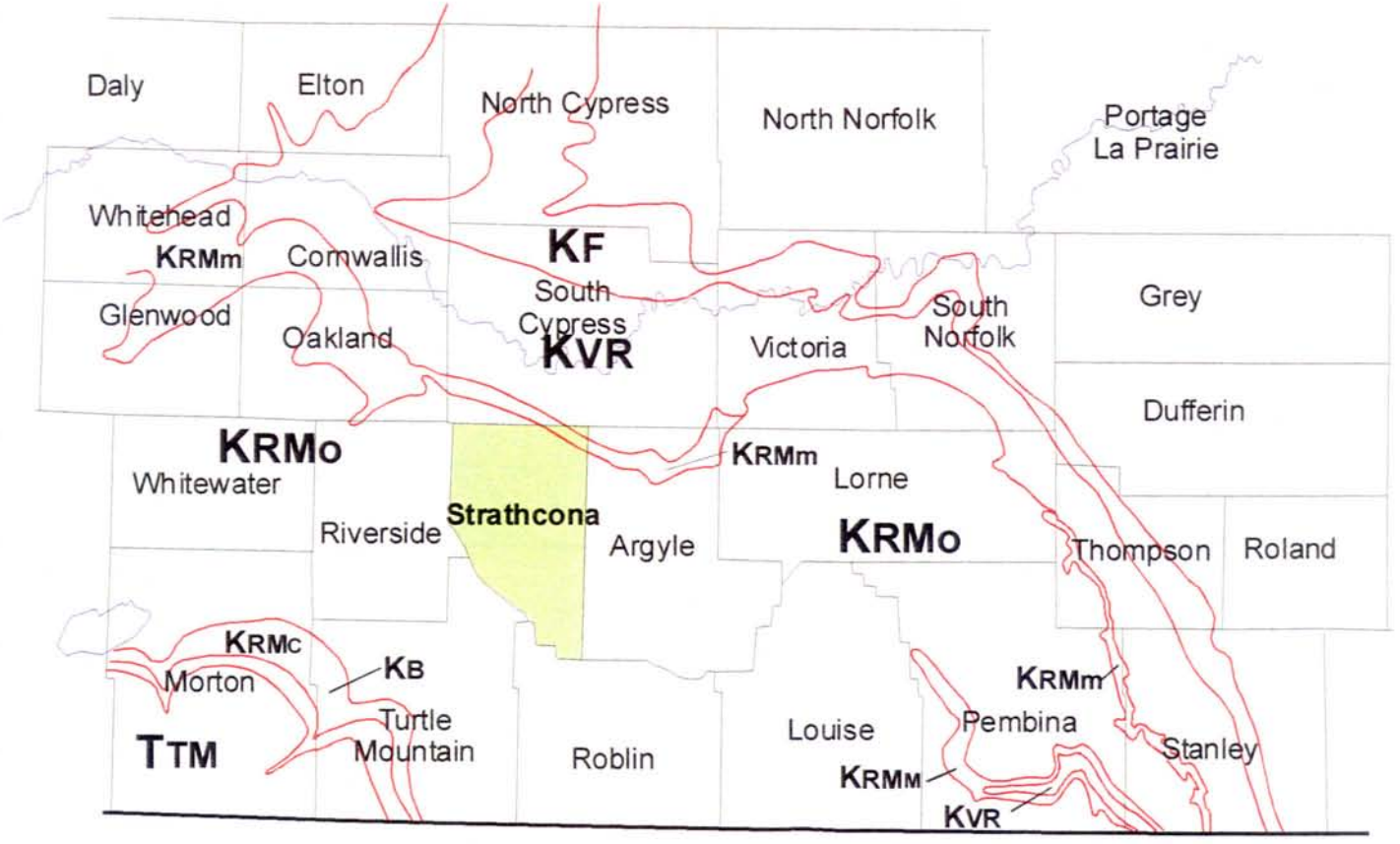
Soil climate consists of soil temperatures and soil moisture both of which are related to aerial climate and consequently ecoclimatic regions. It has a direct influence on most biological, chemical and physical processes in the soil. In the study area soil climate conditions are described as dominantly Boreal, cool to moderately cool subhumid. These soils are characterized by a mean annual soil temperature of 5 to 8°C and a mean summer soil temperature of 12 to 15°C at the 50 cm depth. Data from the closest soil temperature site at Glenboro shows a MAST of 5.4°C and a MSST of 15°C at 50 cm. Generally, soils gain heat during the period from May to August and lose heat from September to March.

1.8 VEGETATION

The study area occurs at the southeastern edge of the Aspen - Oak Section of the Boreal Forest Region of Canada (Rowe 1972). At this point the deciduous element of the boreal forest extends into a transition zone beyond the conifers forming a continuous closed forest or groveland where elements of the prairie are intermixed.

Most of the native vegetation in the study area has been modified or replaced by agricultural use. Where it occurs, the native vegetation is dominantly tall prairie grasses and herbs with scattered groves of aspen. Meadow grasses and sedges occur in the wetter positions. Islands of oak trees are scattered throughout the study, marking the mounds or well drained areas. Generally, stands of mixed deciduous cover are mainly aspen with inclusions of oak, maple and willow in low lying areas. Some of the more common shrubs are hazel, chokecherry, saskatoon, pincherry, rose and dogwood.

The southwestern limit of the municipality is marked by the wooded banks of the Pembina Channel which are covered with oak and poplar. The lower slopes and floor of the valley are protected with woods of elm, maple, ash, birch and willow. The maintenance of a good vegetative cover on the slopes is essential for erosion control, conservation of water and wildlife, as well as scenic and recreational value.



Mesozoic

Cretaceous

Upper Cretaceous

KRM$^{o}_{m}$ Riding Mountain Formation (285-340m thick):
Millwood Member(m) - soft greenish bentonitic shale
Odanah Member (o) - hard grey siliceous shale

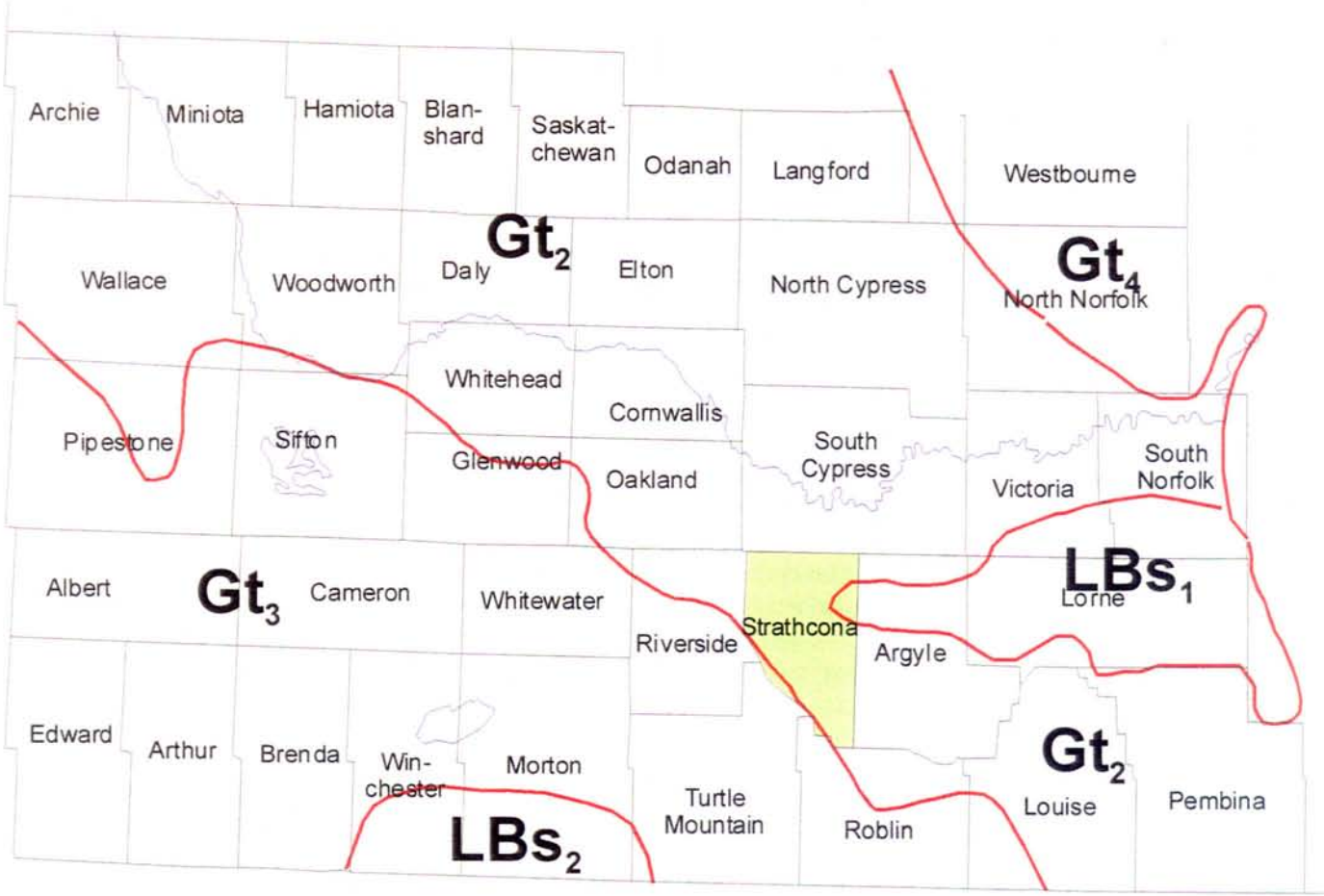
KVR Vermilion River Formation (50-190m thick)
Morden Member - black carbonaceous shale.
Boyne Member - grey calcareous speckled shale and carbonaceous shale.
Pembina Member - thinly interbedded carbonaceous shale, bentonite and bentonitic shale

Reference to:
Manitoba Mineral Resource Division 1979
Geological Map of Manitoba, Scale 1:1 000 000 Map 79-23

Figure 3. Geology of the Study Area.

Table 1. Climate Data from a Climatological Station at Ninette

Climatic Parameters	Ninette
Mean Annual Temperature	2.6°C
Frost Free Period (Days 0°C)	111 days
Last Frost (Spring)	May 25
First Frost (Fall)	Sept 14
Degree Days (above 5°C)	1738
Total Precipitation	512 mm
Mean Annual Rainfall	383 mm
Mean Annual Snowfall	129 cm
Corn Heat Units	(2300 to 2400)



Ecoprovince	Ecoclimatic Region		Subregion
	Name	Symbol	
Grassland	Grassland Transition	Gt	2 3 4
Boreal	Low Boreal, Subhumid	LBs	1 2

Reference to:
Ecoclimatic Regions and
Subregions of Manitoba
Agricultural Resources Section
May, 1988

Figure 4. Ecoclimatic Regions of the Study Area.

PART 2

2 METHODOLOGY

2.1 MAPPING AND MAP SCALE

Semi-detailed (1:50,000 scale) soil mapping was completed throughout the R. M. of Strathcona. This map scale requires that inspections be made to at least one meter depth along road allowances and trails around the square mile at .4 km intervals resulting in an inspection density of approximately one observation/30 ha. Occasionally additional soil inspection traverses or checks were made where soil complexity necessitated additional field observation. Certain minor soils or phases may not be encountered during field investigations and thus become part of the unnamed inclusions of the map. Generally, the proportion of unidentified inclusions increases as inspection density decreases or as natural soil variability increases.

Semi-detailed soil maps provide soil information which can be used for many purposes including local regional planning (Mapping Systems Working Group, 1981). Semi-detailed mapping was utilized in this area because of current landuse patterns and because of predicted future landuse.

2.2 MAP UNITS

A map unit represents mappable portions of the soil landscape that together have characteristics and properties varying within more or less narrow limits that are determined by the intensity of the survey.

A map unit contains predominantly one or more than one soil or nonsoil individual plus a certain proportion (varying within prescribed limits) of unnamed and undescribed inclusions. They are delineated on the basis of the types and relative proportions of their soils or nonsoils, as well as on the basis of external criteria such as slope, stoniness or erosion.

Soil maps show the distribution of kinds of soils and, as such, serve as a link so that the knowledge gained in one locality about the usefulness or behaviour of a kind of soil can be extended to other bodies of the same soil.

A map unit comprises all delineations that contain exactly the same symbol. This includes all the characters denoting soils, nonsoils, phases and deciles. While they represent real portions of the landscapes, most map units are concepts because their total range of properties is made up of the aggregate of all their delineations and no one delineation will contain the full range of properties. The proportions of each of the component soils and nonsoils and undescribed inclusions may vary within reasonable limits from one delineation to another.

A map unit is named from its principal component soils or nonsoils. It is described in terms of the properties of these components, their relative proportions and other external land attributes. In this project, units are described in terms of named soil series and phases of soil series. The soil series is defined as a naturally occurring soil body such that any profile within that body has a similar number and arrangement of horizons whose colour, texture, structure, consistence, reaction and composition are within a narrowly defined range. If a soil has properties which vary slightly from the prescribed range of the series, a soil series variant is established.

Map units will always contain small proportions of inclusions. These inclusions may be soil or non-soil mapping individuals that are named and have their own map units elsewhere in the survey, or they may be rare or insignificant soils or nonsoils that are not recognized or named at all in the survey. They may, however, be mentioned in the description of soil types in the report.

2.3 SIMPLE AND COMPOUND MAP UNITS

There are two major types of map units: simple and compound. The difference between them is

defined in terms of the proportion and contrast of their components.

A Simple Map Unit contains predominantly one soil or nonsoil. The proportion of its components vary according to their areal extent and contrasting characteristics as they may affect soil management or use. Its components vary as follows: the predominant component comprises at least 65 percent with up to 35 percent of nonlimiting, similar components (components that are alike in most properties and behaviour), or up to 25 percent of nonlimiting dissimilar components (components that do not affect management of the map unit but have a significant number of properties that vary from the predominant component), or up to 15 percent of limiting, dissimilar components (components which have many contrasting properties and usually affect management differently).

A Compound Map Unit contains predominantly two soils or nonsoils (or a combination of both). The proportions of the two major components may vary from one considerably exceeding the other to both being approximately equal. Complementary to the definition of a single map unit, the proportions of its components vary according to their areal extent and contrasting characteristics as they may affect soil management or use. Its major components vary as follows: if other components are similar and nonlimiting no single component represents more than 65 percent; or if other components are dissimilar and nonlimiting no single component represents 75 percent or more; or if other components are dissimilar and limiting no single component represents 85 percent or more.

A soil or nonsoil may occur in more than one compound unit. The complex nature of soil landscapes requires that the surveyor be allowed the freedom to describe their combinations as they occur. For the purpose of describing compound map units, components are considered dominant if they occupy over 40 percent of the unit, significant from 15-40 percent and minor if they occupy less than 15 percent. Minor components are described only if they are highly contrasting.

2.4 PHASES

It is frequently desirable to indicate by map unit symbol, a condition or quality of soil property or landscape feature that deviates significantly from the normal definition of map units. These indicated variations or phases of soil properties and landscape features, varying from delineation to delineation, significantly affect soil behaviour and land management or use.

It is not always easy to maintain a clear distinction between a soil phase and a land phase. Soil properties that are frequently used as phase criteria include texture, depth, surface peat, salinity and physical disruption. Properties of land that are used include slope, wind and water erosion, stoniness, rockiness and altered drainage.

In this study the effect of four properties and land features are shown as a character in the denominator of the map unit symbol and described outside the main soil map legend. The four properties and features are erosion, slope class, degree of stoniness and salinity. The degree or magnitude of each is designated in the following manner;

Erosion

x - noneroded or minimal
1 - weakly eroded (25-75% of A horizon)
2 - moderately eroded (>75% of A & part of B)
3 - severely eroded (most of A & B removed)
0 - overblown

Slope Class

x - 0 to .5% level
b - .5 to 2% nearly level
c - 2 to 5% very gently sloping
d - 5 to 9% gently sloping
e - 9 to 15% moderately sloping
f - 15 to 30% strongly sloping
g - 30 to 45% very strongly sloping
h - 45 to 70% extremely sloping

Stoniness	Surfaced Covered
x - nonstony	<.01 %
1 - slightly stony	.01 - .1%
2 - moderately stony	.1 - 3%
3 - very stony	3 - 15%

4 - exceedingly stony	15 - 50 %
5 - excessively stony	> 50%

Salinity

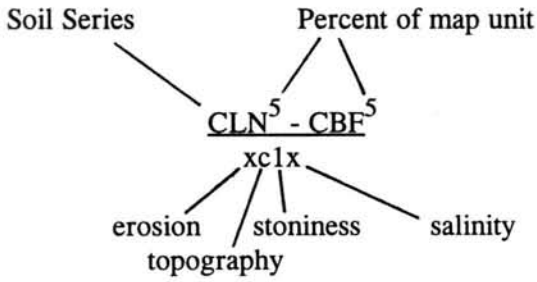
x - nonsaline (0-4 mS/cm)
s - slightly saline (4-8 mS/cm)
t - moderately saline (8-15 mS/cm)
u - strongly saline (> 15 mS/cm)

The convention employed to indicate these features in the map symbol is as follows:

If none of the above properties are observed to be significant, the map symbol representing the normal or unaffected soil series is used alone without modifiers.

If one or more phase features are recognized, the appropriate letter or number is placed below the soil series symbol in one of four designated locations in the map unit symbol. The designated order is erosion, slope class, stoniness and salinity. If a particular feature is not observed to be significant, an x is used in its appropriate designated location in the map symbol.

For example, the compound map unit coded:



Is interpreted to mean that 50 percent of the mapping unit consists of Clementi (CLN^5) series having no erosion (x), very gently sloping (c) topography, slight (1) stoniness, no salinity (x): and 50 percent Cobfield (CBF^5) series having no erosion (x), very gently sloping (c) topography, slightly stony (1) surface conditions and no (x) salinity.

2.5 SAMPLING

During the course of field investigations and mapping, soil samples were taken at selected locations for soil characterization, salinity and irrigation suitability studies. Eleven profiles were described in detail and sampled for soil characterization analysis (Appendix C). In areas where salinity was suspected to be sufficient to inhibit agricultural potential, soils were sampled at 10 to 25 cm and at 50 to 60 cm for electrical conductance measurements and soluble salt analysis. Selected surface and subsurface samples were routinely taken for additional analyses including texture, ph, organic matter, calcium carbonate, etc.

PART 3

3 DEVELOPMENT, CLASSIFICATION AND DESCRIPTION OF SOILS

3.1 SOIL DEVELOPMENT

The principal factors affecting soil formation are: the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; relief and drainage; the length of time the forces of soil formation have acted on the soil material; and influence resulting from the work of man. The characteristics of a soil at any given place are determined by the interaction of these soil forming factors.

Soil characteristics are observed in the soil profile. A profile is the sequence of natural layers or horizons observed in vertical cross-section extending from the surface down into the relatively unweathered and unaltered soil parent material. The main or master horizons have been designated by the letters A, B and C for mineral horizons. Horizon characteristics and combinations of these horizons form the basis for soil classification. The A and B horizons are a reflection of the active soil forming factors, climate and plant and animal life, chiefly plants operating on the parent material. Together the A and B horizons make up the solum. In general, A horizons or surface layers are subjected to the greatest amount of weathering and leaching and/or organic matter accumulation. The B horizons, lying immediately below the A horizon contain most of the material leached from the A horizons; ie. clay, organic matter, iron and aluminum.

In some soils B horizons consist mainly of material that has been altered only slightly by soil forming processes, but has not been translocated. The C horizons represent the relatively unaltered parent material from which the solum has developed.

Within a particular climatic zone, soils differ due to texture and mineralogical composition of the parent material. The soil profile that develops is also very much influenced by soil drainage and groundwater hydrology. Soils developed on sandy to loamy materials are more permeable to water and permit greater leaching of soluble and colloidal components as compared to clayey soils. Soil profiles developed on moderately calcareous sediments are generally deeper than soils developed on strongly calcareous sediments. Restrictions on normal soil development often result from periods of saturation in areas affected by surface ponding, lateral inflow, seepage or near surface groundwater. Under such conditions, leaching of soil material is minimal and in some cases, the translocation of soluble materials is towards the surface. Poor soil drainage associated with depressional areas alters the soil environment from an oxidative state to a reductive state depleted of oxygen. Such soils with restricted drainage are characterized by dull (gleyed) soil colours, the presence of reddish yellow or brown mottles of iron and manganese, the presence of lime carbonate and/or soluble salts near the surface and a high water table. Very poorly drained depressional sites are saturated throughout the year and soils are often characterized by accumulation of shallow organic materials.

Soil development on the various parent materials in the R. M. of Strathcona study is influenced by the regional climate, soil drainage, topography and groundwater hydrology. The soils of the area occur dominantly in the Grassland Transition Ecoclimatic Region (Gt_2) and have developed under cool subhumid climatic conditions which generally provide sufficient moisture and length of growing season for persistence of dominantly native grassland vegetation. This vegetation and climate have resulted in a dominance of Chernozemic Black soils. Dark Gray profiles with weakly leached surface horizons (Ahe) and an accumulation zone (Btj or Bt horizon) may occur on higher, well drained sites under a more continuous tree cover, particularly in areas adjacent

to ravines or valley walls. The imperfectly drained soils are characterized by Gleyed Black and Gleyed Rego Black profiles with dark colored Ah horizons. Humic Gleysol soils found in association with poorly drained areas also have dark colored Ah horizons which grade into a dull colored, mottled parent material. Profile development of the imperfectly and poorly drained soils has been restricted by soil moisture regime and proximity of groundwater to the soil surface.

A portion of the study northeast of Belmont is characterized by a subregional climate, associated vegetation and soils representative of the Low Boreal Subhumid (LBs_2) Ecoclimatic Region. This undulating to hummocky upland with slightly cooler temperatures, results in a slight increase in available moisture, consequently favoring the development of Chernozemic Dark Gray and Dark Gray Luvisol soils on the better drained sites. Poorly and very poorly drained depressions throughout the subregion are characterized by Humic Luvic Gleysols and Rego Humic Gleysols.

The Boissevain Plain subsection of the study corresponds very closely with the Grassland Transition (Gt3) Ecoclimatic Subregion boundary. This undulating to gently rolling till plain occurs as an open grassland area at the southwest edge of the study. Climatic conditions are slightly less favorable than the (Gt2) subregion to the east and north. Indications are that temperatures are warmer and drier conditions prevail. The vegetation and climate have resulted in the development of dominantly Chernozemic Black soils. However, it is interesting to note that the soils of this subregion were described as a dark brown steppe - blackearth transition in the "South Central Reconnaissance Soil Survey 1943". This western portion is more likely to experience conditions of periodic drought.

Soil development in recent alluvial deposits on floodplains along creeks and rivers has been influenced by periodic flooding and accretion of sediments on the soil surface. The resulting immature soils are dominantly Cumulic Regosols with little or no horizon development. The soils on the slopes and terraces along Pelican Lake and the Pembina River Channel are largely Regosolic, however they may exhibit varying degrees of profile development.

3.2 SOIL CLASSIFICATION

Soils in the study area were classified according to the System of Soil Classification for Canada. This system is hierarchical employing 5 levels of generalization or categories of classification. Beginning with the most generalized, these categories are the order, great group, subgroup, family and series. The classification is based on measurable soil properties that can be observed in the field, or can be inferred from other properties observable in the field. The properties selected as criteria for the higher categories are the result of soil genesis or of factors that affect soil genesis. Properties utilized to differentiate soils at the lower levels of family and series affect management. The five levels of generalization are defined as follows:

Order - Soil orders are defined on the basis of soil properties that reflect the soil environment and the kind and degree of dominant soil forming process. An example is Chernozemic in which soils with dark coloured surface horizons develop under subhumid climate and dominantly grassland environments.

Great Group - Each order is subdivided into great groups based on differences in strength of dominant processes or a major contribution of a process in addition to a dominant one. Such processes result in particular kinds, arrangement and degree of expressions of pedogenic horizons. An example of a Luvic Gleysol in which the dominant process is considered to be gleying but clay accumulation in the B horizon is also a major process.

Subgroup - Subgroups are subdivisions of great groups and are defined on the basis of kind and arrangement of horizons that indicate; the central concept of the great group eg. Orthic; intergrades toward soils in other orders, eg. Gleyed, or special features such as lime carbonate in B horizons.

Family - Families are established within a subgroup based on similarity of physical and chemical properties that affect management. Among the properties considered important for recognizing families are particle size distribution, mineralogy, soil climate, soil reaction and thickness of solum.

Series - The series consists of soils that formed in a particular kind of material and have horizons whose color, texture, structure, consistence, thickness, reaction and chemical composition are similar in differentiating characteristics and in arrangement in the soil profile.

3.3 DESCRIPTION OF SOIL SERIES

Soil parent material and soil moisture regime characteristics have a major influence on soil profile type and so become the major features used in classifying and mapping soils. A quick, convenient, abbreviated key form summary of these relationships and the soil series recognized within major areas of similar physiographic and climatic conditions is presented in Tables 2A and 2B. The relationship of parent material and drainage to soil profile type (genetic subgroup) and soil series in the study area is summarized in Tables 3A and 3B.

Generalized descriptions for each soil series mapped in the survey area are not included in the report due to the large volume of information, however, they may be obtained from the Agricultural Resources Section, Ellis Bldg. University of Manitoba. The descriptions include characteristics of the soil and the material in which it formed, including extent of the soil, genetic profile type, texture, parent material type, topography and drainage for each series. A brief description of the features which distinguish the named soil from similar soils is included. The generalized soil descriptions are based on summaries and averages of soil data systematically documented and recorded during the course of the field survey.

Information on the suitability and management of the soils for various agricultural and nonagricultural uses is presented in Part 4 of this report.

Table 2A. Relationship of the Soil Series in the Gt_2 and LBs_2 Subregions to Soil Drainage, Subgroup and Parent Material

SOIL DRAINAGE	TAXONOMIC SUBGROUP	PARENT MATERIALS												
		TILL		LACUSTRINE OVER TILL	FLUVIAL	LACUSTRINE OVER FLUVIAL	LACUSTRINE				ALLUVIUM		UNDIFF-EREN-TIATED	ORGA-NIC MESIC PEAT
		Loamy (L,SiL, SiCL) Extremely Calcareous Till	Loamy (L,CL) Non-Weakly Cal.Shaly Till	Loamy (L,CL,SiCL) over Till	Sand and Gravel	Loamy (L, CL, SiCL) over S & Gr.	Fine Loamy (CL, SiCL)	Fine Loamy over Sandy	Loamy over Sandy (S,LS)	Clayey (C,SiC, SC)over Loamy Strat.	Loamy(L, CL,SiCL, SCL) Stratified	Clayey (C,SiC) Strat.		
Well to Moderately Well	Orthic Black Rego Black Orthic Dark Gray	Hilton (HIT) Bermont(BMN) Tiger Hills (TGL)	Fifere (FFR)	Clementi (CLN)	Dorset (DOT) Leary (LRY)	Croyon (CYN)	Ramada (RAM)	Well-wood (WWD)					Eroded Slopes Complex (ERX)	
Imperfect	Gleyed Cumulic Regosol Gleyed Black Gleyed Rego Black Gleyed Dark Gray Gleyed Black Solonetz	Barwood (BWO)		Cobfield(CBF) Beresford(BSF)		Druxman (DXM)	Charman (CXV)	Oberon (OBR)		Oliver (OIV)	Levine (LEI)	Assinni-boine (ASB)		
Poor	Rego Humic Gleysol Terric Mesisol	Hickson (HKS)		Vodroff(VFF)			Tadpole (TDP)		Grayson (GYS)	Landseer (LSR)	Basker (BKR)			Perillo (PER)

Table 2B. Relationship of the Soil Series in the Gt_3 Subregion to Soil Drainage, Subgroup and Parent Material

SOIL DRAINAGE	TAXONOMIC SUBGROUP	PARENT MATERIALS								
		FLUVIAL over RESIDUAL	FLUVIAL	LACUSTRINE over FLUVIAL	LACUSTRINE over TILL		LACUSTRINE		ALLUVIUM	
		Fine (C,SiC,HC) over Shale	Sandy Skeletal (S & Gr)	Loamy (L,CL) over Sandy Skeletal (S & Gr)	Loamy (L,CL) over Till	Loamy (L,CL) over Till (5-75cm. gr. lens contact)	Sandy (S,LS)	Coarse Loamy (FSL,VFS, LVFS)	Loamy, Stratified (L,SiL)	Fine Loamy, Stratified (CL, SiCL)
Well to Moderately Well	Cumulic Regosol								Melita (MLT)	
	Orthic Black		Bede (BED)	Dromore (DOM)	Waskada (WKD)	Newstead (NWS)	Stanton (STU)	Lyleton (LYT)		
	Black Solod	Antler River (ATV)								
Imperfect	Gleyed Cumulic Regosol								Liege (LIG)	Neelin (NEI)
	Gleyed Black				Two Creeks (TWC)	Bower (BOW)				
	Gleyed Rego Black			Gopher Creek (GPE)	Montgomery (MOT)	Alexander (AXD)				
	Gleyed Eluviated Black				Glenlorne (GNO)					
	Gleyed Black Solonetz	Chesterfield (CHF)								
Poor	Rego Humic Gleysol			William (WIL)	Deloraine (DRI)	Bella Lake (BEL)			Graham (GHM)	Leighton (LGT)

Table 3A. Parent Materials and Related Soils of the Study Area
Part I (Gt2 + LBs2)

	Map Symbol	Ecoclimatic Region
A. GLACIAL TILL		
1. Soils developed on deep (> 100 cm) very strongly to extremely calcareous, loamy (loam to clay loam) glacial till of limestone and granitic origin.		
a) Well drained		
* Hilton Series (Orthic Black)	HIT	Gt2
* Bermont Series (Rego Black)	BMN	Gt2
* Tiger Hills Series (Orthic Dark Gray)	TGL	LBs2
b) Imperfectly drained		
* Barwood (Gleyed Rego Black)	BWO	Gt2
c) Poorly drained		
* Hickson Series (Rego Humic Gleysol)	HKS	Gt2
2. Soils developed on non to weakly calcareous, loamy, till deposits derived dominantly from cretaceous shales, these deposits may be underlain by weathered shale or shale bedrock within 1 to 1.5 m.		
a) Well drained		
* Fifere Series (Orthic Dark Gray)	FFR	LBs2
B. LACUSTRINE OVER TILL		
1. Soil developed on a thin veneer (< 1 m) of dominantly loamy, weakly to moderately calcareous lacustrine sediments overlying moderately to very strongly calcareous glacial till of shale, limestone and granitic origin.		
a) Well drained		
* Clementi Series (Orthic Black)	CLN	Gt2
b) Imperfectly drained		
* Beresford Series (Gleyed Rego Black)	BSF	Gt2
* Cobfield Series (Gleyed Black)	CBF	Gt2
c) Poorly drained		
* Vodroff Series (Rego Humic Gleysol)	VFF	Gt2

C. FLUVIAL DEPOSITS

1. Soils developed on deep (> 100 cm) moderately to strongly calcareous, stratified medium sand to gravelly fluvial outwash or beach deposits with shale, limestone and granitic fragments.

a) Well drained		
* Leary (Orthic Dark Gray)	LRY	LBs2
* Dorset (Orthic Black)	DOT	Gt2

D. LACUSTRINE OVER FLUVIAL

1. Soils developed on a thin mantle (< 1 m) of moderately to strongly calcareous, loamy (L, SCL, SiCL, CL) sediments overlying moderately to strongly calcareous, sandy and gravelly deposits.

a) Well drained		
* Croyon Series (Orthic Black)	CYN	Gt2
b) Imperfectly drained		
* Druxman Series (Gleyed Black)	DXM	Gt2

E. LACUSTRINE

1. Soils developed on deep (> 1 m) moderately to very strongly calcareous, fine loamy (CL, SiCL, SCL) lacustrine sediments.

a) Well drained		
* Ramada Series (Orthic Black)	RAM	Gt2
b) Imperfectly drained		
* Charman Series (Gleyed Black)	CXV	Gt2
c) Poorly drained		
* Tadpole Series (Rego Humic Gleysol)	TDP	Gt2

2. Soils developed on thin (< 1 m) moderately to strongly calcareous, clayey (C, SiC, SC) sediments overlying moderately calcareous, stratified, loamy (L, SiL, SL) sediments.

a) Imperfectly drained		
* Oliver Series (Gleyed Black Solonetz)	OIV	Gt2
b) Poorly drained		
* Landseer Series (Rego Humic Gleysol)	LSR	Gt2

3. Soils developed on thin (< 1 m) moderately to strongly calcareous, fine loamy (CL, SiCL, SCL) lacustrine deposits over moderately calcareous, stratified sand (FS, LFS, LS) deposits.

a) Well drained * Wellwood Series (Orthic Black)	WWD	Gt2
b) Imperfectly drained * Oberon Series (Gleyed Black)	OBR	Gt2
4. Soils developed on thin (< 1 m) moderately to strongly calcareous, loamy (L, SiL, VFSL) lacustrine sediments over moderately calcareous, stratified, sandy (FS, LFS, LS) lacustrine and deltaic deposits.		
a) Poorly drained * Grayson Series (Rego Humic Gleysol)	GYS	Gt2

F. ALLUVIUM

1. Soils developed on moderately to strongly calcareous, stratified, dominantly loamy (VFSL, SL, L, SiL, SiCL, CL) recent alluvial deposits.		
a) Imperfectly drained * Levine Series (Gleyed Cumulic Regosol)	LEI	Gt2
b) Poorly drained * Basker Series	BKR	Gt2
2. Soils developed on deep (> 1 m) moderately to strongly calcareous, stratified, clayey (C, SiC, SC) recent alluvial deposits.		
a) Impefectly drained * Assiniboine Series (Gleyed Cumulic Regosol)	ASB	Gt2

G. ORGANIC

1. Organic soils developed on thin (40-160 cm), moderately decomposed, mesic fen peat overlying stratified sediments.		
a) Poorly to very pooly drained * Perillo Series (Terric Mesisol)	PER	Gt2

H. UNDIFFERENTIATED

1. Soils developed on a complex of undifferentiated materials, with a wide range of properties and soil characteristics, adjacent to and including valley walls, ravines, gullies and drainage channels.		
* Eroded Slopes Complex	ERX	

Table 3B. Parent Materials and Related Soils of the Study Area Part II (Gt3)

	Map Symbol	Ecoclimatic Region
A. FLUVIAL OVER RESIDUAL		
1. Soils developed on thin (< 1 m), moderatey fine to fine textured, weakly to moderately calcareous alluvial or lacustrine sediments underlain by shaly clay and\or soft shale bedrock.		
a) Well drained * Antler River (Black Solod)	ATV	Gt3
b) Imperfectly drained * Chesterfield Series (Gleyed Black Solonetz)	CHF	Gt3
B. FLUVIAL DEPOSITS		
1. Soil developed on deep (> 1 m), strongly calcareous, sandy skeletal (MS, Gr.), stratified outwash deposits.		
a) Well drained * Bede Series (Orthic Black)	BED	Gt3
C. LACUSTRINE OVER FLUVIAL		
1. Soils developed on thin (< 1 m), strongly calcareous, loamy (L, CL, SiCL) sediments over sandy skeletal outwash deposits.		
a) Well drained * Dromore Series (Orthic Black)	DOM	Gt3
b) Imperfectly drained * Gopher Creek (Gleyed Rego Black)	GPE	Gt3
c) Poorly drained * William (Rego Humic Gleysol)	WIL	Gt3
D. LACUSTRINE OVER TILL		
1. Soils developed on thin (< 1 m), loamy (L, CL), strongly calcareous, lacustrine sediments overlying glacial till. A very thin (< 5 cm) gravelly pebble line may occur at the overlay/till contact.		
a) Well drained * Waskada Series (Orthic Black)	WKD	Gt3

b) Imperfectly drained

* Two Creeks Series (Gleyed Black)	TWC	Gt3
* Montgomery Series (Gleyed Rego Black)	MOT	Gt3
* Glenlorne Series (Gleyed Eluviated Black)	GNO	Gt3

c) Poorly drained

* Deloraine Series (Rego Humic Gleysol)	DRI	Gt3

2. Soils developed on thin (< 1 m), loamy (L, CL), strongly calcareous, lacustrine sediments overlying glacial till. A (5-75 cm) gravelly lens occurs at the overlay/till contact.

a) Well drained

* Newstead Series (Orthic Black)	NWS	Gt3

b) Imperfectly drained

* Bower Series (Gleyed Black)	BOW	Gt3
* Alexander Series (Gleyed Rego Black)	AXD	Gt3

c) Poorly drained

* Bella Lake Series (Rego Humic Gleysol)	BEL	Gt3

E. LACUSTRINE

1. Soils developed on deep (> 1 m) moderately to strongly calcareous, sandy (S, LS) lacustrine sediments.

a) Well drained

* Stanton Series (Orthic Black)	STU	Gt3

2. Soils developed on deep (> 1 m), moderately calcareous, coarse loamy (FSL, VFS, LVFS), lacustrine sediments.

a) Well drained

* Lyleton Series (Orthic Black)	LYT	Gt3

F. ALLUVIUM

1. Soils developed on deep (> 1 m), moderately to strongly calcareous, stratified, loamy (L, SiL, VFSL) recent alluvial deposits.

a) Well drained		
* Melita Series (Cumulic Regosol)	MLT	Gt3
b) Imperfectly drained		
* Liege Series (Gleyed Cumulic Regosol)	LIG	Gt3
c) Poorly drained		
* Graham Series (Rego Humic Gleysol)	GHM	Gt3
2. Soils developed on deep (> 1 m), moderately to strongly calcareous, stratified, fine loamy (CL, SiCL, SCL) recent alluvial deposits.		
a) Imperfectly drained		
* Neelin Series (Gleyed Cumulic Regosol)	NEI	Gt3
b) Poorly drained		
* Leighton Series (Rego Humic Gleysol)	LGT	Gt3

PART 4

4 USE AND MANAGEMENT INTERPRETATIONS OF SOILS

4.1 INTRODUCTION

This section provides predictions of performance or soil suitability ratings for various uses of soils based on field observations of soil and landscape characteristics, laboratory data and on observations of soil behaviour under specified conditions of land use and management. Suitability ratings or interpretations are intended only to serve as guides for planners and managers. Caution, with an understanding of the limitations of the soil map must be exercised when applying suitability ratings to soil map units. The value of any rating or interpretation depends upon the nature and composition of individual map unit delineation which in turn depends on the scale of mapping and intensity of ground truthing employed in the survey. An overall acreage factsheet or summary of land resource characteristics for the municipality is provided in Table 4.

In this section, interpretive soil information is provided for the following land use evaluations:

1. Agriculture

   a) dryland farming capability
   b) irrigation suitability

2. Water Erosion Risk

3. Engineering Uses

4. Recreation Uses

4.2 SOIL CAPABILITY FOR AGRICULTURE

Dryland Agriculture

Soil capability classification for dryland agriculture is based on an evaluation of both internal and external soil characteristics that influence soil suitability and limitations for agricultural use. In this classification, mineral soils are grouped into capability classes, and subclasses and units based on their limitations for dryland farming, risk of damage when the soils are used and the way they respond to management (Anon, 1965). There are seven capability classes, each of which groups soils together that have the same relative degree of limitation or hazard for agricultural use. The limitation becomes progressively greater from Class 1 to Class 7. The capability class indicates the general suitability of the soils for agriculture. The first three classes are considered capable of sustained production of common field crops, the fourth is marginal for sustained arable agriculture, the fifth is suitable only for improved permanent pasture, the sixth is capable of use only for native pasture while the seventh class is for soils and land types considered incapable of use for arable agriculture or permanent pasture. A description of the capability classes is provided in Table 5.

Soil Capability subclasses are divisions within classes which group soils with similar kinds of limitations and hazards for agricultural use. The various kinds of limitations recognized at the subclass level are defined in Table 6.

A summary of the soils in the study area showing their major characteristics and their interpretive classification for dryland agriculture and irrigation is presented in Table 7. The areal extent in hectares and percent coverage by series for the soils in the R.M. of Strathcona is summarized in Table 8.

Table 4. Summary of Land Resource Characteristics (R.M. Srathcona)

Summary Class	Hectares	Acres	% of Area
Soil Drainage			
Well to Rapid	30344	75860	56.7 %
Imperfect	14969	37422	28.0 %
Poor to Very Poor	4471	11177	8.3%
Water $Zz	3710	9275	6.9%
Unclassified Land $UL	51	128	0.1%
Agricultural Capability Class			
Class 1	768	1920	1.4%
Class 2	22627	55567	42.4%
Class 3	16233	40582	30.3%
Class 4	3718	9295	6.9%
Class 5	3823	9558	7.1%
Class 6	1581	3953	3.0%
Class 7	984	2460	1.8%
Organic	50	125	0.1%
Irrigation Suitability Rating			
Excellent	55	138	0.1%
Good	17371	43427	32.4%
Fair	23890	59725	44.7%
Poor	8418	21045	15.7%
Water Erosion Risk Class			
Negligible	10332	25830	19.3%
Low	13264	33160	24.8%
Moderate	13119	32798	24.5%
High	1925	4813	3.6%
Severe	11144	27860	20.8%

Slope Class

x (0-.5%) Level	13569	33922	25.3%
b (.5-2%) Nearly Level	9715	24288	18.1%
c (2-5%) Very Gently Sl.	13910	34775	26.0%
d (5-9%) Gently Sloping	9398	23495	17.6%
e (9-15%) Moderately Sl.	1611	4028	3.0%
Eroded Slopes ERX	1581	3953	3.0%

Stoniness Class

x nonstony	22886	57215	42.7%
1 slightly stony	22530	56325	42.1%
2 moderately stony	4366	10915	8.2%
3 very stony	53	133	0.1%
4 exceedingly stony			
5 excessively stony			

Salinity Class

s slightly saline	7669	19173	14.3%
t moderately saline	477	1118	0.8%
u strongly saline			

Erosion Class

Erosion 1 Slightly	3630	9075	6.8%
Erosion 2 Moderately			
Erosion 3 Severely			

Total Hectares in R.M. of Strathcona 53545.

Table 5. Definitions of the Agricultural Capability Classes

Class 1

Soils in this class have no important limitations for crop use. The soils have level or gently sloping topography; they are deep, well to imperfectly drained and have good water holding capacity. The soils are naturally well supplied with plant nutrients, and are easily maintained in good tilth and fertility. They are moderately high to high in productivity for a wide range of cereal and special crops.

Class 2

Soils in this class have moderate limitations that reduce the choice of crops or require moderate conservation practices. The soils have good water holding capacity and are either naturally well supplied with plant nutrients or are highly responsive to inputs of fertilizer. They are moderate to high in productivity for a fairly wide range of crops. The limitations are not severe and good soil management and cropping practices can be applied without serious difficulty.

Class 3

Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices. The limitations in Class 3 are more severe than those in Class 2 and conservation practices are more difficult to apply and maintain. The limitations affect the timing and ease of tillage, planting and harvesting, the choice of crops and maintenance of conservation practices. The limitations include one or more of the following: moderate climatic limitation, erosion, structure or permeability, low fertility, topography, overflow, wetness, low water holding capacity or slowness in release of water to plants, stoniness and depth of soil to consolidated bedrock. Under good management, these soils are fair to moderately high in productivity for a fairly wide range of field crops.

Class 4

Soils in this class have severe limitations that restrict the choice of crops or require special conservation practices or both. These soils have such limitations that they are only suited for a few crops, or the yield for a range of crops may be low, or the risk of crop failure is high. The limitations may seriously affect such farm practices as the timing and ease of tillage, planting and harvesting, and the application and maintenance of conservation practices. These soils are low to medium in productivity for a narrow range of crops but may have higher productivity for a specially adapted crop. The limitations include the adverse effects of one or more of the following: climate, accumulative undesirable soil characteristics, low fertility, deficiencies in the storage capacity or release of soil moisture to plants, structure or permeability, salinity, erosion, topography, overflow, wetness, stoniness, and depth of soil to consolidated bedrock.

Class 5

Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible. These soils have such serious soil, climatic or other limitations that they are not capable of use for sustained production of annual field crops. However, they may be improved by the use of farm machinery for the production of native or tame species of perennial forage plants. Feasible improvement practices include clearing of bush, cultivation, seeding, fertilizing and water control.

Some soils in Class 5 can be used for cultivated field crops provided unusually intensive management is used. Some of these soils are also adapted to special crops requiring soil conditions unlike those needed by the common crops.

Class 6

Soils in this class are capable only of producing perennial forage crops and improvement practices are not feasible. Class 6 soils have some natural sustained grazing capacity for farm animals, but have such serious soil, climatic or other limitations as to make impractical the application of improvement practices that can be carried out on Class 5 soils. Soils may be placed in this class because their physical nature prevents the use of farm machinery, or because the soils are not responsive to improvement practices, or because stock watering facilities are inadequate.

Class 7

Soils in this class have no capability for arable culture or permanent pasture because of extremely severe limitations. Bodies of water too small to delineate on the map are included in this class. These soils may or may not have a high capability for forestry, wildlife and recreation.

Table 6. Agricultural Capability Subclass Limitations

C - Adverse climate: This subclass denotes a significant adverse climate for crop production as compared to the "median" climate which is defined as one with sufficiently high growing season temperatures to bring field crops to maturity, and with sufficient precipitation to permit crops to be grown each year on the same land without a serious risk of partial or total crop failures.

D - Undesirable soil structure and/or low permeability: This subclass is used for soils difficult to till, or which absorb water very slowly or in which the depth of rooting zone is restricted by conditions other than a high water table or consolidated bedrock.

E - Erosion: Subclass E includes soils where damage from erosion is a limitation to agricultural use. Damage is assessed on the loss of productivity and on the difficulties in farming land with gullies.

F - Low fertility: This subclass is made up of soils having low fertility that either is correctable with careful management in the use of fertilizers and soil amendments or is difficult to correct in a feasible way. The limitation may be due to lack of available plant nutrients, high acidity or alkalinity, low exchange capacity, high levels of carbonates or presence of toxic compounds.

I - Inundation by streams or lakes: This subclass includes soils subjected to inundation causing crop damage or restricting agricultural use.

L - Coarse wood fragments: In the rating of organic soils, woody inclusions in the form of trunks, stumps and branches (> 10 cm diameter) in sufficient quantity to significantly hinder tillage, planting and harvesting operations.

M- Moisture limitation: This subclass consists of soils where crops are adversely affected by droughtiness owing to inherent soil characteristics. They are usually soils with low water-holding capacity.

N - Salinity: Designates soils which are adversely affected by the presence of soluble salts.

P - Stoniness: This subclass is made up of soils sufficiently stony to significantly hinder tillage, planting, and harvesting operations. Stony soils are usually less productive than comparable non-stony soils.

R - Consolidated bedrock: This subclass includes soils where the presence of bedrock near the surface restricts their agricultural use. Consolidated bedrock at depths greater than 1 meter from the surface is not considered as a limitation, except on irrigated lands where a greater depth of soil is desirable.

T - Topography: This subclass is made up of soils where topography is a limitation. Both the percent of slope and the pattern or frequency of slopes in different directions are important factors in increasing the cost of farming over that of smooth land, in decreasing the uniformity of growth and maturity of crops, and in increasing the hazard of water erosion.

W- Excess water: Subclass W is made up of soils where excess water other than that brought about by inundation is a limitation to their use for agriculture. Excess water may result from inadequate soil drainage, a high water table, seepage or runoff from surrounding areas.

X - Cumulative minor adverse characteristics: This subclass is made up of soils having a moderate limitation caused by the cumulative effect of two or more adverse characteristics which singly are not serious enough to affect the class rating.

Table 7. Agricultural Interpretations and Areal Extent of Soils in the Study Area

Map Symbol Code	/ Phase	Soil Name	Agricultural Capability	Irrigation Suitability Class	Irrigation Suitability General Rating	Potential Environmental Impact	Area(ha)	Percent
ASB	xxxs	Assiniboine	3N	3wkBi	Fair	Low	21.5000	0.0402
ASB	xxxx	Assiniboine	3I	3wkBi	Fair	Low	23.1350	0.0432
ATV	xx2x	Antler River	4RD	4rA	Poor	Low	62.7200	0.1171
AXD	xxxs	Alexander	3N	3wA	Fair	Moderate	20.7200	0.0387
BED	xxxx	Bede	5M	4mA	Poor	High	48.4300	0.0904
BED	xcxx	Bede	5M	4mBt2	Poor	High	88.6350	0.1655
BED	xexx	Bede	5M	4mCt2	Poor	High	9.1400	0.0171
BEL	xxxx	Bella Lake	5W	4wA	Poor	Moderate	19.8400	0.0371
BKR	xxxx	Basker	5WI	4wDi	Poor	High	62.6800	0.1171
BMN	1c1x	Bermont	2X	2kxBt2	Good	Low	115.0590	0.2149
BMN	1d2x	Bermont	3T	2kxCt2	Fair	Moderate	21.4500	0.0401
BOW	xxxx	Bower	2M	3wA	Fair	Moderate	60.9800	0.1139
BSF	xxxs	Beresford	3N	3swA	Fair	Low	367.3050	0.6860
BSF	xx1s	Beresford	3N	3swA	Fair	Low	98.6600	0.1843
BSF	xb1x	Beresford	2W	3wA	Fair	Low	107.8900	0.2015
BSF	xbxx	Beresford	2W	3wA	Fair	Low	161.7650	0.3021
BSF	xx1x	Beresford	2W	3wA	Fair	Low	23.4700	0.0438
BSF	xxxx	Beresford	2W	3wA	Fair	Low	94.4250	0.1763
BWO	xx1s	Barwood	3N	3swA	Fair	Low	571.4120	1.0672
BWO	xxxs	Barwood	3N	3swA	Fair	Low	630.2810	1.1771
BWO	xc1s	Barwood	3N	3swBt2	Fair	Low	11.5100	0.0215
BWO	xc1x	Barwood	2WT	3wBt2	Fair	Low	2485.4800	4.6419
BWO	xb1x	Barwood	2W	3wA	Fair	Low	693.5020	1.2952
BWO	xb2x	Barwood	2WP	3wA	Fair	Low	1.2900	0.0024
BWO	xbxx	Barwood	2W	3wA	Fair	Low	655.5850	1.2244
BWO	xcxs	Barwood	3N	3swBt2	Fair	Low	58.6100	0.1095
BWO	xcxx	Barwood	2WT	3wBt2	Fair	Low	484.9580	0.9057
BWO	xx1x	Barwood	2W	3wA	Fair	Low	32.9600	0.0616
BWO	xxxx	Barwood	2W	3wA	Fair	Low	708.5960	1.3234
BWO	xb1s	Barwood	3N	3swA	Fair	Low	478.7800	0.8942
BWO	xbxs	Barwood	3N	3swA	Fair	Low	641.4730	1.1980
CBF	xc2x	Cobfield	2WP	3wBt2	Fair	Low	127.1150	0.2374
CBF	xbxx	Cobfield	2W	3wA	Fair	Low	412.0840	0.7696
CBF	xb2s	Cobfield	3N	3wsA	Fair	Low	399.6390	0.7464
CBF	xxxs	Cobfield	3N	3swA	Fair	Low	22.9500	0.0429
CBF	xb1x	Cobfield	2W	3wA	Fair	Low	372.2940	0.6953
CBF	xb2x	Cobfield	2WP	3wA	Fair	Low	317.6680	0.5933
CBF	xx1s	Cobfield	3N	3swA	Fair	Low	72.0340	0.1345
CBF	xx1x	Cobfield	2W	3wA	Fair	Low	348.2840	0.6505
CBF	xx2x	Cobfield	2WP	3wA	Fair	Low	25.1700	0.0470

Map Symbol Code	/ Phase	Soil Name	Agricultural Capability	Irrigation Suitability Class	General Rating	Potential Environmental Impact	Area(ha)	Percent
CBF	xxxx	Cobfield	2W	3wA	Fair	Low	244.8750	0.4573
CHF	xx1s	Chesterfield	4RD	4krA	Poor	Low	39.1050	0.0730
CHF	xx2t	Chesterfield	4RN	4ktA	Poor	Moderate	179.6410	0.3355
CLN	xx2x	Clementi	2P	2kxA	Good	Low	211.8400	0.3956
CLN	xb2x	Clementi	2P	2kxA	Good	Low	730.4880	1.3643
CLN	xxxx	Clementi	1	2kxA	Good	Low	126.8400	0.2369
CLN	xb1x	Clementi	2X	2kxA	Good	Low	1164.1260	2.1741
CLN	xb3x	Clementi	3P	2kxBp	Good	Low	20.8900	0.0390
CLN	xbxx	Clementi	1	2kxA	Good	Low	577.9110	1.0793
CLN	xc3x	Clementi	3P	2kxBt2p	Good	Low	31.7900	0.0594
CLN	xcxx	Clementi	2T	2kxBt2	Good	Low	206.9950	0.3866
CLN	xx1x	Clementi	2X	2kxA	Good	Low	61.7100	0.1152
CXV	xxxx	Charman	2W	3wA	Fair	Low	21.9800	0.0410
CYN	xxxx	Croyon	3M	2mA	Good	Moderate	3.8700	0.0072
CYN1	xcxx	Croyon, Shaly Var.	3M	2mBt2	Good	Moderate	71.8650	0.1342
CYN1	xc2x	Croyon, Shaly Var.	3M	2mBt2	Good	Moderate	22.4400	0.0419
CYN1	xbxx	Croyon, Shaly Var.	3M	2mA	Good	Moderate	15.5950	0.0291
DOM	xxxx	Dromore	3M	2mA	Good	High	98.1150	0.1832
DOM	xx1x	Dromore	3M	2mA	Good	High	39.9500	0.0746
DOM	xdxx	Dromore	3MT	2mCt2	Fair	Moderate	14.7800	0.0276
DOM	xcxx	Dromore	3M	2mBt2	Good	High	266.0570	0.4969
DOM	xc2x	Dromore	3M	2mBt2	Good	High	12.6400	0.0236
DOM1	xcxx	Dromore,Shaly Var.	3M	2mBt2	Good	High	266.0570	0.4969
DOM1	xbxx	Dromore,Shaly Var.	3M	2mA	Good	High	472.4200	0.8823
DOT	xdxx	Dorset	5M	4mCt2	Poor	High	3.7200	0.0069
DOT	xxxx	Dorset	5M	4mA	Poor	High	2.6100	0.0049
DOT	xcxx	Dorset	5M	4mBt2	Poor	High	7.7800	0.0145
DOT1	xcxx	Dorset, Shaly Var.	5M	4mBt2	Poor	High	7.7800	0.0145
DOT1	xd2x	Dorset, Shaly Var.	5M	4mCt2	Poor	High	3.4600	0.0065
DOT1	xdxx	Dorset, Shaly Var.	5M	4mCt2	Poor	High	3.7200	0.0069
DOT1	xxxx	Dorset, Shaly Var.	5M	4mA	Poor	High	2.6100	0.0049
DOT1	1c1x	Dorset, Shaly Var.	5M	4mBt2	Poor	High	25.1400	0.0470
DRI	xxxs	Deloraine	5W	4wA	Poor	Low	27.9000	0.0521
DRI	xxxx	Deloraine	5W	4wA	Poor	Low	294.1200	0.5493
DXM	xxxx	Druxman	2M	3wA	Fair	Moderate	3.6400	0.0068
DXM1	xb2x	Druxman, Shaly Var.	2MP	3wA	Fair	Moderate	125.9970	0.2353
ERX	xxxx	Eroded Slope Compl.	6T	2kDt2	Poor	High	1581.0200	2.9527
FFR	xexx	Fifere	4T	2kCt2	Fair	High	31.7800	0.0594
GHM	xxxx	Graham	5W	4wDi	Poor	Low	42.7560	0.0799
GNO	xxxx	Glenlorne	2W	3wA	Fair	Low	199.3150	0.3722
GPE	xxxx	Gopher Creek	2M	3wA	Fair	High	53.0200	0.0990
GYS	xxxx	Grayson	5W	4wA	Poor	High	85.3400	0.1594

Map Symbol Code	/ Phase	Soil Name	Agricultural Capability	Irrigation Suitability Class	General Rating	Potential Environmental Impact	Area(ha)	Percent
HIT	1cxx	Hilton	2T	2kxBt2	Good	Low	115.8400	0.2163
HIT	1d2x	Hilton	3T	2kxCt2	Fair	Moderate	22.3500	0.0417
HIT	1dxx	Hilton	3T	2kxCt2	Fair	Moderate	200.5400	0.3745
HIT	1d1x	Hilton	3T	2kxCt2	Fair	Moderate	787.9940	1.4717
HIT	1c1x	Hilton	2T	2kxBt2	Good	Low	692.8490	1.2940
HIT	xe2x	Hilton	4T	2kxCt2	Fair	High	123.9900	0.2316
HIT	xexx	Hilton	4T	2kxCt2	Fair	High	4.6000	0.0086
HIT	xcxx	Hilton	2T	2kxBt2	Good	Low	1840.1380	3.4366
HIT	xxxx	Hilton	2X	2kxA	Good	Low	3.8600	0.0072
HIT	xd2x	Hilton	3T	2kxCt2	Fair	Moderate	67.1700	0.1254
HIT	xe1x	Hilton	4T	2kxCt2	Fair	High	50.8900	0.0950
HIT	1e1x	Hilton	4T	2kxCt2	Fair	High	66.6400	0.1245
HIT	xd1x	Hilton	3T	2kxCt2	Fair	Moderate	554.0000	1.0346
HIT	xdxx	Hilton	3T	2kxCt2	Fair	Moderate	479.9600	0.8964
HIT	xc1x	Hilton	2T	2KxBt2	Good	Low	5840.8130	10.9083
HIT	xbxx	Hilton	2X	2kxA	Good	Low	160.8030	0.3003
HIT	xb1x	Hilton	2X	2kxA	Good	Low	179.2190	0.3347
HKS	xx2s	Hickson	5W	4wA	Poor	Low	15.7200	0.0294
HKS	xx1s	Hickson	5W	4wA	Poor	Low	409.5160	0.7648
HKS	xxxs	Hickson	5W	4wA	Poor	Low	526.7610	0.9838
HKS	xb1x	Hickson	5W	4wA	Poor	Low	224.2170	0.4187
HKS	xbxx	Hickson	5W	4wA	Poor	Low	10.1070	0.0189
HKS	xx2x	Hickson	5W	4wA	Poor	Low	10.3300	0.0193
HKS	xxxx	Hickson	5W	4wA	Poor	Low	1606.5640	3.0004
HKS	xb1s	Hickson	5W	4wA	Poor	Low	133.9260	0.2501
HKS	xbxs	Hickson	5W	4wA	Poor	Low	333.5270	0.6229
LEI	xxxx	Levine	3I	3wBi	Fair	Low	23.1350	0.0432
LGT	xxxx	Leighton	5WI	4wDi	Poor	Moderate	137.9100	0.2576
LIG	xxxx	Liege	3I	3wBi	Fair	Low	177.1540	0.3309
LRY	xd1x	Leary	5M	4mCt2	Poor	High	83.8240	0.1565
LSR	xxxt	Landseer	5W	4swA	Poor	Moderate	16.2390	0.0303
LYT	xcxx	Lyleton	3M	1Bt2	Good	Moderate	46.5100	0.0869
MHC	xxxx	Marsh	7W	4wxA	Poor	High	984.5780	1.8388
MHC	xx1s	Marsh	7W	4wxA	Poor	High	71.4720	0.1335
MLT	xxxx	Melita	2I	1A	Excellent	Moderate	54.8700	0.1025
MOT	xxxs	Montgomery	3N	3swA	Fair	Low	658.7200	1.2302
MOT	xxxx	Montgomery	2W	3wA	Fair	Low	51.9600	0.0970
NEI	xxxx	Neelin	3I	3wBi	Fair	Low	47.8700	0.0894
NEI	xxxs	Neelin	3IN	3swBi	Fair	Low	25.9600	0.0485
NWS	xxxx	Newstead	3M	2mA	Good	High	225.7900	0.4217
NWS	xcxx	Newstead	3M	2mBt2	Good	High	16.9150	0.0316
OBR	xxxx	Oberon	2W	3wA	Fair	Moderate	34.7500	0.0649

Map Symbol Code	/ Phase	Soil Name	Agricultural Capability	Irrigation Suitability Class	General Rating	Potential Environmental Impact	Area(ha)	Percent
OIV	xxxt	Oliver	4DN	4dsA	Poor	Moderate	222.2120	0.4150
OIV	xxxx	Oliver	4D	4dkA	Poor	Minimal	164.0100	0.3063
OIV	xxxs	Oliver	4D	4dkA	Poor	Low	105.4610	0.1970
OIV	xbxs	Oliver	4D	4dkA	Poor	Low	95.1100	0.1776
OIV1	xb2s	Oliver, Shaly Var.	4D	4dkA	Poor	Low	932.4910	1.7415
OIV1	xx1s	Oliver, Shaly Var.	4D	4dkA	Poor	Low	35.5600	0.0664
OIV1	xb1t	Oliver, Shaly Var.	4DN	4dsA	Poor	Moderate	127.1150	0.2374
OIV1	xxxt	Oliver, Shaly Var.	4DN	4dsA	Poor	Moderate	222.2120	0.4150
OIV1	xx1x	Oliver, Shaly Var.	4D	4dkA	Poor	Minimal	17.4870	0.0327
RAM	xxxx	Ramada	1	2kA	Good	Minimal	21.9800	0.0410
STU	xcxx	Stanton	4M	2mBt2	Good	High	75.8800	0.1417
TDP	xxxx	Tadpole	5W	4wA	Poor	Low	36.8600	0.0688
TGL	xd1x	Tiger Hills	3T	2kxCt2	Fair	Moderate	2491.8430	4.6538
TGL	xdxx	Tiger Hills	3T	2kxCt2	Fair	Moderate	3360.3000	6.2757
TGL	xcxx	Tiger Hills	2T	2kxBt2	Good	Low	86.2130	0.1610
TGL	1e2x	Tiger Hills	4T	2kxCt2	Fair	High	134.6100	0.2514
TGL	xd2x	Tiger Hills	3T	2kxCt2	Fair	Moderate	157.5400	0.2942
TGL	xc1x	Tiger Hills	2T	2kxBt2	Good	Low	805.5030	1.5044
TGL	xe1x	Tiger Hills	4T	2kxCt2	Fair	High	697.9400	1.3035
TGL	xe2x	Tiger Hills	4T	2kxCt2	Fair	High	176.7300	0.3301
TGL	xexx	Tiger Hills	4T	2kxCt2	Fair	High	47.9400	0.0895
TGL	1d1x	Tiger Hills	3T	2kxCt2	Fair	Moderate	978.3700	1.8272
TGL	1e1x	Tiger Hills	4T	2kxCt2	Fair	High	267.0000	0.4986
TWC	xx1x	Two Creeks	2W	3wA	Fair	Low	127.5900	0.2383
TWC	xxxx	Two Creeks	2W	3wA	Fair	Low	715.1250	1.3356
TWC	xx1s	Two Creeks	3N	3swA	Fair	Low	364.7440	0.6812
VFF	xxxs	Vodroff	5W	4wA	Poor	Low	380.4450	0.7105
VFF	xxxx	Vodroff	5W	4wA	Poor	Low	238.9000	0.4462
WIL	xxxs	William	5W	4wA	Poor	High	125.0600	0.2336
WIL	xxxx	William	5W	4wA	Poor	High	145.3900	0.2715
WKD	xbxx	Waskada	2X	2kxA	Good	Low	170.3000	0.3181
WKD	xcxx	Waskada	2T	2kxBt2	Good	Low	98.5100	0.1840
WKD	xx1x	Waskada	2X	2kxA	Good	Low	660.5100	1.2336
WKD	xxxx	Waskada	2X	2kxA	Good	High	226.4550	0.4229
WWD	xxxx	Wellwood	1	2kA	Good	Moderate	17.6800	0.0330
XVI	xxxx	Xavier	03W	OA	Organic	Organic	50.0200	0.0934
ZZ	xxxx	Water	7W	4wDi	Poor	High	3710.4100	6.9295

Table 8. Areal Extent in Hectares and Percent Coverage by Soil Series in the R.M. of Strathcona

SOIL CODE	AREA (hectares)	PERCENT
ASB	44.6350	0.0830
ATV	62.7200	0.1166
AXD	20.7200	0.0385
BED	146.2050	0.2719
BEL	19.8400	0.0369
BKR	62.6800	0.1166
BMN	136.5090	0.2539
BOW	60.9800	0.1134
BSF	853.5150	1.5872
BWO	7454.4370	13.8624
CBF	2342.1130	4.3554
CHF	218.7460	0.4068
CLN	3132.5900	5.8254
CXV	21.9800	0.0409
CYN	113.7700	0.2116
DOM	1170.0190	2.1758
DOT	56.8200	0.1057
DRI	322.0200	0.5988
DXM	129.6370	0.2411
ERX	1581.0200	2.9401
FFR	31.7800	0.0591
GHM	42.7560	0.0795
GNO	199.3150	0.3706
GPE	53.0200	0.0986
GYS	85.3400	0.1587
HIT	11191.6560	20.8121

SOIL CODE	AREA (hectares)	PERCENT
HKS	3270.6680	6.0822
LEI	23.1350	0.0430
LGT	137.9100	0.2565
LIG	177.1540	0.3294
LRY	83.8240	0.1559
LSR	16.2390	0.0302
LYT	46.5100	0.0865
MHC	1056.0500	1.9638
MLT	54.8700	0.1020
MOT	710.6800	1.3216
NEI	73.8300	0.1373
NWS	242.7050	0.4513
OBR	34.7500	0.0646
OIV	1921.6580	3.5735
RAM	21.9800	0.0409
STU	75.8800	0.1411
TDP	36.8600	0.0685
TGL	9203.9890	17.1158
TWC	1207.4590	2.2454
VFF	619.3450	1.1517
WIL	270.4500	0.5029
WKD	1155.7750	2.1493
WWD	17.6800	0.0329
XVI	50.0200	0.0930
ZZ	3710.4100	6.8999

4.3 IRRIGATION SUITABILITY

The irrigation suitability classification is an interpretive assessment of land suitability for irrigated agriculture and is made from soil survey data. The irrigation rating provided in this section is an initial rating based on general information about specific soils indicated on the soil map. **The decision to irrigate a parcel of land will require additional field investigation that utilizes the same criteria but will include on site examination of water tables, salinity and stratigraphy to a depth of 3 meters.**

The rating guidelines in this section are derived from "An Irrigation Suitability Classification System for the Canadian Prairies" (ISC, 1987). This classification system takes into account recent advances in irrigation management and technology and provides general guidelines for irrigation suitability classification that are applicable to both local and regional conditions. The irrigation suitability rating of the soils is based on soil and landscape characteristics. These characteristics are ranked in terms of their sustained quality under long-term management under irrigation. It does not consider factors such as method of water application, water availability, water quality or economics of this type of land use.

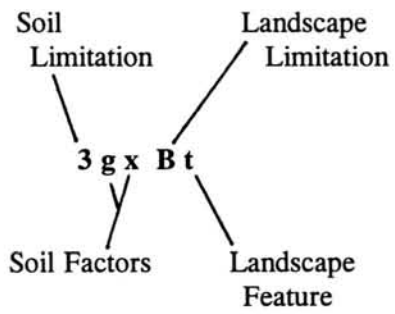
Soil properties considered important for evaluating irrigation suitability are: texture, soil drainage, depth to water table, salinity and geological uniformity. **Landscape features** considered important for rating irrigation suitability relate mainly to the influence of topography and stoniness.

The irrigation suitability classification of the soil and landscape characteristics in the study area will assist in making initial irrigation plans. The decision to irrigate a parcel of land should first be based on a ranking of suitability based on information presented in this report. The next step should involve on site field investigation to examine the depth to water table, salinity and geological uniformity to a depth of 3 m. Drainability, drainage outlet requirement, organic matter status and potential for surface crusting are other factors to consider. This assessment should also consider potential impact of irrigation on "Non-target" non-irrigated areas as well as on the irrigated area.

4.3.1 Irrigation Suitability Rating

The most limiting soil property or landscape feature is combined to determine the placement of a land area in one of 16 classes of irrigation suitability which are grouped and described by 4 ratings of general suitability as **Excellent, Good, Fair and Poor** (Appendix A, Table 12). The guidelines utilized for evaluating the effect of soil properties and landscape features on long term irrigation are included in Appendix A, (Tables 13 and 14 respectively).

An example of an irrigation suitability class rating is shown below:



A maximum of 3 codes is used to identify the subclass rating. Geological uniformity (g) and drainability (x) are soil factors contributing to the soil rating of Class 3, Moderate. Complex topography is the limiting landscape characteristic of the area for rating irrigation suitability. As the soil factor (Class 3, Moderate) is more limiting than the landscape feature (Class B, Slight) the general rating for this land area is Fair.

An ideal soil area to be used for irrigation will have the following characteristics:

- loam texture
- uniform texture both vertically and horizontally
- uniformly well drained
- non saline
- permeable

- nearly level
- non stony

Any departure from these characteristics, i.e. sandy and clayey soils, presence of contrasting textural layers vertically in the soil, horizontal variation in soil texture within the landscape, imperfect and poor drainage, salinity, reduced soil permeability, undulating and hummocky topography and surface stoniness will lower the irrigation suitability. These factors may not only influence the sustainability of irrigation but can also affect the type of irrigation system that can be used and the type of management needed.

Areas with no or slight soil and/or landscape limitations are rated **Excellent** to **Good** and can usually be considered irrigable. Areas with moderate soil and/or landscape limitations are rated as **Fair** and considered marginal for irrigation providing adequate management exists so that the soil and adjacent areas are not adversely affected by water application. Soil and landscape areas rated as **Poor** have severe limitations for irrigation.

The irrigation suitability ratings are based largely on soil characteristics in the upper 1.2 m and the main landscape features for each soil series and phase. Limited information available to the 3 m depth was used to characterize the geological uniformity of major soil types. Following the initial ranking of irrigation suitability, a more detailed investigation may indicate that portions of the area are significantly better or poorer than the general rating indicated.

4.3.2 Environmental Impact

An assessment of potential environmental impact from irrigation is provided in Table 7. The environmental impact from irrigation on either the irrigated land or on "non-target", non irrigated areas and crops is an important aspect to consider prior to irrigation development. The guidelines for environmental impact assessment provide a general assessment of relative ratings ranging from **"minimal to low, moderate and high"** (Table 15). This rating recognizes soil and/or landscape conditions which under irrigation could impact on the irrigated area as well as a "non-target" non-irrigated area. Examples of adverse environmental impact are higher water tables, more persistent soil saturation, increased soil salinity and contamination of groundwater or surface water.

Use of this rating is intended to serve as a warning of possible environmental impact but it is not part of the initial irrigation suitability classification. The evaluation of potential environmental impact has been separated from the initial irrigation suitability rating provided in the ISC system (1987) since it may be possible to design and manage the irrigation system to overcome these limitations. The irrigator must determine the nature or cause of a specific environmental concern and then give special consideration to soil-water-crop management practices that will mitigate the possibility for any adverse impact.

Soil factors and landscape features considered in providing a potential environmental impact evaluation are:

1. Soil Texture
2. Geological Uniformity
3. Hydraulic Conductivity
4. Depth to Water Table
5. Salinity
6. Topography

4.4 SOIL PROPERTIES AFFECTING CROP MANAGEMENT

This section of the report examines specific soil properties that affect various management and associated tillage activities for crop production. The areal distribution of selected soil and landscape properties is shown in a series of single factor and interpretive maps. Soils have been sampled and analyzed for selected chemical and physical characteristics at surface and subsurface depths. This and additional data on bulk density and soil moisture retention properties for specific sites are available on request from the Agricultural Resources Section, Ellis Bldg., U of M.

4.4.1 Soil Texture

The proportion of individual mineral particles (sand, silt, clay) present in a soil is referred to as

texture. Soil texture strongly influences the soil's ability to retain moisture, its general level of fertility, the ease or difficulty of cultivation, permeability and erosion potential. The dominant texture in the R.M. of Strathcona is loam to clay loam which contributes to good available water holding capacity and moderate to moderately slow permeability.

The soils in the R.M., particularly those on steeper slopes, are subject to erosion if the soil surface is not covered by vegetation or crop residue. Continuous cropping and minimum or zero tillage to maximize residue cover will minimize the risk of erosion. These practices will also maintain organic matter in the soil for improved water retention, structure and fertility.

4.4.2 Soil pH

Soil pH values or reaction classes express the degree of acidity and alkalinity. Soil reaction, or pH, influences the way minerals dissolve in soil water and thus the availability of many important nutrients for plants. The surface values in the R.M. range from 5.8 to 8.6 with a mean of pH 7.7. This range of values is characterized as medium acid to moderately alkaline, with the mean value being mildly alkaline. Most crops prefer slightly acid to mildly alkaline soil conditions (pH 6.0 to 7.8).

4.4.3 Organic Matter

Surface organic matter content of the soils in the R.M. ranges from 3 to 10 percent, with a mean of about 6.0 percent, well within the range for loam textured soils in the Chernozemic Black zone of southern Manitoba. There is a general increase in organic matter content from the upper to lower slope positions in the landscape. The overall level of soil organic matter in the R.M. is satisfactory but cultural practices to maintain or increase the organic matter content are required to ensure good structure, fertility and tilth.

4.4.4 Soil Moisture Properties

Soil moisture properties were measured at a number of sites in the R.M. Various other properties including organic carbon, carbonates, particle size and bulk density were also analyzed on soil horizons to a depth of 1.2 meters. Soil moisture content at field capacity, permanent wilting point and available water holding capacity were determined for various soils to a depth of 1.2 meters. This information may be obtained by contacting the Agricultural Resources Section at the Ellis Bldg. U of M.

Field capacity (FC) is the maximum amount of water held in a soil, measured a few days after it has been thoroughly saturated and allowed to drain freely. This is the optimum moisture condition for plant growth.

Permanent wilting point (PWP) is the water content at which plants cannot extract sufficient water to meet their requirement and therefore begin to wilt. As the moisture content of the soil declines, it becomes increasingly difficult for plants to use the remaining soil water.

Available water holding capacity (AWHC) is the amount of water held in the soil that plants can use. The maximum amount of available water held in the soil is the difference between the field capacity and permanent wilting point, expressed in centimetres of water per unit depth of soil.

4.4.5 Soil Salinity

The areal extent and level of salinity across the R.M. is presented in a derived map format shown in Figure 9. Generally, in salt affected areas, the mean electrical conductivity value is 10.5 mS/cm (54 observations). Salinity affects approximately 8,116 hectares or 15.1% of the R.M. of Strathcona. Slightly saline conditions with a conductivity of 4-8 mS/cm account for 14.3% of the total area.

The origin and accumulation of soluble salts in soil is from continual evaporation of soil water and the subsequent concentration of salt at the soil surface. The salinity in the soils results from seepage and evaporation from a saturated soil or from soil adjacent to semi-permanent sloughs and water bodies.

4.4.6 Stoniness

Approximately 50.4% or 26,949 ha. in the R.M. are stony (Figure 10). Slightly stony conditions

account for 42.1% of the total. Stoniness generally occurs on the till and lacustrine over till deposits. Under slightly stony conditions only .01 to .1 % of the land surface is covered by stones and offer only little or no hindrance to cultivation.

4.4.7 Water Erosion Status and Risk Assessment

Erosion is defined as the detachment and movement of soil particles by water, wind, ice or gravity. Soil erosion by water is the main concern on undulating and hummocky soil landscapes in the agricultural region of Manitoba. Soil loss resulting from rainfall-runoff is usually due to combinations of raindrop splash, sheet, rill, gully and channel bank erosion. Sheet and rill erosion are usually least apparent in the landscape, but often the most damaging as it causes gradual thinning of the soil profile over the entire slope. Sheet erosion tends to occur on upper slopes and ridges whereas the more visible rills form in the area of concentrated runoff on mid and lower slopes. The deposition of eroded soil at the base of slopes or in ditches constitutes additional losses and costs attributed to erosion. Soil erosion by water is a concern because it reduces production potential, depletes nutrients and degrades tilth. This process can be accelerated by man's activities which increase runoff and reduce surface cover.

The observed extent and severity of erosion in the R.M. is minimal (Figure 12). Approximately 3630 hectares or 6.8 percent of the soils are characterized by slight erosion (up to 25 percent of the original A horizon may have been removed). Most soils with this degree of erosion are not significantly different in use capabilities and management requirements from noneroded soil.

Evaluating the risk of water erosion is an important management activity which serves to identify the relative susceptibility of various soil landscapes. This information can then be used to design effective conservation practices for susceptible areas. The higher the risk, the more critical becomes the requirement for protective measures.

The risk of water erosion Figure 13 can be estimated using the Universal Soil Loss Equation (Wischmeier and Smith, 1965). The Universal Soil Loss Equation (USLE),

$$A = KRLSCP$$

expresses average annual soil loss (A) as a function of soil erosivity (K), rainfall intensity (R), topography (LS), cover (C) and conservation practices (P). Although soil and crop management practices are the only practical way to control sediment loss, the inherent susceptibility of a soil to particle detachment and transport is a major factor in the soil loss equation. Soil erosion due to rainfall and runoff may vary more than tenfold just because of basic soil differences (Wischmeier et al, 1971).

For calculating the soil loss potential in the R.M. of Strathcona, the following parameters were applied.

R = 765 (rainfall and runoff erosivity factor)

K = Computed soil erodibility factor for each soil series using data from soil names and layer files.

LS = Slope length and steepness factor calculated using:

(Slope Length)		(Slope %)
x, a, b	= 300 m.	x, a = .25%
c, d	= 125 m.	b = 1.0%
e, f, g	= 50 m.	c = 3.5%
		d = 7.0%
		e = 12.0%
		f = 22.0%

C = 1.0 - Crop cover and management factor using bare, unprotected soil surface.

P = 1.0 - Erosion control conservation practice factor. No special control practice used.

Legend - Water Erosion Risk

Class	Soil Loss Tonnes/ha/yr
Negligible	<6.0
Low	6-10.9
Moderate	11.0-21.9
High	22.0-32.9
Severe	>33.0

Soil properties which affect infiltration rate, permeability and total water holding capacity and those that affect dispersion, splashing, abrasion and transportation of soil particles by runoff vary across the R.M. and cause differences in soil loss from water erosion. Application of the USLE parameters indicates the estimated soil loss differs significantly according to differences in slope length and steepness.

Topographic characteristics in the R.M. are shown in Figure 11. Slope steepness in the undulating and hummocky landscapes ranges from 2 to 15 percent. Slope length in these landscapes varies from 50 m to 200 m. Soils in landscapes characterized by steeper slopes and greater lengths are more susceptible to water erosion. Soils in nearly level areas (0.5 to 2 percent slopes) and level to depressional areas (0 to 0.5 percent slopes) are less susceptible to water erosion. These low relief areas however, generally receive sediment removed from adjacent upper slopes and knolls.

Soil loss from a bare, unprotected soil surface (no soil protection from crop cover or management) is considered a worst case scenario and is used in generating the map. Soil loss decreases dramatically if the soil is managed under a minimum till system. The protection to the soil surface provided by crop residue results in a four to five fold reduction in estimated soil loss.

The rate of soil loss is usually expressed in terms of average soil loss in tonnes per hectare per year. Estimation of potential soil loss in the R.M. ranged from 0 to 150 tonnes/ha/yr. A negligible to moderate risk of water erosion would apply to a major portion, 68 percent, of the R.M.

Soil conservation techniques should be practiced in the R.M. of Strathcona particularly on undulating to hummocky landscapes with steep, long slope situations. Grassed waterways, contour cultivation, residue management and little or no summerfallow all contribute to good soil conservation.

4.5 CAPABILITY AND MANAGEMENT

The soils in the rural municipality of Strathcona offer a wide range in agricultural capability.

*Class 1 soils comprise approximately **1.4** percent of the study. These are dominantly well drained, loam to clay loam soils developed on deep lacustrine sediments or overlays on till. The class 1 soils have no significant limitations for crop production.

*Class 2 soils which represent **42.4** percent of the area are largely the imperfectly drained soils with a wetness limitation. Soils having a very gently sloping landscape or moderate stoniness are included. Class 2X is made up of soils having a moderate limitation caused by the cumulative effect of two or more adverse characteristics which singly are not serious enough to affect the class rating.

*Class 3 soils cover **30.3** percent of the study and are characterized by the imperfectly drained solonetzic subgroups and other weakly saline soils. Gently sloping areas are classed as 3T. Imperfectly drained soils subject to inundation are also part of this class. Areas of well drained, droughty soils are in this class as 3M.

*Class 4 soils account for **6.9** percent of the municipality. Included in this group are the solonetzic soils, moderately saline soils, moderately sloping areas and soils with exceedingly stony phases.

*Class 5 soils are spread out over **7.1** percent of the area and include largely the poorly drained gleysols, excessively stony land and strong slopes. The well drained, droughty, gravelly soils are also in this class.

*Class 6 land accounts for **3** percent of soils. The major unit in this class is the Eroded Slopes Complex which includes very rough topography with steep slopes along deep ravines and river channels. Some very poorly drained pothole soils are also placed in this class.

*Class 7 lands including the marsh and water units makes up the remaining 1.8 percent of the area.

4.6 SOIL SUITABILITY FOR SELECTED ENGINEERING USES

This section provides information which can be used by engineers and land use planners concerned with engineering and related geotechnical aspects of soil. It is intended to supplement the information on the soil map with additional data on engineering properties of soils.

The criteria used to evaluate soil suitability for selected engineering and related recreational uses are adopted from guides found in Coen et al (1977), and from guidelines developed by the Soil Conservation Service, United States Department of Agriculture (USDA, 1971), and the Canada Soil Survey Committee (CSSC, 1973).

Definition of Soil Suitability Classes

Evaluation of soil suitability for engineering and recreation uses is based on both internal and external soil characteristics. Four soil suitability classes are used to evaluate both mineral and organic soils and hence, mapping units for selected uses. These ratings express relative degrees of suitability or limitation for potential uses of natural or essentially undisturbed soils. The long term effects of the potential use on the behaviour of the soil are considered in the rating.

The four suitability class ratings are defined as follows:

(G) Good -Soils in their present state have few or minor limitations that would affect the proposed use. The limitations would easily be overcome with minimal cost.

(F) Fair -Soils in their present state have one or more moderate limitations that would affect the proposed use. These moderate limitations would be overcome with special construction, design, planning or maintenance.

(P) Poor -Soils in their present state have one or more severe limitations that would severely affect the proposed use. To overcome these severe limitations would require the removal of the limitation or difficult and costly alteration of the soil or of special design or intensive maintenance.

(V) Very Poor -Soils have one or more features so unfavorable for the proposed use that the limitation is very difficult and expensive to overcome or the soil would require such extreme alteration that the proposed use is economically impractical.

Soil Suitability Subclasses

The basic soil properties that singly or in combination with others commonly affect soil suitability for selected engineering properties and recreation uses are provided in Table 10. These subclass designations serve to identify the kind of limitation or hazard for a particular use.

Guides for Assessing Soil Suitability

Guides for assessing soil suitability for ten engineering related uses are available on request from the Agricultural Resources Section, 346 Ellis Bldg., University of Manitoba. These tables provide as specifically as possible, definitions of the soil properties which result in the specific suitability or degree of limitation. In assessing soil suitability for various engineering uses, the degree of suitability is determined by the most restrictive or severe rating assigned to any one of the listed soil properties. For example, if the suitability is "Good" for all but one soil property and it is estimated to be "Very Poor", then the overall rating of the soil for that selected use is "Very Poor". Suitability of individual soil properties, if estimated to be "Fair" or "Poor", can be accumulative in their effect for a particular use. Judgement is required to determine whether the severity of the combined effects of several soil properties on suitability for a particular use will result in downgrading an evaluation. This is left to the discretion of the interpreter. It is incorrect to assume that each of the major soil properties influencing a particular use has an equal effect. Class limits established for rating the suitability of individ-

ual soil properties take this into account. For a selected use, therefore, only those soil properties which most severely limit that use are specified.

Engineering descriptions of the soils and their estimated properties significant to engineering are not provided in the report, however, are available on request. This data, in addition to information contained in other sections of the report has been used to rate the soils according to their suitability for ten selected engineering uses in Table 9. When using these interpretations, consideration must be given to the following assumptions:

1. Interpretations are based on predictions of soil behavior under defined conditions of use and management as specified in the preamble to each of the guides.

2. Soil ratings do not include site factors such as nearness to towns and highways, water supply, aesthetic values, etc.

3. Soil ratings are based on natural, undisturbed soil.

4. Soil suitability ratings are usually given for the entire soil, but for some uses, they may be based on the limitations of an individual soil horizon or other earthy layer, because of its overriding importance. Ratings rarely apply to soil depths greater than 1 to 2 meters, but in some kinds of soils, reasonable estimates can be given for soil material at greater depths. It should be noted here that the term "soil" has been used throughout the report in the pedologic sense and differs in concept from that commonly used by engineers.

5. Poor and very poor soil ratings do not imply that a site cannot be changed to remove, correct or modify the soil limitations. The use of soils rated as poor depends on the nature of the limitations, whether or not the soil limitation can be altered successfully and economically, and on the scarcity of good sites.

6. Interpretations of map units do not eliminate the need for on-site evaluation by qualified professionals. Due to the variable nature of soils, and the scale of mapping, small, unmappable inclusions of soils with different properties may be present in an area where a development is planned. The need for or importance of on-site studies depends on the use to be made of the soil and the kinds of soil and soil problems involved.

Table 9. Suitability Ratings and Limitations of Soils for Selected Engineering Uses

Map Symbol Code	Phase	SOIL NAME	Topsoil	Sand & Gravel	Road Fill	Bldgs. with Basement	Local Roads & Streets	Sanit. Trench	Land-fill Area	Cover Material	Sewage Lagoon	Septic Fields
ASB	xxxs	Assiniboine	Psn	Va	Pa	Pi	Pai	Pis	Pi	Ps	Vi	Vk
ASB	xxxx	Assiniboine	Psi	Va	Pal	Pi	Pai	Pis	Pi	Ps	Vi	Vk
ATV	xx2x	Antler River	Pus	Va	Pla	Pa	Fd	Ps	Fk	Psd	Pd	Pd
AXD	xxxs	Alexander	Pn	Va	Fa	Paw	Fwa	Pw	Pk	Pq	Vkg	Pkg
BED	xxxx	Bede	Pbs	G	G	G	G	Vsg	Vkg	Vs	Vak	Gg
BED	xcxx	Bede	Pbs	G	G	G	G	Vkg	Vs	Vs	Vak	Gg
BED	xexx	Bede	Pbt	G	G	Ft	Ft	Vsg	Vkg	Vs	Vak	Ft
BEL	xxxx	Bella Lake	Fb	Va	Pw	Vh	Pw	Vw	Vh	Pw	Pa	Vh
BKR	xxxx	Basker	Pi	Va	Pw	Vi	Vi	Vi	Viw	Pw	Vi	Vi
BMN	1c1x	Bermont	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
BMN	1d2x	Bermont	Pb	Va	Fa	Fa	Fa	Fs	G	Fsp	Pt	Fk
BOW	xxxx	Bower	Fb	Va	Fa	Pw	Fwa	Pw	Pk	Pq	Pq	Pkg
BSF	xxxs	Beresford	Pn	Va	Faw	Pw	Fwa	Pw	Fw	Fs	Fk	Phk
BSF	xx1s	Beresford	Pn	Va	Faw	Pw	Fwa	Pw	Fw	Fs	Fk	Phk
BSF	xb1x	Beresford	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Phk
BSF	xbxx	Beresford	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Phk
BSF	xx1x	Beresford	Fs	Va	Faw	Pw	Fwa	Pw	Fw	Fs	Fk	Phk
BSF	xxxx	Beresford	Fs	Va	Faw	Pw	Fwa	Pw	Fw	Fs	Fk	Phk
BWO	xx1s	Barwood	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xxxs	Barwood	Pn	Va	Faw	Pw	Fw	Pw	Fw	Fs	Fa	Ph
BWO	xc1s	Barwood	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fat	Ph
BWO	xc1x	Barwood	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xb1x	Barwood	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xb2x	Barwood	Fsp	Va	Faw	Pw	Faw	Pw	Fw	Fsp	Fa	Ph
BWO	xbxx	Barwood	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xcxs	Barwood	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fat	Ph
BWO	xcxx	Barwood	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xx1x	Barwood	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xxxx	Barwood	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xb1s	Barwood	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
BWO	xbxs	Barwood	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
CBF	xc2x	Cobfield	Fsp	Va	Faw	Pw	Fwa	Pw	Fw	Fsp	Fkt	Ph
CBF	xbxx	Cobfield	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fak	Ph
CBF	xb2s	Cobfield	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fsp	Fka	Ph
CBF	xxxs	Cobfield	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fka	Ph
CBF	xb1x	Cobfield	Fs	Va	Faw	Pw	Fwa	Pw	Fw	Fs	Fak	Ph
CBF	xb2x	Cobfield	Fsp	Va	Faw	Pw	Faw	Pw	Fw	Fsp	Fak	Ph
CBF	xx1s	Cobfield	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fka	Ph
CBF	xx1x	Cobfield	Fs	Va	Faw	Pw	Fwa	Pw	Fw	Fs	Fak	Ph
CBF	xx2x	Cobfield	Fsp	Va	Faw	Pw	Fwa	Pw	Fw	Fsp	Fak	Ph

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CBF	xxxx	Cobfield	Fs	Va	Faw	Pw	Fwa	Pw	Fw	Fs	Fak	Ph
CHF	xx1s	Chesterfield	Psn	Va	Pa	Pda	Pa	Vd	Fw	Pds	Pd	Vk
CHF	xx2t	Chesterfield	Vn	Va	Pa	Pda	Pa	Vd	Fw	Pds	Pd	Vk
CLN	xx2x	Clementi	Fsp	Va	Fa	Fap	Fa	Fsp	G	Fsp	Fka	Fk
CLN	xb2x	Clementi	Fsp	Va	Fa	Fap	Fa	Fsp	G	Fsp	Fka	Fk
CLN	xxxx	Clementi	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
CLN	xb1x	Clementi	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
CLN	xb3x	Clementi	Pp	Va	Fap	Pp	Fap	Fs	G	Pp	Fkp	Fk
CLN	xbxx	Clementi	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
CLN	xc3x	Clementi	Pp	Va	Fap	Pp	Fap	Pp	G	Pp	Fkp	Fk
CLN	xcxx	Clementi	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
CLN	xx1x	Clementi	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
CXV	xxxx	Charman	Fsb	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
CYN	xxxx	Croyon	Fbs	G	G	G	G	Vsk	Vk	Pq	Vka	Gg
CYN1	xcxx	Croyon, Shaly Var.	Fb	Pa	G	G	G	Vsk	Vk	Pq	Vka	Gg
CYN1	xc2x	Croyon, Shaly Var.	Fsp	Pa	G	Fp	G	Vsk	Vk	Pq	Vka	Gg
CYN1	xbxx	Croyon, Shaly Var.	Fbs	Pa	G	G	G	Vsk	Vk	Pq	Vka	Gg
DOM	xxxx	Dromore	Fsb	G	G	G	G	Vsk	Pkg	Pq	Vkg	Gg
DOM	xx1x	Dromore	Fsb	G	G	G	G	Vsk	Pkg	Pq	Vkg	Gg
DOM	xdxx	Dromore	Fts	G	G	G	G	Vsk	Pg	Pq	Vkg	Gg
DOM	xcxx	Dromore	Fsb	G	G	G	G	Vsk	Pkg	Pq	Vkg	Gg
DOM	xc2x	Dromore	Fsp	G	G	Fp	G	Vsk	Pkg	Pq	Vkg	Gg
DOM1	xcxx	Dromore,Shaly Var.	Fsb	Pa	G	G	G	Vsk	Pkg	Pq	Vka	Gg
DOM1	xbxx	Dromore,Shaly Var.	Fsb	Pa	G	G	G	Vsk	Pkg	Pq	Vka	Gg
DOT	xdxx	Dorset	Pbs	G	G	G	G	Vsk	Vkg	Vs	Vak	Gg
DOT	xxxx	Dorset	Pbs	G	G	G	G	Vsk	Vkg	Vs	Vak	Gg
DOT	xcxx	Dorset	Pbs	G	G	G	G	Vsk	Vkg	Vs	Vak	Gg
DOT1	xcxx	Dorset, Shaly Var.	Pbs	Pa	G	G	G	Vsk	Vkg	Vs	Vak	Gg
DOT1	xd2x	Dorset, Shaly Var.	Pbs	Pa	G	Fp	G	Vsk	Vkg	Vs	Vak	Gg
DOT1	xdxx	Dorset, Shaly Var.	Pbs	Pa	G	G	G	Vsk	Vkg	Vs	Vak	Gg
DOT1	xxxx	Dorset, Shaly Var.	Pbs	Pa	G	G	G	Vsk	Vkg	Vs	Vak	Gg
DOT1	1c1x	Dorset, Shaly Var.	Pbs	Pa	G	G	G	Vsk	Vkg	Vs	Vak	Gg
DRI	xxxs	Deloraine	Pn	Va	Vh	Vw	Pw	Vw	Vh	Pw	Fa	Vh
DRI	xxxx	Deloraine	Fs	Va	Vh	Vw	Pw	Vw	Vh	Pw	Fa	Vh
DXM	xxxx	Druxman	Fs	G	Fw	Pw	Fw	Vsg	Pkg	Pq	Vkg	Phg
DXM1	xb2x	Druxman, Shaly Var.	Fps	Paq	Fw	Pw	Fw	Vsk	Pkg	Pq	Vka	Phg
ERX	xxxx	Eroded Slope Compl.	Vt	Va	Pt	Vt	Vt	Pt	Vt	Vt	Vt	Vt
FFR	xexx	Fifere	Pb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
GHM	xxxx	Graham	Pi	Va	Pw	Viw	Vi	Viw	Vhi	Pw	Vi	Vhi
GNO	xxxx	Glenlorne	Fs	Va	Fa	Pw	Fwa	Pw	Fw	Fs	Fh	Fk

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GPE	xxxx	Gopher Creek	Fs	Gq	Fwa	Pw	Fwa	Pwg	Pkg	Pq	Vak	Phg
GYS	xxxx	Grayson	G	Ph	Pw	Vw	Pw	Vw	Pw	Pw	Ph	Ph
HIT	1cxx	Hilton	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Ftk	Fk
HIT	1d2x	Hilton	Pb	Va	Fa	Fap	Fa	Fsp	G	Fs	Pt	Fk
HIT	1dxx	Hilton	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
HIT	1d1x	Hilton	Ptb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
HIT	1c1x	Hilton	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Ftk	Fk
HIT	xe2x	Hilton	Pt	Va	Fa	Fat	Fat	Fsp	Ft	Ftp	Vt	Fkt
HIT	xexx	Hilton	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
HIT	xcxx	Hilton	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Ftk	Fk
HIT	xxxx	Hilton	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
HIT	xd2x	Hilton	Ftb	Va	Fa	Fap	Fa	Fsp	G	Fsp	Pt	Fk
HIT	xe1x	Hilton	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
HIT	1e1x	Hilton	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
HIT	xd1x	Hilton	Ftb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
HIT	xdxx	Hilton	Ftb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
HIT	xc1x	Hilton	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Ftk	Fk
HIT	xbxx	Hilton	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
HIT	xb1x	Hilton	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
HKS	xx2s	Hickson	Pn	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xx1s	Hickson	Pn	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xxxs	Hickson	Pn	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xb1x	Hickson	Fs	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xbxx	Hickson	Fs	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xx2x	Hickson	Fsp	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xxxx	Hickson	Fs	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xb1s	Hickson	Pn	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
HKS	xbxs	Hickson	Pn	Va	Vh	Vw	Pw	Vw	Vh	Pw	Ph	Vh
LEI	xxxx	Levine	Fis	Va	Faw	Piw	Pi	Pi	Pi	Fs	Vi	Pi
LGT	xxxx	Leighton	Pi	Va	Paw	Vi	Vi	Vi	Viw	Pw	Vi	Vih
LIG	xxxx	Liege	Fi	Va	Fa	Piw	Pi	Piw	Phi	G	Vi	Pih
LRY	xd1x	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LSR	xxxt	Landseer	Vn	Va	Paw	Paw	Paw	Vw	Pw	Psw	Fh	Vk
LYT	xcxx	Lyleton	G	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pk	Fk
MHC	xxxx	Marsh	Vw	Va	Vw	Vw	Vw	Vw	Vw	Vw	Vhi	Vhi
MHC	xx1s	Marsh	Vw	Vwa	Vw	Vw	Vw	Vw	Vw	Vw	Vhi	Vhi
MLT	xxxx	Melita	G	Va	Fa	Pi	Fia	Fi	Fi	G	Pi	Pi
MOT	xxxs	Montgomery	Pn	Va	Fa	Pw	Faw	Pw	Fw	Fs	Fh	Pkh
MOT	xxxx	Montgomery	Fs	Va	Fa	Pw	Faw	Pw	Fw	Fs	Fh	Pk
NEI	xxxx	Neelin	Ps	Va	Pa	Piw	Pia	Piw	Phi	Ps	Vi	Pih

Table 9. Suitability Ratings and Limitations of Soils for Selected Engineering Uses

Map Symbol Code	Phase	SOIL NAME	Topsoil	Sand & Gravel	Road Fill	Bldgs. with Basement	Local Roads & Streets	Sanit. Trench	Land-fill Area	Cover Material	Sewage Lagoon	Septic Fields
NEI	xxxs	Neelin	Pn	Va	Pa	Piw	Pia	Piw	Phi	Ps	Vi	Pih
NWS	xxxx	Newstead	Fs	Pa	Fa	Fa	Fa	Fsg	Pkg	Fs	Pkg	Fgk
NWS	xcxx	Newstead	Fs	Pa	Fa	Fa	Fa	Fsg	Pkg	Fs	Pkg	Fgt
OBR	xxxx	Oberon	Fsb	Pq	Fw	Pw	Faw	Vsk	Fwg	Fs	Vk	Fkg
OIV	xxxt	Oliver	Vn	Va	Fw	Paw	Faw	Pws	Ph	Ps	Fa	Pkh
OIV	xxxx	Oliver	Ps	Va	Pa	Paw	Paw	Pws	Ph	Ps	Fa	Pkh
OIV	xxxs	Oliver	Psn	Va	Fw	Paw	Faw	Pws	Ph	Ps	Fa	Pkh
OIV	xbxs	Oliver	Psn	Va	Pa	Paw	Pa	Pws	Ph	Ps	Fa	Pkh
OIV1	xb2s	Oliver, Shaly Var.	Psn	Va	Pa	Paw	Pa	Pws	Ph	Ps	Fa	Pkh
OIV1	xx1s	Oliver, Shaly Var.	Psn	Va	Pa	Paw	Pa	Pws	Ph	Ps	Fa	Pkh
OIV1	xb1t	Oliver, Shaly Var.	Vn	Va	Pa	Paw	Pa	Pws	Ph	Ps	Fa	Pkh
OIV1	xxxt	Oliver, Shaly Var.	Vn	Va	Pa	Paw	Pa	Pws	Ph	Ps	Fa	Pkh
OIV1	xx1x	Oliver, Shaly Var.	Ps	Va	Pa	Paw	Pa	Pws	Ph	Ps	Fa	Pkh
RAM	xxxx	Ramada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
STU	xcxx	Stanton	Ps	Fa	G	G	G	Vk	Vk	Vs	Vk	Gg
TDP	xxxx	Tadpole	Fs	Va	Pw	Vw	Pw	Vw	Pw	Pw	Ph	Vh
TGL	xd1x	Tiger Hills	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
TGL	xdxx	Tiger Hills	Ft	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
TGL	xcxx	Tiger Hills	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL	1e2x	Tiger Hills	Pt	Va	Fa	Fpt	Fat	Fsp	Ft	Fst	Vt	Fkt
TGL	xd2x	Tiger Hills	Fst	Va	Fa	Fap	Fa	Fsp	G	Fsp	Pt	Fk
TGL	xc1x	Tiger Hills	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL	xe1x	Tiger Hills	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TGL	xe2x	Tiger Hills	Pt	Va	Fa	Fat	Fat	Fsp	Ft	Fst	Vt	Fkt
TGL	xexx	Tiger Hills	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TGL	1d1x	Tiger Hills	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
TGL	1e1x	Tiger Hills	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TWC	xx1x	Two Creeks	Fs	Va	Fa	Pw	Faw	Pw	Fw	Fs	Fh	Pkh
TWC	xxxx	Two Creeks	Fs	Va	Fa	Pw	Faw	Pw	Fw	Fs	Fh	Pkh
TWC	xx1s	Two Creeks	Pn	Va	Fa	Pw	Faw	Pw	Fw	Fs	Fh	Pkh
VFF	xxxs	Vodroff	Pn	Va	Pw	Vw	Pw	Vw	Pw	Pw	Ph	Vh
VFF	xxxx	Vodroff	Fs	Va	Pw	Vw	Pw	Vw	Pw	Pw	Ph	Vh
WIL	xxxs	William	Pn	Phq	Vh	Vw	Pw	Vwg	Vhg	Pw	Vhg	Vhg
WIL	xxxx	William	Fb	Phq	Vh	Vw	Pw	Vwg	Vhg	Pw	Vhg	Vhg
WKD	xbxx	Waskada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fa	Fk
WKD	xcxx	Waskada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fat	Fk
WKD	xx1x	Waskada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fak	Fk
WKD	xxxx	Waskada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fak	Fk
WWD	xxxx	Wellwood	Fs	Pq	Fa	G	Fa	Vsk	Gg	Fs	Vk	Fkg
XVI	xxxx	Xavier	G*	Va	Vaw	Vaw	Vaw	Vsw	Vw	Vsw	Vah	Vh
ZZ	xxxx	Water	Vw	Va	Vw	Vw	Vw	Vw	Vw	Vw	Vw	Vh

* Non-woody organic materials are assessed as "good" sources for topsoil if mixed with mineral soil.

4.7 SOIL SUITABILITY FOR SELECTED RECREATION USES

This section provides interpretations of the soil suitability for recreational development. All types of soil can be used for recreational activities of some kind.

Soils and their properties determine to a large degree, the type and location of recreational facilities. Wet soils are not suitable for campsites, roads, playgrounds or picnic areas. Soils that pond and dry out slowly after heavy rains present problems where intensive use is contemplated. It is difficult to maintain grass cover for playing fields and golf courses on droughty soils. The feasibility of many kinds of outdoor activities are determined by other basic soil properties such as depth to bedrock, stoniness, topography or land pattern, and the ability of the soil to support vegetation of different kinds as related to its natural fertility.

The suitability of the various soil series and phases for selected recreation uses is shown in Table 11, according to four classes, Good, Fair, Poor and Very poor as defined previously in the section on Engineering Uses. Subclasses are employed to identify the kind of limitation or hazard for a particular use. An explanation of subclass symbols is provided in Table 10.

The guidelines for various recreation uses are available from the Agricultural Resources Section, 346 Ellis Bldg., University of Manitoba.

Table 10. Codes utilized to identify limitations in evaluating soil suitability for selected Engineering and Recreational Uses (Table 9 and 11)

a subgrade properties
b thickness of topsoil
c coarse fragments on surface
d depth to bedrock
e erosion or erodibility
f susceptibility to frost hazard
g contamination hazard of groundwater
h depth to seasonal water table
i flooding or inundation
j thickness of slowly permeable material
k permeability or hydraulic conductivity
l shrink-swell properties
m moisture limitations or deficit
n salinity or sulphate hazard
o organic matter
p stoniness
q depth to sand or gravel
r rockiness
s surface texture
t topographic slope class
u moist consistence
w wetness or soil drainage class
z permafrost

4.7.1 Single Factor and Derived Interpretive Maps

Evaluation of soil resource information (soil properties) is most appropriate in relation to the landscape and environment in which the soil occurs. Management of soil and landscape data using Geographic Information System (GIS) technology enables rapid and more quantitative analysis of natural soil variability than is possible using manual techniques. The areal distribution of various soil components and properties that occur in complex landscapes can be highlighted in map form and so assist in planning and managing the soil resource. Such single factor maps and interpretative maps show the distribution of individual soil properties and indicate the degree of soil limitation or potential for selected agricultural uses and environmental applications.

GIS techniques can help the land manager in understanding soil and landscape relations and in implementing research and demonstration activities. In addition, use of the GIS can assist in the design of sampling and instrumentation sites for monitoring soil quality and assessing environmental impact.

A series of derived and interpretive maps for the R.M. of Strathcona are provided in Figures 5 to 13. These colour thematic maps are generated by the PAMAP Geographic Information System from the 1:50000 scale soil map and related soil analysis and landscape information. The maps portray a selection

of individual soil properties or landscape conditions for each map unit delineation. Combinations of soil properties or landscape features affecting land use and management are derived as specific interpretations.

The interpretive and single factor themes generated for the R.M. of Strathcona are:

- Interpretive Map for Agricultural Capability . . . . . Figure 5
- Interpretive Map for Irrigation . . . Figure 6
- Potential Environmental Impact under Irrigation . . . . . Figure 7
- Derived Map for Drainage . . . . . Figure 8
- Derived Map for Salinity . . . . . Figure 9
- Derived Map for Stoniness . . . . . Figure 10
- Derived Map for Topography . . . Figure 11
- Derived Map for Erosion . . . . . Figure 12
- Interpretive Map for Water Erosion Risk . . . . . Figure 13

Table 11. Suitability Ratings of Soils for Recreational Uses

Map Symbol (Code/Phase)		Soil Name	Play Ground	Picnic Area	Camp Area	Path and Trails	Perm.Bldgs. wo Basement
ASB	xxxs	Assiniboine	Psk	Ps	Psi	Ps	Pai
ASB	xxxx	Assiniboine	Psk	Ps	Psi	Ps	Pai
ATV	xx2x	Antler River	Pks	Ps	Pk	Fs	Fd
AXD	xxxs	Alexander	Fw	Fw	Fw	Fw	Faw
BED	xxxx	Bede	Pq	Fs	Fs	G	G
BED	xcxx	Bede	Pq	Fs	Fs	G	G
BED	xexx	Bede	Vt	Fst	Fst	G	Ft
BEL	xxxx	Bella Lake	Pw	Pw	Pw	Pw	Pw
BKR	xxxx	Basker	Viw	Vwi	Vwi	Pw	Vh
BMN	1c1x	Bermont	Fst	Fs	Fs	Fs	Fa
BMN	1d2x	Bermont	Pt	Fs	Fs	Fs	Fa
BOW	xxxx	Bower	Fw	Fw	Fsw	Fs	Faw
BSF	xxxs	Beresford	Fwn	Fwn	Fwn	Fsw	Faw
BSF	xx1s	Beresford	Fwn	Fwn	Fwn	Fsw	Faw
BSF	xb1x	Beresford	Fw	Fsw	Fsw	Fsw	Faw
BSF	xbxx	Beresford	Fw	Fsw	Fsw	Fsw	Faw
BSF	xx1x	Beresford	Fw	Fsw	Fws	Fsw	Faw
BSF	xxxx	Beresford	Fw	Fsw	Fws	Fsw	Faw
BWO	xx1s	Barwood	Fwn	Fwn	Fwn	Fsw	Faw
BWO	xxxs	Barwood	Fwn	Fwn	Fwn	Fsw	Fwa
BWO	xc1s	Barwood	Fwn	Fwn	Fwn	Fsw	Faw
BWO	xc1x	Barwood	Fwt	Fsw	Fsw	Fsw	Faw
BWO	xb1x	Barwood	Fsw	Fsw	Fsw	Fsw	Faw
BWO	xb2x	Barwood	Fwp	Fsw	Fwp	Fsw	Faw
BWO	xbxx	Barwood	Fsw	Fsw	Fsw	Fsw	Faw
BWO	xcxs	Barwood	Fwn	Fwn	Fwn	Fsw	Faw
BWO	xcxx	Barwood	Fwt	Fsw	Fsw	Fsw	Faw
BWO	xx1x	Barwood	Fsw	Fsw	Fsw	Fsw	Faw
BWO	xxxx	Barwood	Fws	Fws	Fws	Fws	Faw
BWO	xb1s	Barwood	Fwn	Fwn	Fwn	Fsw	Faw
BWO	xbxs	Barwood	Fwn	Fwn	Fwn	Fsw	Faw
CBF	xc2x	Cobfield	Fpt	Fsw	Fwp	Fsw	Fap
CBF	xbxx	Cobfield	Fw	Fw	Fw	Fws	Faw
CBF	xb2s	Cobfield	Fpn	Fwn	Fpn	Fsw	Fap
CBF	xxxs	Cobfield	Fwn	Fwn	Fwn	Fsw	Faw
CBF	xb1x	Cobfield	Fw	Fw	Fw	Fws	Faw
CBF	xb2x	Cobfield	Fwp	Fw	Fwp	Fws	Fwp
CBF	xx1s	Cobfield	Fwn	Fwn	Fwn	Fsw	Faw
CBF	xx1x	Cobfield	Fw	Fsw	Fw	Fsw	Faw
CBF	xx2x	Cobfield	Fwp	Fsw	Fwp	Fsw	Fap

Map Symbol (Code/Phase)		Soil Name	Play Ground	Picnic Area	Camp Area	Path and Trails	Perm.Bldgs.wo Basement
CBF	xxxx	Cobfield	Fw	Fw	Fw	Fw	Faw
CHF	xx1s	Chesterfield	Pk	Ps	Ps	Ps	Pa
CHF	xx2t	Chesterfield	Pkn	Ps	Psn	Ps	Pa
CLN	xx2x	Clementi	Fsp	Fs	Fsp	Fs	Fa
CLN	xb2x	Clementi	Fsp	Fs	Fsp	Fs	Fa
CLN	xxxx	Clementi	Fs	Fs	Fs	Fs	Fa
CLN	xb1x	Clementi	Fs	Fs	Fs	Fs	Fa
CLN	xb3x	Clementi	Pp	Fsp	Pp	Fs	Fa
CLN	xbxx	Clementi	Fs	Fs	Fs	Fs	Fa
CLN	xc3x	Clementi	Pp	Fsp	Pp	Fsp	Fap
CLN	xcxx	Clementi	Fst	Fs	Fs	Fs	Fa
CLN	xx1x	Clementi	Fs	Fs	Fs	Fs	Fa
CXV	xxxx	Charman	Fsw	Fsw	Fsw	Fsw	Faw
CYN	xxxx	Croyon	Fs	Fsm	Fs	Fs	G
CYN1	xcxx	Croyon, Shaly Var.	Fst	Fsm	Fs	Fs	G
CYN1	xc2x	Croyon, Shaly Var.	Fsp	Fsm	Fsp	Fs	G
CYN1	xbxx	Croyon, Shaly Var.	Fs	Fsm	Fs	Fs	G
DOM	xxxx	Dromore	Fs	Fsm	Fs	Fs	Fa
DOM	xx1x	Dromore	Fs	Fsm	Fs	Fs	Fa
DOM	xdxx	Dromore	Pt	Fsm	Fs	Fs	Fa
DOM	xcxx	Dromore	Fst	Fsm	Fs	Fs	Fa
DOM	xc2x	Dromore	Fpt	Fsm	Fsp	Fs	G
DOM1	xcxx	Dromore,Shaly Var.	Fst	Fsm	Fs	Fs	Fa
DOM1	xbxx	Dromore,Shaly Var.	Fs	Fsm	Fs	Fs	Fa
DOT	xdxx	Dorset	Ptm	Pm	Fs	G	G
DOT	xxxx	Dorset	Pmq	Fs	Fs	G	G
DOT	xcxx	Dorset	Pmq	Fs	Fs	G	G
DOT1	xcxx	Dorset, Shaly Var.	Psq	Fs	Fs	G	G
DOT1	xd2x	Dorset, Shaly Var.	Pqt	Fs	Fs	G	G
DOT1	xdxx	Dorset, Shaly Var.	Pst	Fs	Fs	G	G
DOT1	xxxx	Dorset, Shaly Var.	Psq	Fs	Fs	G	G
DOT1	1c1x	Dorset, Shaly Var.	Pq	Fs	Fs	G	G
DRI	xxxs	Deloraine	Pw	Pw	Pw	Pw	Vh
DRI	xxxx	Deloraine	Pw	Pw	Pw	Pw	Vh
DXM	xxxx	Druxman	Fsw	Fsw	Fs	Fsw	Fwa
DXM1	xb2x	Druxman, Shaly Var.	Fsw	Fsw	Fps	Fsw	Faw
ERX	xxxx	Eroded Slope Compl.	Vt	Vt	Vt	Pt	Vt
FFR	xexx	Fifere	Vt	Fst	Fst	Fs	Fat
GHM	xxxx	Graham	Piw	Pw	Pi	Pw	Viw
GNO	xxxx	Glenlorne	Fws	Fw	Fws	Fsw	Fwa
GPE	xxxx	Gopher Creek	Fw	Fw	Fws	Fw	Fwa
GYS	xxxx	Grayson	Pw	Pw	Pw	Pw	Pw

Map Symbol (Code/Phase)		Soil Name	Play Ground	Picnic Area	Camp Area	Path and Trails	Perm.Bldgs.wo Basement
HIT	1cxx	Hilton	Fst	Fs	Fs	Fs	Fa
HIT	1d2x	Hilton	Pt	Fs	Fs	Fs	Fa
HIT	1dxx	Hilton	Pt	Fs	Fs	Fs	Fa
HIT	1d1x	Hilton	Pt	Fs	Fs	Fs	Fa
HIT	1c1x	Hilton	Fts	Fs	Fs	Fs	Fa
HIT	xe2x	Hilton	Vt	Fst	Ftp	Fs	Fat
HIT	xexx	Hilton	Vt	Fst	Fst	Fs	Fat
HIT	xcxx	Hilton	Fst	Fs	Fs	Fs	Fa
HIT	xxxx	Hilton	Fks	Fs	Fsk	Fs	Fa
HIT	xd2x	Hilton	Pt	Fs	Fsp	Fs	Fat
HIT	xe1x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT	1e1x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT	xd1x	Hilton	Pt	Fs	Fs	Fs	Fa
HIT	xdxx	Hilton	Pt	Fs	Fs	Fs	Fa
HIT	xc1x	Hilton	Fst	Fs	Fs	Fs	Fa
HIT	xbxx	Hilton	Fs	Fs	Fs	Fs	Fa
HIT	xb1x	Hilton	Fs	Fs	Fs	Fs	Fa
HKS	xx2s	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xx1s	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xxxs	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xb1x	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xbxx	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xx2x	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xxxx	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xb1s	Hickson	Pw	Pw	Pw	Pw	Pw
HKS	xbxs	Hickson	Pw	Pw	Pw	Pw	Pw
LEI	xxxx	Levine	Fis	Fis	Pi	Fsw	Pi
LGT	xxxx	Leighton	Viw	Viw	Viw	Pw	Vi
LIG	xxxx	Liege	Fi	Fi	Pi	Fw	Pi
LRY	xd1x	Leary	Pt	Pm	Fs	G	G
LSR	xxxt	Landseer	Vk	Psw	Psw	Psw	Paw
LYT	xcxx	Lyleton	Ft	G	G	G	Fa
MHC	xxxx	Marsh	Vw	Vw	Vw	Vw	Vw
MHC	xx1s	Marsh	Vw	Vw	Vw	Vw	Vw
MLT	xxxx	Melita	Fis	Fs	Fis	G	Fi
MOT	xxxs	Montgomery	Fn	Fn	Fn	Fsw	Faw
MOT	xxxx	Montgomery	Fsw	Fsw	Fsw	Fsw	Faw
NEI	xxxx	Neelin	Psw	Ps	Ps	Ps	Pai
NEI	xxxs	Neelin	Psw	Psw	Psw	Ps	Pai
NWS	xxxx	Newstead	Fs	Fs	Fsk	Fs	Fa
NWS	xcxx	Newstead	Fst	Fs	Fsk	Fs	Fa
OBR	xxxx	Oberon	Fsw	Fs	Fsw	Fsw	Fw

Map Symbol (Code/Phase)		Soil Name	Play Ground	Picnic Area	Camp Area	Path and Trails	Perm.Bldgs.wo Basement
OIV	xxxt	Oliver	Pws	Psn	Psn	Ps	Pa
OIV	xxxx	Oliver	Ps	Ps	Ps	Ps	Pa
OIV	xxxs	Oliver	Ps	Pws	Ps	Ps	Pa
OIV	xbxs	Oliver	Ps	Ps	Ps	Ps	Pa
OIV1	xb2s	Oliver, Shaly Var.	Ps	Ps	Ps	Ps	Pa
OIV1	xx1s	Oliver, Shaly Var.	Ps	Ps	Ps	Ps	Pa
OIV1	xb1t	Oliver, Shaly Var.	Ps	Psn	Psn	Ps	Pa
OIV1	xxxt	Oliver, Shaly Var.	Ps	Psn	Psn	Ps	Pa
OIV1	xx1x	Oliver, Shaly Var.	Ps	Ps	Ps	Ps	Pa
RAM	xxxx	Ramada	Fs	Fs	Fs	Fs	Fa
STU	xcxx	Stanton	Fs	Fs	Fs	G	G
TDP	xxxx	Tadpole	Pw	Pw	Pw	Pw	Pw
TGL	xd1x	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL	xdxx	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL	xcxx	Tiger Hills	Fst	Fs	Fs	Fs	Fa
TGL	1e2x	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL	xd2x	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL	xc1x	Tiger Hills	Fst	Fs	Fs	Fs	Fa
TGL	xe1x	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL	xe2x	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL	xexx	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL	1d1x	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL	1e1x	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TWC	xx1x	Two Creeks	Fsw	Fsw	Fsw	Fsw	Faw
TWC	xxxx	Two Creeks	Fsw	Fsw	Fsw	Fsw	Faw
TWC	xx1s	Two Creeks	Pwn	Pwn	Pwn	Fsw	Faw
VFF	xxxs	Vodroff	Pw	Pw	Pw	Pw	Pw
VFF	xxxx	Vodroff	Pw	Pw	Pw	Pw	Pw
WIL	xxxs	William	Pw	Pw	Pw	Pw	Pw
WIL	xxxx	William	Pw	Pw	Pw	Pw	Pw
WKD	xbxx	Waskada	Fs	Fs	Fs	Fs	Fa
WKD	xcxx	Waskada	Fts	Fs	Fs	Fs	Fa
WKD	xx1x	Waskada	Fs	Fs	Fs	Fs	Fa
WKD	xxxx	Waskada	Fs	Fs	Fs	Fs	Fa
WWD	xxxx	Wellwood	Fs	Fs	Fs	Fs	Fa
XVI	xxxx	Xavier	Vsw	Vsw	Vsw	Vsw	Vaw
ZZ	xxxx	Water	Vw	Vw	Vw	Vw	Vw

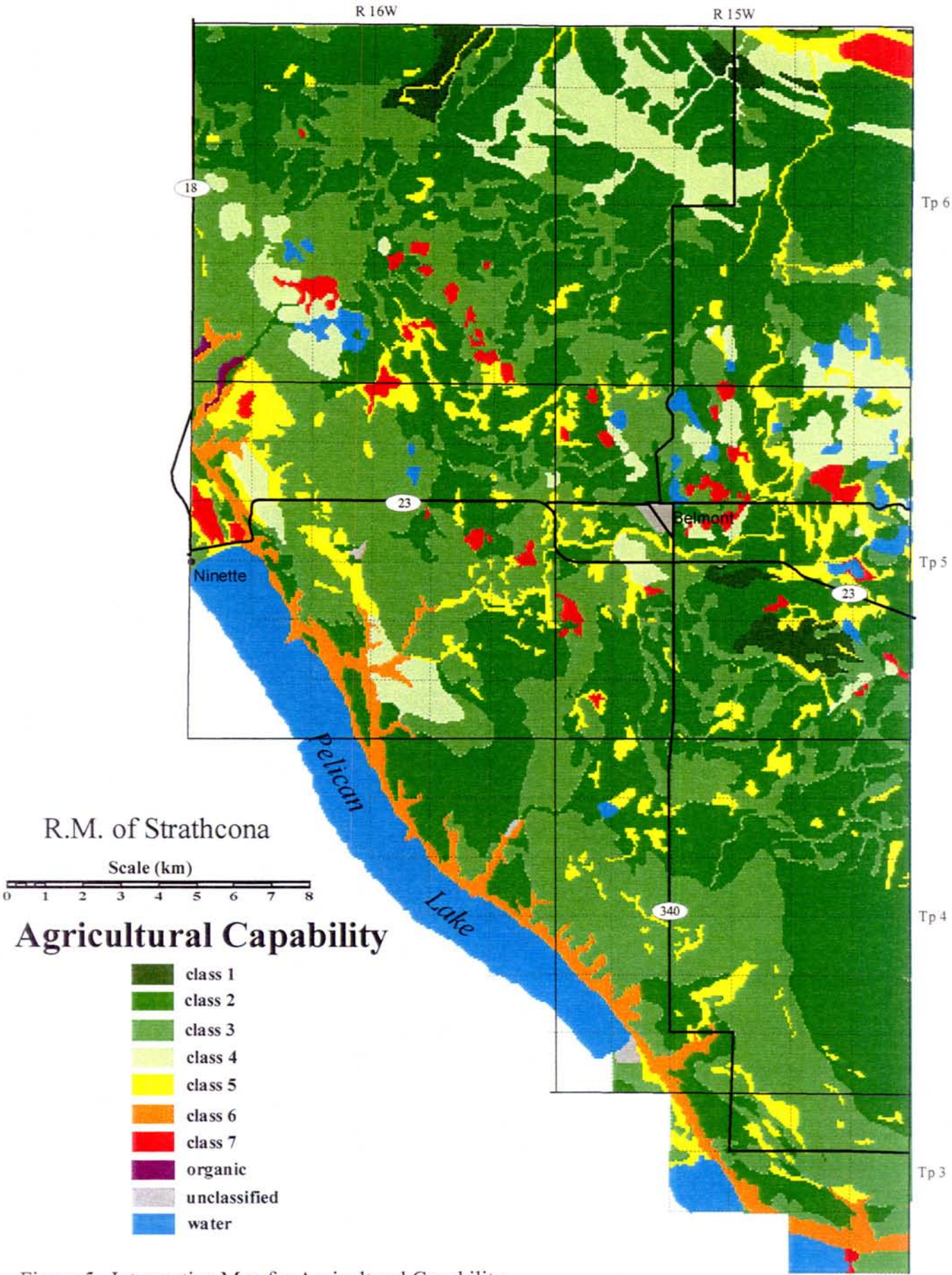

Figure 5. Interpretive Map for Agricultural Capability.

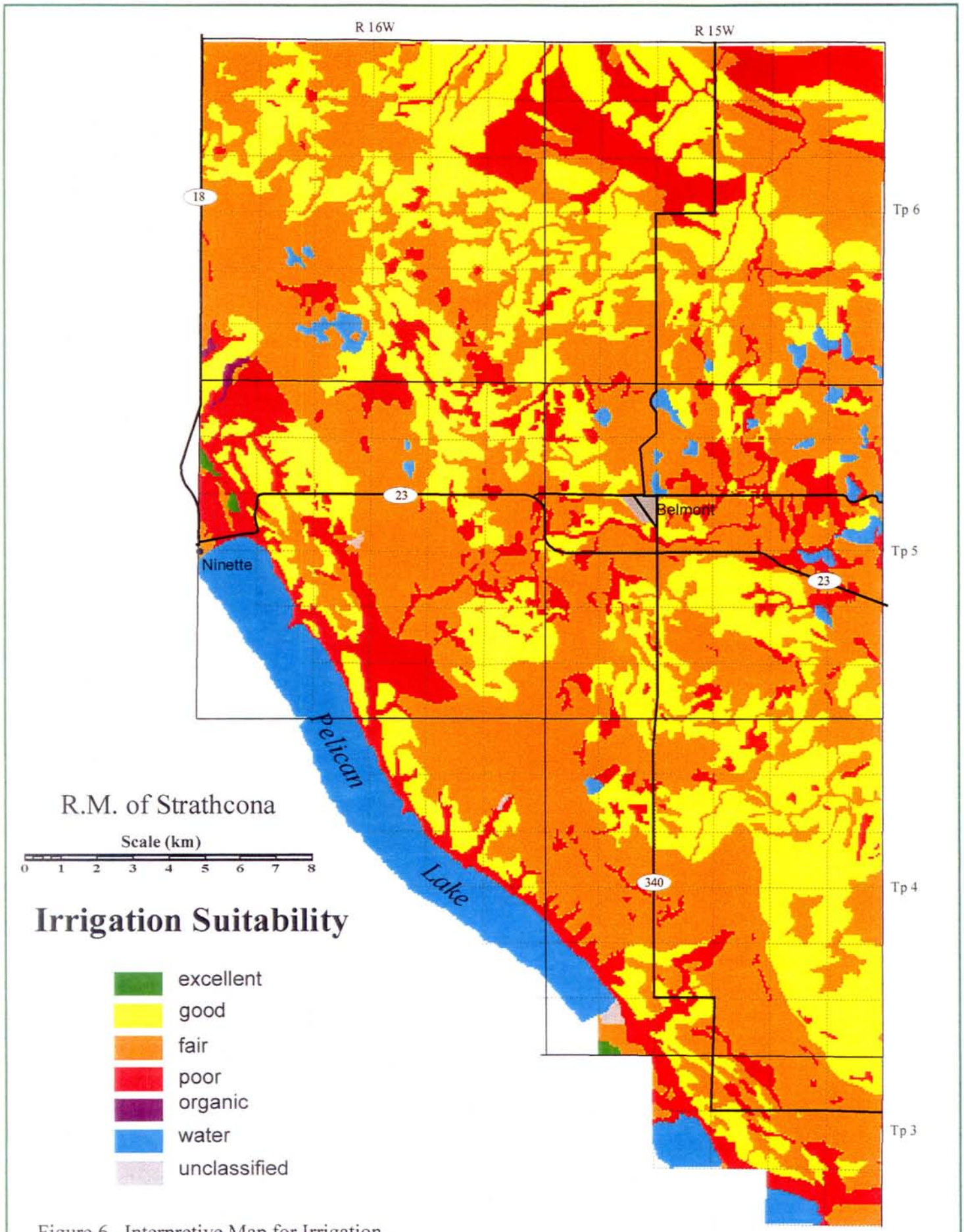

Figure 6. Interpretive Map for Irrigation.

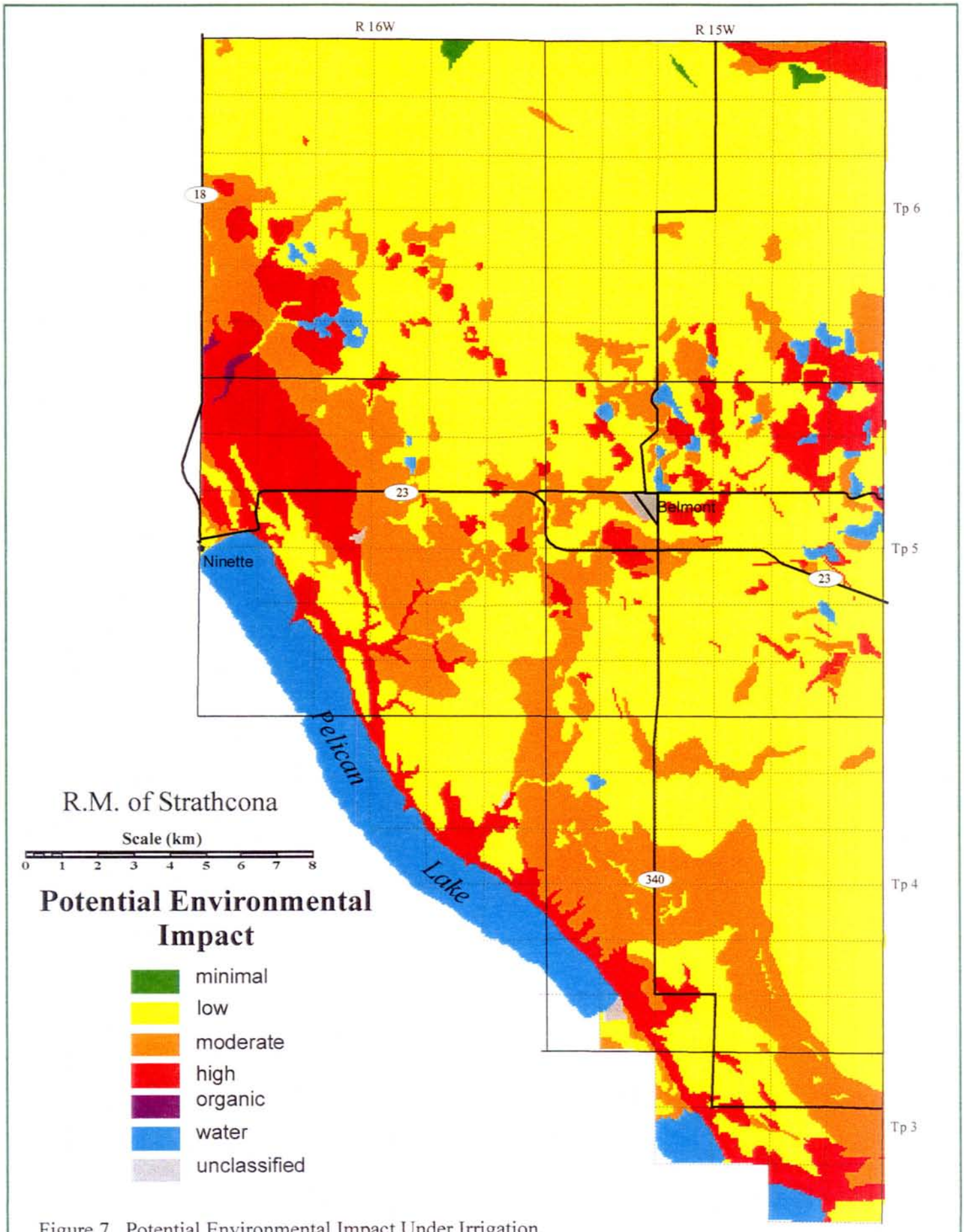

Figure 7. Potential Environmental Impact Under Irrigation.

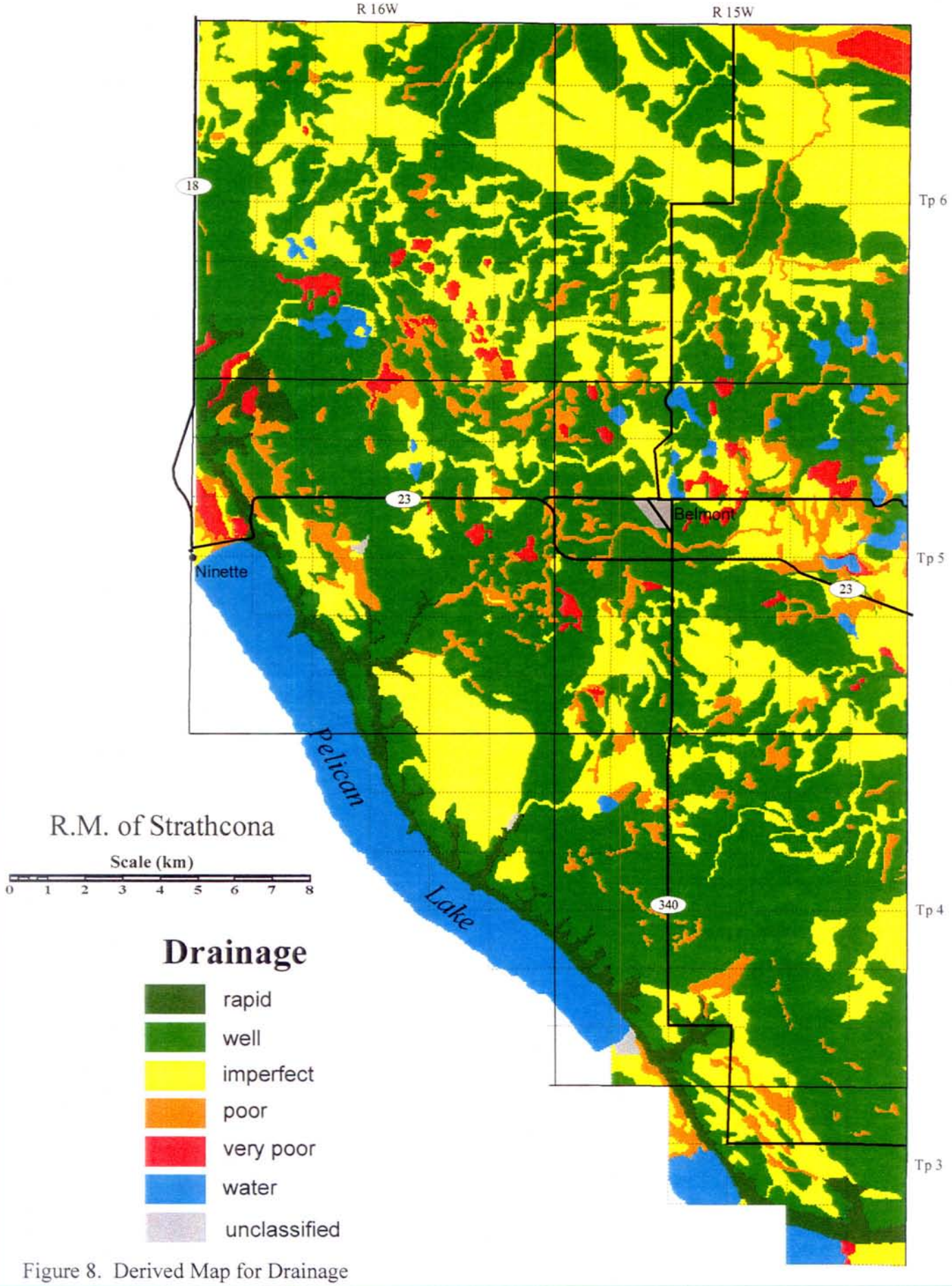

Figure 8. Derived Map for Drainage

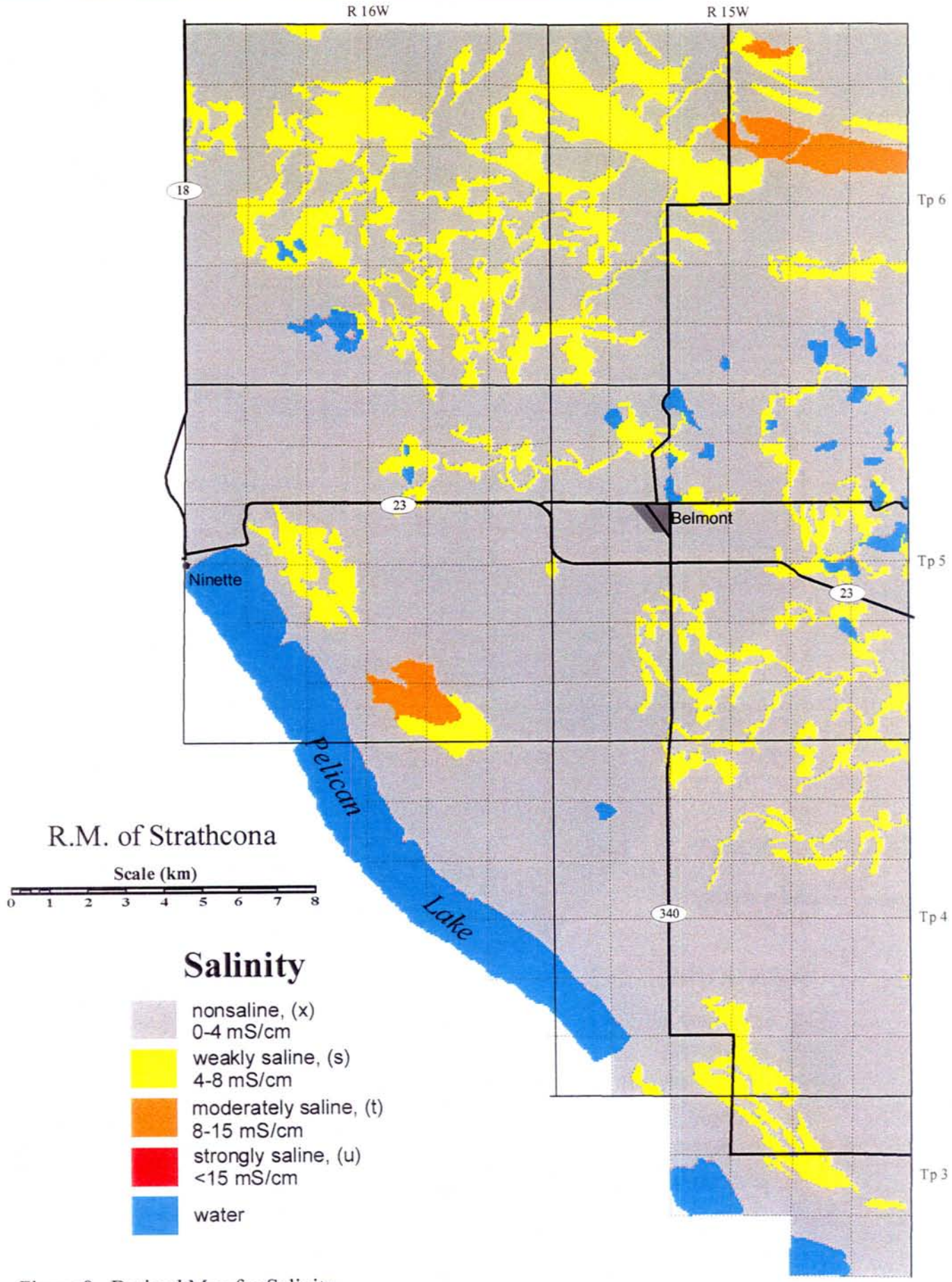

Figure 9. Derived Map for Salinity.

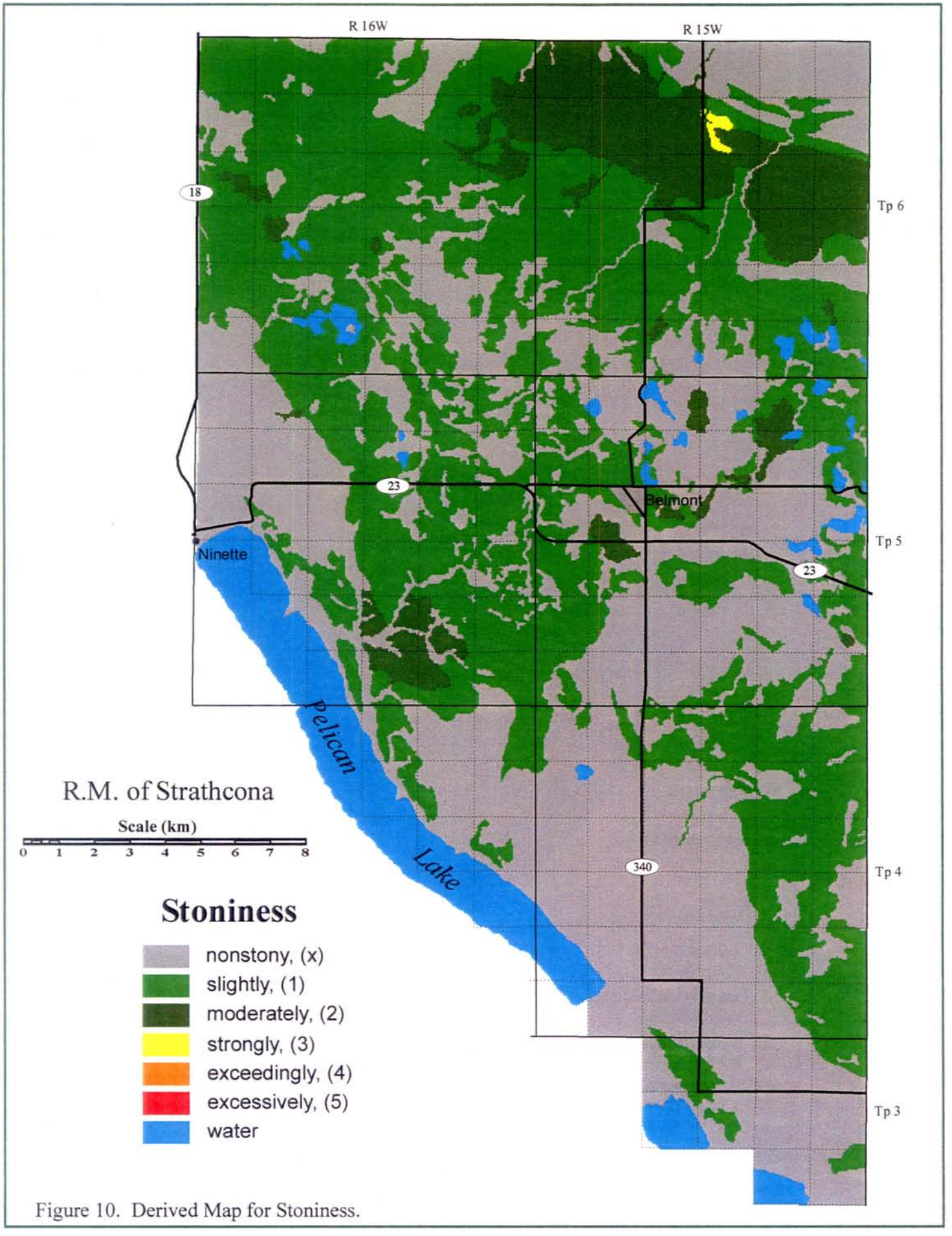

Figure 10. Derived Map for Stoniness.

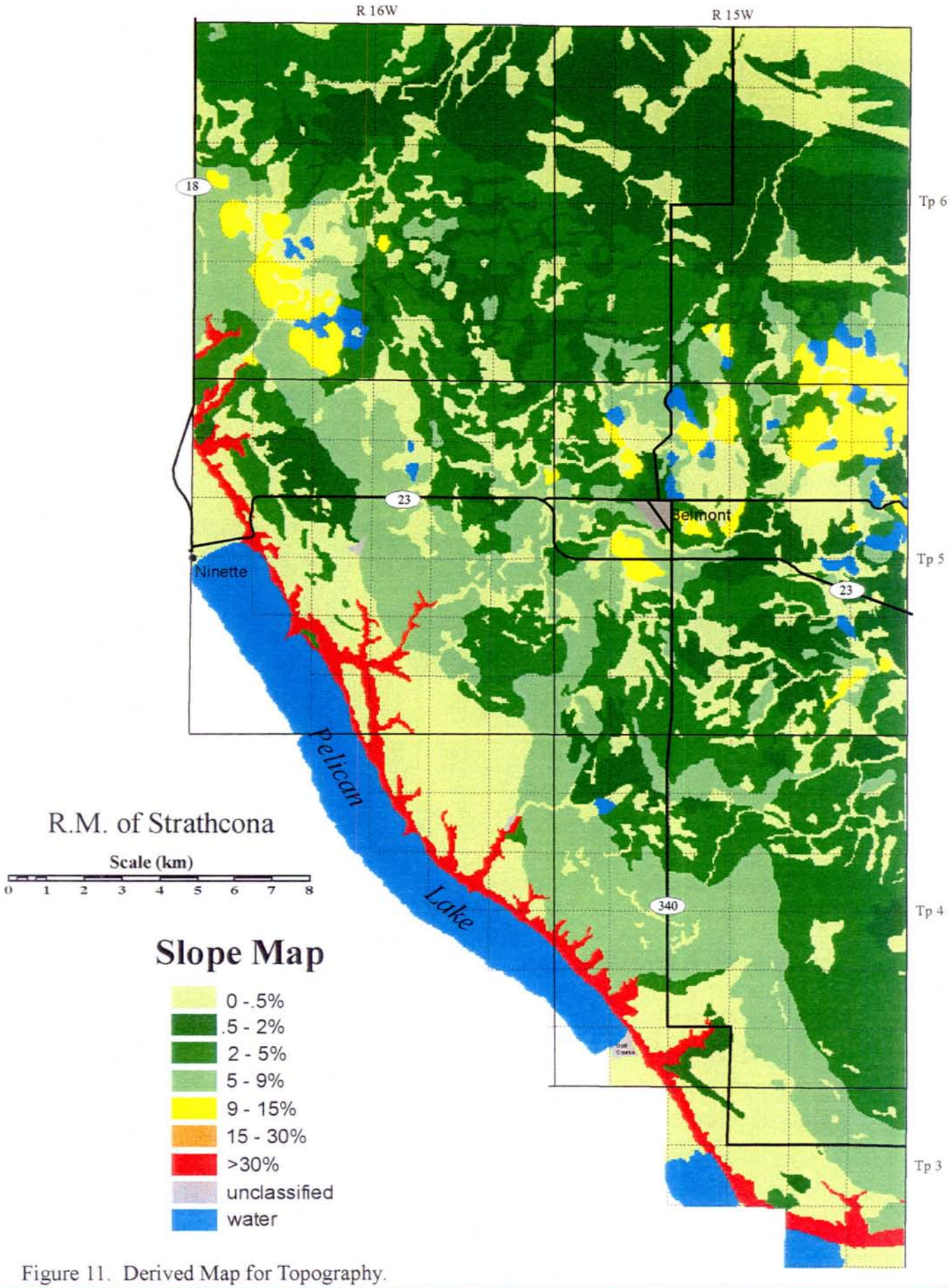

Figure 11. Derived Map for Topography.

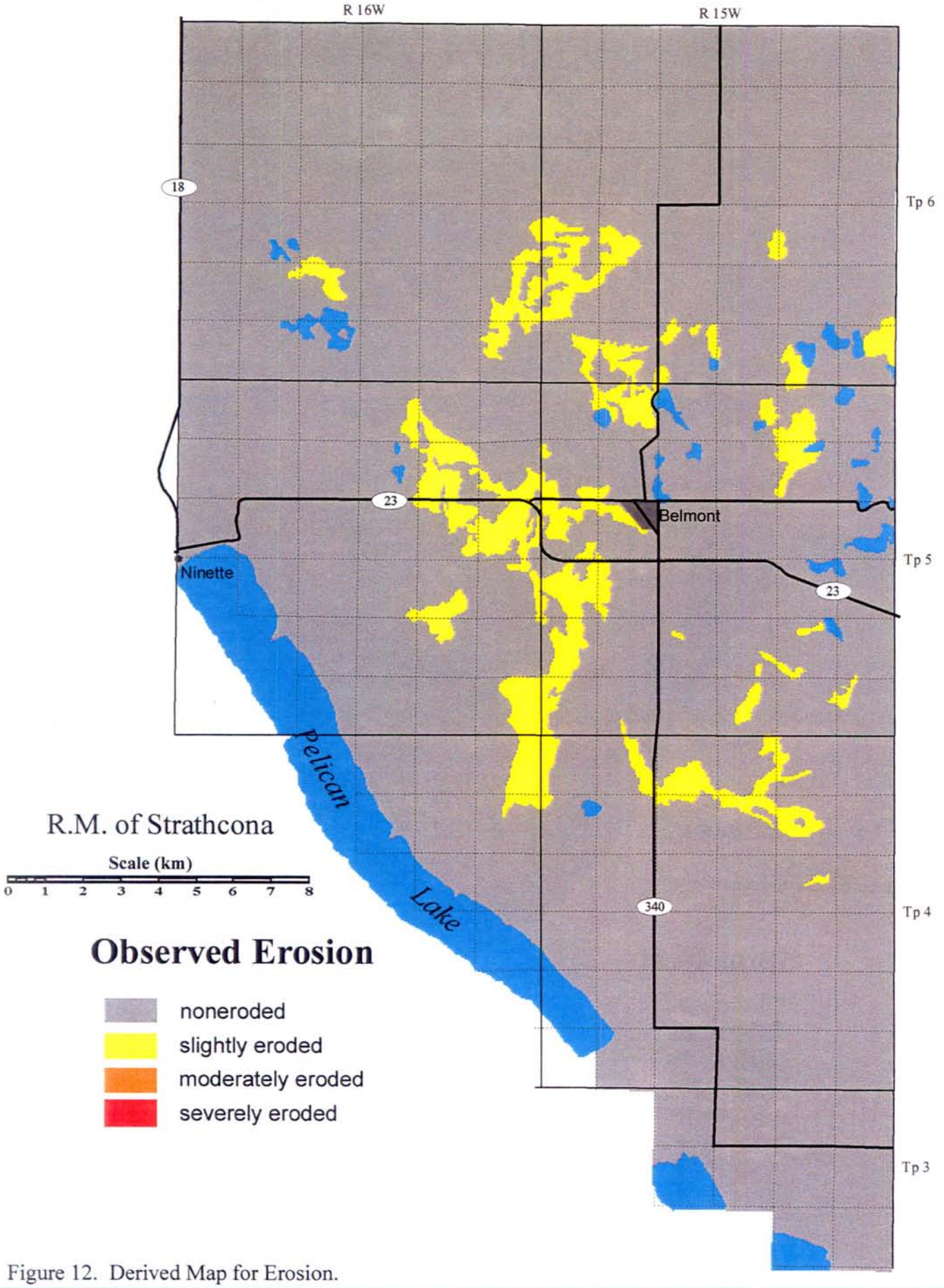

Figure 12. Derived Map for Erosion.

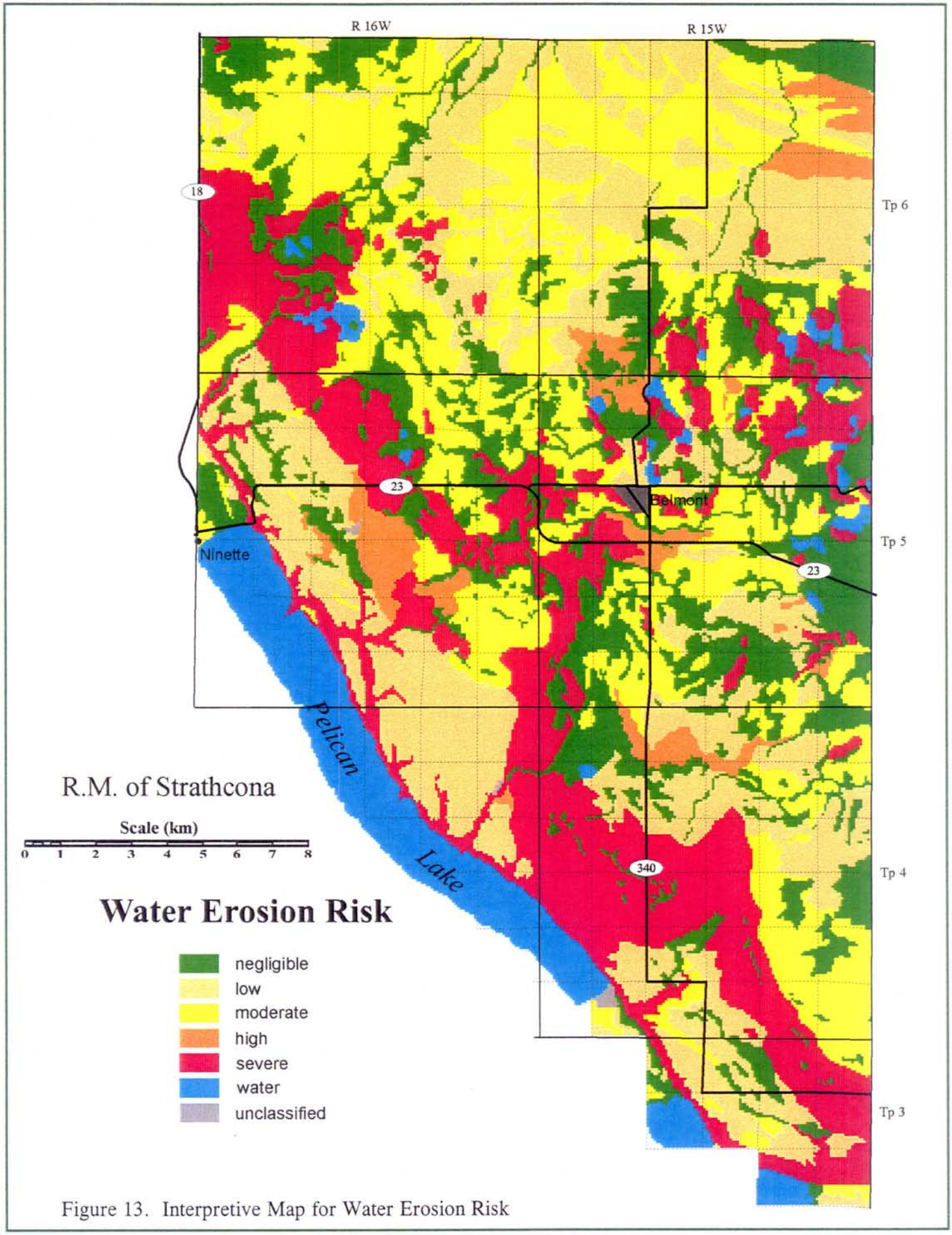

Figure 13. Interpretive Map for Water Erosion Risk

APPENDIX A

GUIDES FOR EVALUATING IRRIGATION SUITABILITY

Table 12. Description of Irrigation Suitability Classes

General Rating	Class	Degree of Limitation	Description
Excellent	**1A**	No soil or landscape limitations	These soils are medium textured, well drained and hold adequate available moisture. Topography is level to nearly level. Gravity irrigation methods may be feasible.
Good	**2A** **2B** **1B**	Slight soil and/or landscape limitations	The range of crops that can be grown may be limited, as well, higher development inputs and management skills are required. Sprinkler irrigation is usually the only feasible method of water application.
Fair	**3A** **3B** **3C** **1C** **2C**	Moderate soil and/ or landscape limitations	Limitations reduce the range of crops that may be grown and increase development and improvement costs. Management may include special conservation techniques to minimize soil erosion, limit salt movement, limit water table build-up or flooding of depressional areas. Sprinkler irrigation is usually the only feasible method of water application.
Poor	**4A** **4B** **4C** **4D** **1D** **2D** **3D**	Severe soil and/ or landscape limitations	Limitations generally result in a soil that is unsuitable for sustained irrigation. Some lands may have limited potential when special crops, irrigation systems, and soil and water conservation techniques are used.

Table 13. Soil Features Affecting Irrigation Suitability

Symbol	Soil Feature	Degree of Limitation			
		None(1)	Slight(2)	Moderate(3)	Severe(4)
d	Structure	Granular, Single Grained, Prismatic, Blocky, Subangular Blocky	Columnar Platy	Massive	Massive
k	Ksat (mm/hr) (0 - 1.2m)	>50	50 - 15	15 - 1.5	<1.5
x	Drainability (1.2 - 3m) (mm/hr)	>15	5 - 15	0.5 - 5	<0.5
m	AWHC subhumid mm/1.2m (% vol.) subarid	>120 (>10) >150 (>12)	120 - 100 (8 - 10) 120 - 150 (12 - 10)	100 - 75 (6 - 8) 100 -120 (10 - 8)	<75 (<6) <100 (<8)
q	Intake Rate (mm/hr)	>15	1.5 - 15	1.5 - 15	<1.5
s	Salinity depth(m) (dS/m) 0 - .6 .6 - 1.2 1.2 - 3	<2 <4 <8	2 - 4 4 - 8 8 - 16	4 - 8 8 - 16 >16	>8 >16 >16
n	Sodicity (m) (SAR) 0 - 1.2 1.2 - 3	<6 <6	6 - 9 6 - 9	9 - 12 9 - 12	>12 >12
g	Geological 0 - 1.2m Uniformity 1.2 - 3m	1 Textural Group 2 Textural Groups	2 Textural Groups, Coarser Below 3 Textural Groups Coarser Below	2 Textural Groups Finer Below 3 Textural Groups Coarser Below 3 Textural Groups Finer Below	3 Textural Groups Finer Below
r	Depth to Bedrock (m)	>3	3 - 2	2 - 1	<1
h	Depth to Watertable (m)	>2	2 - 1.2 (if salinity is a problem)	2 - 1.2 (if salinity is a problem)	<1.2
w	Drainage Class	Well, Moderately Well, Rapid, Excessive	Imperfect	Imperfect	Poor, Very Poor
	*Texture (Classes) 0 - 1.2m	L, SiL, VFSL, FSL	CL, SiCL, SCL, FSCL, SL, LVFS	C, SC, SiC VFS, LS, CoSL	HvC GR, CoS, LCoS, S
	*Organic Matter %	>2	1 - 2	1 - 2	<1
	Surface Crusting Potential	Slight	Low	Low	Moderate

* Other important factors used to interpret type and degree of limitation but which do not present a limitation to irrigation themselves. No symbol is proposed for these factors since they will not be identified as subclass limitations.

Table 14. Landscape Features Affecting Irrigation Suitability

Symbol	Landscape Features	Degree of Limitation			
		None (A)	Slight (B)	Moderate (C)	Severe (D)
t1	Slope - Simple %	<2	2 - 10	10 - 20	>20
t2	- Complex %	<5		5 - 15	>15
e	Relief m (Average Local)	<1	1 - 3	3 - 5	>5
p	Stoniness -Classes -Cover (%)	0, 1 & 2 (0-3%)	3 (3-15%)	4 (15-50%)	5 (>50)
i	Inundation -Frequency of Flooding (period)	1:10 (yr)	1:5 (yr)	1:1 (annual-spring)	1:<1 (seasonal)

Table 15. Soil and Landscape Conditions Affecting Environmental Impact Rating

Soil Property and Landscape Feature	Potential Degree of Impact			
	Minimal	Low	Moderate	High
Textural Groups[1] (Classes[2]) Surface Strata (1.2 m)	MF (SCL,CL,SiCL) F (SC,SiC,C)	M (Si,VFSL,L,SiL)	MCo (CoSL,SL, FSL,VFS, LVFS)	VCo (VCoS,CoS); Co (LCoS,LS, FS,LFS)
Geological Uniformity Weighted textural groupings[3] Surface Strata (1.2 m) / Substrata (1.2-3.0 m)	MF to VF / M to VF; M / MF to VF	MF / MCo to Co; F / Co; MCo to Co / MF to VF	M / MCo to Co; Co / M; MF / VCo	VCo to Co / VCo to Co; MCo / Co to VCo; Co / VCo to MCo; M / VCo
Hydraulic Cond Ksat (mm/hr)	< 1.5	1.5 - 15	15 - 50	>50
Depth to Water Table (m)	> 2 m	(2 m ---------- 1 m)		<1 m
Salinity (dS/m)	0 - 4	4 - 8	8 - 15	>15
Topography (% Slope)	0 - 2	2 - 5	5 - 9	> 9

[1]Textural Groups: VF=Very Fine, F=Fine, MF=Moderately Fine, M=Medium, MCo=Moderately Coarse, Co=Coarse, VCo=Very Coarse

[2]Texture Classes:

Very Coarse - VCo
- VCoS -Very Coarse Sand
- CoS -Coarse Sand
- S -Sand

Coarse - Co
- LCoS -Loamy Coarse Sand
- LS -Loamy Sand
- FS -Fine Sand
- LFS -Loamy Fine Sand

Moderately Coarse - MCo
- CoSL -Coarse Sandy Loam
- SL -Sandy Loam
- FSL -Fine Sandy Loam
- VFS -Very Fine Sand
- LVFS -Loamy Very Fine Sand

Medium - M
- Si -Silt
- VFSL -Very Fine Sandy Loam
- L -Loam
- SiL -Silt Loam

Moderately Fine - MF
- SCL -Sandy Clay Loam
- SiCL -Silty Clay Loam
- CL -Clay Loam

Fine - F
- SC -Sandy Clay
- SiC -Silty Clay
- C -Clay

Very Fine - VF
- HC -Heavy Clay

[3]Slash indicates surface strata (1.2 m) overlying substrata (1.2-3.0 m), ie: MF to VF / M to VF

Notes for Table 15.

1. Guidelines developed for making this impact rating employ four relative degrees of risk of degradation: **Minimal, Low, Moderate and High.** This rating is not part of the irrigation suitability classification, but rather is intended to serve as a warning of possible adverse impact on the soil, adjacent crops or the environment. Since all situations cannot be completely covered by general guidelines, an on-site inspection is recommended for the evaluation of potential adverse environmental impact.

2. A major concern for land under irrigation is the possibility of adverse impact on the groundwater and surface water quality in and adjacent to the irrigated area. The soil factors selected for impact evaluation include those properties that determine water retention and movement through the soil and topographic characteristics that affect runoff and redistribution of moisture in the landscape. The risk of altering the soil drainage regime and soil salinity or the potential for runoff, erosion or flooding is determined by the detailed criteria for each property. Soil factors and landscape features considered in determining an environmental impact evaluation are:

    1. Soil Texture
    2. Geological Uniformity
    3. Hydraulic Conductivity
    4. Depth to Water Table
    5. Salinity
    6. Topography

3. **Soil texture** and the **thickness and uniformity of geological deposits** (assessed by weighting textures in surface strata and subsurface strata) combine to affect the soil's water holding capacity and **hydraulic conductivity** (ability to transmit water and leachate either vertically or laterally in the soil). The presence and sequence of strongly contrasting soil textures within 3 m of the surface (**geological uniformity**) are used to determine the potential for downward movement (moderately coarse to fine materials underlain by coarse materials) or lateral movement (very coarse and coarse materials underlain by fine materials) of water and leachate. Uniform, highly permeable materials with low water holding capacity present the highest potential for adverse impact on groundwater quality. Uniform materials of low permeability provide the best buffer against impact on groundwater quality.

   A shallow **depth (< 1 m) to water table** has a higher risk for contamination than soils with a deep water table. Soils with high levels of **salinity** may adversely impact on groundwater quality due to the leaching associated with irrigation practices (ie: applied leaching fraction).

   Topographic patterns with slopes in excess of 2 percent require special consideration for soil and water management to reduce the potential for runoff and erosion. The risk of runoff and potential for local flooding, build-up of water tables and soil erosion increases with slope gradient. Soil erosion results in loss of topsoil and transport of nutrients and pesticides to non-target areas.

APPENDIX B

CORRELATION OF SOIL SERIES IN THE R. M. OF STRATHCONA WITH SOIL ASSOCIATIONS AND ASSOCIATES OF THE SOUTH-CENTRAL REPORT NO.4, 1943 AND SOUTH-WESTERN REPORT NO.3, 1940 RECONNAISSANCE SURVEYS.

Table 16. Correlation of Soil Series in the R. M. of Strathcona with Soil Associations and Associates of the South-Central (1943) and South-Western (1940) Reconnaissance Survey, Reports.

Soil Symbol	Soil Name	Subgroup	Soil Association or Associate of the South-Central Map (1943) or South-Western Map (1940)	Remarks
ASB	Assiniboine	Gleyed Cumulic Regosol	Assiniboine	The same as the dominant member in the Assiniboine Association.
ATV	Antler River	Black Solod	Heaslip, weathered shale	A significant, well drained inclusion in the Chesterfield Association (Southwest 1940). Also Heaslip clay on shale.
AXD	Alexander	Gleyed Rego Black, carb.	Waskada modified phase, Cartwright-Bede, Heaslip	A significant inclusion in these associations, where textural variation in the vertical profile varies from loam to gravel to loamy glacial till.
BED	Bede	Orthic Black	Bede(SW-1940)	The well drained, Dark Brown Steppe-Blackearth associate.
BEL	Bella Lake	Rego Humic Gl., carb.	Waskada modified phase, Cartwright-Bede, Heaslip	A minor inclusion in the Waskada Association and Cartwright-Bede and Heaslip Complex.
BKR	Basker	Rego Humic Gleysol	Assiniboine Complex, Neelin	The poorly drained, immature Meadow soil.
BMN	Bermont	Rego Black	Hilton	The well drained member of the Hilton Assoc.
BOW	Bower	Gleyed Black	Waskada modified, Cartwright-Bede, Heaslip	A significant inclusion in these associations.
BSF	Beresford	Gleyed Rego Black	Carroll, till substrate	Imperfectly drained member.
BWO	Barwood	Gleyed Rego Bl.,carb.	Hilton	Imperfectly drained member of the Hilton.
CBF	Cobfield	Gleyed Black	Carroll, till substrate	Imperfectly associate of this association.
CHF	Chesterfield	Gleyed Bl. Solonetz	Heaslip, weathered shale	The dominant soil type in the Chesterfield Association.
CLN	Clementi	Orthic Black	Carroll, till substrate	The well drained associate.
CXV	Charman	Gleyed Black	Carroll, Holland	The intermediately drained Meadow-Prairie associates.
CYN	Croyon	Orthic Black	Marringhurst	The well drained, Blackearth associate with a loam to clay loam overlay.

Table 16. Correlation of Soil Series in the R. M. of Strathcona with Soil Associations and Associates of the South-Central (1943) and South-Western (1940) Reconnaissance Survey, Reports (Cont'd)

Soil Symbol	Soil Name	Subgroup	Soil Association or Associate of the South-Central Map (1943) or South-Western Map (1940)	Remarks
DOM	Dromore	Orthic Black	Bede(SW-1940)	The well drained associate having a deeper and finer surface texture.
DOT	Dorset	Orthic Black	Marringhurst	The dominant, well drained Blackearth associate.
DRI	Deloraine	Rego Humic Gl., carb.	Waskada	A significant inclusion in the Waskada Assoc. The poorly drained member.
DXM	Druxman	Gleyed Black	Marringhurst	The well drained member, with a significantly thicker loamy textured surface layer over gravel.
ERX	Eroded Slopes		Eroded Slopes Complex	Variable materials, development and drainage.
FFR	Fifere	Orthic Dark Gray	Manitou	The well drained, Gray-Black associate of the Manitou association.
GHM	Graham	Rego Humic Gl., carb.	Neelin	The poorly drained member of the Neelin Association.
GNO	Glenlorne	Gleyed Eluviated Black	Waskada(modified)	A minor inclusion in the imperfectly drained associate.
GPE	Gopher Creek	Gleyed Rego Bl., carb.	Cartwright-Bede	The imperfectly drained member, with a loamy textured surface over gravel.
GYS	Grayson	Rego Humic Gleysol	Glenboro	The poorly drained associate of the Glenboro.
HIT	Hilton	Orthic Black	Hilton	The same as the dominant, well drained member of the Hilton Association.
HKS	Hickson	Rego Humic Gl., carb.	Hilton	The poorly drained associate of the Hilton Association.
LEI	Levine	Gleyed Cumulic Regosol	Assiniboine Complex, Neelin	The intermediately drained, immature soils of these associations on alluvial deposits.

Table 16. Correlation of Soil Series in the R. M. of Strathcona with Soil Associations and Associates of the South-Central (1943) and South-Western (1940) Reconnaissance Survey, Reports (Cont'd)

Soil Symbol	Soil Name	Subgroup	Soil Association or Associate of the South-Central Map (1943) or South-Western Map (1940)	Remarks
LGT	Leighton	Rego Humic Gl., carb.	Neelin	The poorly drained member of the Neelin Association.
LIG	Liege	Gleyed Cumulic Regosol	Neelin	The imperfectly drained, clay loam member of the Neelin.
LRY	Leary	Orthic Dark Gray	Leary	The well drained associate.
LSR	Landseer	Rego Humic Gleysol	Oliver	The poorly drained member of the Oliver.
LYT	Lyleton	Orthic Black	Souris(SW-1940)	The well drained, Blackearth associate of the Souris fine sandy loam.
MHC	Marsh Compl.	Variable	Peat, Marsh	An associate of the shallow peat and muck soils.
MLT	Melita	Cumulic Regosol	Neelin	The moderately well drained sandy loam to loam textured member of this association.
MOT	Montgomery	Gleyed Rego Black	Waskada(modified)	The imperfectly drained, Meadow-Prairie associate of the Waskada modified.
NEI	Neelin	Gleyed Cum. Regosol	Neelin	The same as the dominant, imperfectly drained member of the Neelin Association.
NWS	Newstead	Orthic Black	Waskada Modified, Heaslip	The well drained member of the Waskada Modified and Heaslip Associations.
OBR	Oberon	Gleyed Black	Glenboro	The imperfectly drained member of the Glenboro Association.
OIV	Oliver	Gleyed Black Solonetz	Oliver	Similar to the Oliver Association.
RAM	Ramada	Orthic Black	Carroll, Holland	The dominant Blackearth associate of the Carroll or Holland clay loam.
STU	Stanton	Orthic Black	Souris	The well drained associate of the Souris Association.
TDP	Tadpole	Rego Humic Gleysol	Carroll, Holland	The poorly drained, Meadow associate of the Carroll or

Table 16. Correlation of Soil Series in the R. M. of Strathcona with Soil Associations and Associates of the South-Central (1943) and South-Western (1940) Reconnaissance Survey, Reports (Cont'd)

Soil Symbol	Soil Name	Subgroup	Soil Association or Associate of the South-Central Map (1943) or South-Western Map (1940)	Remarks
				Holland clay loam.
TGL	Tiger Hills	Orthic Dark Gray	Tiger Hills	The dominant well drained member of the Tiger Hills Association.
TWC	Two Creeks	Gleyed Black	Waskada(modified)	A significant inclusion in the Meadow-Prairie soils of the Waskada modified.
VFF	Vodroff	Rego Humic Gleysol	Carroll, till substrate	The same as the poorly drained member.
WIL	William	Rego Humic Gl., carb.	Cartwright-Bede, Bede	A minor inclusion in these associations. The poorly drained member with a thick loamy textured surface over gravels.
WKD	Waskada	Orthic Black	Waskada	The same as the dominant well drained member of the Waskada Association.
WWD	Wellwood	Orthic Black	Glenboro	The dominant, well drained Blackearth associate of the Glenboro clay loam over sand.
XVI	Xavier	Typic Mesisol	Peat	The dominant organic soil in the Peat Complex.
ZZ	Water		Lakes	

APPENDIX C

DAILY SITE DESCRIPTION AND DETAILED SOIL DESCRIPTION DATA

During the course of the field program, approximately 553 **Daily Site Description Forms** were filled out to capture site and landscape observations covering the municipality. These daily site observations are backed up with samples for laboratory analysis to confirm attributes or properties that cannot be sufficiently determined on site, e.g. textural class or presence of salts.

Eleven profiles were characterized with observations recorded on a **Detailed Soil Description Form.** All profiles were sampled and brought to the laboratory for physical and chemical analysis.

The data accumulated from Daily Site Descriptions, Detailed Soil Descriptions and laboratory analysis performed on the soil samples, has resulted in the generation of a large volume of information that can no longer be accommodated in this report. This data now resides in one of the several Canada-Manitoba Soil Survey Databases.

For assistance and special requests of soil data contact: Manitoba Agricultural Resources Section/Land Resource Unit, Department of Soil Science, Rm. 362 Ellis Building, University of Manitoba, Winnipeg R3T 2N2.

Selected Detailed Profile Descriptions Available from the R.M. of Strathcona

Series Name	Location	Sample Year	Site Number
Hilton (HIT)	SW 24-04-15W	1991	1
Tiger Hills (TGL)	SE 15-04-15W	1991	2
Barwood (BWO)	SE 13-05-15W	1991	3
Cobfield (CBF)	NW 23-05-15W	1991	4
Dromore (DOM)	NW 06-06-16W	1992	5
Hilton (HIT)	NE 32-06-16W	1992	6
Clementi (CLN)	NE 35-06-16W	1992	7
Barwood (BWO)	SW 32-06-16W	1992	8
Tiger Hills (TGL)	NW 28-05-15W	1992	9
Oliver (OIV)	NE 25-06-15W	1992	10
Stanton (STU)	SE 30-05-16W	1992	11

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APPENDIX D

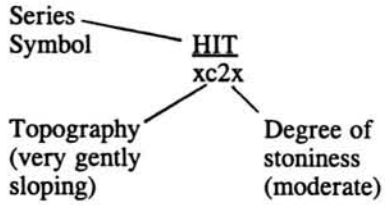
R.M. of STRATHCONA SOIL LEGEND

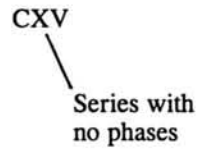
Soil Symbol	Soil Name	Surface Texture	Soil Drainage	Mode of Deposition	Family Particle Size	Subgroup
ASB	Assiniboine	SIC	IMPER	Fluvial	Clayey	GLCU.R
ATV	Antler River	CL-C	WELL	Fluvial/Residual	Clayey/Clayey(Shale)	BL.SO
AXD	Alexander	L	IMPER	Lacustrine/Glaciofluvial/Till(Morainal)	Loamy/Sandy-Skeletal/Fine Loamy	GLR.BL
BED	Bede	LS	RAPID	Glaciofluvial	Sandy-Skeletal	O.BL
BEL	Bella Lake	L	POOR	Lacustrine/Glaciofluvial/Till(Morainal)	Loamy/Sandy-Skeletal/Fine Loamy	R.HG
BKR	Basker	SICL	POOR	Fluvial	Loamy	R.HG
BMN	Bermont	L	WELL	Till(Morainal)	Loamy	R.BL
BOW	Bower	L	IMPER	Lacustrine/Glaciofluvial/Till(Morainal)	Loamy/Sandy-Skeletal/Fine Loamy	GL.BL
BSF	Beresford	CL	IMPER	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	GLR.BL
BWO	Barwood	L	IMPER	Till(Morainal)	Loamy	GLR.BL
CBF	Cobfield	CL	IMPER	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	GL.BL
CHF	Chesterfield	CL-C	IMPER	Fluvial/Residual	Clayey/Clayey(Shale)	GLBL.SZ
CLN	Clementi	CL	WELL	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	O.BL
CXV	Charman	CL	IMPER	Lacustrine	Fine Loamy	GL.BL
CYN	Croyon	L-CL	WELL	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	O.BL
CYN1	Croyon, Shaly Var.	L-CL	WELL	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	O.BL
DOM	Dromore	L	WELL	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	O.BL
DOM1	Dromore, Shaly Var.	L	WELL	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	O.BL
DOT	Dorset	LS	WELL	Glaciofluvial	Sandy-Skeletal	O.BL
DOT1	Dorset, Shaly Var.	LS	WELL	Glaciofluvial	Sandy-Skeletal	O.BL
DRI	Deloraine	L-CL	POOR	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	R.HG
DXM	Druxman	L-CL	IMPER	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	GL.BL
DXM1	Druxman, Shaly Var.	L-CL	IMPER	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	GL.BL
ERX	Eroded Slope Complex		RAPID	Colluvial	Texture Complex	O.R
FFR	Fifere	CL	WELL	Till(Morainal)	Fine Loamy	O.DG
GHM	Graham	L	POOR	Fluvial	Loamy	R.HG
GNO	Glenlorne	L-CL	IMPER	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	GLE.BL
GPE	Gopher Creek	L	IMPER	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	GLR.BL
GYS	Grayson	SIL	POOR	Lacustrine/Lacustrine	Loamy/Sandy-Fine	R.HG
HIT	Hilton	L	WELL	Till(Morainal)	Loamy	O.BL

HKS	Hickson	L	POOR	Till(Morainal)	Loamy	R.HG
LEI	Levine	SICL	IMPER	Fluvial	Loamy	GLCU.R
LGT	Leighton	CL	POOR	Fluvial	Fine Loamy	R.HG
LIG	Liege	L	IMPER	Fluvial	Loamy	GLCU.R
LRY	Leary	LS	RAPID	Glaciofluvial	Sandy-Skeletal	O.DG
LSR	Landseer	C	POOR	Lacustrine/Lacustrine	Clayey/Loamy	R.HG
LYT	Lyleton	LVFS	WELL	Lacustrine	Coarse Loamy	O.BL
MHC	Marsh	L	V.POOR	Mineral, Undifferentiated	Loamy	R.G
MLT	Melita	L	WELL	Fluvial	Loamy	CU.R
MOT	Montgomery	L-CL	IMPER	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	GLR.BL
NEI	Neelin	CL-C	IMPER	Fluvial	Fine Loamy	GLCU.R
NWS	Newstead	L	WELL	Lacustrine/Glaciofluvial/Till(Morainal)	Loamy/Sandy-Skeletal/Fine Loamy	O.BL
OBR	Oberon	CL	IMPER	Lacustrine/Lacustrine	Fine Loamy/Sandy-Fine	GL.BL
OIV	Oliver	C	IMPER	Lacustrine/Lacustrine	Clayey/Loamy	GLBL.SZ
OIV1	Oliver, Shaly Var.	C	IMPER	Lacustrine/Till(Shaley)	Clayey/Loamy	GLBL.SZ
RAM	Ramada	CL	WELL	Lacustrine	Fine Loamy	O.BL
STU	Stanton	LFS	WELL	Lacustrine	Sandy-Fine	O.BL
TDP	Tadpole	CL	POOR	Lacustrine	Fine Loamy	R.HG
TGL	Tiger Hills	L	WELL	Till(Morainal)	Loamy	O.DG
TWC	Two Creeks	L-CL	IMPER	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	GL.BL
VFF	Vodroff	CL	POOR	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	R.HG
WIL	William	L	POOR	Lacustrine/Glaciofluvial	Loamy/Sandy-Skeletal	R.HG
WKD	Waskada	L-CL	WELL	Lacustrine/Till(Morainal)	Loamy/Fine Loamy	O.BL
WWD	Wellwood	CL	WELL	Lacustrine/Lacustrine	Fine Loamy/Sandy-Fine	O.BL
XVI	Xavier	M	V.POOR	Fen Peat	Mesic	TY.M
ZZ	Water					

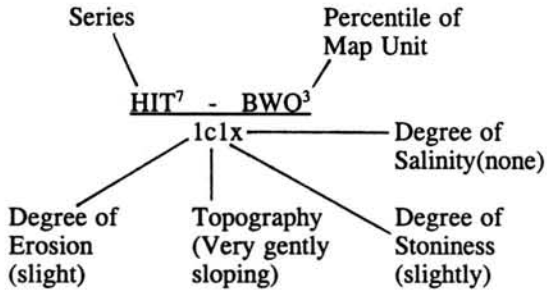
MAP UNIT SYMBOLOGY

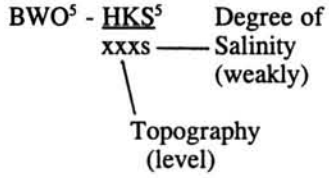
Simple Map Units





Compound Map Units





In a compound unit where two series share the same denominator, the phases apply to both series accordingly.

Phases

Degree of Erosion

x	noneroded or minimal	
1	slightly eroded	(25-75% of A horizon)
2	moderately eroded	(>75% of A & part of B)
3	severely eroded	(most of A & B removed)
o	overblown	

Stoniness

		(% Suface Covered)
x	nonstony	<.01%
1	slightly stony	.01-.1%
2	moderately stony	.1-3%
3	very stony	3-15%
4	exceedingly stony	15-50%
5	excessively stony	>50%

Slope Class

x	0-.5%	level to nearly level
b	.5-2%	nearly level
c	2-5%	very gently sloping
d	5-9%	gently sloping
e	9-15%	moderately sloping
f	15-30%	strongly sloping
g	30-45%	very strongly sloping
h	45-70%	extremely sloping

Degree of Salinity
Cond. (mS/cm)

x	nonsaline	0-4
s	weakly saline	4-8
t	moderately saline	8-15
u	strongly saline	15+

Variants

A shaly variant of a normal series includes a high proportion of shale derived fragments in the parent material.

e.g. CYN1, DOM1

- Croyon, shaly variant
- Dromore, shaly variant