Soil Survey and Agricultural Capability of Selected Land Parcels, Mayo Area, Yukon Territory

prepared by Mougeot GeoAnalysis
for Lands Branch, Community and Transportation Services,
Government of Yukon

October 23, 1992

1.0 INTRODUCTION

1.1 PROJECT OBJECTIVES

This report gives detailed information on soil associations, parent material and agricultural capability of 7 selected land parcels in the Mayo area (see Map 1 in back pocket). These land parcels were selected initially as having favourable agricultural potential and as having no conflict with other land or resource use. Soil and agricultural capability maps at 1:20,000 scale or 1:30,000 scale for these 7 parcels are necessary for the planning of agricultural subdivisions and will also facilitate additional soils inventory work in the area. General comments about the residential capability of these same parcels are inferred from the soil and site characteristics and are also included in this report.

The following soil association descriptions include textural ranges, observed drainage conditions, parent material types and the agricultural potential of the soil. Photocopied base maps of page size were provided by Community and Transportation Services, Government of Yukon. The soil and agricultural capability maps included in this report should be transferred on Government of Yukon land use maps.

1.2 METHODOLOGY

A review of the existing literature including soils mapping and surface geology mapping by Rostad (1962) and Hughes (1964) was done prior to fieldwork. In addition, air photo interpretation of the land parcels was completed prior to fieldwork. This was followed by ground truthing and sample collection in the field during August 1992 with the assistance of a summer student provided by the Lands Branch, Government of Yukon.

Soils related information obtained during the field investigation was transferred daily from air photo to base maps and samples were submitted to a soil laboratory for analysis. Analytical results are shown in Appendix 1.

1.3. SOIL ASSOCIATIONS AND AGRICULTURAL CLASSIFICATION SYSTEM

The soil association names used here are derived from previously published maps and drainage and slope characteristics are defined with the help of a numerical modifier (Table 1-1). The symbols on the soil survey maps include: a. the soil association symbol; b.drainage classes and c. slope class range.

The agricultural capability classification system (Table 1-2) was developed in 1987 by the Alberta Soil Advisory Committee (1987). It is now an accepted nation-wide standard and is based on land and environmental factors, such as soil, climate and landscape. Economics and land improvements are not considered by this rating system. The climate rating used for this soil survey was derived from previous surveys and is usually 4C or 5C for the Mayo area. The soil and landscape ratings are calculated using field observations, basic soil properties and systematic point deductions (examples for each soil associations are included in Appendix 2). The rated capability classes on the agricultural maps were obtained from the total points calculated using this standard agricultural classification system (Table 1-2). General information about this system is provided in Appendix 3. If the land parcel being assessed requires more than one agricultural capability rating a complex designation is used. For example, 4M/6M indicates that 60 % of the land surface is rated at 4M and 40 % is rated at 6M. Also, 4M//6M indicates that 80 % of the land surface is rated at 4M and 20 % is rated at 6M.

Table 1-1

SLOPE CLASS	SLOPE NAME	DRAINAGE CLASS
1: 0.0- 0.5 %	Level	1-very rapidly drained
2: 0.5-2.0 %	Nearly Level	2-rapidly drained
3: 2.0-5.0 %	Very Gentle Slope	3-well drained
4: 6.0-9.0 %	Gentle Slope	4-moderately well drained
5: 10.0-15.0 %	Moderate Slope	5-imperfectly drained
6: 16.0-30.0 %	Strong Slope	6-poorly drained
7: >30 %	Very Strong Slope	7-very poorly drained

Table 1-2

Limitation	Index Points	Description
1	80-100	none to slight
2	60-79	slight
3	45-59	moderate
4	30-44	severe (marginal)
5	20-29	very severe
6	10-19	extremely severe
7	0-9	not useful

2.0 SOIL ASSOCIATION DESCRIPTIONS

Five dominant soil associations are found within the survey map area and all of these were previously described by Rostad (1962). Table 2-1 summarizes the main characteristics of the soil associations in the survey area and associated agricultural capability range. The major limiting factors for soil based agriculture include low moisture holding capacity (M on maps), steep topography (T on maps), risk of flooding (I on maps), and very poor drainage (W on maps). The presence of permafrost is indicated by the letter Z on the maps in this report.

Table 2-1

Soil Association	Map Symbol	Dominant Soils	Dominant Texture	Agricultural Capability
Dry Creek	Dk	Orthic Eutric Brunisol	silt loam to sandy loam over gravel	4M, 6M, 6MT
French Creek	Fk	Gleysols, Cryosols	silt loam to sandy loam over gravel(?)	4M(Z), 5W(Z), 6W(Z)
McQuesten	Mc	Organic soils, Gleyed Eutric Brunisol	silt loam to sandy loam over sand	4M to 6M
Alluvial	All	Regosols	loamy sand to sand	6I to 7I
Stewart Crossing	St	Orthic Eutric Brunisol	silt loam to sand loam over sand	4M to 6M

DRY CREEK SOIL ASSOCIATION (Dk)

The Dry Creek soil association consists of Orthic Eutric or Dystric Brunisols developed on glaciofluvial or fluvial gravel deposits. The soils in this association typically have a thin loamy organic surface layer which is usually thinner than 3 centimetres. This surface organic surface generally overlies a veneer of wind blown sediment which ranges in texture from silt loam to fine sandy loam which in turn rests on cobbly to pebbly gravel. The wind blown veneer of fine grained silty sediment has an irregular thickness which is related to the undulating surface of the underlying gravelly sediments. This soil is occasionally slightly acidic, with Ph ranging from 6.5 to 6.0. Dry Creek soils tend to be well drained and generally do not retain moisture very well. In land parcels 2 and 6, the Dry Creek soils have a wider drainage range which is the result of a thick

loamy veneer which is underlain by permafrost.
In terms of agricultural capability, this soil association does not rate high. It has a low organic content and the gravelly parent material has a low moisture retention. The loamy veneer however does allow for surface moisture retention which acts as a fine-textured buffer between the surface organic mat and the underlying gravelly deposit. When the surface loamy veneer is thicker than 20 centimetres, it provides a sufficient base for root development and the soils maps show drainage classes which ranges from 3 to 4 and an agricultural capability of 4M. When the loamy veneer is thinner than 20 cm, the drainage classes range from 1 to 3 and the capability rating is usually 6M.

Site conditions in the Dry Creek soil association, include slopes which range from 2% to 30% and local topography which is nearly level to gently rolling. Only on steep slopes (greater than 25%) is the topography rated as 6T. In the few polygons where permafrost (Z is added to the map symbol) is present, clearing of the land will be followed by melting of the permafrost and saturation of the surface. The land user will have to let the land sit inactive after clearing until drainage of the melted ice is completed which will require a time frame in the order of years.

This soil association lends itself well to residential and road development with the major concern being the presence of permafrost. It has a good bearing capacity, good drainage and texture which would probably have percolation rates adequate for septic tanks and a gentle topography in most cases.

FRENCH CREEK SOIL ASSOCIATION (Fk)

The French Creek soil association can be described a poorly drained, frozen silt loam to fine sandy loam. The soil horizons are often blanketed by thick partially decomposed litter or by an organic layer. The surface organic horizons and the Ah horizon (e.g.'black dirt') ranges in thickness from 5 centimetres to greater than 40 centimetres. In a few soil pits, an upper organic layer thicker than 40 centimetres is present and in this situation the soil is classified as an organic soil. This soil association is found on parcels 2 and 3 and is always associated with the Dry Creek soil association. Gravel was occasionally present at shallow depths within the French Creek map units which suggests that this soil is underlain by a gravelly fluvial deposit as is the Dry Creek association. In most cases, gravel was not reached and is assumed to be at depth greater than 40 centimetres. Permafrost however, was always present at depths ranging between 24 and 40 centimetres. Other frost indicators visible at the surface include: 1. well defined micro-mounding up to 1 metre high, 2.

frost cracking and 3. poorly drained to wet depressions where the vegetation cover had been removed (e.g. old road). If the insulating surface vegetation was removed from areas which have French Creek soils the permafrost table would move downward due to surface melting and the result would be excess surface water and potentially unstable ground conditions. In the Dawson City area soils underlain by permafrost are being farmed. These soils required a period of ground preparation of 3 to 5 years which included draining and drying. In terms of agricultural capability French Creek soils rank as 4M and 5W to 7W where seepage and poor drainage conditions are present. The capability of this map unit to sustain buildings and road is less certain. Shallow drilling for geotechnical characterization is required to evaluate the topography associated with the French Creek soil association.

McQUESTEN SOIL ASSOCIATION (Mc)

The McQuesten soil association consists of Gleyed Eutric Brunisols and Gleysols developed on glaciofluvial or fluvial gravel deposits. The soils in this association typically have a loamy organic surface layer which is up 25 centimetres thick. This surface organic surface generally overlies a veneer of wind blown sediment which ranges in texture from silt loam to fine sandy loam which in turn rests on cobbly to pebbly gravel. The wind blown veneer of fine grained silty sediment has an irregular thickness which is related to the undulating surface of the underlying gravelly sediments. This soil is occasionally slightly acidic, with Ph ranging from 6.5 to 6.0. These soils tend to be imperfectly drained to very poorly drained and in some cases are underlain by permafrost. In terms of agricultural capability, this soil association does not rate high. It has a poor drainage and often seepage occurred in the soil pits. This soil association is usually rated 5W to 7W.

STEWART CROSSING SOIL ASSOCIATION (St)

This soil association consists of Orthic Eutric Brunisols developed on silt loam to sandy loam resting on loamy sand to sand on low level fluvial terraces in valley bottoms. The Ah horizon in these soils is generally thin and organic matter content is also generally low.

In terms of agricultural capability, Stewart Crossing soil usually rates as 4M if the surface 20 centimetres is silty loam and 5M to 6M if the surface sediments are composed of loamy sand or sand. The sandy nature of the soils in the Stewart Crossing Association reduces the moisture retention capacity which is the major factor in determining the agricultural capability.

Residential development in areas of the Stewart Crossing Association will have to deal with problems such as an elevated water table and potential flooding. The texture of this soil varies with depth and will range from silt to pebbly sand. Site specific studies are required to assess the geotechnical characteristics at depth.

ALLUVIAL LANDFORM (ALL)

These landforms are identified as young surfaces with no soil development. They usually form the lowest terraces and/or active floodplain with soils which have a wide range in physical characteristics. The Alluvial Landform soil association has a texture which ranges from a silt loam, which has good moisture retention to a well drained loamy sand and sand. In poorly drained depressions and abandoned meanders, the texture of the parent material is usually finer and the soil was gleyed which indicates poor drainage and fluctuations of a perched watertable. This soil has no organic matter and flooding is an important concern for any valley bottom development.

This landform usually is rated as 6I to 7I as a outlined above, flooding is the most important limiting factor for development.

3.0 SOILS AND RATING OF LAND PARCELS

PARCEL M1

Parcel M1 is approximately 150 Ha in size and is located directly south of the airport and east of the Mayo-Keno road within the limits of the Mayo Block Land Transfer. M1 is accessible by trails and roads which were used for field observations in addition to off road foot traverses. The following comments are based on air photo interpretation and a total of 47 field observations.

The Dry Creek soil association is dominant soil type on this land parcel. On the soil survey map, drainage classes of 2 and 3 outline the approximate boundary where the soil texture is dominantly a loamy veneer which is up to 20 centimetres thick. These areas are usually rated dominantly as 6M. In the areas where this fine-grained loamy veneer is thicker than 20 centimetres, the soil is rated at 3 or 4 in terms of agricultural capability. In areas which are capable of supporting cultivated agriculture a rating of 4M is shown on the capability maps.

The parent material of the Dry Creek soil association has good bearing capacity and high drainage rates which is favourable for percolation rates. These land parcels are therefore considered to be favourable for residential development and road construction providing that the poorly drained areas are avoided (e.g. Mc-6 and Mc-7).

RECOMMENDATIONS:
The majority of land parcel M1 has a mixture of soils which are suitable to very marginally suitable for cultivated agriculture. Limited soil based agricultural holdings are possible, however the mixture of soil rated as 6M with soil rated as 4M seriously jeopardizes the success of soil based farming. The ease of land access and the favourable parent material types suggests that country residential development or other non soil based activity should be considered here.

PARCEL M2

Land parcel M2 is located between the Mayo-Keno road and the Mayo River, directly west of the airport. It is also located within the Mayo Land Transfer Block and is accessible through a road located east of the Mayo River Bridge. It covers approximately 100 ha and is presently forested. Access within the land parcel is difficult due to the poorly drained areas which are interspaced with small marshes. The following comments are based on air photo interpretation and a total of 29 field observations.

This land parcel is composed mainly of the Dry Creek and French Creek soil associations. The Dry Creek soil association is found in the eastern half of Parcel M2 and rates as 4M to 6M depending on the thickness of the loamy veneer. The western half of Parcel M2 is mainly the French Creek soil association. This soil association has a thick layer of fine grained sediments which generally overlies gravel at depth. In addition, soil in the French Creek association has a high content of organic matter and low undulating topography. Drainage varies slightly from site to site but is dominantly moderately well drained to poorly drained. Permafrost is consistently present at shallow depths (e.g 18 to 40 cm from the surface) and surface features such as frost mounds and frost cracks are spatially related to the distribution of permafrost. As outlined earlier, removal of the insulating vegetation cover on the forest floor would allow the soil to warm up and the permafrost table to recede deeper or disappear. This removal of surface vegetation is done naturally by forest fires, as it has been done on parcel M3, for example. Parcel M2 probably has a coarse gravelly parent material which should allow excess water to drain if the permafrost degrades by disturbance of the vegetative cover. However, Parcel M2 may have in places a perched watertable as this area is located on the lower terrace level of the Mayo River. As a result poor drainage conditions may be a continual problem.

RECOMMENDATIONS:
Most of M2 is rated suitable for agriculture. Special farming procedures are require to deal with the permafrost underlying the western half of the parcel. As mentioned above, there might be a risk of high water table causing poor drainage once permafrost is melted. These considerations make this map unit less desirable in spite of the favourable capability rating. The major limiting factor for residential development is the presence of permafrost.

PARCEL M3

Parcel M3 is located approximately 16 kilometres north of Mayo, directly north of Minto Creek and east of the Mayo-Keno road. It covers approximately 240 Ha and access to the parcel is by foot only. The area was burned recently, (e.g. 1990 or 1991) and as a result blackened timber and young aspen re-growth covers most of parcel M3. The following comments are based on air photo interpretation and a total of 44 field observations.

The dominant soil associations found on this parcel includes Dry Creek and French Creek. The Dry Creek association is characterized by a loamy veneer overlying gravel. On this parcel, the loamy veneer is generally thinner on crests and upper slopes and thicker in depressions and lower slopes. In an overall sense the rating of Dry Creek map units is mainly 4M, however the distribution of the loam sediment affects this spatial distribution of this capability rating.

The burned area in Parcel M3 has initiated the melting of permafrost on French Creek map units. These map units are generally poorly drained and water is seeping in frost cracks and other ground depressions. A considerable portion of M3 has a steep hummocky topography or slopes too steep to sustain farming. These areas are rated 6T which indicates that slopes are greater than 25%.

RECOMMENDATIONS:
This parcel is marginally suitable for agriculture. The intermediate terrace in Parcel M3 is rated mainly as 4M to 6M and is the most promising candidate for agricultural use in this area. Special practices will be required to deal with the permafrost in portions of Parcel M3 as explained in the section dealing with Parcel M2.

PARCEL M4

Parcel M4 is located directly north of M3. It covers approximately 500 ha and is presently forested. This parcel is accessible by trails and roads which were utilized for field observations in addition to foot traverses. The following comments are based on air photo interpretation and a total of 37 field observations.

The Dry Creek soil association is the dominant soil type on Parcel M4. The agricultural capability varies from 3M to 4M with a thinner loamy veneer and 6M in areas where the loamy veneer thickens. Also as outlined in the description of the Dry Creek soil association, the parent material is favourable for both residential development and road construction.

RECOMMENDATIONS:
Most of Parcel M4 is rated at 6M and is therefore unsuitable for soil based agriculture. Limited agricultural activity is possible however in the southeast corner of M4.

PARCEL M5

Parcel M5 is located north-west of the Mayo Lake road at Field Creek. It covers approximately 180 Ha and is presently forested. This parcel is accessible by trails and roads which were utilized for field observations in addition to foot traverses. The following comments are based on a total of 33 field observations as no air photos were available.

The Dry Creek soil association is dominant soil type on this parcel. On the soil survey map, in areas where a fine-grained veneer of sediments is thicker than 20 centimetres a rating of 4M is shown. The western portion of the parcel has a steep hummocky topography and is rated 6T and 4M. The parent material of the Dry Creek soil association has good bearing capacity and favourable drainage characteristics which should result in good percolation rates. Thus, this parcel is considered to be favourable for residential development and road construction.

RECOMMENDATIONS:
Most of M5 is rated as 4M and therefore is suitable for agricultural development.

PARCEL M6

Parcel M6 is located approximately 15 km southwest of Mayo, on a fluvial terrace on the north side of the Stewart River. It covers approximately

100 ha and is presently forested. Field observations were made both beside trails and roads as well as by foot traverses. The following comments are based on air photo interpretation and a total of 35 field observations.

This parcel aerially covers a higher bench or fluvial terrace composed mainly of gravel and a lower terrace composed mainly of sand, sand over gravel and silty loam over sand. The dominant soil association on the upper bench has been called Dry Creek for convenience although the gravelly parent material is of fluvial rather than glaciofluvial origin. On most of this upper surface, gravel is exposed and therefore is rated as 6M. Large portions of the lower terrace have Stewart Crossing soils and are rated as 4M. In a few individual soil pits the soils rated as 3M.

RECOMMENDATIONS:
Approximately 40 % of this parcel is suitable for agricultural development. Most of the upper terrace surface is composed of gravel and is therefore unsuitable. In addition, flooding is a limiting factor in areas near river banks in Parcel M6.

PARCEL M7

Parcel M7 is located directly south of M6 along the Stewart River. It covers approximately 90 Ha and there is no road access. The following comments are based on air photo interpretation and a total of 17 field observations.

The majority of this parcel contains Stewart Crossing soils and in most cases is rated as 4M with some areas rating as 5M and 6M.

RECOMMENDATIONS:
M7 is mainly suitable for agricultural development with the exception of the marsh areas which are rated as 6W. Flooding is considered to be a limiting factor in areas near river banks in M7.

Appendix 1

T6E 0P5

LABS

(403)438-5522
(403)438-0398fax

LAB NUMBER. 127166

MOUGEOT GEO ANALYSIS
R.R. S12,C46
WHITEHORSE, YK

MOUGEOT GEO A
7

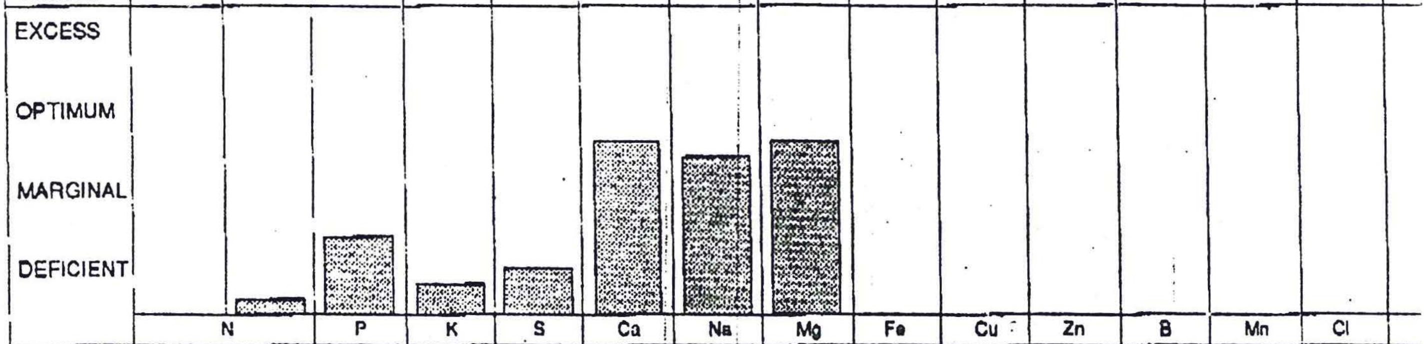
SAMPLE RECEIVED: 13 OCT 92
ANALYSIS COMPLETED: 21 OCT 92
SAMPLE RETAINED UNTIL: 21 NOV 92
FOR INFORMATION CALL: Doug Keyes
AT: 1-800-661-7
or 403-438-5

client number 2661 fax FAX4036683955 phone

DRY CREEK PARCEL 1

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
0-12"		<1	9	27	<1	1070	2	193						
TOTAL LBS./ACRE		<4	36	107	<4									
ESTIMATED AVAILABLE LBS./ACRE		6	25	54	6									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)	E.C.(SALINITY)	ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE
0-12"	7.3	0.1	<1.0				

MICRONUTRIENTS

No micronutrient analysis requested.

RECOMMENDATIONS

COMMENTS

This recommendation is made for soil: P
The previous crop was TREES&SHRUB

These recommendations are given as a management tool based on general research consensus. They should not replace prudent and responsible judgment.

R.R. S12,C46
WHITEHORSE, YK

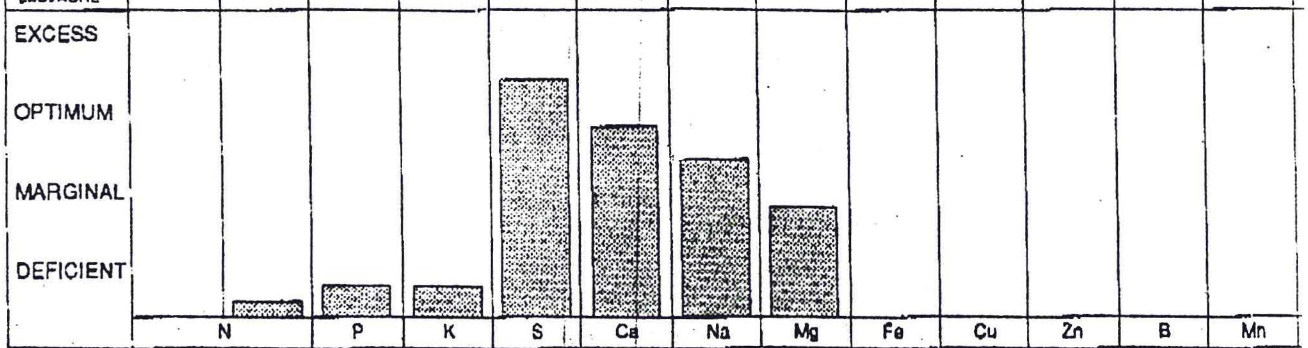
MOUGEOT GEO A
8

ANALYSIS COMPLETED
SAMPLE RETAINED UNTIL
FOR INFORMATION CALL
AT:

client number 2001 fax FAX4036683535 phone

FRENCH Creek Soil Ass. M2.

SAMPLE DEPTH	NUTRIENT ANALYSIS (P.P.M.) AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	C
0-12"		<1	3	24	>20	2360	5	46						
TOTAL LBS./ACRE		<4	10	97	>80									
ESTIMATED AVAILABLE LBS./ACRE		6	7	49	113									



SAMPLE DEPTH	SOIL QUALITY pH (ACIDITY)	E.C.(SALINITY)	ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE	MICRONUTR
0-12"	6.7	0.6	55.4					No micronutrient analysis re

RECOMMENDATIONS

COMMEN

This recommendation is ma
The previous crop was TRE

These recommendations are g
management tool based on ge
consensus. They should not r
and responsible judgment.

938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS
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MOUGEOT GEO ANALYSIS
R.R. S12,C46
WHITEHORSE, YK

MOUGEOT GEO A
10

SAMPLE RECEIVED: 13 OCT 92
ANALYSIS COMPLETED: 21 OCT 92 10:27
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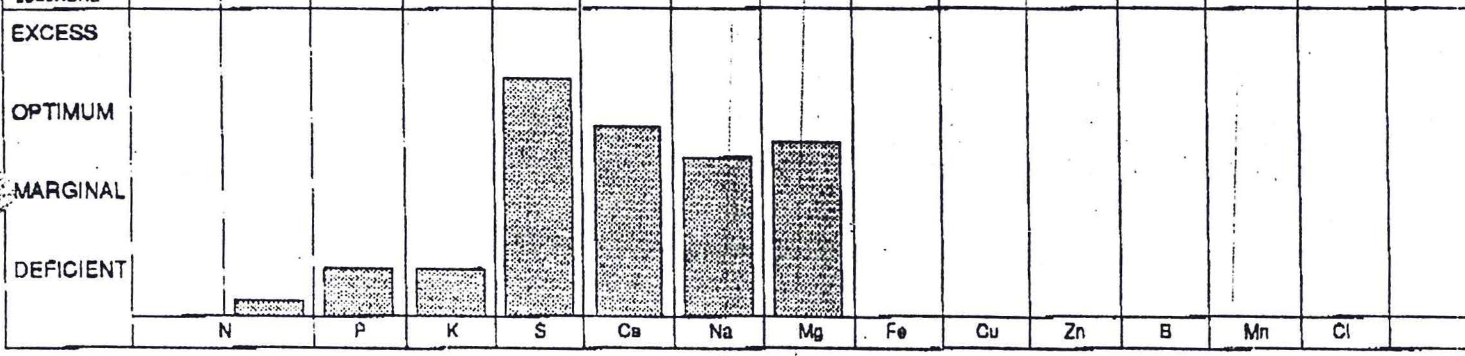
McQuesten Soil Association.

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
0-12"		<1	5	43	>20	2860	6	243						
TOTAL LBS./ACRE		<4	20	170	>80									
ESTIMATED AVAILABLE LBS./ACRE		6	14	85	113									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)	E.C.(SALINITY)	ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE
0-12"	7.5	0.3	6.8				

MICRONUTRIENTS

No micronutrient analysis requested.

RECOMMENDATIONS

COMMENTS

This recommendation is made for soil: Peace
The previous crop was TREES&SHRUBS

These recommendations are given as a management tool based on general research consensus. They should not replace prudent and responsible judgment.

9938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS

(403)438-5522
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LAB NUMBER. 127168

MOUGEOT GEO ANALYSIS
R.R. S12,C46
WHITEHORSE, YK

MOUGEOT GEO A.
9

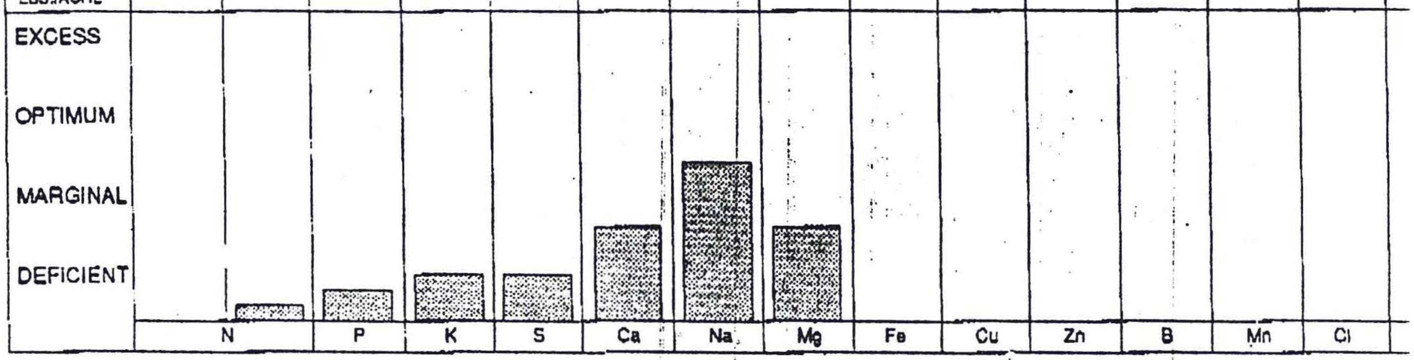
SAMPLE RECEIVED: 13 OCT 92
ANALYSIS COMPLETED: 21 OCT 92
SAMPLE RETAINED UNTIL:21 NOV 92
FOR INFORMATION CALL: Doug Keye
AT: 1-800-661-
or 403-438

client number: 2681 fax:FAX4036663955 phone

Steward River Soil Association

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
0-12"		<1	2	40	<1	109	3	40						
TOTAL LBS./ACRE		<4	7	160	<4									
ESTIMATED AVAILABLE LBS./ACRE		6	5	80	6									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)	E.C.(SALINITY)	ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE
0-12"	5.7	0.0	1.6				

MICRONUTRIENTS

No micronutrient analysis requested.

RECOMMENDATIONS

COMMENTS

This recommendation is made for soil: F
The previous crop was TREES&SHRU

These recommendations are given as a management tool based on general research ...

Appendix 2

_____ NAME: M-1 Date: August 1992

SOILS (S)

Map Component 1. Dry Creek 3/3 (Name, %) — 2. Dry Creek 3-4/3 (Name, %)

(0-20cm) 20cm+. 50cm+ → 2m.

factor	1. value	1. deduction	2. value	2. deduction
1. Surface factors				
texture (M)	VFSL (10cm)	25	SiL (30cm)	10
structure (D)	SGF	0	SGF	0
org. matter (F)	<1	15	<1	15
depth (E)	0-5	10	0-5	10
acidity (V)	6.0	2	6.1	2
salinity (N)	–		–	–
sodicity (Y)	–			–
calcareous (K)	–			–
organic (O)	–		–	–
Basic Rating = 100 -		52 = (a) 48	100 - 37 =	a) 63
2. Subsoil factors (% deduction)				
texture (M)	GR	20	GR	20
structure (D)	SGF	0	SGF	0
depth (R,D,M)	10	50	30	30
acidity (V)	–	–	–	–
salinity (N)	–	–	–	–
sodicity (Y)	–	–	–	–
Sub soil deduction =		70 % of a=b) 33.6		= 50 % of a=b) 31.5
Interim Soil Rating = a-b =		c)		a-b =c)
3. Drainage factor (% deduction)				
drainage (W)	–			
Drainage deduction =		– % of c=d)		% of c=d)
Final Soil Rating(s) = a-(b+d) =		14.4 6m.	S = a-(b+d) =	31.5 4m

LANDSCAPE (L)

Map Component 1. DK 3/3 (Name, %) — 2. DK 3-4/3 (Name, %)

factor	1. value	1. deduction	2. value	2. deduction
1. Slope (T)				
steepness	4 %		4 %	
length	30 m		30 m	
LS factor	.4		.4	
region	1	25	1	25
2. Pattern (J)				
number of obstacles per ¼ section	–	–		
3. Stoniness (P)				
class				
size	–	–		
Landscape Rating (L) = 100 -		25 = 75	L = 100 - 25 =	75

2T — 2T

5C-4M-2T

5C-6M-2T

Wolcurn

... PARCEL 4 NAME: ______________ Date: ______________

SOILS (S)

m4-21

Map Component 1. M4 - 28 (Name) DR-3/3 (%)   2. DR-2/3 (Name) ___ (%)

factor	value	deduction	value	deduction
1. Surface factors				
texture (M)	SL	25	Sand	50
structure (D)		0	Sg	0
org. matter (F)		15	S1	15
depth (E)	0	10	0	10
acidity (V)		2	✓	
salinity (N)		0	✓	
sodicity (Y)		0	✓	
calcareous (K)		0	✓	
organic (O)		0	✓	
Basic Rating = 100 -		47 = (a) 53	100 - 75 =	a) 25
2. Subsoil factors (% deduction)				
texture (M)		~~25~~ 5	grv	20
structure (D)		0	sg	0
depth (R,D,M)		30	1.3	50
acidity (V)		2	✓	
salinity (N)		0	✓	
sodicity (Y)		0	✓	
Sub soil deduction =		37 % of a=b) 19.61	= 70 % of a=b)	17.5
Interim Soil Rating = a-b =		c) 33.4	a-b =c)	7.5
3. Drainage factor (% deduction)				
drainage (W)				\
Drainage deduction =		0 % of c=d) 33.4		\ % of c=d)
Final Soil Rating(s) = a-(b+d) =		4m	S = a-(b+d) =	7.5 (7m)

LANDSCAPE (L)

Map Component 1. ______ (Name) ______ (%)   2. ______ (Name) ______ (%)

factor	value	deduction	value	deduction
1. Slope (T)				
steepness	2 %		2.5 %	
length	20 m		20 m	
LS factor	0.2		0.2	
region	1	15	1	15
2. Pattern (J) number of obstacles per ¼ section				
3. Stoniness (P) class				
size				
Landscape Rating (L) = 100 -		15 = 85 (1T)	L = 100 - 15 =	85 (1T)

Sr - 4m - 1T   Sc - 7m - 1T

... NAME: M. 2 - MAYO NAME: ____ Date: August 22

SOILS (S)

Map Component 1. Dk. 3-4/2 ____ (Name, %) 2. ____ ____ (Name, %)

factor	value	deduction	value	deduction
1. Surface factors				
texture (M)	vFSL	25		
structure (D)	platy	0		
org. matter (F)	<1	15		
depth (E)	0cm	10		
acidity (V)	—			
salinity (N)	—			
sodicity (Y)	—			
calcareous (K)	—			
organic (O)	—			
Basic Rating = 100 -		40 = (a) 60	100 - ____ =	a) ____
2. Subsoil factors (% deduction)				
texture (M)	2T clay	20		
structure (D)	0			
depth (R,D,M)	45cm-50cm	30		
acidity (V)	0			
salinity (N)	0			
sodicity (Y)	0			
Sub soil deduction =		50 % of a=b) 30	= ____ % of a=b) ____	
Interim Soil Rating = a-b =		c) 30	a-b =c) ____	
3. Drainage factor (% deduction)				
drainage (W)	—	—		
Drainage deduction =		— % of c=d) ____	____ % of c=d) ____	
Final Soil Rating(s) = a-(b+d) =		30	S = a-(b+d) =	

Class 4

LANDSCAPE (L)

Map Component 1. ____ ____ (Name, %) 2. ____ ____ (Name, %)

factor	value	deduction	value	deduction
1. Slope (T)				
steepness	2 %		%	
length	30 m		m	
LS factor	.2			
region	1	15		
2. Pattern (J)				
number of obstacles per ¼ section				
3. Stoniness (P)				
class				
size				
Landscape Rating (L) = 100 -		15 = 85	L = 100 - ____ =	

class 1T

5C - 4M - 1T | Pooled 5

Date: ______

SOILS (S) M2-12 → Best rating of Fr

Map Component 1. French Creek Soil Association. (2) — Name / % — French Creek S.A. - 4/2 (2) — Name / %

factor	value	deduction	value	deduction
1. Surface factors				
texture (M)	SiL	10	SL	25
structure (D)	Platy	5	Sg	5
org. matter (F)	∅	15	OK	0
depth (E)		10	10	2
acidity (V)		0	✓	✓
salinity (N)		0	✓	✓
sodicity (Y)		0	✓	✓
calcareous (K)		0	✓	✓
organic (O)		0	✓	✓
Basic Rating = 100 -		30 = (a) 70	100 - 37 =	a) 63
2. Subsoil factors (% deduction)				
texture (M)		0	20 GV	20
structure (D)		0	SG	0
depth (R,D,M)		0	30	30
acidity (V)		0	✓	✓
salinity (N)		0	✓	✓
sodicity (Y)		0	✓	✓
Sub soil deduction =		___% of a=b) ___	= 50 % of a=b)	31.5
Interim Soil Rating = a-b =		c) ___	a-b =c)	31.5
3. Drainage factor (% deduction)				
drainage (W)		0		
Drainage deduction =		___% of c=d) ___	___% of c=d)	___
Final Soil Rating(s) = a-(b+d) =		70 — 2M	S = a-(b+d) =	315 — 4M

Frozen at 40 cm

LANDSCAPE (L)

Map Component 1. Fr - 4/4 — Name / % — 2. Fr - 4/2 — Name / %

factor	value	deduction	value	deduction
1. Slope (T)				
steepness	___ %		2 %	
length	___ m		10 m	
LS factor	1.4		.2	
region		40	1	15
2. Pattern (J) number of obstacles per ¼ section				
3. Stoniness (P)				
class				
size				
Landscape Rating (L) = 100 -		___ = 40	L = 100 - 15 =	75 — 1T

? h topo

60 ~

4T + micro mounded.

5C-2M-4T

5C-4M-1T

...... PARCEL 6 NAME:______________ Date:______________

BEST OF Steward Crossing SOILS (S) — AVERAGE Melanie Burnett

Map Component 1. St-4/2 (Name) MG-4 (%) — 2. St-3/2 (Name) (%)

factor	value	deduction	value	deduction
1. Surface factors				
texture (M)	L	10	SL	25
structure (D)	PGR	0	SG-P	5
org. matter (F)	2-3	2-5	<1	15
depth (E)	20-25	0	0	10
acidity (V)	?	? (2-5)	—	
salinity (N)	N		—	
sodicity (Y)	N		—	
calcareous (K)	N		—	
organic (O)	15cm LC	10	—	
Basic Rating = 100 -		25 = (a) 75	100 - 55 =	a) 45
2. Subsoil factors (% deduction)				
texture (M)	SiL	0	S-LS	0
structure (D)		0	SG	0
depth (R,D,M)		0	50	30
acidity (V)		0	—	—
salinity (N)		0	—	—
sodicity (Y)		0	—	—
Sub soil deduction =		0 % of a=b)		= 30% of a=b) 13.5
Interim Soil Rating = a-b =		c)		a-b =c) 31.5
3. Drainage factor (% deduction)				
drainage (W)	4	0		
Drainage deduction =		% of c=d)		% of c=d)
Final Soil Rating(s) = a-(b+d) =		75 2M	S = a-(b+d) =	31.5 4M

LANDSCAPE (L)

Map Component 1. ______ (Name) ______ (%) — 2. ______ (Name) ______ (%)

factor	value	deduction	value	deduction
1. Slope (T)				
steepness	2% %		2% %	
length	40m m		350m m	
LS factor	.2		.2	
region	1	15	1	15
2. Pattern (J)				
number of obstacles per ¼ section	0			
3. Stoniness (P)				
class	0			
size				
Landscape Rating (L) = 100 -		15 = 75	L = 100 - 15 =	75

4C-2M-2T — 4C-4M-2T

PARCEL 6, St-

[illegible] NAME: Date:

SOILS (S) PARCEL 2, poorly drained depression

Map Component 1. M2-1 (Name) FK-6 (%) 1 2. ____ (Name) ____ (%) FK.

factor	value	deduction	value	deduction
1. Surface factors				
texture (M)	loam	10		
structure (D)		0		
org. matter (F)		2		
depth (E)		2		
acidity (V)		0		
salinity (N)		0		
sodicity (Y)		0		
calcareous (K)		0		
organic (O)		0		
Basic Rating = 100 -		14 = (a) 86	100 - ____ =	a) ____
2. Subsoil factors (% deduction)				
texture (M)		20		
structure (D)		0		
depth (R,D,M)		30		
acidity (V)		0		
salinity (N)		0		
sodicity (Y)		0		
Sub soil deduction =		50 % of a=b) 43	= ____ % of a=b)	____
Interim Soil Rating = a-b =		c) 43	a-b =c)	____
3. Drainage factor (% deduction)				
drainage (W)		70		
Drainage deduction =		70 % of c=d) 30.1	____ % of c=d)	____
Final Soil Rating(s) = a-(b+d) =		12.9 6W	S = a-(b+d) =	

LANDSCAPE (L) 5C-(6W)-1T

Map Component 1. ____ (Name) ____ (%) 2. ____ (Name) ____ (%)

factor	value	deduction	value	deduction
1. Slope (T)				
steepness	%		%	
length	m		m	
LS factor				
region		0		
2. Pattern (J)				
number of obstacles per ¼ section				
3. Stoniness (P)				
class				
size				
Landscape Rating (L) = 100 -		10 = 90	L = 100 - ____ =	

* Extremely cold soil at 42cm depth. Ice crystals present.

Appendix 3

A. Approaches and Assumptions

The guidelines suggested the use of a capability approach to the rating of land for arable dryland agriculture. Following are some definitions which are relevant to the rating system:

1. Capability - focuses on the nature and degree of limitations imposed by the physical characteristics of a land unit for a certain use (Smit et al 1983).
2. Arable - tillable; agricultural production based on cultivation practices; land that is cultivated or capable of being cultivated. Arable is used in contrast to agriculture based on grazing (non-cultivated) systems.
3. Dryland (rainfed) - an agricultural system based on natural precipitation - in contrast to irrigated systems.

As a starting point, the basic concepts of the Canada Land Inventory: Soil Capability for Agriculture (Canada Land Inventory 1965) were adopted. This is a seven class system with class 1 having the highest capability (least limitations) and class 7 having the lowest capability (greatest limitations). Also accepted were the general assumptions of the CLI which were:

a) It is an interpretive system based on limitations for agriculture and general productive capacity for common field crops. In the Alberta situation this includes the small grains (wheat, barley and oats) and oilseeds (represented mainly by canola). Present land use is not considered diagnostic.

b) Good soil management practices that are feasible and practical under a largely mechanized system of agriculture are assumed.

c) Lands in each class are similar with respect to degree, but not necessarily to kind, of limitations for arable agriculture. Therefore, lands in any one class may require different management or treatment.

d) Lands are classified according to their continuing limitation assuming feasible improvements will be made. Examples are minor drainage, conservation measures and stone removal or other improvements within the means of individual producers.

e) The capability classification could change with major changes in such features as land use, drainage schemes or climate.

f) Off-farm economics such as, distance to market, size of farm, kind of roads or grain market prices are not considered.

g) Capability grouping could change as more information becomes available on soil response or crop requirements.

However, the guidelines also suggested that a specific, quantitative methodology was required to reduce subjectivity. An indexing approach, such as used in the Storie system, has some advantages so the following class/index framework was established.

Table II-1. Relationship of capability class to index point

Capability class	Index points	Limitation
1	80-100	none to slight
2	60-79	slight
3	45-59	moderate
4	30-44	severe(marginal)
5	20-29	very severe
6	10-19	extremely severe
7	0-9	not useful

The next consideration was the accommodation of the three major components climate, soils and landscape. It was agreed that each could by themselves be limiting to agriculture. Therefore each should be considered separately and each should be assessed over the total scale, that is, each assessed a value between 0 and 100. The final rating would be based on the most limiting of the three, not on the accumulated total.

While the final class placement is based on the most limiting component, the system also allows for the identification of specific factors and the relative contribution of each. This is important for the planning process or for land evaluation because some limitations might be corrected or managed while others might not. That becomes part of the considerations. For example, if there were three areas of class 4; one with climate limiting, one with soils and one with landscape, they could and should be considered separately. Climate generally has to be accepted as it exists but soils might be readily improved and landscape might be a management concern. The identification and rating of each limitation was therefore accepted as the preferred approach and any limitation resulting in a one class or greater reduction would be shown in the rating symbol.

The assessment of degree of limitation (how many points to deduct in a given situation or the development of rating scales) became a separate process for each parameter. It was carried out within the context and meaning of the rating system - Class 1 is none to slight limitation, Class 4 is marginal, etc. Critical points or characteristics were identified and the scale constructed. The process was interactive and based on our knowledge and understanding of how the various parameters affect the identified use. For example, critical points for assessment of pH were as follows:

pH	Rating	Class	Point deduction
3.0	no value for arable agriculture	7	100
4.5	slight to moderate limitation	2	30
6.5-7.5	no limitation for arable agriculture	1	0

It was also recognized that some factors were less important than others. The ratings were adjusted to reflect this concern in two ways:

a) The whole range of 0 to 100 was not used for some parameters. Organic matter content with a maximum 15 point deduction is an example.
b) Some factors were considered to be modifiers to a base rating and were treated as perçentage rather than absolute deductions. The drainage factor is an example of this approach. This also recognizes that the class limits are not all equal, becoming narrower at the lower ratings.

B. System Description

The new system retains a close similarity to the older CLI - soil capability for agriculture system (Canada Land Inventory 1965) but attempts to be more quantitative. In both systems land is grouped into seven classes according to their potentialities and limitations for agricultural use. The definition of the classes are essentially the same as previously defined (op cit) except that a range of index points is now assigned to each class. The first three classes are capable of sustained production of common cultivated crops, while the fourth class is considered marginal.

The classes, the broadest category in the system, are an assessment of the degree of intensity of limitation. For example, Class 3 land has limitations which are more severe than Class 2 land. The second category, the subclass, describes the kind of limitation responsible for the class designation. Thus, when used together, the class and subclass provide information about the degree and kind of limitation. This information is useful for land use planning and for determining conservation and management requirements.

1. Land capability classes

Class 1 - These lands have no significant limitations for crop production (80-100 index points).

Class 2 - These lands have slight limitations that restrict the range of crops or require modified management practices (60-79 index points).

Class 3 - These lands have moderate limitations that restrict the range of crops or require special management practices (45-59 index points).

Class 4 - These lands have severe limitations that restrict the range of crops that can be grown or require special management practices or both (30-44 index points).

Class 5 - These lands have very severe limitations for sustained arable agriculture. Annual cultivation using common cropping practices is not recommended (20-29 index points).

Class 6 - These lands have such severe limitations for arable agriculture that cropping is not feasible even on an occasional basis (10-19 index points).

Class 7 - These lands have no capability for arable agriculture (0-9 index points).

It must be emphasized that lands within a capability class are similar only with respect to the degree of intensity of limitation and not the kind of limitation. Each class includes many different kinds of soil and land characteristics and many of the soil and land characteristics within any one class may require different management practices.

Note too that no assessment is made with regard to pasture or grazing. Classes 5 and 6 while not recommended for cultivated crops could have potential for grazing.

2. Land capability subclasses

The subclass is a grouping of soils and lands with the same kind of limitation. Twenty one different kinds of limitations are recognized as a result of adverse climate, soil or landscape characteristics. The subclasses are as follows:

Climate (C)
- moisture limiting factor (A)
- temperature limiting factor (H)

Soils (S)
- texture in mineral soils (M)
- structure and consistence in mineral soils (D)
- organic matter content (F)
- depth of Ah or Ap in mineral soils (E)
- acidity/alkalinity (V)
- salinity (N)
- sodicity/saturation percentage (Y)
- calcareousness (K)
- peaty surface (O)
- depth to nonconforming layer (R) (D) (M)
- drainage (W)

Organic soils (O)
- organic soil temperature (Z)
- degree of decomposition (B)
- wood content (I)
- nutrient status (G)
- salinity (N)
- depth of deposit (X)
- subsurface acidity (V)
- drainage (W)

Landscape (L)
- slope (T)
- surface stoniness (P)
- pattern (J)

:. Information Requirements

In order to use the rating system data are required for each ›f the identified factors within the climate, soils and landscape :omponents. Some can be estimated from maps and reports, other lata are best collected by site inspection. The level and pur›ose of the capability rating also has a bearing on the detail :equired, with regional assessments generally satisfied by es:imates from published data but assessment of individual land ›arcels requiring detailed site investigations. Individual ›:rameters also differ in their data requirements.

.. Climate data requirements

The climate parameters are based on long term records, 1951-30 normals wherever possible. The data are therefore best ob:ained by estimating values from the attached maps. If <u>docu-ıented</u> local knowledge is available, the assessor has the option ›f adjusting the parameters. This is particularly applicable to :he modifying or "fine tuning" of local factors. Such adjustıents should always be made with specific reference to the sug;ested values.

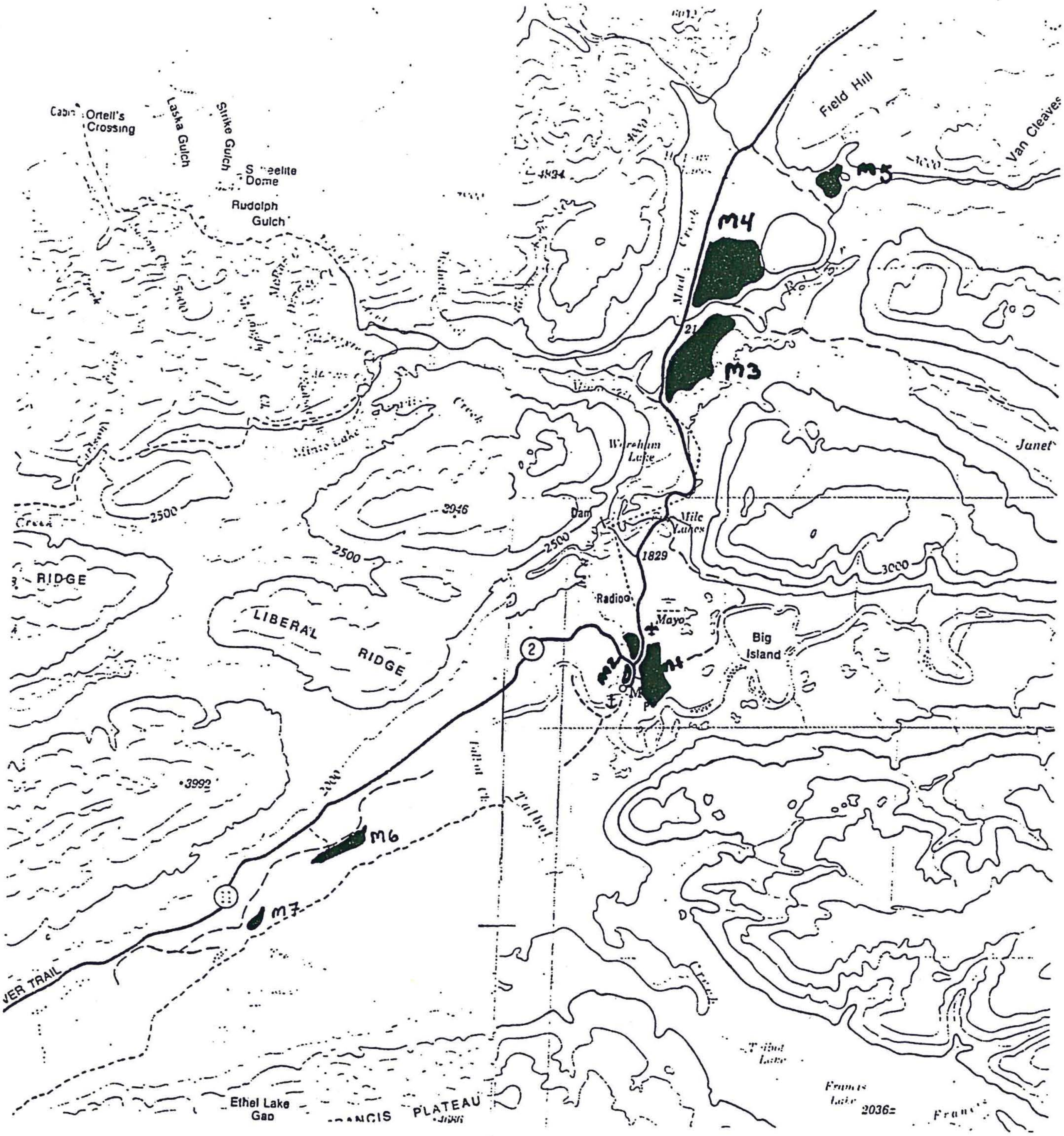
If one wished to make a very detailed local analysis of the :limatic parameters and had access to site specific data it would ›e appropriate to recalculate the parameters based on that data.

It is recognized that as our knowledge improves, the forıulas used in calculating the climatic values could be modified ıs could the parameters themselves. This would be an evolving ›rocess and would not likely produce a major change in the rela:ive climatic rating.

:. Soil and Landscape data requirements

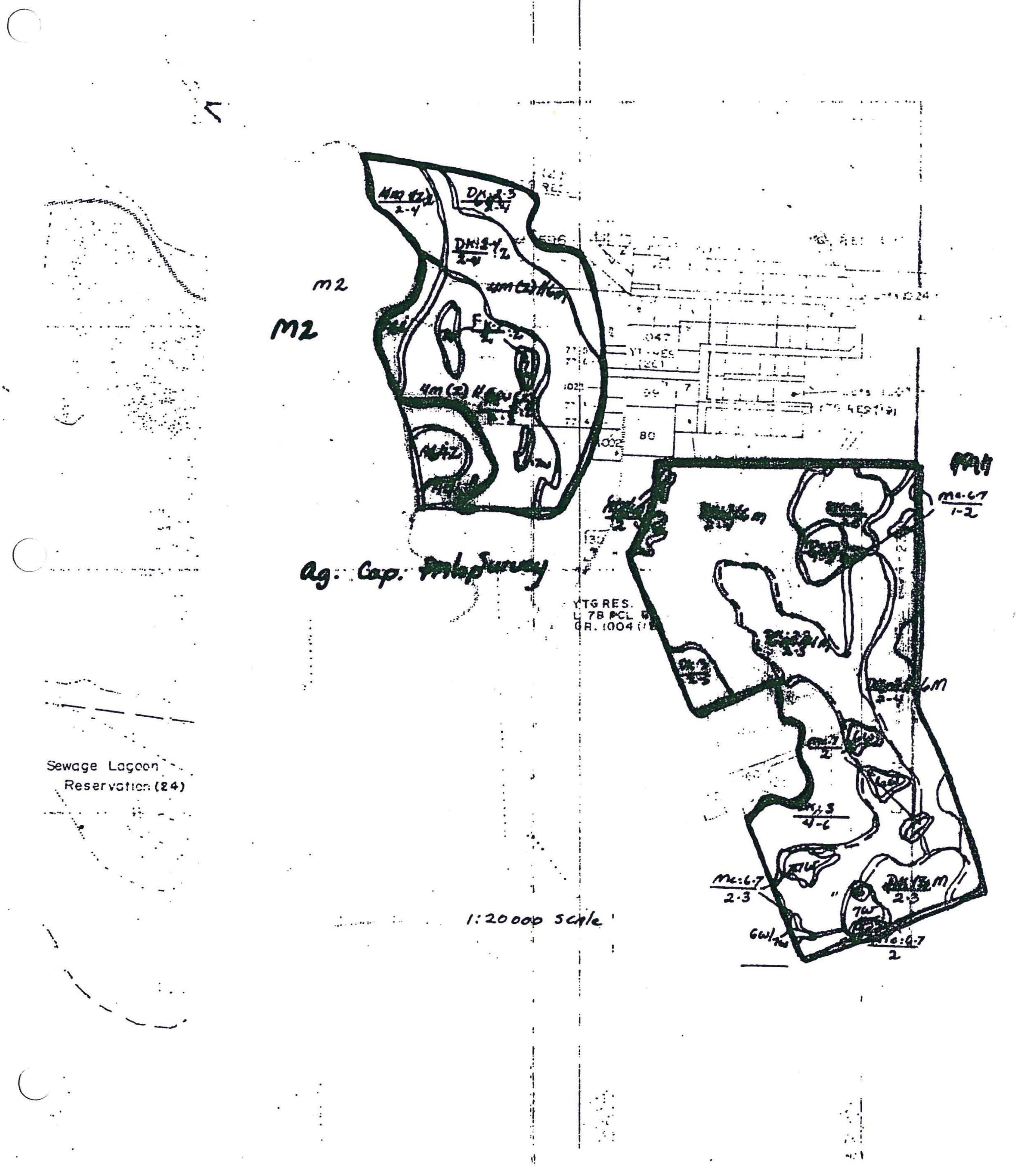
Soil and landscape data are more site specific than the :limate requirements and wherever possible should be collected in :he field. This is particularly important for more detailed ıssessments. The definition and descriptions of individual parameters follow standards established by the national soils community. The assessor should refer to The Canada Soil Information System: Manual for describing soils in the field (Expert Committee on Soil Survey 1983) and the Canadian System of Soil Classification (Canada Soil Survey Committee 1978). Soil Taxonomy (classification) is not required but can be used as a surrogate for estimating many of the parameters used in the rating system.

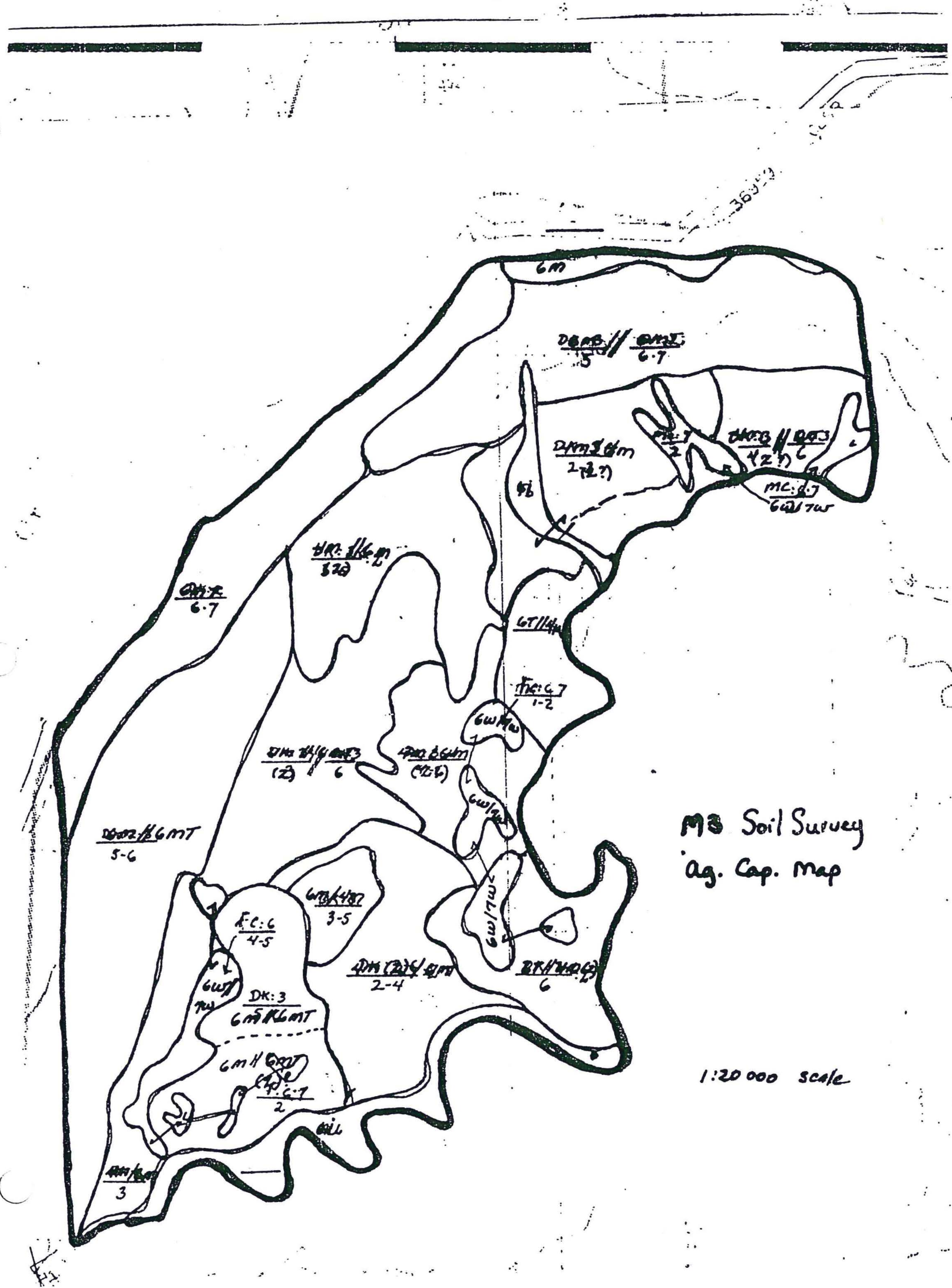
For general capability assessments, particularly those of a regional nature, existing data may be used to markedly reduce field time. Soil survey reports and maps provide the most comprehensive set of soil and landscape data but data collected by other agencies such as Public Lands Division and Resource Evaluation and Planning Divison of Forestry, Lands and Wildlife, Land Classification Branch of Alberta Agriculture and the private sector should also be consulted where applicable.

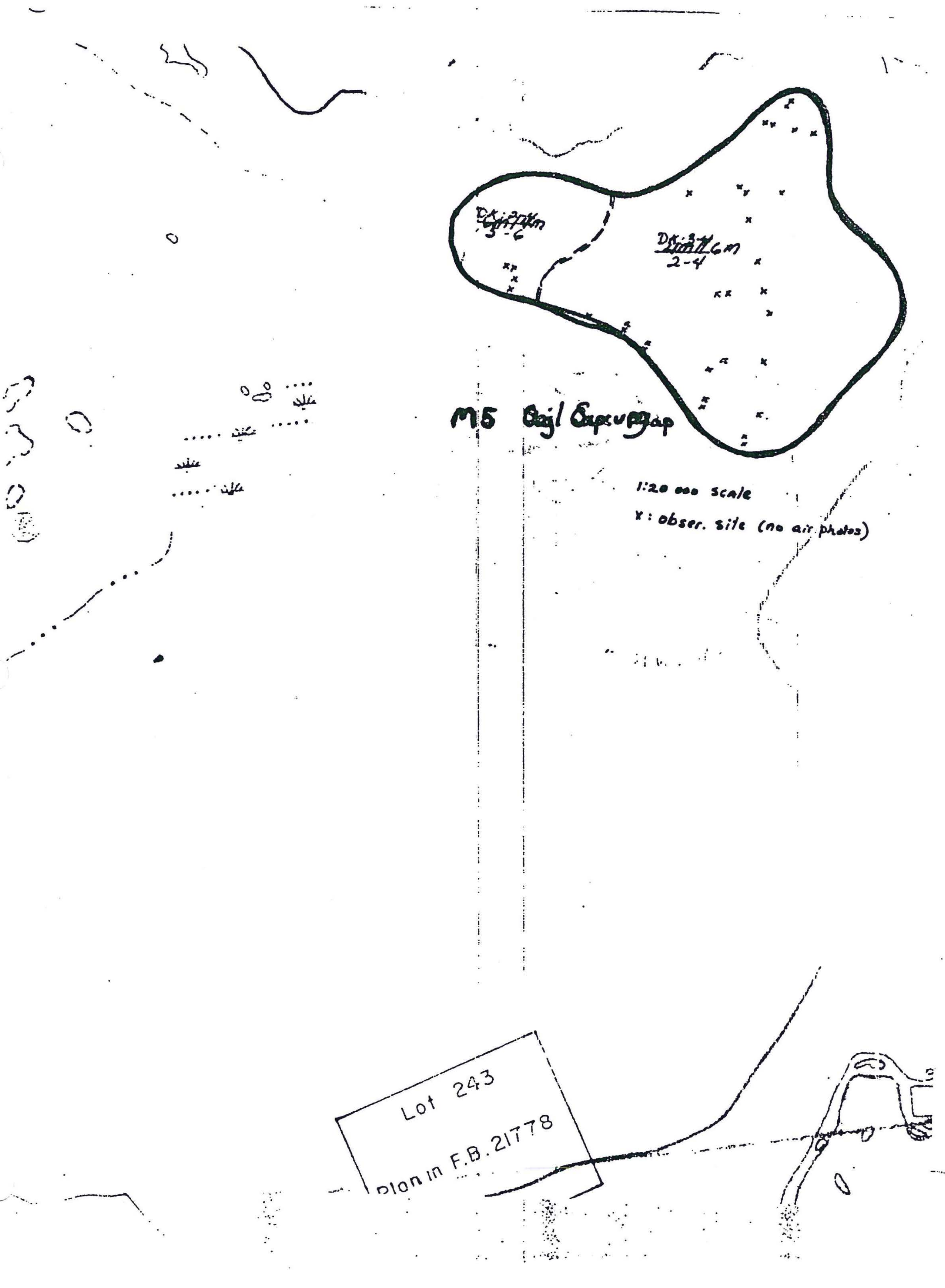


Ortell's Crossing
Laska Gulch
Strike Gulch
Dome
Rudolph Gulch
Field Hill
Van Cleaves
M4
M5
M3
Janet
2046
2500
Dam
Mile Lakes
1829
3000
RIDGE
LIBERAL RIDGE
Radio
Mayo
Big Island
2
3992
M6
M7
VER TRAIL
Ethel Lake Gap
PLATEAU
2036

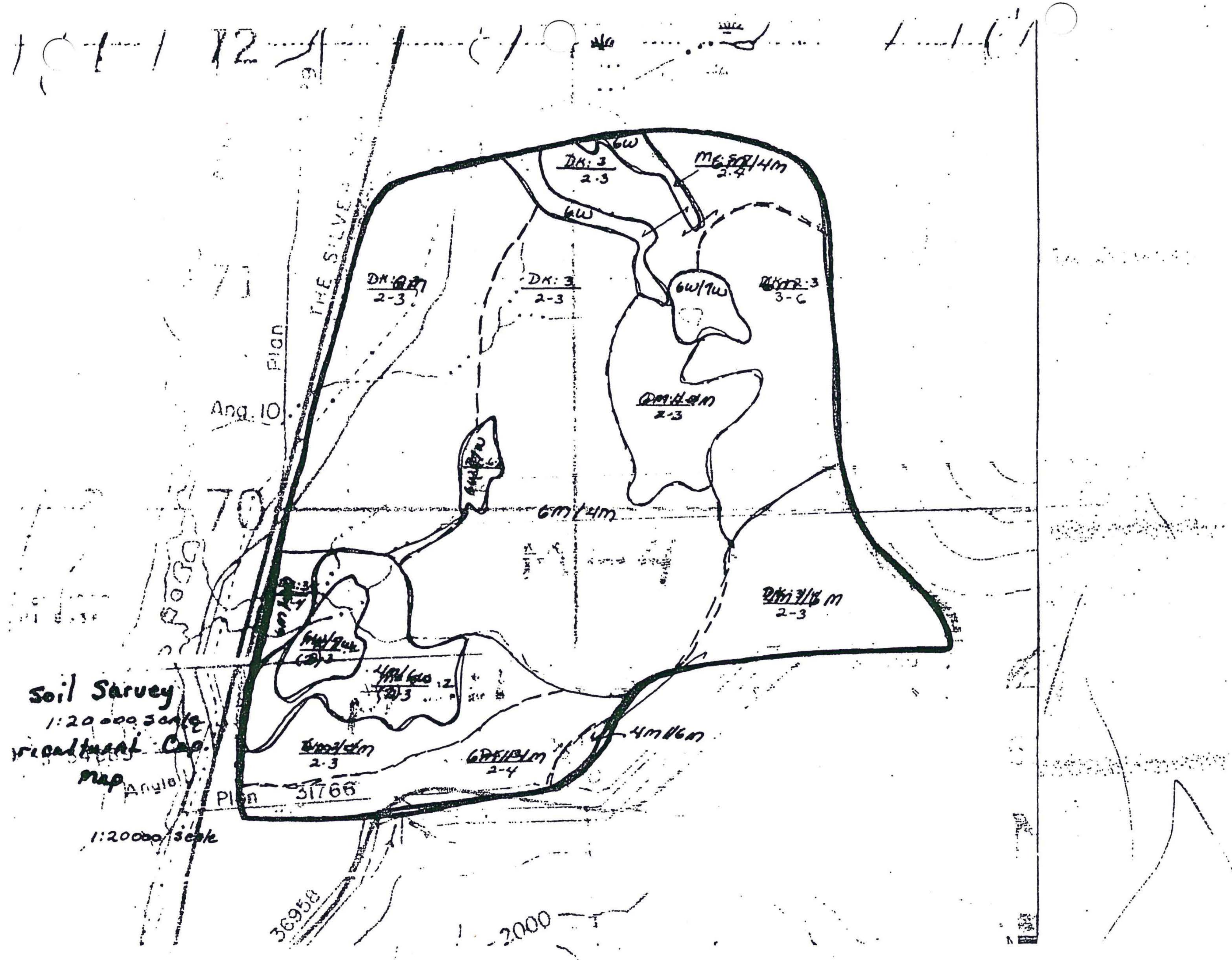
4 55.

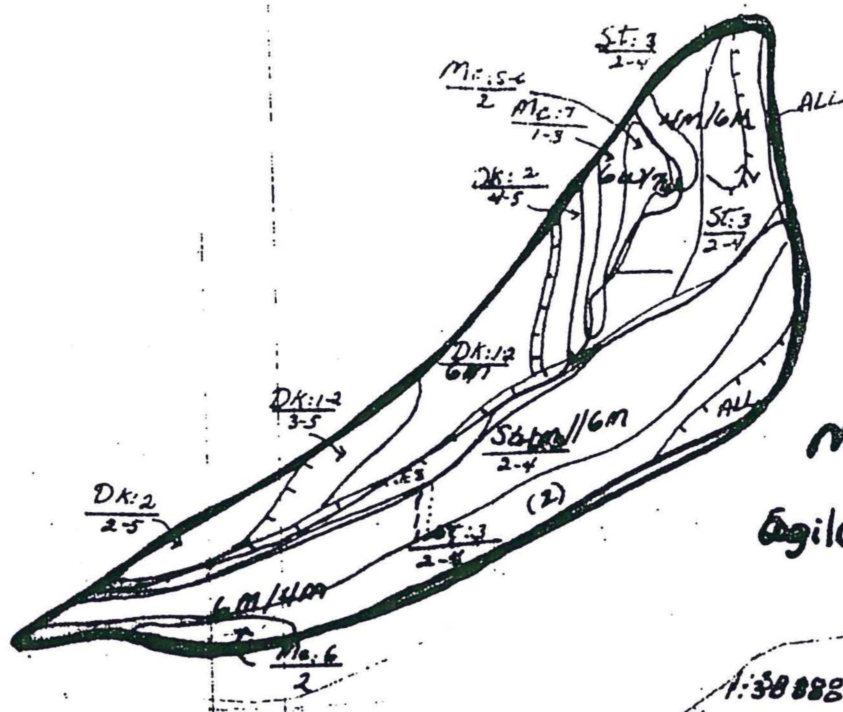

M2
m2
Ag. Cap.
YTG RES.
80
Sewage Lagoon
Reservation (24)
1:20000 scale


MB Soil Survey
Ag. Cap. Map
1:20 000 scale
6M
6·7
5-6
1-2
3-5
4-5
DK:3
2-4
6
2
3



3-6
2-4
M5
1:20 000 scale
x : obser. site (no air photos)
Lot 243
Plan in F.B. 21778

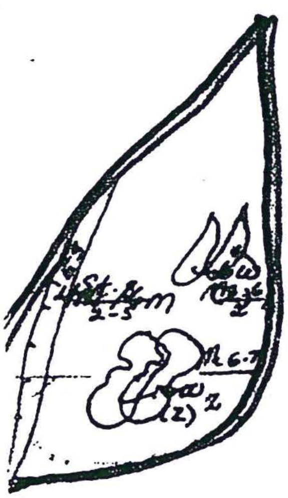

Soil Survey
1:20 000 scale
Map
1:20000 scale
DK: 3
2-3
DK: 3
2-3
6W
6W/9W
Dm: 4m
2-3
6m/4m
Dk: 3/6m
2-3
4m/6m
2-4
2-3
Plan
Plan 31766
Ang. 10
Angle
THE SILVE
70
36958
2000



M6

Eagil Canyon

1:38888 scale



M7