Ontario Geological Survey

Northern Ontario
Engineering Geology Terrain Study 44

STEEL LAKE AREA

(NTS 42E/SE)

District of Thunder Bay

by

John F. Gartner

1979

Ontario

Ministry of Natural Resources

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Deputy Minister

Ministry of Northern Affairs

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1200-79-H of C

CONTENTS

TABLE

MAP
(accompanying report)

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1.0 INTRODUCTION:

This report contains an inventory of regional engineering terrain conditions in the Steel Lake area, District of Thunder Bay. The area, which covers NTS block 42E/SE, lies between Latitudes 49°00'N and 49°30'N and Longitudes 86°00'W and 87°00'W. This report forms part of a series of publications which provide similar terrain data for some 370 000 km^2 of northern Ontario.

The purpose of the mapping is to provide a guide for engineering and resource planning functions at a level of detail consistent with a scale of 1:100 000. The terrain information is contained on the Data Base Map (OGS Map 5080, accompanying this report).

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[1]Consulting Engineering Geologist, Gartner Lee Associates Limited, Markham, Ontario.

Manuscript approved for publication by the Chief, Engineering and Terrain Geology Section, July 25, 1979. This report is published with the permission of E. G. Pye, Director, Ontario Geological Survey.

Interpretation of existing black and white aerial photographs, at scales of approximately 1:54 000, was the primary method of obtaining this terrain information. The interpretation was checked with published and unpublished literature which documented previous field visits and observations. During the summer of 1978, roads in the area were traversed and observed terrain conditions recorded as further verification of the office studies. Thus, the map represents a reconnaissance overview of the engineering conditions of the terrain.

An engineering terrain legend was developed to facilitate the mapping and to provide a common information base for the entire map series. This legend is shown on the accompanying Data Base Map. Further information on the mapping techniques, legend format, and possible uses of this information is available in the "Ontario Engineering Geology Terrain Study Users' Manual" (Gartner, Mollard, and Roed, in preparation), a companion publication to this series of maps and reports.

2.0 GEOLOGICAL SETTING:

2.1 BEDROCK:

The map-area is underlain by rocks of Precambrian age and bedrock exposures are abundant, a factor which contributes to the extremely rugged topography. The dominant lithologies, by far, are a variety of felsic igneous rocks. Minor amounts of metasediments are found in the northeast and southwest corners of the area and several thin, northeast-trending belts of metavolcanics occur in the southeast corner (Carter *et al.* 1973; Milne *et al.* 1972).

Northeast of Killala Lake in the central part of the map-area, there is an alkalic complex characterized by a diagnostic ringed pattern visible on the airphotos.

The area is dissected by numerous northerly- and northwesterly-trending faults which exert considerable control on the drainage pattern.

Mineral potential is rated as medium to unknown, except for an annular ring corresponding to the margin of the Killala Lake alkalic complex where potential is high, particularly for base and platinum group metals (Springer 1978).

2.2 QUATERNARY:

Glacial ice advanced from the northeast, depositing a thin and scattered veneer of ground moraine over the bedrock. The till layer reaches an appreciable thickness only in the northeast corner of the map-area and in small isolated patches scattered throughout the western half of the area.

Glaciofluvial deposits, consisting mainly of outwash and esker complexes, trend southward, following faulted valleys and occupying lower and flatter areas. Such deposits are common along the upper reaches of the Little Pic and Steel Rivers, and southwest of Killala Lake.

When the ice front had retreated well to the northeast, the southern and eastern portions of the map-area were inundated by an arm of the post-Minong Lake and the subsequent Lake Houghton.

Thus, glaciolacustrine plains, consisting of varved silt and clay and fine sand, occupy river valleys of the Pic and Little Pic River drainage basins in the eastern half of the area. These deposits have been identified and discussed by previous investigators (Farrand 1960; Zoltai 1967; Milne 1968; Coates 1970).

3.0 ENGINEERING TERRAIN UNITS:

3.1 BEDROCK:

3.1.1 Description:

Rock knob (RN) terrain dominates the map-area. Fault-controlled valleys and abundant bedrock hills produce a rugged and complex landscape. Relative relief of 30 m is common, and this often increases locally to over 100 m. Slopes are steep and complex.

Drift cover in this terrain is shallow (less than 1 m) and bare bedrock is common. The drift becomes thicker on the flanks of some bedrock hills, and boulders are scattered over much of the ground surface. The overburden consists of ground moraine silty sand till. In the eastern portion of the map-area, glaciolacustrine deposits sometimes form the subordinate unit.

A typical symbol depicting this terrain unit is:

$$\frac{\text{RN(tMG/R)}}{\text{Hj-M}}$$

Rock knob terrain (RN), the dominant landform, has high rugged relief (Hj) and mixed wet and dry surface drainage (M). Subordinate amounts of ground moraine till form a veneer over the bedrock (tMG/R).

3.1.2 Significance:

RESOURCES: Portions of the rock can be used for crushed stone purposes, but detailed evaluations of suitability for aggregate use would be required. Ground water resources within the bedrock will be limited to fractures, faults, and fissures. The occurrence of aquifers is unpredictable and the terrain has only fair potential for ground water supplies.

GENERAL CONSTRUCTION: The major constraint in terms of construction is the presence of massive, irregular, and complexly sloping bedrock outcrops, and of large boulders on the ground surface. This means that, in most instances, below-ground excavations will require blasting. Site grading will be expensive and rock fills will be necessary in grading works. Foundation conditions should be excellent on the bedrock, but route alignments will require rock cut-and-fill operations.

Because of the shallow drift cover and complex bedrock slopes, development activities will be more difficult, and hence more expensive, than in areas of thicker overburden. Construction will be extremely difficult in those areas of high, sheer rock cliffs and steep bedrock hills. Also, land management for any development would be complex. The variable and steep rock slopes, combined with the shallow overburden, will make the terrain sensitive to surface erosion, especially when cleared of vegetation.

WASTE DISPOSAL: The bedrock terrain is not amenable, in its natural state, to the disposal of waste, whether it be garbage, septic tank effluent, or industrial liquid waste. Development of lagoons or tile fields would require extensive grading of rock materials and importation of soil fill. Fractures in the bedrock could act as conduits for migration of effluents, and the impact on surface drainage courses could be significant.

3.2 MORAINAL LANDFORMS:

3.2.1 Description:

Ground moraine (MG) appears either as a subordinate unit in conjunction with the rock knob terrain, or as a dominant unit in the form of a thicker veneer over bedrock. The latter situation occurs in the northeast corner of the map-area and in small isolated patches scattered throughout the western half of the area.

Where the moraine is dominant, it appears to form a 1 to 3 m thick mantle overlying bedrock. It consists of silty sand till, contains abundant stones, cobbles, and boulders and in places has been modified by glaciolacustrine processes.

South of Tickseed Lake in the northeast corner of the area, there is a small unit of silty till which contains materials similar to those found in the vicinity of Geraldton (Gartner 1979). This till apparently has a significant $CaCO_3$ content and is similar to the "Bankfield till" described by Dell (1963). A sample of this till, taken by Zoltai (1967) from southwest of Tickseed Lake, consisted of 24 percent sand, 50 percent silt, and 26 percent clay. The sample contained 29 percent $CaCO_3$.

In all areas where ground moraine is the dominant landform, the underlying bedrock controls the relief and the terrain is moderately undulating. Rock knobs are common, and areas of flat-lying bedrock exist beneath the thin till cover.

Typical terrain unit symbols are:

$$\frac{\text{tmMG/R(RN)}}{\text{Lu-M}} \qquad \frac{\text{tMG/RN(smLP/R)}}{\text{Mu-M}} \qquad \frac{\text{tMG/R(RN)}}{\text{Lu-M}}$$

The symbols indicate that ground moraine till occurs as a significant veneer over bedrock (tMG/R), but rock knobs (RN) are still common. The relief is low and undulating (Lu), and surface drainage is mixed (M).

3.2.2 Significance:

RESOURCES: Sand and gravel resources are scarce within this terrain unit and nothing more than small pockets of suitable materials can be expected.

Ground water resources are not expected to be significant. The moraines are generally too shallow to provide good aquifer conditions, and any water will likely be obtained from fractures in the bedrock.

GENERAL CONSTRUCTION: Because the glacial tills are bouldery and often form only a thin veneer over bedrock, there will be a number of construction problems associated with rock excavation and grading. Thus, excavations, except for very shallow ones, can be expected to intersect bedrock and zones of very bouldery soils. Because the till has a significant silt content, re-use of the materials might encounter local problems with handling and compaction, especially during wet weather conditions. Foundation conditions should be adequate for normal structures.

WASTE DISPOSAL: The bouldery nature of the overburden cover and the presence of bedrock near the surface place constraints on the siting of waste disposal facilities. Septic systems are probably feasible, but detailed site-specific investigations are required. The drift is generally not deep enough to provide a good environment for solid or liquid waste disposal.

3.3 GLACIOFLUVIAL LANDFORMS:

3.3.1 Description:

Outwash (GO) deposits occupy portions of the valleys of the Steel and Little Pic Rivers and the upper reaches of the Pic River. These valley train deposits contain sand and gravel materials of varying thicknesses. The outwash is often terraced and kettle holes are common.

The deposits along the Little Pic River and surrounding Physalis Lake in the southern and central parts of the area respectively, have low undulating relief and indications of high water tables.

In most cases, the outwash plains are not extensive, but rather are confined by the surrounding bedrock terrain. However, south of Killala Lake and bordering the Little Pic River, the outwash is more planar in aspect and a high water table is suspected. A drill hole sunk on the north shore of Prairie Lake, near the southern margin of the map-area (Erdosh 1976), indicated:

0 to 22.0 m – Sand, with occasional gravel
22.0 to 24.4 m – Clay
24.4 to 30.8 m – Medium sand
below 30.8 m – Bedrock

Typical terrain unit symbols are:

$$\frac{\text{sgGO}}{\text{Ltd-D}} \qquad \frac{\text{sGO,pOT(RN)}}{\text{Lu-Mh}} \qquad \frac{\text{sgGO(RN)}}{\text{Lu-M}} \qquad \frac{\text{sGO(pOT)}}{\text{Lu-Dh(W)}}$$

In these symbols the use of a comma implies that the two landforms are of equal importance. For example, sGO,pOT represents an area where both sandy outwash and peaty organic terrain are the dominant landforms.

Eskers (GE) are found along the Steel River and southwest of Killala Lake. These two occurrences are the only major esker deposits within the map-area.

The Steel River esker is associated with a pitted or kettled outwash plain. The esker ridge is generally less than 15 m high, consists of sand and gravel, and has good drainage. The Killala Lake esker is about 8 km long, contains sand and gravel, and has associated sandy outwash deposits.

Typical symbols depicting this terrain unit are:

$$\frac{\text{sgGE,sgGO(RN)}}{\text{Lkr-D}} \qquad \frac{\text{sgGE}}{\text{Lr-D}}$$

3.3.2 Significance:

RESOURCES: The outwash and esker landforms contain potential sand and gravel resources. Of particular significance are the esker-outwash complexes bordering Steel River and southwest of Killala Lake. Other areas of potential are associated with terrain units containing gravelly sand (sg) materials. However, in many of these landforms, there are indications of high water tables (Dh) or mixed wet and dry (M) surface drainage. These conditions could cause difficulties in the extraction of the materials. Ground water supplies may occur beneath the larger and deeper outwash landforms.

GENERAL CONSTRUCTION: The following general comments describe the construction suitability of the glaciofluvial landforms:

1) Excavations will encounter few problems, except in areas with suspected high water tables and where bedrock is close to the surface. High water tables are suspected in many of the deposits bordering the Little Pic River and south of Killala Lake.
2) Grading operations should encounter only minimal handling problems and compaction should be satisfactory.
3) Bearing capacities for normal structures should be adequate, but individual sites must be investigated in more detail.

WASTE DISPOSAL: Because of the permeable nature of these soils and the possibility of connection between ground water and surface drainage, the disposal of liquid and solid wastes within these landforms must be approached with considerable caution. Septic systems, if properly designed, should function satisfactorily. However, raised tile fields may be necessary in areas of high water tables. Detailed hydrogeological investigations are recommended prior to construction of any waste disposal facility.

3.4 GLACIOLACUSTRINE LANDFORMS:

3.4.1 Description:

Glaciolacustrine plains (LP) cover extensive areas bordering the Pic River and south of Vein Lake. The deposits consist of varved clay and silt, and have been described by previous investigators, as noted in Section 2.2 of this report. A sample of varved clay taken by Zoltai (1967) from Nama Creek near the southeastern boundary of the map-area contained 47 percent silt and 53 percent clay. Milne (1968) described deposits of varved clay exposed in the lower parts of the river banks along Fourbay and Nama Creeks. The varves generally range in thickness from less than ¼ inch to 1 inch and the total thickness of clay exposed rarely exceeds 10 feet.

The clay is often overlain by deposits of sand, which in some areas may reach thicknesses of 30 to 50 feet. Thus, the general stratigraphy in the lacustrine environments is sand or sandy silt overlying varved clay.

Typical terrain unit symbols are:

$$\frac{\text{mscLP}}{\text{Md-M}} \qquad \frac{\text{smLP}}{\text{Ld-D}} \qquad \frac{\text{smcLP(pOT)}}{\text{Ldu-Mh(W)}} \qquad \frac{\text{smLP/RN(RN)}}{\text{Lu-M}}$$

3.4.2 Significance:

RESOURCES: These glaciolacustrine sediments have little resource potential with respect to sand and gravel. The clay and silt may have use in the manufacture of tiles and bricks, but the high lime content of the sediments and the overlying blanket of sand detract even from this use.

Ground water resources are scarce within the silt and clay strata; however, aquifers might occur at depth beneath the clay, especially if there is a horizon of sand and gravel overlying bedrock.

GENERAL CONSTRUCTION: Because the soils have high percentages of silt and clay, construction conditions within these glaciolacustrine landforms are far from ideal. The following conditions can be expected:

1) instabilities along river banks or on man-made cuts,
2) erosion and gullying, with resultant siltation of drainage courses,
3) difficulties with earth movement operations and subsequent compaction of fills,
4) low bearing strengths for footings and foundations,
5) frost susceptible soils which could affect pavement designs and backfill operations.

WASTE DISPOSAL: Septic tile field designs must contend with impermeable soils and poor drainage conditions. These problems will be mitigated to some degree if adequate thicknesses of sand overlie the clay.

Solid waste disposal facilities will lack suitable fill materials, and care must be taken to protect surface waters from contamination.

The disposal of liquid wastes in lagoons is possible, but construction could be complicated by the existence of surface sand and poorly drained silt soils.

3.5 ALLUVIAL PLAINS AND ORGANIC TERRAIN:

3.5.1 Description:

Alluvial plains (AP) and *organic terrain* (OT) are not widespread in the map-area. Alluvial plains border all of the drainage channels, but attain a significant size on only a few of the rivers. Where they occur, the terrain is generally flat and prone to flooding, and soils are fine grained and often contain peat. Small pockets of organic terrain are found in low areas between rock outcrops. A few larger deposits can be found, particularly in the northeast corner of the area and west of Vein Lake in the central part of the area.

3.5.2 Significance:

These alluvial and organic landforms have poor engineering properties, and should be avoided by human activities. They are prone to flooding, contain soft and compressible soils, and are generally unsuitable for any type of development.

4.0 SUMMARY OF ENGINEERING SIGNIFICANCE:

The preceeding section described the characteristics of the major landform types and the engineering and resource significance of these units. Table 1 is a summary of the general engineering significance of the more common terrain units found in the area. This table is intended only as a guide to help the reader in assessing the overall significance of the map units. Site-specific work is necessary to better define actual ground conditions. Also, it must be realized that there are a number of conditions, such as drainage and slope, which are not considered in the table but which may affect the engineering significance of the various terrain units.

TABLE 1 SUMMARY OF ENGINEERING SIGNIFICANCE.

		BEDROCK	MORAINAL	GLACIOFLUVIAL		GLACIO-LACUSTRINE	ALLUVIAL	ORGANIC
		RN(tMG/R)	tMG/R(RN)	sgGO/Ltd-D	sgGE/Lr-D	mscLP/Md-M	pAP/Lp-W	pOT/Lp-W
RESOURCE POTENTIAL	Sand & Gravel	Poor	Poor	Excellent	Excellent	Poor	Poor	N/A
	Ground Water	Poor	Poor	Good	Fair	Poor	Poor	Poor
LIGHT CONSTRUCTION CONDITIONS	Excavation	Blasting	Fair	Good	Good	Fair	Poor	Poor
	Foundation	Excellent	Excellent	Good	Good	Poor	Poor	Very Poor
	Grading	Difficult	Fair	Good	Good	Poor	Poor	Very Poor
	Material Re-Use	Rock Fill	Good	Excellent	Excellent	Poor	Poor	Very Poor
WASTE DISPOSAL SUITABILITY	Septic	Very Poor	Fair	Good	Fair	Fair to Poor	Very Poor	Very Poor
	Landfill	Poor	Fair	Fair	Fair	Fair	Very Poor	Very Poor
	Lagoons	Very Poor	Fair	Fair	Fair	Fair	Very Poor	Very Poor

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In all areas where ground moraine is the dominant landform, the underlying bedrock controls the relief and the terrain is moderately undulating. Rock knobs are common, and areas of flat-lying bedrock exist beneath the thin till cover.

Typical terrain unit symbols are:

$$\frac{\text{tmMG/R(RN)}}{\text{Lu-M}} \qquad \frac{\text{tMG/RN(smLP/R)}}{\text{Mu-M}} \qquad \frac{\text{tMG/R(RN)}}{\text{Lu-M}}$$

The symbols indicate that ground moraine till occurs as a significant veneer over bedrock (tMG/R), but rock knobs (RN) are still common. The relief is low and undulating (Lu), and surface drainage is mixed (M).

3.2.2 Significance:

RESOURCES: Sand and gravel resources are scarce within this terrain unit and nothing more than small pockets of suitable materials can be expected.

Ground water resources are not expected to be significant. The moraines are generally too shallow to provide good aquifer conditions, and any water will likely be obtained from fractures in the bedrock.

GENERAL CONSTRUCTION: Because the glacial tills are bouldery and often form only a thin veneer over bedrock, there will be a number of construction problems associated with rock excavation and grading. Thus, excavations, except for very shallow ones, can be expected to intersect bedrock and zones of very bouldery soils. Because the till has a significant silt content, re-use of the materials might encounter local problems with handling and compaction, especially during wet weather conditions. Foundation conditions should be adequate for normal structures.

WASTE DISPOSAL: The bouldery nature of the overburden cover and the presence of bedrock near the surface place constraints on the siting of waste disposal facilities. Septic systems are probably feasible, but detailed site-specific investigations are required. The drift is generally not deep enough to provide a good environment for solid or liquid waste disposal.

3.3 GLACIOFLUVIAL LANDFORMS:

3.3.1 Description:

Outwash (GO) deposits occupy portions of the valleys of the Steel and Little Pic Rivers and the upper reaches of the Pic River. These valley train deposits contain sand and gravel materials of varying thicknesses. The outwash is often terraced and kettle holes are common.

The deposits along the Little Pic River and surrounding Physalis Lake in the southern and central parts of the area respectively, have low undulating relief and indications of high water tables.

In most cases, the outwash plains are not extensive, but rather are confined by the surrounding bedrock terrain. However, south of Killala Lake and bordering the Little Pic River, the outwash is more planar in aspect and a high water table is suspected. A drill hole sunk on the north shore of Prairie Lake, near the southern margin of the map-area (Erdosh 1976), indicated:

0 to 22.0 m – Sand, with occasional gravel
22.0 to 24.4 m – Clay
24.4 to 30.8 m – Medium sand
below 30.8 m – Bedrock

Typical terrain unit symbols are:

$\frac{\text{sgGO}}{\text{Ltd-D}}$ $\frac{\text{sGO,pOT(RN)}}{\text{Lu-Mh}}$ $\frac{\text{sgGO(RN)}}{\text{Lu-M}}$ $\frac{\text{sGO(pOT)}}{\text{Lu-Dh(W)}}$

In these symbols the use of a comma implies that the two landforms are of equal importance. For example, sGO,pOT represents an area where both sandy outwash and peaty organic terrain are the dominant landforms.

Eskers (GE) are found along the Steel River and southwest of Killala Lake. These two occurrences are the only major esker deposits within the map-area.

The Steel River esker is associated with a pitted or kettled outwash plain. The esker ridge is generally less than 15 m high, consists of sand and gravel, and has good drainage. The Killala Lake esker is about 8 km long, contains sand and gravel, and has associated sandy outwash deposits.

Typical symbols depicting this terrain unit are:

$\frac{\text{sgGE,sgGO(RN)}}{\text{Lkr-D}}$ $\frac{\text{sgGE}}{\text{Lr-D}}$

3.3.2 Significance:

RESOURCES: The outwash and esker landforms contain potential sand and gravel resources. Of particular significance are the esker-outwash complexes bordering Steel River and southwest of Killala Lake. Other areas of potential are associated with terrain units containing gravelly sand (sg) materials. However, in many of these landforms, there are indications of high water tables (Dh) or mixed wet and dry (M) surface drainage. These conditions could cause difficulties in the extraction of the materials. Ground water supplies may occur beneath the larger and deeper outwash landforms.

GENERAL CONSTRUCTION: The following general comments describe the construction suitability of the glaciofluvial landforms:

1) Excavations will encounter few problems, except in areas with suspected high water tables and where bedrock is close to the surface. High water tables are suspected in many of the deposits bordering the Little Pic River and south of Killala Lake.
2) Grading operations should encounter only minimal handling problems and compaction should be satisfactory.
3) Bearing capacities for normal structures should be adequate, but individual sites must be investigated in more detail.

WASTE DISPOSAL: Because of the permeable nature of these soils and the possibility of connection between ground water and surface drainage, the disposal of liquid and solid wastes within these landforms must be approached with considerable caution. Septic systems, if properly designed, should function satisfactorily. However, raised tile fields may be necessary in areas of high water tables. Detailed hydrogeological investigations are recommended prior to construction of any waste disposal facility.

3.4 GLACIOLACUSTRINE LANDFORMS:

3.4.1 Description:

Glaciolacustrine plains (LP) cover extensive areas bordering the Pic River and south of Vein Lake. The deposits consist of varved clay and silt, and have been described by previous investigators, as noted in Section 2.2 of this report. A sample of varved clay taken by Zoltai (1967) from Nama Creek near the southeastern boundary of the map-area contained 47 percent silt and 53 percent clay. Milne (1968) described deposits of varved clay exposed in the lower parts of the river banks along Fourbay and Nama Creeks. The varves generally range in thickness from less than ¼ inch to 1 inch and the total thickness of clay exposed rarely exceeds 10 feet.

The clay is often overlain by deposits of sand, which in some areas may reach thicknesses of 30 to 50 feet. Thus, the general stratigraphy in the lacustrine environments is sand or sandy silt overlying varved clay.

Typical terrain unit symbols are:

$$\frac{\text{mscLP}}{\text{Md-M}} \qquad \frac{\text{smLP}}{\text{Ld-D}} \qquad \frac{\text{smcLP(pOT)}}{\text{Ldu-Mh(W)}} \qquad \frac{\text{smLP/RN(RN)}}{\text{Lu-M}}$$

3.4.2 Significance:

RESOURCES: These glaciolacustrine sediments have little resource potential with respect to sand and gravel. The clay and silt may have use in the manufacture of tiles and bricks, but the high lime content of the sediments and the overlying blanket of sand detract even from this use.

Ground water resources are scarce within the silt and clay strata; however, aquifers might occur at depth beneath the clay, especially if there is a horizon of sand and gravel overlying bedrock.

GENERAL CONSTRUCTION: Because the soils have high percentages of silt and clay, construction conditions within these glaciolacustrine landforms are far from ideal. The following conditions can be expected:

1) instabilities along river banks or on man-made cuts,
2) erosion and gullying, with resultant siltation of drainage courses,
3) difficulties with earth movement operations and subsequent compaction of fills,
4) low bearing strengths for footings and foundations,
5) frost susceptible soils which could affect pavement designs and backfill operations.

WASTE DISPOSAL: Septic tile field designs must contend with impermeable soils and poor drainage conditions. These problems will be mitigated to some degree if adequate thicknesses of sand overlie the clay.

Solid waste disposal facilities will lack suitable fill materials, and care must be taken to protect surface waters from contamination.

The disposal of liquid wastes in lagoons is possible, but construction could be complicated by the existence of surface sand and poorly drained silt soils.

3.5 ALLUVIAL PLAINS AND ORGANIC TERRAIN:

3.5.1 Description:

Alluvial plains (AP) and *organic terrain* (OT) are not widespread in the map-area. Alluvial plains border all of the drainage channels, but attain a significant size on only a few of the rivers. Where they occur, the terrain is generally flat and prone to flooding, and soils are fine grained and often contain peat. Small pockets of organic terrain are found in low areas between rock outcrops. A few larger deposits can be found, particularly in the northeast corner of the area and west of Vein Lake in the central part of the area.

3.5.2 Significance:

These alluvial and organic landforms have poor engineering properties, and should be avoided by human activities. They are prone to flooding, contain soft and compressible soils, and are generally unsuitable for any type of development.

4.0 SUMMARY OF ENGINEERING SIGNIFICANCE:

The preceeding section described the characteristics of the major landform types and the engineering and resource significance of these units. Table 1 is a summary of the general engineering significance of the more common terrain units found in the area. This table is intended only as a guide to help the reader in assessing the overall significance of the map units. Site-specific work is necessary to better define actual ground conditions. Also, it must be realized that there are a number of conditions, such as drainage and slope, which are not considered in the table but which may affect the engineering significance of the various terrain units.

TABLE 1 SUMMARY OF ENGINEERING SIGNIFICANCE.

		BEDROCK	MORAINAL	GLACIOFLUVIAL		GLACIO-LACUSTRINE	ALLUVIAL	ORGANIC
		RN(tMG/R)	tMG/R(RN)	sgGO / Ltd-D	sgGE / Lr-D	mscLP / Md-M	pAP / Lp-W	pOT / Lp-W
RESOURCE POTENTIAL	Sand & Gravel	Poor	Poor	Excellent	Excellent	Poor	Poor	N/A
	Ground Water	Poor	Poor	Good	Fair	Poor	Poor	Poor
LIGHT CONSTRUCTION CONDITIONS	Excavation	Blasting	Fair	Good	Good	Fair	Poor	Poor
	Foundation	Excellent	Excellent	Good	Good	Poor	Poor	Very Poor
	Grading	Difficult	Fair	Good	Good	Poor	Poor	Very Poor
	Material Re-Use	Rock Fill	Good	Excellent	Excellent	Poor	Poor	Very Poor
WASTE DISPOSAL SUITABILITY	Septic	Very Poor	Fair	Good	Fair	Fair to Poor	Very Poor	Very Poor
	Landfill	Poor	Fair	Fair	Fair	Fair	Very Poor	Very Poor
	Lagoons	Very Poor	Fair	Fair	Fair	Fair	Very Poor	Very Poor

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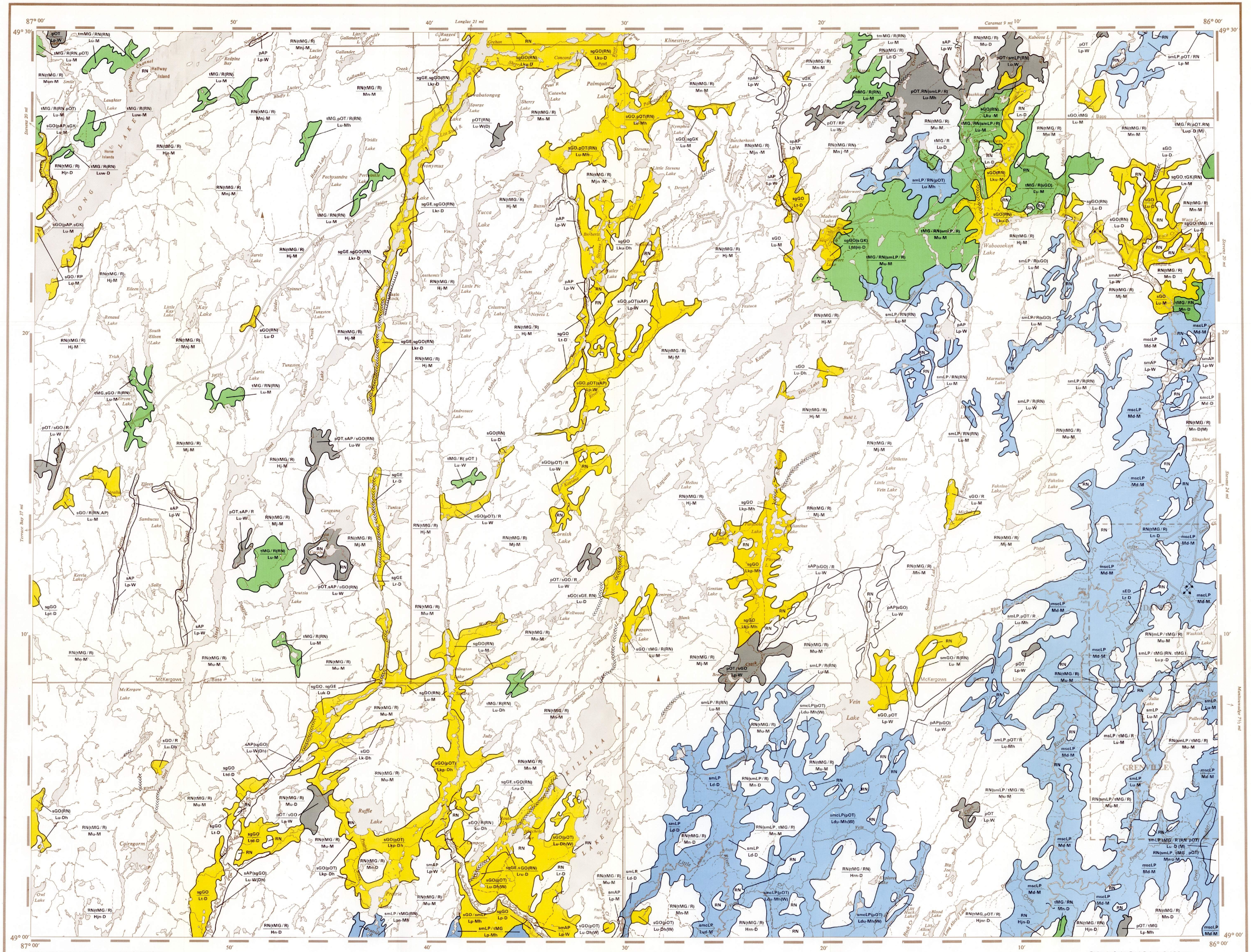

Published 1980. Base Map derived from 1 inch to 2 miles Provincial Series, Surveys and Mapping Branch, Ministry of Natural Resources.

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Ontario Ministry of Natural Resources

Hon. James A. C. Auld, Minister

Dr. J. K. Reynolds, Deputy Minister

Ontario Geological Survey

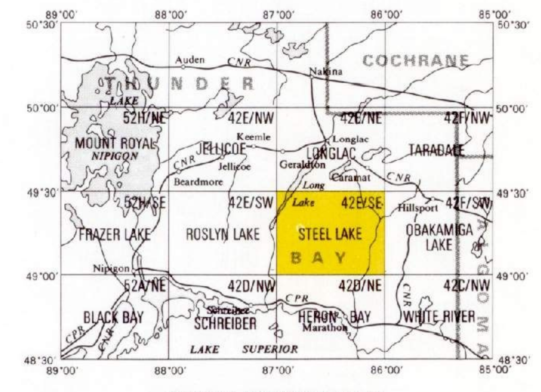
Map 5080

STEEL LAKE

NTS 42 E/SE

Data Base Map

Northern Ontario Engineering Geology Terrain Study



INDEX TO ADJOINING SHEETS

1:100 000

2 1 0 2 4 6

One centimetre represents one kilometre

LEGEND

LANDFORM

MORAINAL

- **ME** *End moraine*
- **MG** *Ground moraine*
- **MH** *Hummocky moraine*

GLACIOFLUVIAL

- **GD** *Ice contact delta, esker delta, kame delta, delta moraine*
- **GE** *Esker, esker complex, crevasse filling*
- **GK** *Kame, kame field, kame terrace, kame moraine*
- **GO** *Outwash plain, valley train*

GLACIOLACUSTRINE

- **LB** *Raised (abandoned) beach form*
- **LD** *Glaciolacustrine delta*
- **LP** *Glaciolacustrine plain*

ALLUVIAL

- **AP** *Alluvial plain*

COLLUVIAL

- **CS** *Slope failure*
- **CT** *Talus pile*
- **CW** *Slopewash and debris creep sheet; minor talus*

EOLIAN

- **ED** *Sand dunes*

ORGANIC

- **OT** *Organic terrain*

BEDROCK

- **RL** *Bedrock plateau*
- **RN** *Bedrock knob*
- **RP** *Bedrock plain*
- **RR** *Bedrock ridge*
- **/R** *Bedrock below a drift veneer*

MATERIAL

- **b** *boulders, bouldery*
- **c** *clay, clayey*
- **g** *gravel, gravelly*
- **p** *peat, muck*
- **r** *rubble*
- **s** *sand, sandy*
- **m** *silt, silty*
- **t** *till*

TOPOGRAPHY

LOCAL RELIEF

- **H** *Mainly high local relief*
- **M** *Mainly moderate local relief*
- **L** *Mainly low local relief*

VARIETY

- **c** *channelled*
- **d** *dissected, gullied*
- **j** *jagged, rugged, cliffed*
- **j*** *cliffed volcanic rock signature*
- **k** *kettled, pitted*
- **n** *knobby, hummocky*
- **p** *plain*
- **r** *ridged*
- **s** *sloping*
- **t** *terraced*
- **u** *undulating to rolling*
- **w** *washed, reworked*

DRAINAGE

SURFACE CONDITION

- **W** *Wet*
- **D** *Dry*
- **M** *Mixed wet and dry*
- **h** *Suspected high water table*

The letter codes describing the terrain units are made up of four components arranged as follows:–

MATERIAL	LANDFORM
TOPOGRAPHY	DRAINAGE

Examples:

1. **tMG(RN)** / **Mu(Hj)-D** — material; dominant landform; subordinate landform; drainage; relief of subordinate landform; topographic variety of dominant landform; local relief

2. **pOT/sGO** / **Lp-W** — slash indicates a veneer of one landform overlying a second landform

SYMBOLS

- *Significant end moraine or linear moraine-like feature*
- *Well expressed drumlins and drumlinoid ridges*
- *All other linear ice-flow features*
- *Esker ridge (continuous, discontinuous; the symbol does not indicate direction of flow)*
- *Abandoned shoreline (continuous, discontinuous)*
- *Local dune area (type and location of individual dunes not indicated)*
- *Abandoned river channel, spillway, or ice marginal channels*
- *Escarpment*
- ●10 *Sample location*
- *Small landslide scar*
- *Sand or gravel pit*
- *Quarry or mine workings evident from airphotos or field observation (crossed picks are shown in the area of open excavation)*
- *Other man-made features (rock dumps, tailings, lagoons, landfills, etc.: type of feature mentioned where identifiable)*
- *Steep-walled valleys, often bedrock-controlled features*
- *Talus (defined, inferred; base of talus triangle indicates downslope side of escarpment)*
- *Line joining the same terrain units*

NOTE 1:

This map is intended to be an inventory of regional engineering terrain conditions, as determined largely by airphoto interpretation. Its purpose is to provide a guide for engineering and resource planning functions. The boundaries of the terrain units shown on the map are approximate only, consistent with a 1:100 000 scale. Site specific investigations are required in order to obtain detailed information for a particular area. The map user should refer to the accompanying report for a fuller description of terrain in the study area.

NOTE 2:

Colour is used to enhance what is considered to be the dominant engineering condition in simple, complex or layered terrain units.

NOTE 3:

Not all letter and graphic symbols shown in the legend necessarily appear on this map sheet.

Reference to this map is recommended as follows:

Gartner J. F.
1980: Northern Ontario Engineering Geology Terrain Study, Data Base Map, Steel Lake
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