

THESE TERMS GOVERN YOUR USE OF THIS DOCUMENT

Your use of this Ontario Geological Survey document (the “Content”) is governed by the terms set out on this page (“Terms of Use”). By downloading this Content, you (the “User”) have accepted, and have agreed to be bound by, the Terms of Use.

Content: This Content is offered by the Province of Ontario’s *Ministry of Northern Development and Mines* (MNDM) as a public service, on an “as-is” basis. Recommendations and statements of opinion expressed in the Content are those of the author or authors and are not to be construed as statement of government policy. You are solely responsible for your use of the Content. You should not rely on the Content for legal advice nor as authoritative in your particular circumstances. Users should verify the accuracy and applicability of any Content before acting on it. MNDM does not guarantee, or make any warranty express or implied, that the Content is current, accurate, complete or reliable. MNDM is not responsible for any damage however caused, which results, directly or indirectly, from your use of the Content. MNDM assumes no legal liability or responsibility for the Content whatsoever.

Links to Other Web Sites: This Content may contain links, to Web sites that are not operated by MNDM. Linked Web sites may not be available in French. MNDM neither endorses nor assumes any responsibility for the safety, accuracy or availability of linked Web sites or the information contained on them. The linked Web sites, their operation and content are the responsibility of the person or entity for which they were created or maintained (the “Owner”). Both your use of a linked Web site, and your right to use or reproduce information or materials from a linked Web site, are subject to the terms of use governing that particular Web site. Any comments or inquiries regarding a linked Web site must be directed to its Owner.

Copyright: Canadian and international intellectual property laws protect the Content. Unless otherwise indicated, copyright is held by the Queen’s Printer for Ontario.

It is recommended that reference to the Content be made in the following form: <Author’s last name>, <Initials> <year of publication>. <Content title>; Ontario Geological Survey, <Content publication series and number>, <total number of pages>p.

Use and Reproduction of Content: The Content may be used and reproduced only in accordance with applicable intellectual property laws. *Non-commercial* use of unsubstantial excerpts of the Content is permitted provided that appropriate credit is given and Crown copyright is acknowledged. Any substantial reproduction of the Content or any *commercial* use of all or part of the Content is prohibited without the prior written permission of MNDM. Substantial reproduction includes the reproduction of any illustration or figure, such as, but not limited to graphs, charts and maps. Commercial use includes commercial distribution of the Content, the reproduction of multiple copies of the Content for any purpose whether or not commercial, use of the Content in commercial publications, and the creation of value-added products using the Content.

Contact:

FOR FURTHER INFORMATION ON	PLEASE CONTACT:	BY TELEPHONE:	BY E-MAIL:
The Reproduction of Content	MNDM Publication Services	Local: (705) 670-5691 Toll Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales@ndm.gov.on.ca
The Purchase of MNDM Publications	MNDM Publication Sales	Local: (705) 670-5691 Toll Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales@ndm.gov.on.ca
Crown Copyright	Queen’s Printer	Local: (416) 326-2678 Toll Free: 1-800-668-9938 (inside Canada, United States)	Copyright@gov.on.ca

LES CONDITIONS CI-DESSOUS RÉGISSENT L'UTILISATION DU PRÉSENT DOCUMENT.

Votre utilisation de ce document de la Commission géologique de l'Ontario (le « contenu ») est régie par les conditions décrites sur cette page (« conditions d'utilisation »). En téléchargeant ce contenu, vous (l'« utilisateur ») signifiez que vous avez accepté d'être lié par les présentes conditions d'utilisation.

Contenu : Ce contenu est offert en l'état comme service public par le *ministère du Développement du Nord et des Mines* (MDNM) de la province de l'Ontario. Les recommandations et les opinions exprimées dans le contenu sont celles de l'auteur ou des auteurs et ne doivent pas être interprétées comme des énoncés officiels de politique gouvernementale. Vous êtes entièrement responsable de l'utilisation que vous en faites. Le contenu ne constitue pas une source fiable de conseils juridiques et ne peut en aucun cas faire autorité dans votre situation particulière. Les utilisateurs sont tenus de vérifier l'exactitude et l'applicabilité de tout contenu avant de l'utiliser. Le MDNM n'offre aucune garantie expresse ou implicite relativement à la mise à jour, à l'exactitude, à l'intégralité ou à la fiabilité du contenu. Le MDNM ne peut être tenu responsable de tout dommage, quelle qu'en soit la cause, résultant directement ou indirectement de l'utilisation du contenu. Le MDNM n'assume aucune responsabilité légale de quelque nature que ce soit en ce qui a trait au contenu.

Liens vers d'autres sites Web : Ce contenu peut comporter des liens vers des sites Web qui ne sont pas exploités par le MDNM. Certains de ces sites pourraient ne pas être offerts en français. Le MDNM se dégage de toute responsabilité quant à la sûreté, à l'exactitude ou à la disponibilité des sites Web ainsi reliés ou à l'information qu'ils contiennent. La responsabilité des sites Web ainsi reliés, de leur exploitation et de leur contenu incombe à la personne ou à l'entité pour lesquelles ils ont été créés ou sont entretenus (le « propriétaire »). Votre utilisation de ces sites Web ainsi que votre droit d'utiliser ou de reproduire leur contenu sont assujettis aux conditions d'utilisation propres à chacun de ces sites. Tout commentaire ou toute question concernant l'un de ces sites doivent être adressés au propriétaire du site.

Droits d'auteur : Le contenu est protégé par les lois canadiennes et internationales sur la propriété intellectuelle. Sauf indication contraire, les droits d'auteurs appartiennent à l'Imprimeur de la Reine pour l'Ontario.

Nous recommandons de faire paraître ainsi toute référence au contenu : nom de famille de l'auteur, initiales, année de publication, titre du document, Commission géologique de l'Ontario, série et numéro de publication, nombre de pages.

Utilisation et reproduction du contenu : Le contenu ne peut être utilisé et reproduit qu'en conformité avec les lois sur la propriété intellectuelle applicables. L'utilisation de courts extraits du contenu à des fins *non commerciales* est autorisée, à condition de faire une mention de source appropriée reconnaissant les droits d'auteurs de la Couronne. Toute reproduction importante du contenu ou toute utilisation, en tout ou en partie, du contenu à des fins *commerciales* est interdite sans l'autorisation écrite préalable du MDNM. Une reproduction jugée importante comprend la reproduction de toute illustration ou figure comme les graphiques, les diagrammes, les cartes, etc. L'utilisation commerciale comprend la distribution du contenu à des fins commerciales, la reproduction de copies multiples du contenu à des fins commerciales ou non, l'utilisation du contenu dans des publications commerciales et la création de produits à valeur ajoutée à l'aide du contenu.

Renseignements :

POUR PLUS DE RENSEIGNEMENTS SUR	VEUILLEZ VOUS ADRESSER À :	PAR TÉLÉPHONE :	PAR COURRIEL :
la reproduction du contenu	Services de publication du MDNM	Local : (705) 670-5691 Numéro sans frais : 1 888 415-9845, poste 5691 (au Canada et aux États-Unis)	Pubsales@ndm.gov.on.ca
l'achat des publications du MDNM	Vente de publications du MDNM	Local : (705) 670-5691 Numéro sans frais : 1 888 415-9845, poste 5691 (au Canada et aux États-Unis)	Pubsales@ndm.gov.on.ca
les droits d'auteurs de la Couronne	Imprimeur de la Reine	Local : 416 326-2678 Numéro sans frais : 1 800 668-9938 (au Canada et aux États-Unis)	Copyright@gov.on.ca



ONTARIO
DEPARTMENT OF MINES
AND NORTHERN AFFAIRS

HONOURABLE LEO BERNIER, *Minister*

D.P. DOUGLASS, *Deputy Minister*

E.G. PYE, *Director, Geological Branch*

Geology
of the
Black Sturgeon River Area
District of Thunder Bay

By

M.E. Coates

Geological Report 98

TORONTO
1972

**Publications of the Ontario Department of Mines and Northern Affairs
and price list
are obtainable through the
Publications Office, Ontario Department of Mines and Northern Affairs
Parliament Buildings, Queen's Park, Toronto, Ontario
and
The Ontario Government Bookstore
880 Bay Street, Toronto, Ontario.**

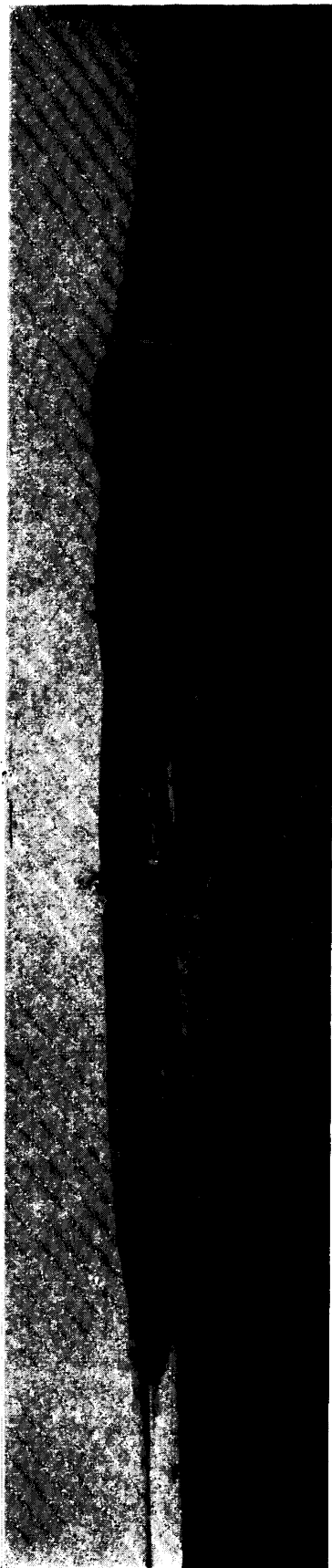
**Orders for publications should be accompanied by cheque,
or money order, payable to Treasurer of Ontario.**

Parts of this publication may be quoted if credit is given to the Ontario Department of Mines and Northern Affairs. It is recommended that reference to this report be made in the following form:

Coates, M. E.

1972: Geology of the Black Sturgeon River Area, District of Thunder Bay; Ontario Dept. Mines and Northern Affairs, GR 98, 41p. Accompanied by Maps 2233, 2234, 2235, 2236, scale 1 inch to 1 mile.

1,000-685-1971b



Frontisplece—Panoramic view of the Black Sturgeon Fault Escarpment.

CONTENTS

	PAGE
Abstract	vii
Introduction	1
Acknowledgments	2
Means of Access	2
Previous Geological Work	2
Geophysics	3
Topography and Drainage	3
Resources	3
General Geology	5
Table of Lithologic Units	6
Archean	5
Metavolcanics	5
Metasediments	5
Iron Formation	7
Hybrid Rocks	8
Migmatites	8
Felsic Igneous and Metamorphic Rocks	9
Granitic Rocks	9
Proterozoic	9
Keweenawan	9
Sibley Group	9
Basal Conglomerate (5a)	10
Sibley Sandstone (5b)	12
Red Sandstone and Siltstone (5c)	12
Mudstone and Shale (5d)	12
Cryptozoon Limestone (5e)	13
Disraeli Lake	14
Spruce River	14
Shillabeer Lake	15
Abigogami Lake	15
Sturgeon Escarpment	15
Wolfpup Lake	15
Eileen Lake	15
Stewart Lake	15
Starnes Lake	16
Red Rock Gravel Pit	16
Kama Hills	16
Summary	16
Calcareous Mudstone, Limestone, and Dolomite (5f)	16
Geochemistry of the Sibley Group	17
Sample Descriptions For Tables 3 and 4	18
Intrusive Igneous Rocks	22
Diabase	22
Structural Geology	22
Faulting	23
Economic Geology	26
Copper	26
Description of Properties	27
Algoma Steel Corporation Limited, The (5)	27
Commerce Nickel Mines Limited (6)	27
Falconbridge Nickel Mines Limited (7)	28
McAteer, William, Gilbert, Weldon P. (9)	29
Phelps Dodge Corporation of Canada Limited (11, 12)	29
Ranta, Walley, Option (11)	29
Sturge Lake Group (12)	30
Iron	30
Description of Properties and Occurrences	31
Gresky Magnetite Occurrence (8)	31
Minoletti Occurrence (10)	31
Sturgeon Escarpment Occurrence (1, 4)	32
Territory Mining Company Limited [1959] (2)	32
West Shore Occurrence (3)	32
Uranium	33
Description of Occurrence	33
Hele Township Occurrence (14)	33

	PAGE
Industrial Minerals	35
Marl	35
Description of Occurrence	35
Gresky Marl Occurrence (13)	35
Gravel	37
Selected References	38
Index	40

Tables

1-Table of Lithologic Units	5
2-Analyses of argillaceous dolomitic rocks	17
3-Oxide content of Sibley Group rocks	18
4-Trace element content of Sibley Group rocks	19
5-Mineral composition of diabase sills	21
6-Chemical analysis of Fog (Eagle) Mountain sill	21
7-Ages of several Keweenawan diabase bodies	23
8-Assessment work data	26
9-Analysis of sample from McAteer-Gilbert property	29
10-Analyses of Phelps Dodge drill core	30
11-Drill log, Minoletti occurrence	31
12-Analysis of magnetite sand	33
13-Analyses of magnetite sand	33
14-Analyses of marl from Gresky property	36
15-Analyses of Shillabeer Creek Marl deposit	37

Figures

1-Key map showing location of the Black Sturgeon River area	vii
2-Locations and numbers of airborne magnetic survey sheets	4
3a-Cross-section, northern part	Chart A, back pocket
3b-Cross-section, southern part	Chart A, back pocket
4-Stratigraphic sections	11
5-Locations of diabase samples	20
6-Marl deposit	34

Photographs

Frontispiece-Panoramic view of the Black Sturgeon Fault Escarpment	iv
1-Andalusite schist	7
2-Iron formation	8
3-Stromatolites in plan	13
4-Stromatolites in longitudinal section	14
5-Aerial photo of Black Sturgeon Trench and River	24
6-Aerial photo of Black Sturgeon Trench and River	25
7-Packsack drilling	28

Geological Maps

Back Pocket

- Map 2233 (coloured)-Black Sturgeon Lake Sheet, Thunder Bay District. Scale, 1 inch to 1 mile.
 Map 2234 (coloured)-Frazer Lake Sheet, Thunder Bay District. Scale, 1 inch to 1 mile.
 Map 2235 (coloured)-Disraeli Lake Sheet, Thunder Bay District. Scale, 1 inch to 1 mile.
 Map 2236 (coloured)-Shillabeer Creek Sheet, Thunder Bay District. Scale, 1 inch to 1 mile.

ABSTRACT

This report describes the stratigraphy, structure, and economic geology of the Black Sturgeon River area northwest of Nipigon, Ontario. Reconnaissance mapping was carried out during the summer of 1967.

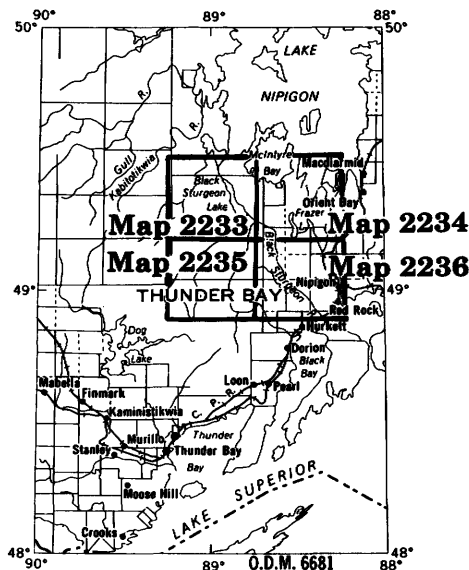


Figure 1—Key map showing location of the Black Sturgeon River area. Scale, 1 inch to 50 miles.

The oldest Precambrian rocks are Keewatin(?) metavolcanics and metasediments. These were intruded by and included in granitic rocks. Subsequently, the region was reduced to a mammillated peneplane.

Sedimentation, with progressive northern onlap, commenced again in the Proterozoic with the deposition of the Sibley Group rocks. Thin lenses of conglomerate were deposited in local depressions on the peneplane. Quartz sandstones, ferruginous siltstones, mudstones, dolomites, and cryptozoon limestones, apparently derived from a source area to the north, accumulated in shallow water.

Folding, supratenuous and superficial, is common throughout the area underlain by Sibley Group sedimentary rocks. Instability of the basin floor is also evident from the abundance of coarse mudstone breccia in the area west of the Black Sturgeon River. This instability culminated in the Keweenaw intrusive event during which dikes and sills of diabase were emplaced along fractures, bedding planes, and the basal unconformity surface. This diabase is the youngest Precambrian rock-type exposed.

Graben-style faulting, along the Black Sturgeon Fault Zone and other sympathetic structures, resulted in the depression of the Black Sturgeon Basin area and an accompanying prism of Sibley Group sedimentary rocks.

Glaciation in Pleistocene time removed residual soils and deposited till and gravel over much of the area.

Most of the area has been briefly prospected. Diamond drilling has been done on copper prospects in the vicinity of Disraeli Lake and at an iron occurrence east of Black Sturgeon Lake. Explorations have been severely impeded by extensive overburden and the presence of diabase sheets that mask the older underlying rocks. Deposits of marl and placer ilmenite-magnetite, which occur in the area, have not been sufficiently tested to permit an accurate assessment of their worth.

Geology
of the
Black Sturgeon River Area
District of Thunder Bay

By
M. E. Coates¹

INTRODUCTION

During the 1967 field season an Ontario Department of Mines Field Party carried out reconnaissance geological mapping in the Black Sturgeon River area. The area mapped is bounded by Latitudes $48^{\circ}52'30''$ and $49^{\circ}30'$, by Longitudes $88^{\circ}20'$ and $89^{\circ}15'$ and covers about 1,950 square miles (in the northeast the mapping continued to Longitude $88^{\circ}15'$). The map-area includes the townships of Innes, Graydon, Adamson, Cockeram, McMaster, McIvor, Church, Hele, and parts of Glen, Stirling, Nipigon, Booth, and Purdom.

The southern area-boundary is approximately 30 miles north of Thunder Bay and can be reached from that city via Highway 800.

The Trans-Canada Highway, Highway 11-17, crosses the southeastern corner of the Black Sturgeon River area. An all-weather gravel road originating at Hurkett, on the Trans-Canada Highway, leads northwards through the centre of the area surveyed. This trunk road, with its numerous branches, provides excellent access to the middle and western parts. The best access to the country near the eastern boundary is from Nipigon via Highway 585, which leads northwards to Pine Portage on Lake Nipigon.

Mapping was done by running pace-and-compass traverses to outcrop areas interpreted by stereographic examination of air photographs at a scale of 1 inch to $\frac{1}{4}$ mile. Mapping and sample locations were marked directly on the air photographs and later transferred to cronaflex base maps prepared by the Cartography Section of the Ontario Department of Mines and Northern Affairs from maps from the Silviculture Section, Timber Branch, Ontario Department of Lands and Forests. Wherever possible, stream channels were traversed as the best rock exposures are found along them. A light 'bush-bike' with trail-gear was used to map isolated outcrops in areas serviced by tote-roads that are no longer passable by 4-wheel-drive vehicles.

¹ Postgraduate student, McGill University, Montreal, 1967. Accepted for publication by the Chief Geologist, 20 August 1969.

Black Sturgeon River Area

ACKNOWLEDGMENTS

The author was assisted in the field by J. R. Trusler, David Muscalo, J. R. DeGrace, A. W. Chalk, G. A. Sugar, D. A. Allen, J. C. Holzschuh and R. E. A. Peterson were present for parts of the season. As senior assistants, Messrs. Trusler, Muscalo, and DeGrace conducted independent survey work. Mr. DeGrace was responsible for much of the drafting.

The Abitibi Paper Company Limited assisted by providing billets in their camp at Cameron Falls (east of the map-area) during the early parts of the season.

The author is indebted to M. E. Holt, Phelps Dodge Corporation of Canada Limited, who supplied much additional information on the Disraeli Lake area.

Clarence Kustra, Resident Geologist, Ontario Department of Mines and Northern Affairs, Port Arthur (Thunder Bay), helped the author on many occasions during the course of the field work.

Much valuable reference information, on the Thunder Bay area in general, was provided by Dr. E. G. Pye, Chief Geologist, Ontario Department of Mines and Northern Affairs.

Discussions with Jim Franklin of the Geological Survey of Canada were of much help to the author. His assistance is gratefully acknowledged.

MEANS OF ACCESS

Much of the area is accessible by road, using a 4-wheel-drive vehicle. Some of the branch roads are in poor repair, with bridges washed out and some sections flooded. The areas that have been worked over by the pulp and paper companies are serviced by networks of tote-roads that are accessible by bush-bike in summer and snowmobile in winter.

The least accessible area is in the northwest, near Poshkokagan Lake (west of the map-area). However, Circle Lake, Little Poshkokagan Lake, and Poshkokagan Lake are large enough for landing float-equipped aircraft.

Most of the water courses in the area, excepting the Black Sturgeon River, are too shallow and rocky to be navigable by canoe.

PREVIOUS GEOLOGICAL WORK

The first work in the area was by Robert Bell in 1869. At the time he was conducting a survey of the shores of Lake Nipigon and the valleys of the principal streams draining into it. His work described the geology and distribution of the more important formations (Bell 1870). William McInnes and D. B. Dowling (McInnes 1896) from the Geological Survey of Canada office, surveyed the shores of Lake Nipigon. In 1901, W. A. Parks explored some of the southeastern parts of the area (Parks 1901). A. P. Coleman (1909) explored the iron occurrences on claims east of Black Sturgeon Lake. A. W. G. Wilson (1910) described the results of his work in the area and cited the works of previous investigators.

T. O. Tanton (1931) mapped the areas to the south in detail and established stratigraphic relationships between the members of the Sibley Group. His detailed descriptions remain the best reference petrography of the various rock-types present in the Sibley Group.

GEOPHYSICS

The Black Sturgeon River area has been covered by airborne magnetic surveys carried out jointly by the Ontario Department of Mines and the Geological Survey of Canada (ODM-GSC 1962a,b,c,d,e,f,g,h, and i). The maps are published at a scale of 1 inch to 1 mile. The locations and index numbers of the various map sheets are shown in Figure 2.

Regional anomalies trending northeast correspond to layers of iron formation in the Archean metasedimentary or migmatitic basement rocks. In areas underlain by diabase, results in many places are difficult to interpret. This is possibly a consequence of a combination of factors including topography, overburden, and irregular thickness and outline of the diabase sheets.

TOPOGRAPHY AND DRAINAGE

The Black Sturgeon Basin area contains numerous large lakes, the largest of which is Black Sturgeon Lake. The terrain in the basin area is characterized by low rolling hills, usually thickly wooded, with few bedrock exposures. The country east of the Black Sturgeon River is several hundred feet higher and has many more outcrops. The characteristic land form in the higher country is the mesa or cuesta, formed by brittle layers of diabase that form protective caps over the less resistant sedimentary rocks.

The western parts of the map-area are drained by northeast-flowing streams that flow into the Black Sturgeon River, which empties into Lake Superior. The Black Sturgeon River also receives waters of shorter streams that flow into it from the northeast.

The drainage from the eastern parts of the map-area empties into Lake Superior via the Nipigon River.

RESOURCES

The swampy or overburden covered areas sustain a growth of spruce and jack pine suitable for pulpwood. Currently there are two pulp and paper companies operating in the region; Abitibi Paper Company Limited and The Great Lakes Paper Company Limited, operating from camps situated on Highway 800 and the Hurkett to Armstrong Road. Much of the country has already been cut over as logging has been carried on in the district since the turn of the century.

Streams in the area are famous for trophy trout fishing. The lakes contain pickerel, pike, trout, and whitefish.

Numerous moose, deer, and some foxes were seen in the area.

Black Sturgeon River Area

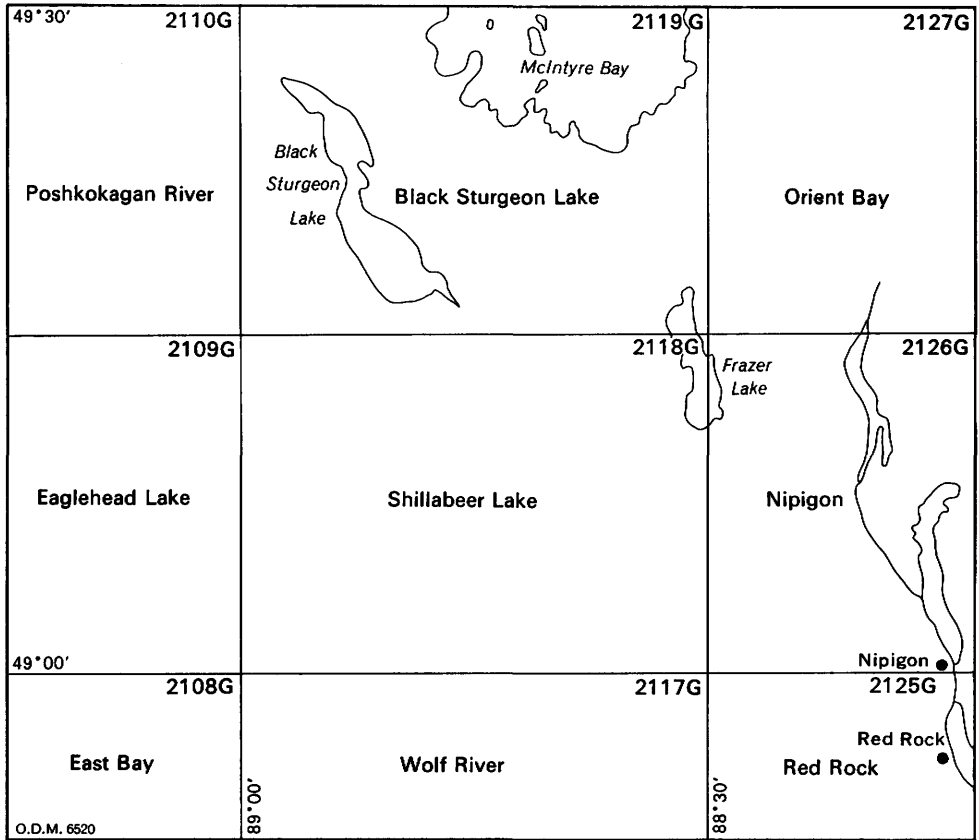


Figure 2—Sketch map showing locations and index numbers of airborne magnetic survey sheets covering the Black Sturgeon River area.

GENERAL GEOLOGY

The bedrock in the area is of Precambrian age. It is covered in most places by a thin veneer of gravel, till, and recent swamp deposits. The oldest rocks in the area are steeply-dipping clastic sedimentary and volcanic rocks. They have been regionally metamorphosed to intermediate grades, highly deformed, and intruded by granite. This complex is unconformably overlain by unmetamorphosed, flat-lying sedimentary rocks of the Sibley Group. Keweenawan diabase sills are found intercalated with Sibley sedimentary rocks and along the unconformity surface at the base of the Sibley Group.

ARCHEAN

The rocks of the Archean basement in the Black Sturgeon River area are dominantly migmatitic in nature. Within this granitized complex, screens, septa, and pendants of metasedimentary and metavolcanic rocks are preserved. Metamorphism in these remnant bodies is of low to intermediate grades and the boundary zones, where the granitic complex infringes on the older rocks, are marked by occurrences of hybrid granitic gneisses. These rocks have been intruded by stocks of granite and quartz monzonite, which appear to be late-tectonic in age.

Metavolcanics

Three areas of metavolcanics were mapped in the Black Sturgeon River area. They occur 1 mile northwest of Eaglehead Lake, 2 miles north of Mawn Lake, and immediately northeast of the southern end of Black Sturgeon Lake.

The volcanic rocks are intermediate to mafic in composition. They usually are medium to dark grey-green chlorite- or hornblende-rich rocks with a well developed foliation. Small amounts of garnet and pyrite are found locally. At several localities, notably northeast of Black Sturgeon Lake, layers of metasediments and iron formation are found intercalated with the metavolcanics.

Metasediments

Metasedimentary rocks occur in association with metavolcanics north of Eaglehead and Mawn Lakes and northeast of Black Sturgeon Lake. The largest body, over 7 miles wide, outcrops on the fault escarpment east of Nonwatin and Eskwanonwatin Lakes and extends eastward as far as Elizabeth Lake.

The dominant rock-type is a greywacke-type, biotite-quartz-feldspar gneiss. These metasediments are medium grey, fine- to medium-grained and poorly bedded. Biotite usually forms 20 to 25 percent of the rock, quartz 25 to 30 percent, and feldspar the remainder. Garnets and zircon are present in minor to trace amounts. Though massive varieties are present, the metasediments usually have a moderately well developed foliation.

Black Sturgeon River Area

Table 1

TABLE OF LITHOLOGIC UNITS FOR THE BLACK STURGEON RIVER AREA.

CENOZOIC

RECENT

Swamp and stream deposits

PLEISTOCENE

Glacial drift, gravel, sand, silt, and clay

Unconformity

PRECAMBRIAN

PROTEROZOIC

KEWEENAWAN

INTRUSIVE IGNEOUS ROCKS

Diabase sills and dikes

Intrusive Contact

SIBLEY GROUP

Conglomerate, sandstone, siltstone, mudstone, shale, limestone, dolomite

Unconformity

ARCHEAN

FELSIC IGNEOUS AND METAMORPHIC ROCKS

Albite granite, muscovite-biotite-albite granite, quartz monzonite, quartz diorite, hornblende granite gneiss, pegmatite

HYBRID ROCKS

Migmatite

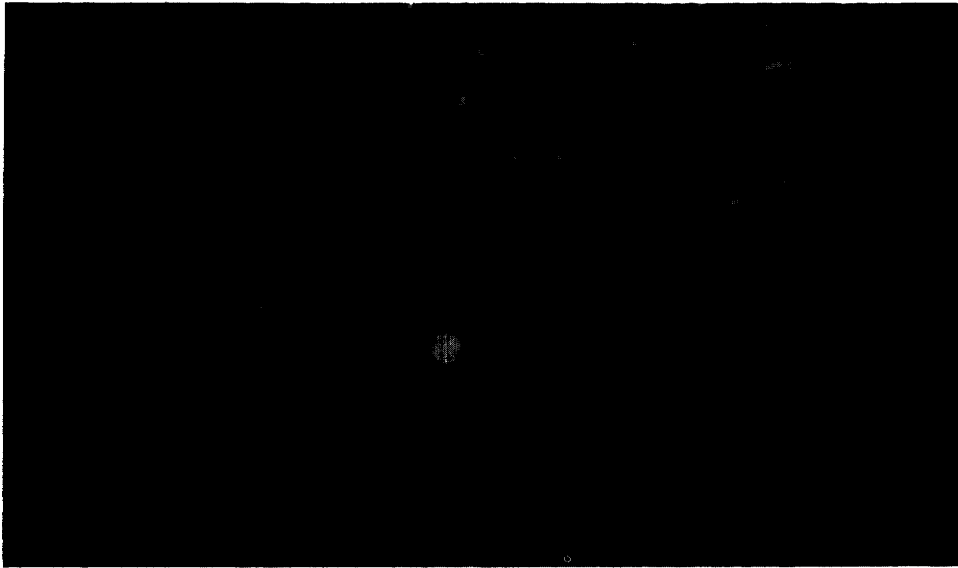
Intrusive Contact

METASEDIMENTS

Biotite-quartz-feldspar gneisses and schists, greywacke, andalusite-biotite-quartz-feldspar gneiss, hornblende-biotite-quartz-feldspar gneiss, iron formation

METAVOLCANICS

Mafic to intermediate metavolcanics, hornblende and chlorite schists, meta-sediments, iron formation



ODM 8570

Photo 1—Andalusite schist; roadside outcrop east of Eskwanonwatin Lake.

The most unusual variety of metasediment occurs in the body east of Eskwanonwatin Lake and is characterized by layers rich in metacrysts of andalusite. Andalusite crystals, which make up almost 10 percent of the rock in places, are euhedral to anhedral in form and preferentially concentrated in parallel layers which presumably reflect original alumina-rich beds (see Photo 1). The crystals are strongly poikiloblastic and usually are enclosed in a thin corona of muscovite and biotite.

West of Stucco Lake, north of Mawn Lake, metagreywacke with cobbles of 'greenstone' and granite is found. In the metasediments to the south many lithic fragments up to $\frac{1}{2}$ inch across are found. Graded bedding is common in the metasediments north of Mawn Lake.

Iron Formation

Small bodies of quartz-magnetite iron formation are found at various levels within the volcanic-sedimentary sequence. No body of any appreciable size was seen during the present survey.

On the northwestern shore of Mawn Lake iron formation occurs within a body of biotite-quartz-feldspar gneiss. Highly contorted magnetite-rich layers 2 inches to 8 inches thick alternate with magnetite-poor layers 1 foot to 4 feet in thickness. The magnetite-rich layers contain approximately 25 percent magnetite (see Photo 2).

Northeast of Black Sturgeon Lake narrow bands of Mawn Lake-type iron formation occur within the metasediments. Immediately to the north, along the roadside, outcrops of hybrid granitic rocks (hornblende granite gneiss) contain

Black Sturgeon River Area



ODM 8571

Photo 2—A thin layer of iron formation; near Minoletti occurrence (10), Mawn Lake.

screens of metamorphosed iron formation, which is rich in dark green amphibole and garnet. This variety contains 15 to 20 percent magnetite. All occurrences seen were small.

Iron formation associated with the volcanic-sedimentary sequence give rise to pronounced anomalies on Aeromagnetic Maps of the area (ODM-GSC 1962a,b,c, d,e,f,g,h, and i). The general trends of the major anomalies are shown on the accompanying geological maps (Maps 2233, 2234, 2235, and 2236, back pocket). These trends may be used to predict areas of metasedimentary subcrop in areas overlain by diabase or overburden.

Hybrid Rocks

MIGMATITE

In this report *migmatite* refers to the mixed metasedimentary or metavolcanic and granitic rocks of the injection complex. The complex is characterized by *lit-par-lit* injection of granitic material along bedding or schistosity planes in the older rocks or by the presence of abundant inclusions of these older rocks within the granite bodies. Wherever possible, at the scale of mapping, relatively uncontaminated zones of metasediments and metavolcanics have been shown as discrete units. Many other remnants have been included in the migmatite unit as they were not of mappable size.

Areas underlain by relatively uncontaminated granite have been mapped separately as such. Narrow zones of angular injection breccia or *agmatite* occur

near the contacts of some of the granitic stocks; these zones are too small to show at map-scale.

Felsic Igneous and Metamorphic Rocks

GRANITIC ROCKS

Two main types of granitic rocks were seen in the Black Sturgeon River area:

- (1) White to pale pink albite granite and biotite-muscovite-albite granite gradational to quartz monzonite.
- (2) Pink biotite quartz monzonite.

The rocks of type (1) are medium to coarse grained and occur with their related pegmatites as stratiform intrusions in the migmatite complex. Rocks of type (2) are uniformly medium grained and occur as stocks discordantly intruding the earlier migmatitic rocks. Contact zones are marked by narrow zones of *agmatite* or injection breccia.

Two miles east of the southern tip of Black Sturgeon Lake, white, medium- to coarse-grained granitic rocks form the rim of the Black Sturgeon Fault Escarpment. These rocks are almost devoid of mafic minerals, being composed of plagioclase (An_{35-40}) and approximately 25 to 30 percent quartz. This rock-type is shown on the map-face as quartz diorite.

At or near the contact zones with the volcanic-sedimentary remnants, grey, hybrid gneissic rocks with a mafic mineral content of 25 to 30 percent occur as a boundary rock-type. Grain-size is uniformly medium with the mafic minerals gathered in small augen. Mafic minerals are green hornblende and subordinate biotite; quartz makes up approximately 15 to 20 percent of the rock and the remainder is plagioclase (An_{25-30}).

PROTEROZOIC

Keweenawan

SIBLEY GROUP

The Sibley Group, in the Black Sturgeon River area, directly overlies the rocks of the Archean basement. It has been previously noted that the remnants have been preserved through crustal subsidence in the Lake Nipigon and Lake Superior areas (Moorhouse 1957). The group is largely composed of clastic sedimentary rocks with minor limestone and dolomite. The sedimentary rocks have been intruded by dikes, sills, and laccoliths of diabase. Extensive erosion has unroofed many of the intrusive bodies. At many locations tabular diabase forms a brittle cap sheathing the less resistant sedimentary rocks. High mesas and plateaus are characteristic of the areas underlain by diabase. Sibley rocks are best observed either at cliff-faces below the diabase cover or along stream channels.

Black Sturgeon River Area

The area underlain by Sibley rocks is roughly oval in shape, approximately 15 by 25 miles in dimensions and is bounded on the east by the Black Sturgeon Fault zone. The actual maximum thickness of the sedimentary rocks in the Black Sturgeon Basin area is not known. From examination of stratigraphic sections it seems probable that the maximum thickness is in excess of 1,000 feet and would be found in the area of greatest depression, near the Black Sturgeon Fault zone. The prism of sedimentary rocks wedges out to the north and west. The dominant rock unit in the Sibley Group is a shallow-water deposited red mudstone in which ripple-marks and mudcracks abound. The occurrence of algal limestone and dolomite (originally, lime secreting seaweeds) indicate former intertidal zones. Fluctuations in sea level at the time of deposition has resulted in facies change and omission or thinning of units in the northern and western parts of the area. Schematic cross-sections through the Black Sturgeon graben area are shown in Figure 3 (Chart A, back pocket). The order of succession and probable thickness of the various members of the group are as follows:

Argillaceous dolomite and limestone	200-300 feet
Cryptozoon limestone	0- 12 feet
Mudstone and shale	450 feet
Red sandstone and siltstone	100 feet
Sibley sandstone	100 feet
Basal conglomerate	0- 2 feet

Generalized stratigraphic sections at three localities in the southern part of the area are shown in Figure 4.

Traverses were run with transit and stadia rod to provide vertical control for the sections measured. The localities examined are all reasonably accessible by road. The Nipigon fire tower section can only be reached using a four-wheel-drive vehicle, but the Stewart Lake and Fog Mountain sites have good gravel roads passing nearby. The Fog (Eagle) Mountain section occurs ½ mile west of the Armstrong Road, at a point approximately 16 miles north of Hurkett on Highway 17. It can most easily be reached by following the line that was cut by the stadia survey party. Reference elevations for the three sections were taken from the nearest stream or lake shown on 1:40,000 scale topographic maps (these maps were seen by the courtesy of the Topography Survey, Ottawa and when issued will be at 1:50,000 scale). Base elevations for the Fog Mountain section is the water level of the nearby Black Sturgeon River. The relative vertical position of the sections shown in Figure 4 should be accurate to ± 25 feet. A systematic description of the component units is given below.

Basal Conglomerate (5a)

This unit (5a) is of very restricted occurrence in the map-area. It is found locally in depressions in the Archean-Proterozoic unconformity surface. At most localities it is not present; buff to grey quartz sandstone is found instead. Where present, it rarely exceeds a foot in thickness. At some localities the conglomerate occurs as intraformational lenses a few inches to several feet above the unconformity surface. The best exposure of this unit, within the map-area, is on the western shore of Frazer Lake. At this locality the conglomerate bed is about 1 foot in thickness. It consists of pebbles of granite and quartz in a sandy matrix with small amounts of carbonate cement.

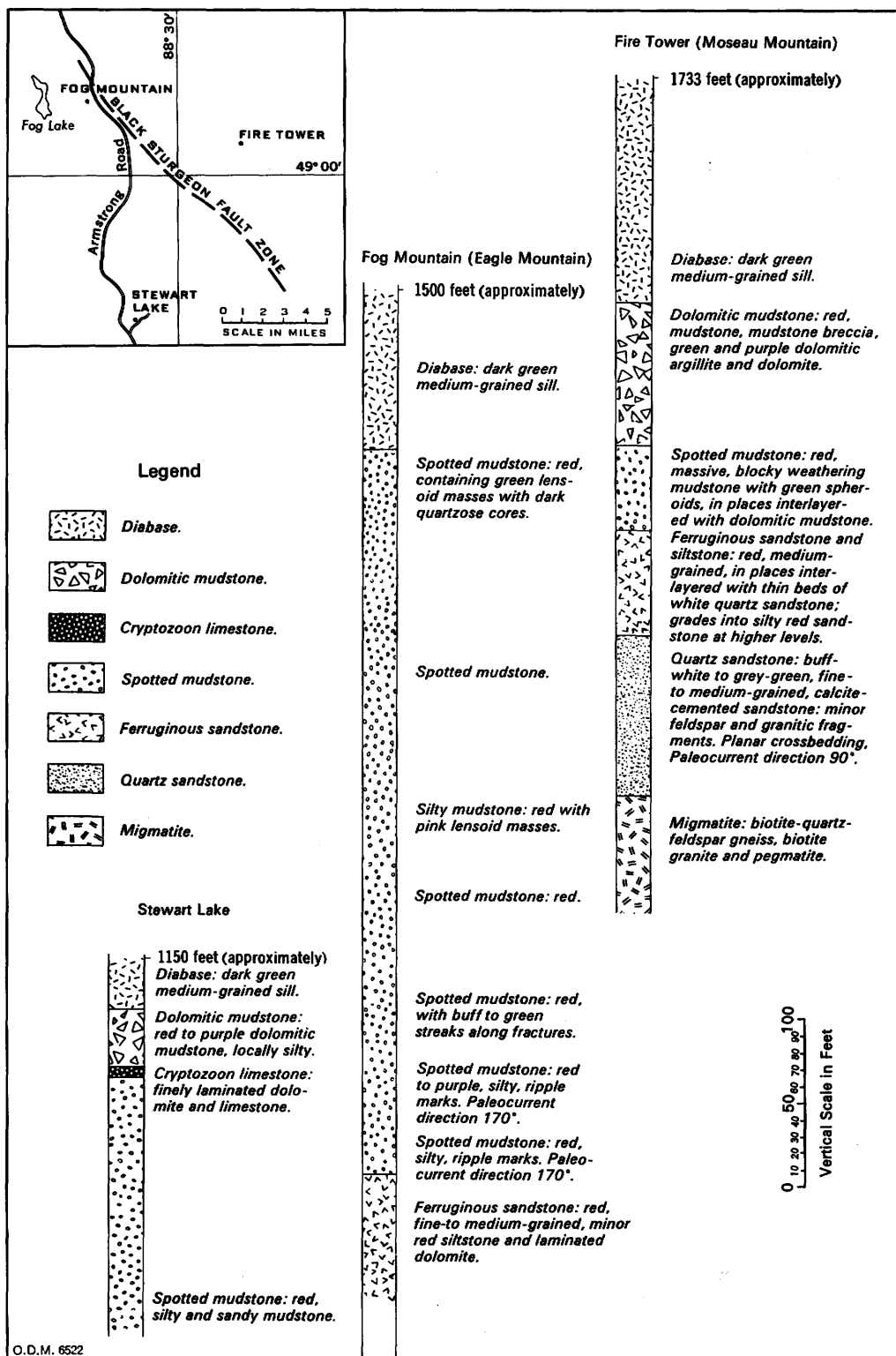


Figure 4—Generalized stratigraphic sections at three localities in the southern part of the Black Sturgeon River area.

Black Sturgeon River Area

Type exposures of the basal conglomerate are found south of the area near Loon Lake. In the type section the formation has a thickness of approximately 8 feet (Tanton 1931).

Sibley Sandstone (5b)

Sandstone (5b) is the rock-type usually encountered at the Sibley-basement contact. At most localities it is a buff to white, fine- to medium-grained, quartzose sandstone, with small amounts of carbonate cement. Bedding is moderately well developed (0.2 cm to 10 cm) and crossbedding was seen at several sites. This unit was not seen in the area west of the Black Sturgeon Fault zone. It is probably present at depths, but has never been exposed in the Black Sturgeon Basin area. The maximum measured thickness for this unit within the map-area is 95 feet as seen near the Nipigon fire tower at Moseau Mountain.

Red Sandstone and Siltstone (5c)

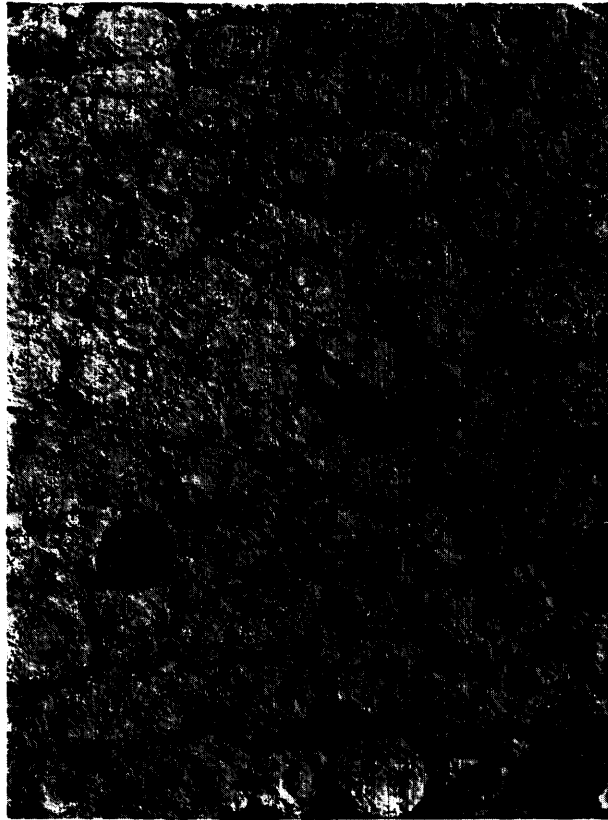
The base of this unit (5c) is marked by an oxidation boundary. The contact is very sharp and easily mapped in the field. Over several inches the sandstone changes from buff to brick-red.

Near the base of the unit the rock texturally resembles (5b) but gradually becomes finer grained away from the contact. As the texture becomes more argillaceous the carbonate content of the rock also increases. The rocks of this unit are red to maroon and where bedded display crossbedding and slump structures.

Mudstone and Shale (5d)

Immediately above the 'Red Sandstone' unit uniformly argillaceous red mudstones (5d) are found. The thickness of this unit is highly variable but sections in excess of 400 feet are present at Fog (Eagle) Mountain, west of the Black Sturgeon Fault Escarpment. Layers of pink argillaceous dolomite up to 8 inches in thickness occur at various levels in the unit.

Penecontemporaneous deformation is thought to have caused the numerous disconformities and lensoid bodies of intraformational breccia that characterize this unit. Generally, bedding is not well developed; outcrops have a massive blocky appearance. Shaly beds occur but are usually thin. At some localities the rocks of this unit have a mottled or spotty appearance. The spots are usually pale grey-green, roughly circular, and up to 5 inches in diameter. The spots usually display a nodular or concretionary aspect; some have a chert core and up to five concentric zones of varying colour and mineral composition.



ODM 8572

Photo 3—Stromatolites in plan; from roadside occurrence near Disraeli Lake.

Cryptozoon Limestone (5e)

Rocks bearing remnants of algal material were seen at several localities in the area and its environs. The stratigraphic level at which the stromatolite unit occurs appears to be highly variable as does the form of the algal growth and the thickness of the unit. The following localities are described briefly:

1. Disraeli Lake
2. Spruce River
3. Shillabeer Lake
4. Abigogami Lake
5. Sturgeon Escarpment
6. Wolfpup Lake
7. Eileen Lake
8. Stewart Lake
9. Starnes Lake
10. Red Rock gravel pit
11. Kama Hills

Black Sturgeon River Area



ODM 8573

Photo 4—Stromatolites in longitudinal section; from roadside occurrence near Disraeli Lake.

Disraeli Lake

The stromatolite horizon at this locality is up to 12 feet in thickness. The rock is flesh-pink to buff and is porous throughout. Stromatolite columns are up to 6 inches in diameter and 30 inches in length (see Photos 3 and 4).

The unit is largely composed of siliceous dolomite whereas the vugs or pores are lined with small calcite crystals. Columns are composed of concentric shells 1 mm to 5 mm in thickness and the space between the shells, usually 1 mm to 3 mm, is largely void. The layers of dolomite beneath the columns are composed of finely laminated pink dolomite and, in places, fragments of auto-breccia. This unit forms the host for copper mineralization on the Commerce Nickel Mines Limited property (6) north of Disraeli Lake.

Spruce River

Stromatolitic limestone boulders occur over a distance of several hundred yards along a road west of the Spruce River, approximately 3 miles northwest of

the occurrence at Disraeli Lake. The algal structures are similar in form to those described in the Disraeli Lake area.

Shillabeer Lake

A layer of stromatolitic limestone, approximately 6 feet in thickness, is exposed along a road about 1 mile southeast of Shillabeer Lake. This unit is similar in most respects to the occurrence at Disraeli Lake.

Abigogami Lake

Fragments of stromatolitic limestone are found on the western shore of Abigogami Lake. These boulders appear to be composed of a variety similar to the stromatolitic limestone at Disraeli Lake.

Sturgeon Escarpment

Boulders of stromatolitic limestone are found north of Nonwatin Lake near the base of the Black Sturgeon Fault Escarpment.

Wolfpup Lake

Cherty grey-green, finely laminated limestone, which outcrops on the roadside near the southwestern corner of Wolfpup Lake, contains structures similar to those present in the algal unit at Stewart Lake. No thickness was determined for this occurrence.

Eileen Lake

Near the eastern end of Eileen Lake blocks of limestone containing large amounts of replacement magnetite have been found (see 'Gresky Magnetite Occurrence', property 8). These blocks contain vague structures reminiscent of the stromatolites in the Disraeli Lake area.

Stewart Lake

The algal unit at Stewart Lake outcrops on a cliff-face at the western end of the lake. Two layers of dolomite are present and are separated by a central shaly bed. The three beds measure approximately 3 feet in total thickness. The dolomite is pink on the weathered surface and finely laminated in the upper parts. Numer-

Black Sturgeon River Area

ous chevron colloform or fold-like traces are apparent in cross-sections through the laminated parts of the beds.

The massive parts of the beds are composed of fine-grained breccia fragments of dolomite, ovoid in form, in a matrix of fine-grained dolomite, which has been pigmented by iron oxide.

No microstructures were visible in the thin-sections examined.

Starnes Lake

A small reef-like mass of finely crystalline limestone was reported by L. Kaye (1969, p.18). Kaye described 'peculiar structures' in the limestone that may be of organic origin. No further description is available for the occurrence, which is out of the map-area.

Red Rock Gravel Pit

This occurrence, which is out of the map-area, was examined briefly by the author and appears to be similar in many respects to the Stewart Lake occurrence.

Kama Hills

A layer of siliceous dolomite approximately 2 feet in thickness outcrops on a cliff-face beside the Trans-Canada Highway (17) at Kama Hills, approximately 12 miles east of Nipigon, that is, about 15 miles east of the map-area. This occurrence, examined briefly by the author, appears to consist of alternating layers of silica and calcareous material 0.5 cm to 1.0 cm in thickness.

Summary

It was not possible to correlate occurrences of the Cryptozoon limestone within the map-area. It seems probable, in view of the contrasting types of algal reef material present, that the Cryptozoon unit is not a contiguous or unique time-stratigraphic unit. The occurrences reflect former intertidal zones that may have very different times of deposition.

Calcareous Mudstone, Limestone, and Dolomite (5f)

The dolomitic rocks in the vicinity of the Black Sturgeon Basin appear to be the uppermost member of the Sibley Group. The dolomitic rocks are extensively distributed in the northern parts of the basin where accumulations in excess of 200 feet have been observed. West of Black Sturgeon Lake, in the valley of the

Poshkokagan River, high cliffs of limy rocks are found. They are white, yellow-white, and mottled red and green and appear to weather easily. Beds range in thickness from several millimetres to over 1/2 metre. An analysis of this rock is given in Table 2.

Outcrops of similar rocks are found at the following localities that are mainly out of the map-area:

1. South shore of Lake Nipigon at Cooke Point, just west of the outlet (Wilson 1910).
2. A mile from the foot of Pijitawabik Bay, about 250 feet above the lake (Wilson 1910).
3. A mile and a half inland from the northern end of Helen Lake (Wilson 1910).
4. On the south side of the Jackfish River just north of the Canadian Pacific railway, overlying red dolomites and limestones (Wilson 1910).

Green argillaceous dolomites with fine-grained texture are found in the north-eastern parts of Chief Bay, Lake Nipigon, in beds 3 inches to 12 inches thick. Two miles to the southeast, near Tchiatang Bluff, but on the north shore, similar dolomite is found (Wilson 1910).

Table 2

ANALYSES OF ARGILLACEOUS DOLOMITIC ROCKS FROM THE BLACK STURGEON RIVER AREA, VALUES IN PERCENT

Sample No.	1	2	3	4
CaCO ₃	47.0	46.0*	27.7	35.0*
MgCO ₃	31.7	15.0*	27.9	35.0*
Insoluble	20.0	38.5	40.0	30.1
Total	98.7	99.5*	95.6	100.1*

Analyses 1, 2, and 3 after A. W. G. Wilson 1910.

Analysis 4 by the Laboratory and Research Branch of the Ontario Department of Mines and Northern Affairs, 1968.

1. White limestone, Poshkokagan River valley.
2. Green argillaceous dolomite, Chief Bay, Lake Nipigon.
3. Green argillaceous dolomite, Tchiatang Bluff, Lake Nipigon.
4. Nipigon fire tower section.

* These values are approximate only.

Geochemistry of the Sibley Group

A selected suite of specimens from a section of Sibley sedimentary rocks, which outcrops along the road below the Nipigon fire tower, were analyzed for major and minor oxide and trace element content in the Laboratory and Research Branch, of the Ontario Department of Mines and Northern Affairs. The following facts are noteworthy:

1. Total iron content of the most ferruginous of the beds is only 1.95 percent.
2. Carbonate content increases appreciably at higher levels in the stratigraphic section.
3. Dolomite and calcite are present in approximately equal amounts in the carbonate-rich parts of the section.

Black Sturgeon River Area

Major and minor oxide analyses for the samples and trace element analyses are given in Tables 3 and 4, and sample descriptions are given below.

Trace element content of each of the analyzed specimens is shown in Table 4.

Table 3

MAJOR AND MINOR OXIDE CONTENT OF SIBLEY GROUP
SEDIMENTARY ROCKS IN THE BLACK STURGEON RIVER AREA, IN
PERCENT; ANALYSES BY LABORATORY AND RESEARCH BRANCH,
ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS

Components	Sample Numbers*							
	55-2	55-4	55-7	55-8	55-10	55-11	55-13	55-15
SiO ₂	96.5	86.2	75.3	66.6	35.5	68.4	17.5	26.4
Al ₂ O ₃	3.49	3.96	4.35	4.17	6.35	3.67	2.90	5.76
Fe ₂ O ₃	0.21	0.20	0.77	1.17	1.51	0.18	0.58	0.41
FeO	Nil	0.36	0.39	0.39	0.44	0.47	0.24	0.44
MgO	0.15	0.71	3.90	6.24	13.3	5.84	18.7	16.7
CaO	0.10	3.92	5.96	7.60	15.2	7.82	22.8	23.2
Na ₂ O	0.05	Nil	0.09	0.09	0.18	Nil	0.14	0.09
K ₂ O	0.38	0.68	1.31	1.39	1.91	1.16	0.97	0.90
H ₂ O+	Nil	0.19	0.01	0.20	0.48	0.18	0.57	3.08
H ₂ O-	0.12	0.06	0.14	0.20	0.20	0.05	0.02	0.22
CO ₂	0.20	3.12	7.15	11.80	23.7	11.7	35.5	23.1
TiO ₂	0.05	0.08	0.12	0.13	0.20	0.12	0.13	0.33
P ₂ O ₅	0.01	0.02	0.03	0.03	0.05	0.03	0.02	0.06
S	0.03	0.03	0.01	0.01	0.01	0.03	0.01	0.01
MnO	0.01	0.04	0.07	0.07	0.05	0.03	0.02	0.02
Total	100.3	99.6	99.6	100.1	99.1	99.7	100.1	100.7
Specific gravity	2.43	2.63	2.63	2.69	2.75	2.70	2.79	2.70

* See text for sample locations.

Sample Descriptions for Tables 3 and 4

- 55-2 Buff quartzose sandstone; moderately rounded to well rounded grains mostly less than 0.5 mm; well sorted; some interstitial mica.
- 55-4 Buff quartzose sandstone; angular grains mostly less than 0.5 mm; minor coarse grains of quartz and granite fragments; traces of carbonate cement.
- 55-7 Ferruginous sandstone; reddish fine-grained clastic, subangular to subround; mainly fine sand-size grains; approximately 30 percent cement of reddish brown colour, dolomitic, illitic with minor ferruginous material.
- 55-8 Dolomitic, ferruginous sandstone; texturally and mineralogically similar to 55-7 but with higher percentage of dolomite and less quartz.
- 55-10 Siliceous argillaceous dolomite; reddish, very fine-grained carbonate with argillaceous material and approximately 30 percent grains of subround to round quartz.

- 55-11 Dolomitic, ferruginous sandstone; subround to round sand grains (less than 0.5 mm) and some larger rock fragments; cement (approximately 30 percent) is dark in colour and mainly dolomitic (similar to 55-8 in mineralogy and composition).
- 55-13 Siliceous, argillaceous dolomite; very fine-grained red coloured rock with a shaly odour; a few veinlets of quartz.
- 55-15 Argillaceous carbonate rock; red very fine-grained rock with an earthy odour; small veinlets of quartz and carbonate; argillaceous minerals identified in the acid insoluble fraction include mica, chlorite, talc, and montmorillonite, present in about equal amounts.

Table 4

TRACE ELEMENT CONTENT SIBLEY GROUP SEDIMENTARY ROCKS
IN THE BLACK STURGEON RIVER AREA, IN PPM; ANALYSES BY
LABORATORY AND RESEARCH BRANCH, ONTARIO DEPARTMENT
OF MINES AND NORTHERN AFFAIRS

Element	Sample Numbers*								Detection Limits(ppm)
	55-2	55-4	55-7	55-8	55-10	55-11	55-13	55-15	
Sb	....	....	....	....	....	....	....	....	4
As	....	....	....	....	....	....	....	....	5
Ba	300	300	300	200	200	500	300	200	....
Be	....	....	....	....	....	....	....	....	1
Cr	....	15	15	20	20	20	20	20	10
Co	....	....	....	....	....	....	....	....	10
Cu	10	10	10	3	10	10	8	10	....
Ga	....	....	....	....	....	....	....	....	10
Pb	30	30	10	10	5	5	5	5	....
Li	20	30	20	20	40	20	20	100	....
Mn	30	300	300	300	300	200	300	300	....
Mo	....	....	....	....	....	....	....	....	10
Ni	....	20	20	20	10	10	10	10	5
Sc	20	20	20	20	20	20	....	20	20
Ag	1	<1	<1	<1	<1	<1	<1	<1	....
Sr	20	30	30	30	30	40	50	50	....
Sn	....	....	....	....	....	....	....	....	10
Ti	300	500	800	1000	1000	700	800	2000	....
V	....	....	10	10	20	10	10	20	10
Y	30	10	20	20	20	20	10	20	....
Zn	20	30	10	20	30	20	20	40	....
Zr	20	100	200	250	100	30	30	100	....
Radio-activity (U ₃ O ₈) Equiv.	....	....	20	....	....	20	....	10	10

< means less than
* See text for sample locations.

Black Sturgeon River Area

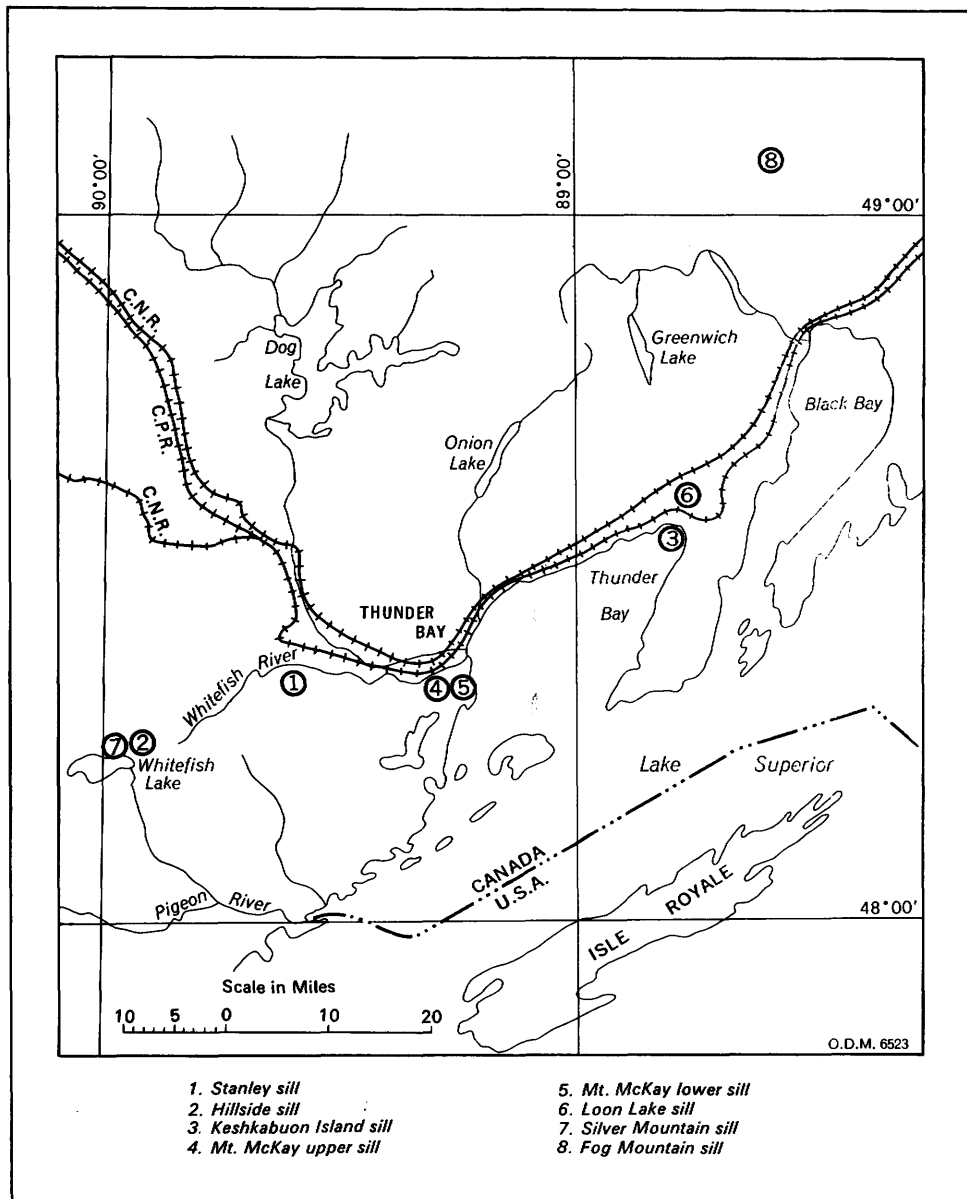


Figure 5—Sketch map showing the locations of the diabase samples referred to in Table 5.

Table 5

**AVERAGE MINERAL COMPOSITION OF SOME DIABASE SILLS IN
THE THUNDER BAY DISTRICT, ONTARIO.***

Sill No.	Average Composition of Sills							
	1(15)**	2(20)	3(14)	4(29)	5(9)	6(8)	7(16)	8(3)
Plagioclase	58.3	57.6	54.6	55.9	51.8	60.0	59.6	60.4
Clinopyroxene	19.7	19.1	28.7	17.1	11.2	24.6	22.2	23.8
Amphibole	5.1	1.7	....	0.4	....	0.6	1.2	....
Biotite	7.7	9.2	2.0	12.6	10.7	6.6	5.9	1.2
Chlorite	....	1.0	5.4	1.0	13.3	1.0	1.3	1.6
Olivine	0.5	0.4	4.3	2.6	....	0.7	0.3	10.3
Quartz	....	....	1.7	1.8	....	....	....	....
Magnetite	7.7	10.6	2.9	7.9	12.5	6.4	9.4	2.5
	99.0	99.6	99.6	99.3	99.5	99.9	99.9	99.8

* Sills 1 to 7 after Blackadar (1956); Sill No. 8 by present author. See Figure 5 for locations.

** Figure in brackets indicates number of Rosiwal analyses used to obtain average composition.

- | | |
|---|--|
| 1. Stanley sill
2. Hillside sill
3. Keshkabuon Island sill
4. Mt. McKay upper sill | 5. Mt. McKay lower sill
6. Loon Lake sill
7. Silver Mountain sill
8. Fog (Eagle) Mountain sill
(Black Sturgeon River area) |
|---|--|

Table 6

**TOTAL CHEMICAL ANALYSIS OF SAMPLE FROM GLASSY SELVEDGE
OF FOG (EAGLE) MOUNTAIN SILL IN THE BLACK STURGEON
RIVER AREA; ANALYSES BY LABORATORY AND RESEARCH
BRANCH, ONTARIO DEPARTMENT OF MINES AND NORTHERN
AFFAIRS.**

Major components in percent		Trace components in ppm	
SiO ₂	49.6	Sb	8
Al ₂ O ₃	14.4	As	5
Fe ₂ O ₃	2.05	Ba	200
FeO	8.60	Be	....
MgO	6.70	Cr	100
CaO	10.3	Co	70
Na ₂ O	2.50	Cu	350
K ₂ O	0.73	Ga	20
H ₂ O+	0.84	Pb	20
H ₂ O-	0.40	Li	30
CO ₂	0.46	Mn	3,000
TiO ₂	1.63	Mo	....
P ₂ O ₅	0.14	Ni	200
S	0.02	Sc	60
MnO	0.37	Ag	<1
		Sr	100
		Sn	30
		Ti	10,000
		V	400
		Y	40
Total	98.7	Zn	120
Specific gravity	2.90	Zr	200

< less than
 Radioactivity U₃O₈ Equivalent, none detected
 none detected

Black Sturgeon River Area

INTRUSIVE IGNEOUS ROCKS

Diabase

Diabase sheets occur at various levels within the Sibley sedimentary sequence and also along the unconformity surface between the basement rocks and the Sibley sedimentary rocks. At one locality on the Trans-Canada Highway immediately to the east of the map-area, Red Rock cuesta, a feeder dike emerges from the crystalline basement and deflects to become a sill within the Sibley Group sedimentary rocks. Remnants of the sills in many places stand high above the surrounding countryside as isolated mesas. Columnar fracturing is well developed in most of the sills.

The thickest accumulation of diabase is in the northeastern part of the map-area near Lake Nipigon. The entire area is obscured by diabase that appears to be a continuous sheet over 100 feet in thickness. These diabase sheets appear to be similar in most respects to other sills in the Lake Superior region. An exhaustive study of these rocks was made by Blackadar (1956). He concluded that many of the bodies were composite intrusions, that relatively little differentiation has taken place, and that the associated 'red-rock' was a product of assimilation of granite rocks from the crystalline basement.

The rock is a reddish brown colour on weathered surfaces and medium to dark green where fresh. The grain size is uniformly medium, except near the contacts with country rocks where a narrow glassy selvage is usually present. Several modal analyses of diabase from the Fog Mountain sill, made by the present author, together with compiled analyses after Blackadar are shown in Table 5. A total chemical analysis of a diabase sample taken from the glassy selvage of the same sill is shown in Table 6. Dating performed on one of the sills in the southern part of the area indicates, 1,000 million years as the probable age of the intrusions (Jim Franklin of the Geological Survey of Canada, personal written communication, April, 1969). A tabulation of results from the K/Ar dating of four samples of Keweenawan intrusions is given in Table 7.

STRUCTURAL GEOLOGY

The Archean rocks in Black Sturgeon River area strike generally northeast and dip steeply. These rocks have been isoclinally folded and occur as roof pendants or septa in the dominantly granitic basement of the region. Proterozoic rocks deposited on the irregular or mammillated unconformity surface of Archean rocks dip at low to moderate angles. Folding in the rocks of the Sibley Group appears to be of two types:

1. Supratenuous folding; layers of clastic sediments have been deposited over hills on the basement surface, in many places with consequent omission of beds.
2. Penecontemporaneous folding; downslope movement of unconsolidated sediments resulting in the flexures and crenulations that abound in the Sibley sedimentary rocks.

Table 7

AGE DATINGS CARRIED OUT ON SEVERAL KEWEENAWAN DIABASE BODIES IN THE THUNDER BAY DISTRICT. DATA PROVIDED BY JIM FRANKLIN, GRADUATE STUDENT, UNIVERSITY OF WESTERN ONTARIO.

Sample Number	Location	Age (K/Ar) in millions of years
67FR480	49°07'N; 88°59'W (Disraeli Lake)	1,080 ± 40
67FR475	48°59'N; 88°20'W (Highway 17, near Red Rock)	963 ± 134
67FR476	48°59'N; 88°20'W (Highway 17, near Red Rock)	1,000 ± 140
67FR472	49°30'N; 88°03'W (Kama Bay, Lake Superior)	837 ± 115

Sample Descriptions:

67FR480: fresh, dark green, medium-grained gabbro composed of augite, olivine, biotite, hornblende, plagioclase, and accessory serpentine and magnetite. It forms part of a cylindrical body that varies from olivine gabbro in the centre through pyroxene gabbro to syenite on the rim. This body cuts the Sibley Group thus fixing the uppermost time limit for Sibley deposition. The age is similar to the 1,080 million year date of the Duluth gabbro complex (Faure 1964) and to the 980–1,100 million year age range for Keweenaw volcanic rocks of the Keweenawa peninsula of Michigan (Faure and Chaudhuri 1967). Thus this body apparently forms part of the same magmatic suite as other volcanic and intrusive rocks of the Lake Superior Region (Franklin, personal written communication April 22, 1969).

67FR475: chilled margin at the base of a diabase sheet. Composed of plagioclase microlites, slightly altered mafic minerals and ilmenite.

67FR476: fine-grained, dark green diabase taken from just above the chilled margin of diabase sheet.

67FR472: light green chill margin of small sill. Composed of carbonate, plagioclase, and saussurite (possibly some assimilation of limy mudstone).

Faulting

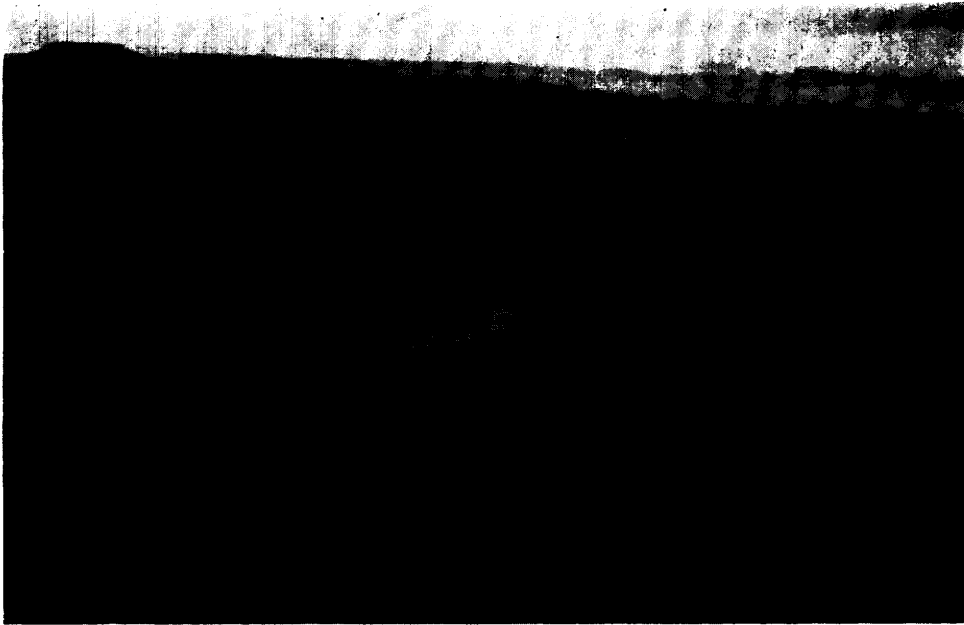
Faulting has been well developed along at least three major trends:

1. Northwest; parallel to the most dominant trend of diabase dike swarms in the Thunder Bay District.
2. Northeast; conjugate to the faults of set 1 and in much of the area sub-parallel to the regional fabric of the basement complex.
3. North; a trend of fracturing and diabase dike intrusion that occurs at many localities in the north shore of Lake Superior region.

It has not been possible to accurately determine displacements on any of the fault zones as most have been scoured out by glaciers and are now represented by linear, drift-filled valleys. From lithological comparisons made in the area between the Nipigon fire tower and the Black Sturgeon River it seems certain that vertical displacements of 700 to 1,000 feet are involved along faults of northwest trend*.

* This conclusion depends partly on the assumption that the oxidation boundary in the Sibley Group (base of 'red-beds') corresponded roughly to a particular paleo-contour.

Black Sturgeon River Area



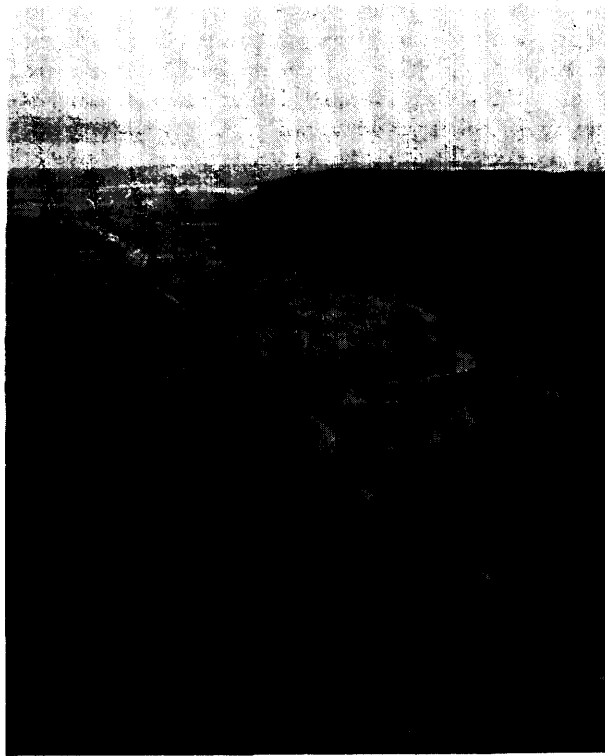
ODM 8574

Photo 5—Oblique aerial photograph of the Black Sturgeon Trench and the Black Sturgeon River. The Black Sturgeon Escarpment is shown from upper left to lower right. The mesa below the Nipigon fire tower is shown on the horizon.

The Black Sturgeon Fault zone, which appears to be the zone of maximum displacement, is marked by a prominent escarpment over much of its length (see Photos 5, 6, and Frontispiece). East of Eskwanonwatin Lake at the base of the escarpment red-beds of the Sibley Group are upturned, brecciated and dissected by veinlets of quartz, calcite, and barite. This locality has also been visited by Wilson (1910, p. 118).

In the Black Sturgeon Lake district there is a strong escarpment formed by trap-capped crystalline rocks. This escarpment may be traced southeast from Tchiatang Bluff [on the shores of Lake Nipigon] to below Eskwanonwatin Lake. At a number of points, particularly north of Nonwatin Lake, a breccia composed of fragments [is] found at the base of the bluff. Red Keweenawan sandstones lie close to the foot of the bluff, seemingly much brecciated; in some places a deep valley has been cut between them and the foot of the cliff. Wherever the sections have been studied the red sandstones overlie white sandstones, and hence it is improbable that the red sandstones at the foot of the bluff represent the base of the series. On the top, and at a little distance from the edge of the escarpment, basal conglomerates, white sandstones, and pink sandstone, in the order named, are found in place resting upon the crystallines. It seems very probable that this escarpment is formed by the edge of a fault block. The displacement has here been over 400 feet. The eastern edge of this block forms the west side of the Nipigon gorge.

West of the Black Sturgeon Fault zone a prism of Sibley Group sedimentary rocks has been preserved; a consequence of the depression of a large segment of the underlying basement rocks. It appears that the collapse of this segment, a roughly oval area 15 miles by 25 miles, was effected along *en echelon* faults of northwest trend.



ODM 8575

Photo 6—Oblique aerial photograph of the Black Sturgeon Trench and the Black Sturgeon River. This photograph is looking southwards towards Lake Superior from above the Black Sturgeon Fault Escarpment.

The net displacement of the blocks in question was hinge-like with almost negligible movement in the northwest whereas maximum movement occurred in the southeastern parts of the area (see Figure 3, Chart A, back pocket). Faulting associated with the depression is thought to have coincided with or immediately followed Keweenaw igneous activity and was a satellite effect to cauldron subsidence in the Lake Superior and Lake Nipigon regions. The zone of major dislocation is difficult to trace north of Black Sturgeon Lake but, in the author's opinion, it may be that it is contiguous with the northeast-trending structure that passes through the Big Beaverhouse Lake area. Several factors suggest that the Black Sturgeon Fault zone may penetrate to abyssal depths.

1. Vast outpourings of basaltic magmas undoubtedly followed depth penetrative fissures of northwest trend.
2. Ultramafic bodies, long known as associates of abyssal fault zones are present in the area (mica peridotite at Disraeli Lake, J. Franklin 1968, verbal communication).

Black Sturgeon River Area

3. In the vicinity of the Black Sturgeon Basin the intensity of magnetic expression of iron formation present in the basement rocks drops abruptly, indicative of large displacement of crustal blocks.
4. Age dating of Big Beaverhouse alkalic rocks (Gittins *et al.* 1967) indicates that faulting and alkalic igneous activity in that area are possibly coeval with the Keweenawan igneous activity that resulted in penetration of the crustal rocks by immense volumes of mafic rocks and the outpouring of copious effusions of basaltic lavas, all believed to be of deep-seated origin.

ECONOMIC GEOLOGY

Various parts of the area have been prospected and staked in the past, but very little development work has been done. Most of the activity in the area was sparked by the discovery of copper mineralization near Disraeli Lake in 1965. Diamond drilling has been carried out in the surrounding area since the time of the discovery. There are no patented claims in the area (December 1967).

A certain amount of assessment work, including geological reports and drill logs, has been submitted to the Ontario Department of Mines and Northern Affairs. Reports are on file at Toronto in the Mining Lands Branch office. Reports and drill logs are filed with the Resident Geologist in Thunder Bay. A list of assessment work reports filed to the end of 1967 is given in Table 8.

Table 8

ASSESSMENT WORK REPORTS FOR THE BLACK STURGEON RIVER
AREA TO THE END OF 1967 FILED WITH THE RESIDENT
GEOLOGIST AT THUNDER BAY, ONTARIO.

File Name	Year	Type of Information
Territory Mining Co. Ltd.	1960	Geological
Alex Gresky, Hurkett	1958-1961	Geological
Phelps Dodge Corporation of Canada Ltd.	1966	Drill logs
Commerce Nickel Mines Ltd.	1966	Geological
J. Minoletti	1966	Drill logs
Algoma Steel Corporation Ltd., The	1967	Drill logs
Falconbridge Nickel Mines Ltd.	1967	Geophysical

COPPER

The prospected occurrences of copper in the Black Sturgeon River area are found either in the Keweenawan diabase sills or in the underlying Sibley Group sedimentary rocks. Those in the sedimentary rocks show strong indications of having been derived by metasomatic replacement related to the intrusion of the diabase magma or by later supergene processes. The latter alternative is favoured by the writer for the occurrences within the Sibley limestone in the vicinity of Disraeli Lake. The process envisaged, involved unroofing of the diabase intrusions by erosion, leaching of primary or introduced copper from the diabase by surface waters percolating through fractures, and re-deposition of the copper within the

porous and chemically favourable limestone. The author's reasons for this hypothesis include the presence of chalcopyrite in the altered zone adjoining the diabase and the fact that chalcocite has been deposited in vuggy reef rocks in the Disraeli Lake area. These vuggy rocks show little evidence of any alteration, therefore the chalcocite was probably derived from the overlying diabase by leaching, and redeposited with a pH drop.

The role of metasomatic replacement could be better assessed after a study of the trace element content of argillaceous rocks in proximity to the diabase intrusions. This work is presently being undertaken by Jim Franklin of the Geological Survey of Canada at the University of Western Ontario.

DESCRIPTION OF PROPERTIES

*The Algoma Steel Corporation Limited (5)**

During the summer of 1967, The Algoma Steel Corporation Limited conducted a packsack diamond drilling program on their property that consisted of 10 claims extending north from Disraeli Lake to north of the Spruce River (see Photo 7).

About eight holes in all had been drilled by the end of August 1967. Holes that were begun in overburden had to be abandoned because of the excessive thickness of the glacial drift. Three holes, which were located high on a hillside, collared in bedrock intersected copper mineralization. The holes were drilled for their entire length (100 feet to 125 feet) in diabase. Chalcopyrite was present in trace amounts only and in most cores was confined to narrow pegmatoid veinlets.

Ground magnetometer surveys of the property failed to outline any anomalous zones.

Commerce Nickel Mines Limited (6)

The initial discovery of copper in the Disraeli Lake area was made by Commerce Nickel Mines Limited in the latter part of 1965. The discovery was made on a group of claims immediately northwest of Disraeli Lake. Copper mineralization, largely blue chalcocite, was found within a porous bed of Sibley stromatolite limestone. Minor amounts of galena and native copper were detected in some of the specimens.

In February 1966, D. H. Yardley, P.Eng., visited the property and after examination of the showings drafted a report recommending an exploration program. Geological mapping and drilling were carried out. Several occurrences of mineralized float were found, but drilling apparently failed to produce any encouraging results. The holes drilled were all short and were collared on the outcrop of the mineralized zone. Results of the drilling were not available to the author at the time of writing.

* Number in brackets refers to property number shown on Maps 2233, 2234, 2235, and 2236, back pocket.

Black Sturgeon River Area



ODM 8576

Photo 7—Packsack drilling with a "Winkie" diamond drill, The Algoma Steel Corporation Limited property (5), north of Disraeli Lake.

Falconbridge Nickel Mines Limited (7)

In August 1967, induced polarization and resistivity surveys were conducted on the property of Falconbridge Nickel Mines Limited. The group of 16 claims, about 5 miles southwest of Disraeli Lake, is entirely underlain by diabase. Discovery of chalcocite-bearing dolomite float in the vicinity of the claims presented a possibility that mineralized dolomite might be present beneath a diabase sheet. Three anomalies were outlined by the survey and exploratory diamond drilling was recommended in the geophysicist's report. At the time of writing no drilling had been done on the claims.

William McAteer-Weldon P. Gilbert (9)

At the southwestern tip of Disraeli Lake copper mineralization was discovered by McAteer and Gilbert in the summer of 1967. Several holes were put down with a packsack drill to test the extent and grade of the mineralized zone. The results of the drilling were not known by the author at the time of writing.

Disseminated sulphide minerals, mainly chalcopyrite with some pyrrhotite, are found at the surface in a Keweenaw diabase sill. The mineralized part of the diabase is characterized by a brick-red coloration. The rock, which is uniformly medium grained and biotite-bearing, is reminiscent of the 'red rock' described by Moorhouse (1959, p. 184).

An analysis of a representative sample collected by the author is given in Table 9.

Table 9

ANALYSIS OF A REPRESENTATIVE GRAB SAMPLE FROM THE WILLIAM McATEER-WELDON P. GILBERT PROPERTY (8) NEAR DISRAELI LAKE IN THE BLACK STURGEON RIVER AREA; ANALYSIS BY LABORATORY AND RESEARCH BRANCH, ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS.

Sample	McAteer-Gilbert #1
Chromium	Tr
Copper	Tr
Lead	Tr
Manganese	Tr-Low
Nickel	Tr
Titanium	Low-Medium
Vanadium	Tr
Zirconium	Tr

Phelps Dodge Corporation of Canada Limited (11, 12)

In 1966, the Phelps Dodge Corporation of Canada Limited held two large blocks of claims in the Disraeli Lake area. One group, approximately 2 miles west of Disraeli Lake, was under option from Walley Ranta of Port Arthur (Thunder Bay), Ontario. The second group was immediately west of Sturge Lake.

Walley Ranta Option (11)

Most of the claim block is obscured by 10 feet to 30 feet of overburden. The bedrock, however, consists entirely of sedimentary rocks of the Sibley Group. Four vertical holes (R-1, R-2A, R-3E, R-4F) were drilled in an attempt to find economic mineralization in an algal limestone member. The limestone member was reached at a depth of 49 feet in drill hole R-1; intersections in the other holes were at greater depths (R-2A, 241 feet; R-3, 195 feet; R-4, 210 feet). The limestone member in all

Black Sturgeon River Area

cores was between 10 feet and 12 feet in thickness and showed no visible signs of sulphide mineralization, other than a small amount of malachite staining in Hole R-2A.

Table 10

ANALYSES OF SAMPLES FROM PHELPS DODGE CORPORATION OF CANADA LIMITED DRILL HOLES NEAR DISRAELI LAKE (PROPERTY 11) IN THE BLACK STURGEON RIVER AREA; ANALYSES BY LABORATORY AND RESEARCH BRANCH, ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS.

Sample	R-1	R-2A	R-3
Lead	Tr.	Tr.	Tr.
Manganese	Tr.	Tr.	Tr.
Titanium	....	....	Tr.
Zirconium	....	....	Tr.

Analyses of representative samples of the limestone collected by the writer yielded the values shown in Table 10.

Numerous dislodged blocks of limestone are found along a lumber road that crosses the northwestern corner of the claims. No mineralization was detected by the writer.

Sturge Lake Group (12)

Five holes were drilled on the claim group to the west of Sturge Lake. All of the holes were collared and completed in diabase. The diabase was described as medium grained with moderate to heavy serpentinization and fracturing throughout (Holt, geologist with Phelps Dodge 1968, written personal communication).

IRON

Discontinuous bands of iron formation are found in a northeast-trending belt of metasediments extending from Mawn Lake to the southern end of Lake Nipigon. The trend of the iron-rich zones is readily apparent from their aeromagnetic expression (ODM-GSC 1962a,b,c,d,e,f,g,h, and i). The occurrences previously examined have been of low grade and are usually narrow.

Iron-rich sands are found along the shores of Black Sturgeon Lake. The deposits have not been examined in great detail so it is difficult to assess their economic potential at present. They do, however, merit further consideration. If a deposit of sufficient size could be outlined a simple magnetic separation method could be used for concentrating.

Small occurrences of hematite are found along faults of northwest trend (see Coleman 1909, Map 18A). These showings are usually very small and confined to tension fractures related to the faulting.

Magnetite and hematite are commonly found as replacements in the Sibley sedimentary rocks near contacts with diabase intrusions. Fracture planes commonly bear a thin film of magnetite or hematite.

DESCRIPTION OF PROPERTIES AND OCCURRENCES

Gresky Magnetite Occurrence (8)

About 18 blocks of limestone have been located in the overburden $\frac{1}{4}$ mile east of Eileen Lake. The glacial erratics are about 200 yards south of the creek that flows out of the lake.

The author visited the site with Alex Gresky of Hurkett, Ontario, in August 1967 and examined the blocks. The limestone has been considerably altered but structures reminiscent of the algal limestone of the Sibley Group were recognized in a few of the blocks. The boulders are fairly angular and measure up to 10 feet in their maximum dimension. Magnetite content is between 50 and 75 percent in most samples. Magnetite has replaced the limestone preferentially along relict bedding planes; crystals are mostly of dodecahedral form and are 2 mm to 2 cm in diameter.

The actual source of the boulders is not known.

The mineralized erratics are probably representatives of a zone where the reactive limestone adjoined an iron-rich diabase intrusion.

Minoletti Occurrence (10)

The Minoletti occurrence lies immediately west of Mawn Lake. Two trenches have been cut across an outcrop of banded iron formation; these trenches are not shown on Map 2235 (back pocket). In October 1965, J. Minoletti had a 550-foot hole drilled to test the thickness and tenor of the formation. The results of the drilling are shown in Table 11.

No further development work has been done on the property to date.

Table 11

DRILL LOG, MINOLETTI OCCURRENCE (10) NEAR MAWN LAKE IN THE BLACK STURGEON RIVER AREA; LOGGED BY J. MINOLETTI; FROM ODMNA FILES, THUNDER BAY.

Footage		Formation
From	To	Bearing: Due south Dip -60°
0	9	Loam and clay.
9	40	Altered sediments, quartz stringers, minor magnetite.
40	550	Fine- to coarse-grained diabase.
	550	End of hole.

Black Sturgeon River Area

Sturgeon Escarpment Occurrence (1, 4)

The Sturgeon Escarpment occurrence is found on the face of a prominent fault escarpment $\frac{3}{4}$ mile east of the southern end of Black Sturgeon Lake (see Coleman 1909, Map 18A). The history of ownership was not known to the author at the time of writing.

The mineralization consists of narrow lenses of specular hematite localized in tension fractures associated with the major faulting. Lenses seldom exceed 3 feet in length and 1 inch in thickness; the average is much smaller. The host rocks are Keewatin-type mafic volcanics. Occurrences of this type had been investigated early in the century and are described by Wilson (1910, p. 138).

Discoveries of hematite in the district east of Black Sturgeon Lake and north of Nonwatin Lake led to the location of a number of claims in this region in the seasons of 1901 and 1902. Hematite in small quantities was found in a number of localities along the base of an escarpment close to the contact between Archean rocks and the Keweenaw series of sediments, and it was supposed that an iron range existed in this locality, extending in an east and west direction for about seven miles. No iron range rocks similar to those found elsewhere in the district have been reported in this locality.

The hematite occurs as small stringers and veins in the Archean rocks (Keewatin schists, Laurentian gneisses and granites), and also as a cementing material occupying the interstices between fragments of these crystalline rocks. These bodies of breccia, cemented with hematite, are large, more or less lenticular masses, and are found along the base of a prominent escarpment which is made by the southwest edge of the central plateau. In all probability this escarpment is the edge of an old fault block, and the breccias are fault breccias. Coleman has suggested that they may be talus blocks at the foot of a cliff. A small amount of exploration has been carried out by sinking test pits and by diamond drilling. The logs of the drill holes are not available, but on the ground it appeared to the writer that the holes had all been placed in the Keewatin schists, which are destitute of hematite except in the vicinity of the breccias. No holes appear to have been located with a view to exploring the breccias in which the hematite occurs.

Territory Mining Company Limited [1959] (2)

In 1959, Territory Mining Company Limited staked a small group of claims at the northern end of Black Sturgeon Lake. Six auger holes were drilled along a line trending N15E. The first hole was about 15 feet from the lakeshore; the last was about 175 feet from the lake. No analytical results are recorded for this work.

A sample of beach sand was collected by Dr. E. G. Pye¹ in 1965 and was analyzed to determine the presence or absence of rutile. Rutile was found to be absent and the small amount of titanium present was found to occur in the form of titaniferous magnetite (ODMNA files, Thunder Bay). The results of the analysis are shown in Table 12.

West Shore Occurrence (3)

Magnetite sand of a type similar to that found at the Territory Mining occurrence is found on the western shore of Black Sturgeon Lake. Two samples of the sand were collected by the author and submitted for analysis. The results are shown in Table 13.

¹ In 1965 Dr. Pye was Resident Geologist, Ontario Department of Mines, Port Arthur (Thunder Bay), Ontario.

Table 12

ANALYSIS OF MAGNETITE SAND, TERRITORY MINING COMPANY LIMITED OCCURRENCE (2), BLACK STURGEON LAKE, BLACK STURGEON RIVER AREA; ANALYSIS BY LABORATORY AND RESEARCH BRANCH, ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS, REF. No. C-11637.

Sample	Black Sturgeon No. 1
Silica (SiO ₂)	50.37%
Iron (Fe)	9.91%
Titanium dioxide (TiO ₂)	1.01%

Table 13

ANALYSES OF MAGNETITE SAND, WEST SHORE OCCURRENCE (3), BLACK STURGEON LAKE, BLACK STURGEON RIVER AREA; ANALYSES BY LABORATORY AND RESEARCH BRANCH, ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS, REF. No. C-13496-7.

Components	WS 1	WS 2
Iron (Fe) Total	10.4%	19.0%
Iron (Fe) Acid Soluble	4.46%	10.8%

Both of the samples consisted of dark coloured sands composed mainly of silicate minerals of which pyroxene is the most abundant, along with lesser quantities of quartz, feldspar, hornblende, and garnet.

Magnetite and ilmenite occur in relatively small quantities. No rutile was identified and it appears to be absent in the sand.

URANIUM

DESCRIPTION OF OCCURRENCE

Hele Township Occurrence (14)

The author was accompanied to the occurrence by Jim Franklin of the Geological Survey of Canada. A pronounced anomalous condition was detected by a non-selective scintillometer provided by the Geological Survey. Geological examination of the area indicated that the only anomalous zone corresponded with a narrow steep-walled valley in biotite-quartz-feldspar gneiss that was intruded *lit-par-lit* by pegmatite. No mineralization was discovered in the area. It seems probable that the observed anomaly is caused by presence of thorium or radon gas and thus is not of economic importance.

Black Sturgeon River Area

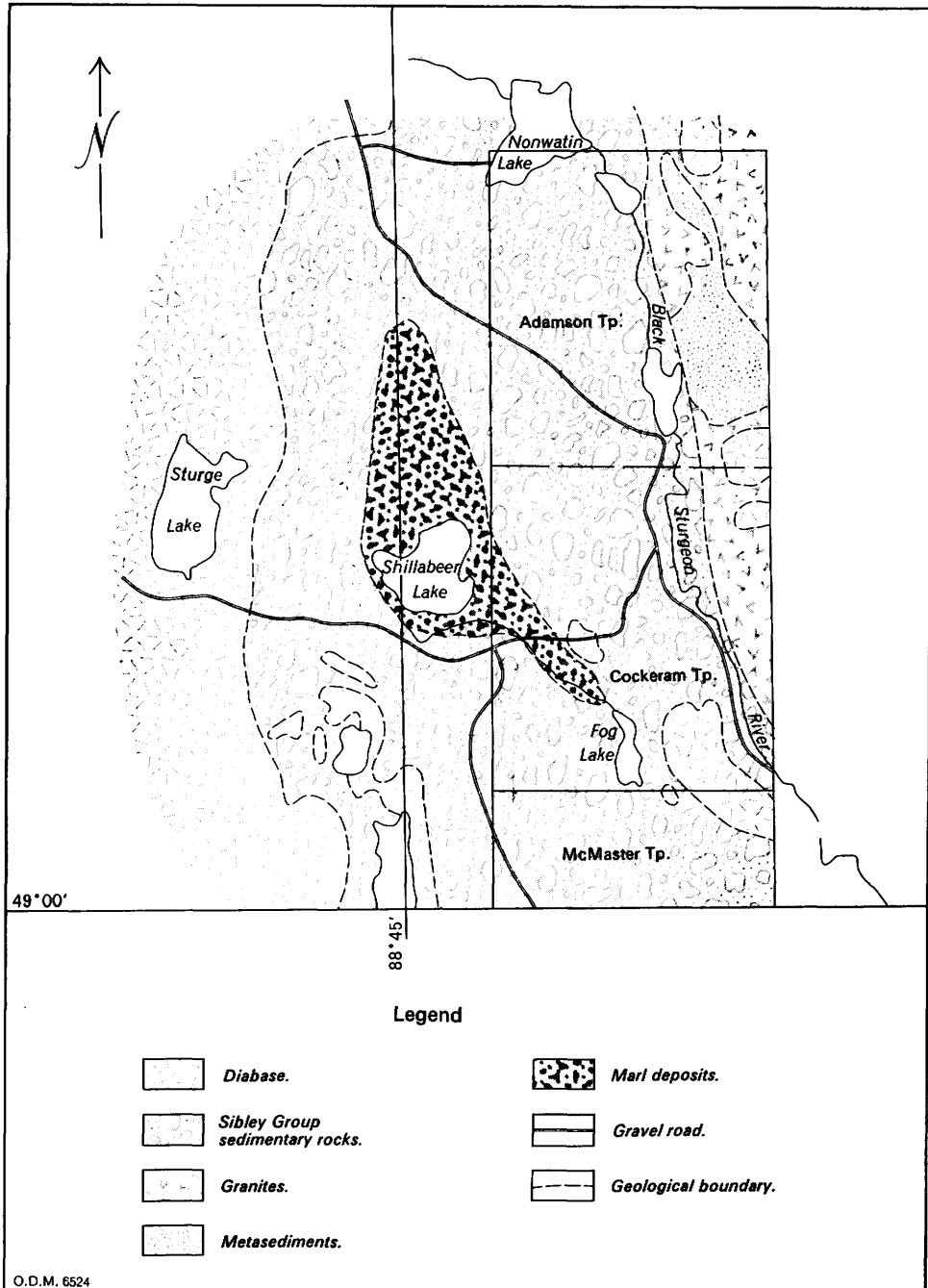


Figure 6—Sketch map showing location and approximate extent of marl deposits in the Black Sturgeon River area.

INDUSTRIAL MINERALS

Marl

Large deposits of loose, water saturated lime mud are localized in the basin containing Shillabeer and Fog Lakes, and Shillabeer Creek (Figure 6). Shillabeer Lake is south of Lake Nipigon and 20 miles northwest of Hurkett. A road trending west from the Hurkett-Armstrong Highway follows the south shore of Shillabeer Lake.

The deposits in Shillabeer Lake, then known as Sucker Lake, are described by Wilson (1910, p. 116) as follows:

Another group of deposits, which may at some time be of economic importance, are the marl and peat beds now forming on the bottoms of some of the upland lakes and swamps. One of these is Sucker [Shillabeer] Lake, about four and a half miles west of Eskwanonwatin Lake on the Black Sturgeon River. The average depth of the lake at the time of our visit (September, 1901) was about 12" or 14". The maximum depth that we noted in a number of soundings along what seemed to be a stream channel was 6 ft. but over the greater part of the lake the depth was between 6" and 8". In many places it was impossible to reach the shore at all, and for several miles in our course around the lake the canoe was forced through the slime forming the bed of the lake. The water had a somewhat sulphurous taste and disagreeable odour due to the decomposition of a species of Chara, which everywhere is found growing over the bottom. The depth of the deposit of marl now forming was not ascertained though it is certainly over 6 ft. The material seems to consist of calcareous casts of Chara sp. mingled with carbonaceous material.

DESCRIPTION OF OCCURRENCE

Gresky Marl Occurrence (13)

A. Gresky of Hurkett staked the deposit in 1958 and subsequently optioned a group of claims to L. Baarts and L. Herminston of Thunder Bay, Ontario. Auger drilling by the latter confirmed the existence of a large deposit of marl (E. G. Pye, 3 December 1959, Ontario Department of Mines and Northern Affairs, Thunder Bay Resident Geologist's office, Unpublished Report).

In 1959-1960, drilling by Anaconda Iron Ore (Ontario) Limited encountered lime mud 10 to 70 feet in thickness (A. Gresky *circa* 1967, personal verbal communication).

The lime beds occur for a distance of over 5 miles and may exceed $\frac{1}{2}$ mile in width.

Average analysis of several samples received by Domtar Limited indicates an available calcium oxide content of 90 percent (F. Katzmayr 18 September 1958, Thunder Bay Resident Geologist's office, assessment files).

The quality of the marl is generally good. The results of test work on samples submitted by W. S. Miners and F. Koosel of Thunder Bay, Ontario are detailed in Table 14.

Three samples of marl were taken by hand auger. The samples represent sections from 2 to 6 feet below creek bed at points 400 feet apart. Results of analytical studies by the Laboratory and Research Branch, Ontario Department of Mines and Northern Affairs, are shown in Table 15.

Black Sturgeon River Area

Table 14

ANALYSES OF SAMPLES FROM THE GRESKY MARL DEPOSIT (13),
SHILLABEER LAKE, IN THE BLACK STURGEON RIVER AREA;
FROM GUILLET 1969, p.109, 135, and 137.

Sample Number	M49	M73
Thickness (feet)	bulk	bulk
Chemical analysis (minus 100-mesh fraction)		
CaO, percent	46.12	47.84
MgO, percent	0.58	1.12
Fe ₂ O ₃ , percent	0.34	0.32
Moisture, percent	1.42	0.70
Loss on ignition, percent	43.56	45.28
Insoluble, percent	5.44	2.26
Total	97.46	97.52
Calculated CaCO ₃ , percent	82.4	85.5
Calculated MgCO ₃ , percent	1.2	2.3
Total carbonate	83.6	87.8
Brightness (relative to mag. carb. standard)	51.5	45.0
Oil absorption (lbs. oil per 100 lbs. marl)	56.4	71.0
Moisture (crude marl), percent		44.5
Dry marl per cu. yd. of crude, lbs.		910
Particle size analysis		
Percent finer than 74 micron (200-mesh)	81.0	85.0
Percent finer than 44 micron (325-mesh)	74.0	79.5
Percent finer than 30 micron	67.5	74.5
Percent finer than 20 micron	59.5	69.0
Percent finer than 10 micron	43.0	58.0
Percent finer than 5 micron	28.5	43.5
Percent finer than 2 micron	15.0	29.0
Shells		
(A = common; B = present; C = rare)		
Gastropoda (snails)		
<i>Amnicola</i>	B	B
<i>Physa</i>		
<i>Planorbis</i>	B	C
<i>Graulus</i>	B	C
<i>Valvata</i>	C	B
Pelecypoda (clams)		
<i>Pisidium</i>	B	B
<i>Sphaerium</i>	.....	.....
Ostracoda (ostracods)	.....	.....
Chara (algae)	B	A

Table 15

ANALYSES OF SHILLABEER CREEK MARL IN THE BLACK
STURGEON RIVER AREA; M. E. COATES SAMPLES; FROM GUILLET
1969, p.110.

	GM-1 percent	GM-2 percent	GM-3 percent
CaO	51.50	41.30	50.40
MgO	0.96	1.60	0.98
Fe ₂ O ₃	0.13	1.57	0.17
Loss on ignition	45.29	36.42	44.95
Insoluble	1.45	16.27	1.33
Total	99.33	97.16	97.83
Calculated CaCO ₃	92.00	73.70	90.00
Calculated MgCO ₃	2.00	3.34	2.02
Total carbonate	94.00	77.04	92.02
Brightness	62.0	53.5	65.0
Oil absorption	31.3	30.9	37.4

Gravel

Numerous small deposits of gravel are found throughout the Black Sturgeon River area. Usually the deposits are till deposits (eskers, kames, etc.). Metal for roads of the area has been obtained locally in most cases.

Black Sturgeon River Area

SELECTED REFERENCES

Bell, Robert

- 1870: Report on the geology of the northeast side of Lake Superior and of the Nipigon district; Geol. Surv. Canada, Report for 1866-1869, p. 313-364.

Blackadar, R. G.

- 1956: Differentiation and assimilation in the Logan sills, Lake Superior district, Ontario; American J. Sci., Vol. 254, October 1956, p. 623-645.

Coleman, Arthur P.

- 1909: Black Sturgeon iron region; Ontario Bur. Mines, Vol.18, pt.1, p.163-179. Accompanied by sketch map 18A.

Faure, G.

- 1964: The age of the Duluth gabbro complex and the Endion sill by the whole rock Rb-Sr method; MIT 12th Annual Progress Report, p. 255-257.

Faure, G., and Chaudhuri, S.

- 1967: The geochronology of the Keweenawan rocks of Michigan and the origin of the copper deposits; Report No. 1, Lab. for Isotope Geol. and Geoch., Dept. of Geol., Ohio State University.

Gittins, J., Macintyre, R. M., and York, D.

- 1967: The ages of carbonatite complexes in eastern Canada; Canadian J. of Earth Sci., Vol. 4, No. 4, p. 651-655.

Guillet, G. R.

- 1969: Marl in Ontario; Ontario Dept. Mines, IMR 28, 137p.

Kaye, L.

- 1969: Geology of Eayrs Lake-Starnes Lake area; Ontario Dept. Mines, GR77, 29p. Accompanied by Map 2172, scale 1 inch to 1 mile.

McInnes, Wm.

- 1896: Summary report on the survey of Lake Nipigon; Geol. Surv. Canada, Report for 1894, New Series, Vol. 7, pt. A, p. 48-51.

Moorhouse, W. W.

- 1957: The Proterozoic of the Port Arthur and Lake Nipigon regions, Ontario; p.67-76 in The Proterozoic in Canada, Royal Soc. Canada, Special Publ. No. 2, 191p.
1959: The study of rocks in thin section; Harper & Brothers, New York, 514p.

ODM-GSC

- 1962a: East Bay Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2108G, scale 1 inch to 1 mile. Survey flown April to October 1962.
1962b: Eaglehead Lake Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2109G, scale 1 inch to 1 mile. Survey flown April to October 1962.
1962c: Poshkokagan River Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2110G, scale 1 inch to 1 mile. Survey flown April to October 1962.
1962d: Wolf River Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2117G, scale 1 inch to 1 mile. Survey flown April to October 1962.

- 1962e: Shillabeer Lake Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2118G, scale 1 inch to 1 mile. Survey flown April to October 1962.
- 1962f: Black Sturgeon Lake Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2119G, scale 1 inch to 1 mile. Survey flown April to October 1962.
- 1962g: Red Rock Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2125G, scale 1 inch to 1 mile. Survey flown April to October 1962.
- 1962h: Nipigon Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2126G, scale 1 inch to 1 mile. Survey flown April to October 1962.
- 1962i: Orient Bay Sheet, Thunder Bay District; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Map 2127G, scale 1 inch to 1 mile. Survey flown April to October 1962.

Parks, William Arthur

- 1901: The country east of Nipigon Lake and River; Geol. Surv. Canada, Summary Report 1901, pt. A, p.105A-109A.

Tanton, T. O.

- 1931: Fort William and Port Arthur and Thunder Cape map-area, Thunder Bay District, Ontario; Geol. Surv. Canada, Mem. 167, 222p. Accompanied by 3 maps.

Wilson, A. W. G.

- 1910: Geology of the Nipigon Basin; Geol. Surv. Canada, Mem. 1, 152p. Accompanied by Map 8A.

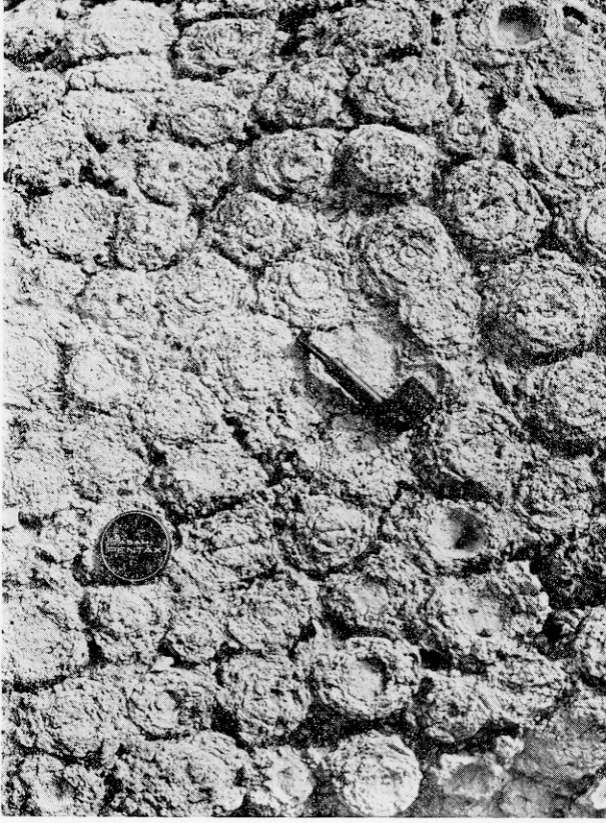
Black Sturgeon River Area

INDEX

	PAGE		PAGE
Abigogami Lake	13, 15	Disraeli Lake	13, 14, 15, 26, 27, 28, 29
Abitibi Paper Co. Ltd.	3	Dolomite	9, 10, 12, 14, 16, 28
Access	2	Dolomitic rocks:	
Acknowledgments	2	Chemical analyses, table	17
Adamson Township	1	Domtar Ltd., analysis by	35
Age dating, table	23	Drainage	3
Algoma Steel Corp. Ltd., The	27	Eaglehead Lake	5
Assessment work, table	26	Economic Geology	26-37
Anaconda Iron Ore (Ontario) Ltd.	35	Eileen Lake	13, 15
Analysis	35	Elizabeth Lake	5
Chemical:		Eskwanonwatin Lake	5, 7, 24
Diabase, table	29	Falconbridge Nickel Mines Ltd.	28
Dolomitic rocks, table	17	Assessment work, table	26
Fog (Eagle) Mountain sill, table	21	Faulting	23-26
Limestone, table	30	Fish and game	3
Magnetite sand, tables	33	Fog (Eagle) Mountain	10, 12
Marl, tables	36, 37	Sill:	
Sibley Group sedimentary rocks, tables	18, 19	Chemical analyses, table	21
Microscopic, note	16	Modal analyses, notes and table	21, 22
Andalusite schist, notes and photo	7	Fog Lake	35
Archean	3, 5-9, 22, 32	Frazer Lake	10
Assessment work, table	26	General Geology	5-22
Baartz, L., of Thunder Bay	35	Geochemistry:	
Barite veinlets	24	Of Sibley Group	17-21
Black Sturgeon Basin	10, 12, 16, 26	Geology	
Black Sturgeon Fault Escarpment	9, 12, 15	Economic	26-37
Photo	Frontispiece, 24	General	5-22
Black Sturgeon Fault zone	10, 12, 24	Structural	22-26
Black Sturgeon Lake	5, 7, 16, 25, 30, 32	Geophysics	3
Black Sturgeon River, photos	24, 25	Gilbert, Weldon P.	29
Black Sturgeon Trench, photos	24, 25	Glen Township	1
Booth Township	1	Gravel	5, 37
Breccia	8	Graydon Township	1
Calcite veinlets	24	Great Lakes Paper Co. Ltd., The	3
Chalcocite	27, 28	Gresky, A., of Hurkett	35, 36
Chalcopyrite	27, 29	Assessment work, table	26
Chemical analysis:		Gresky magnetite occurrence	31
Diabase, table	29	Gresky marl occurrence	35
Dolomitic rocks, table	17	Helen Lake	17
Fog (Eagle) Mountain sill, table	21	Hele Township	1
Limestone, table	30	Occurrence	33
Magnetite sand, tables	33	Hematite	30, 31, 32
Marl, tables	36, 37	Herminston, L., of Thunder Bay	35
Sibley Group Sedimentary rocks, tables	18, 19	Hurkett, settlement of	1, 3
Chief Bay	17	Hybrid rocks	8-9
Church Township	1	Igneous rocks	9, 22
Circle Lake	2	Industrial minerals:	
Cockeram Township	1	Gravel	37
Commerce Nickel Mines Ltd.	14, 27	Marl	35
Assessment work, table	26	Chemical analyses, tables	36, 37
Conglomerate	10-12	Innes Township	1
Cooke Point	17	Intrusive igneous rocks	22
Copper	14, 26-30	Iron	30-33
Description of properties	27-30	Description of properties	31-32
Cryptozoon Limestone	10, 16	In tables	33
Diabase	27, 28	Iron formation	3, 5, 7-8, 26
Chemical analyses, table	29	Jackfish River	17
Dikes	9, 22, 23	Kama Hills	13, 16
Sills	5, 26, 29		
Modal analyses, table	21		
Dikes	9, 22, 23		

	PAGE
Keweenaw	5, 9-22, 29
Koosel, F., of Thunder Bay	35
Lake Nipigon	1, 2, 9, 17, 22, 30
Lake Superior	3, 9
Limestone	9, 10, 31
Chemical analyses, table	30
Cryptozoon	10
Stromatolitic	15, 27
Lithologic units, table of	6
Little Poshkokagan Lake	2
Loon Lake	12
McAteer, William	29
McIvor Township	1
McMaster Township	1
Magnetite	8, 15, 31
Magnetite sand	32
Chemical analyses of	33
Mapping, notes	1
Maps:	
Geological (Coloured)	<i>back pocket</i>
Sketch	4, 20, 34
Marl	35-37
Sketch map of locations	34
Mawn Lake	5, 7, 30
Metagreywacke	7
Metamorphic rocks	9
Metasedimentary rocks	3, 5, 8
Metasediments	5-7, 30
Métavolcanic rocks	5, 8
Microscopic analyses, notes	16
Miners, W. S., of Thunder Bay	35
Minoletti occurrence	31
Assessment work, table	26
Moseau Mountain	12
Mudstone	10, 12, 16
Nipigon, village of	1, 16
Nipigon Township	1
Nonwatin Lake	5, 15, 24, 32
Packsack drilling, notes and photo	27, 28
Phelps Dodge Corp. of Canada Ltd.	29
Assessment Work, table	26
Pijitawabik Bay	17
Pine Portage, settlement of	1
Poshkokagan Lake	2
Poshkokagan River	17
Proterozoic	9-22
Purdon Township	1
Pyrrhotite	29
Ranta, Walley, of Port Arthur	29
Ranta, Walley, option	29
Red Rock cuesta	22
Red Rock gravel pit	13, 16

	PAGE
'Red Sandstone'	12
Resources	3
Sand, magnetite	32
Chemical analyses of, tables	33
Sandstone	10, 12
Sedimentary rocks	5, 9, 24
<i>See also:</i> Metasedimentary rocks;	
Metasediments; Sibley Group rocks	
Shale	10, 12
Shillabeer Creek	35
Shillabeer Lake	13, 15, 35
Sibley Group rocks	5, 9-19, 24
Chemical analyses of, table	18, 19
Geochemistry of	17-19
Limestone	26
Stromatolite	27
Sandstone	10, 12
Sills	9
Diabase	26
Keweenaw	5, 29
Fog (Eagle) Mountain:	
Chemical analyses, table	21
Modal analyses, notes and table	21, 22
Siltstone	10, 12
Spruce Lake	13
Spruce River	14, 27
Starnes Lake	13, 16
Sterling Township	1
Stewart Lake	10, 13, 15
Stocks	9
Stromatolites	15, 27
Photos	13, 14
Structural geology	22-26
Stucco Lake	7
Sturge Lake	29, 30
Sturgeon Escarpment	13, 15
Hematite occurrence	32
Sucker Lake	35
<i>See also:</i> Shillabeer Lake.	
Sulphide Minerals:	
<i>See:</i> Chalcopyrite; Pyrrhotite.	
Tchiatang Bluff	17, 24
Territory Mining Co. Ltd.	32
Assessment work, table	26
Till	25, 37
Uranium	33
Veinlets	24
West Shore occurrence	32
Wolfpup Lake	13, 15
Yardley, D. H., P. Eng.	27
Zircons	5

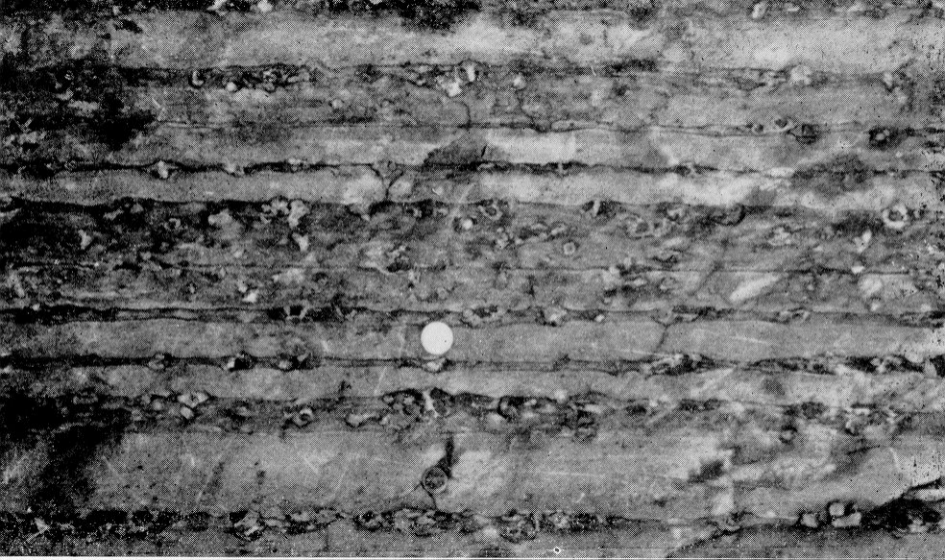




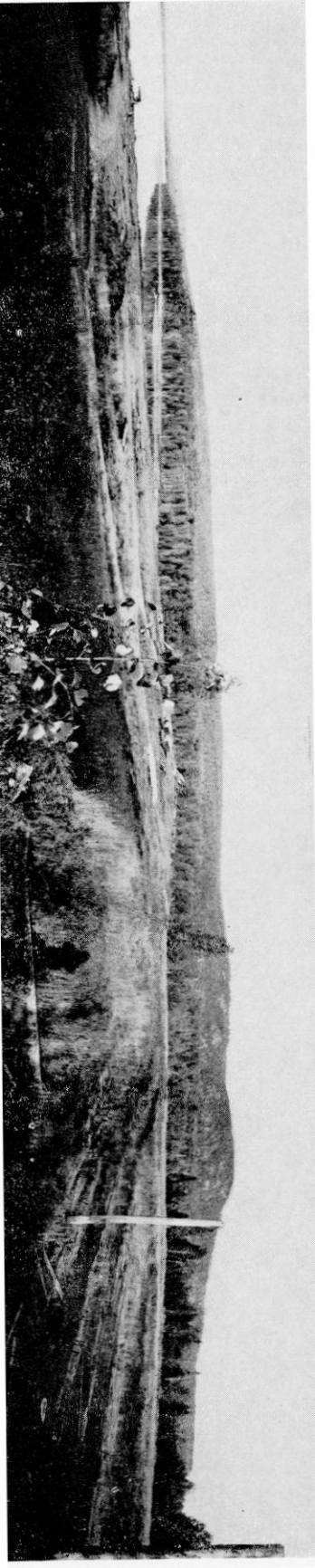












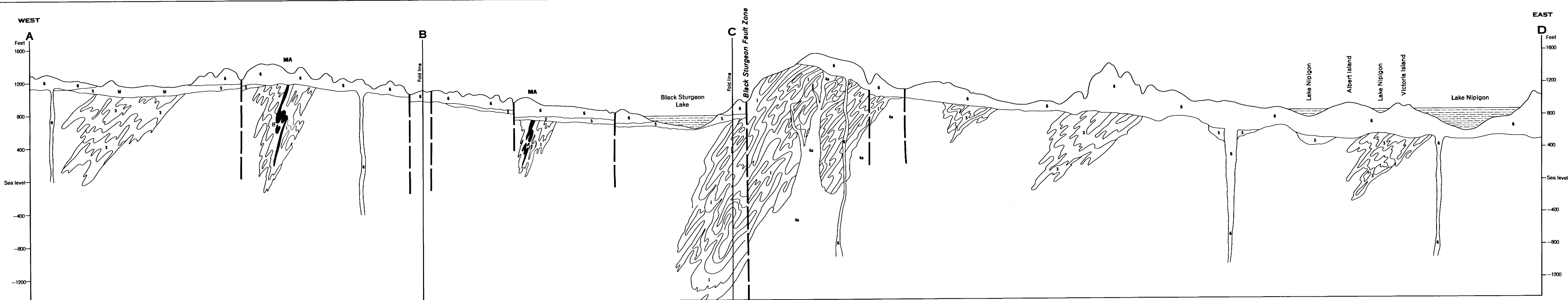


Figure 3a. Schematic cross-section along line A-D

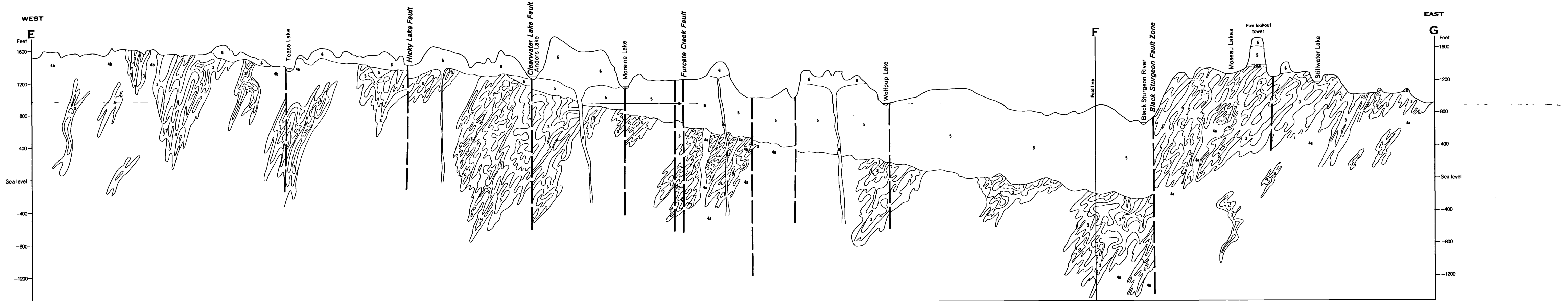


Figure 3b. Schematic cross-section along line E-G

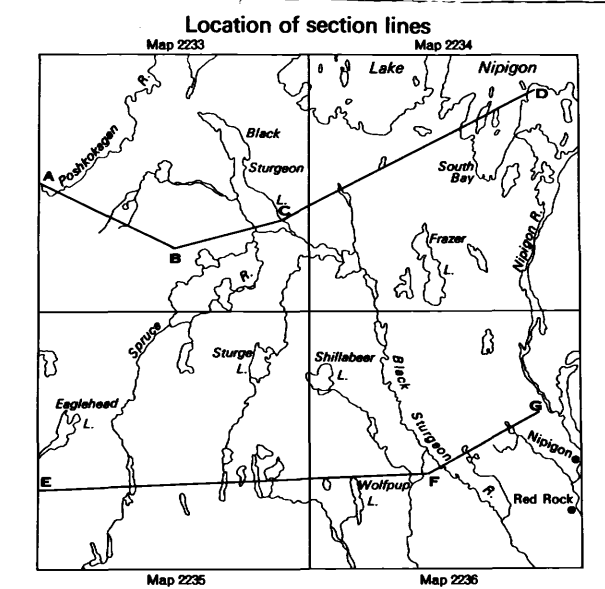
**Black Sturgeon River Area
Schematic Cross Sections**

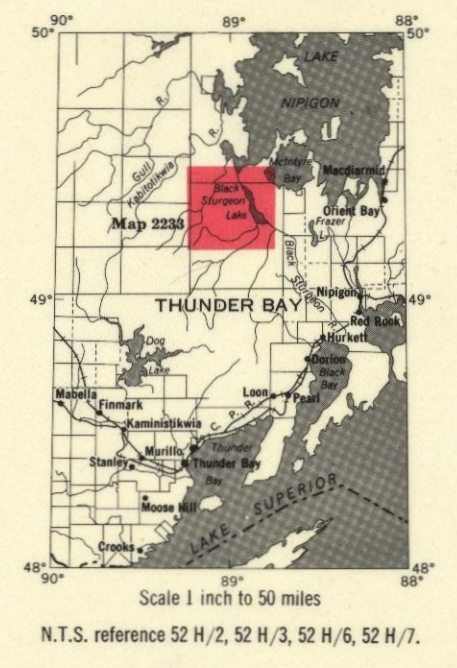
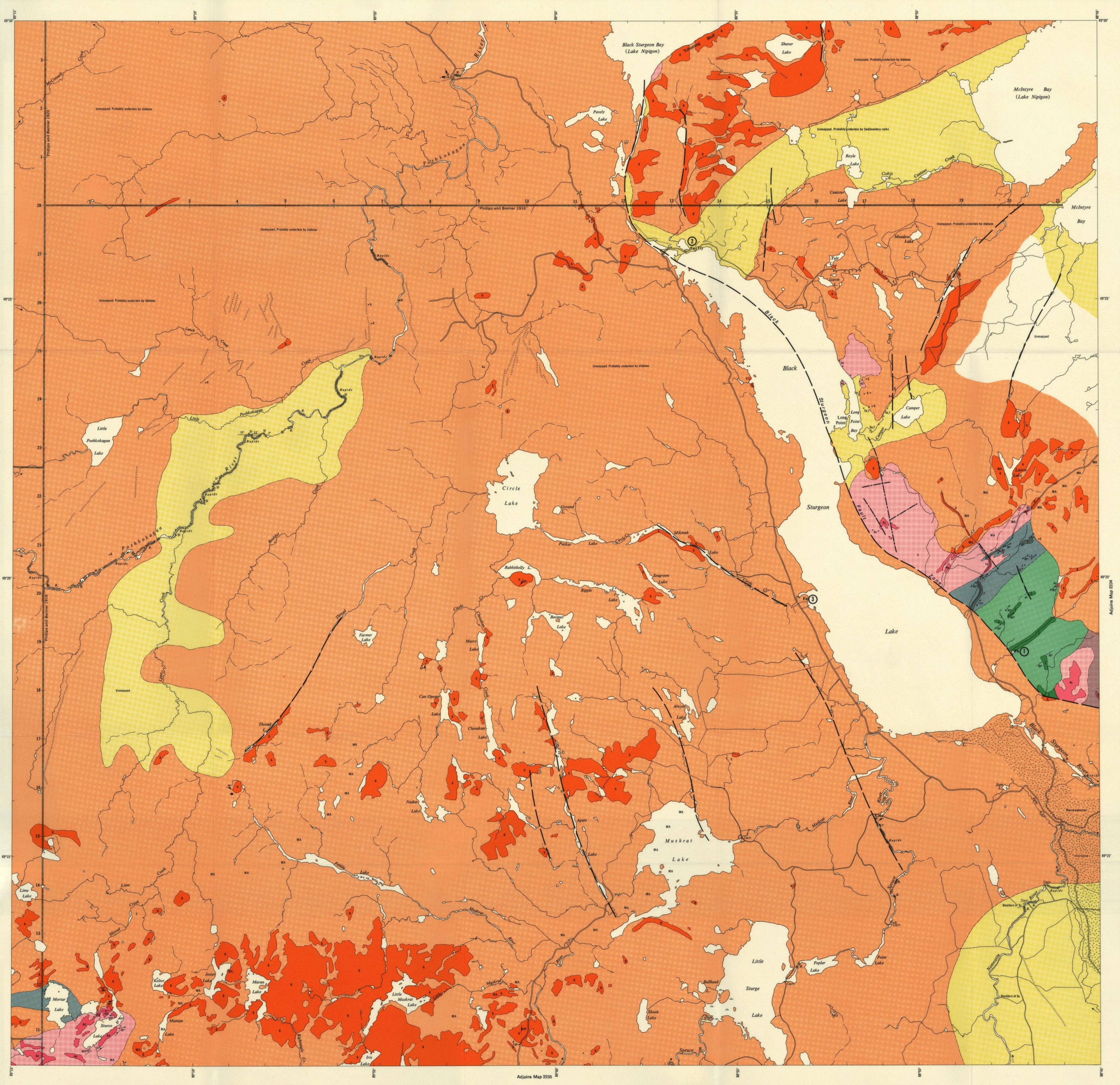
Horizontal Scale 1 inch to 2 miles
Vertical Scale 1 inch to 800 feet

LEGEND*

- CENOZOIC**
Not indicated.
- UNCONFORMITY
- PRECAMBRIAN**
- PROTEROZOIC**
- KEWEENAWAN**
- INTRUSIVE IGNEOUS ROCKS**
- 6 Diabase.
- INTRUSIVE CONTACT
- SIBLEY GROUP**
- 5 Unsubdivided sedimentary rocks.
- 5f Calcareous mudstone and shale, limestone and dolomite.
- 5c Red sandstone, siltstone and silty mudstone.
- 5b Sandstone, minor intraformational conglomerate.
- UNCONFORMITY
- ARCHEAN**
- FELSIC IGNEOUS ROCKS**
- 4a Albite granite, muscovite-biotite-albite granite.
- 4b Quartz monzonite.
- HYBRID ROCKS**
- 3 Migmatite.
- INTRUSIVE CONTACT
- METAVOLCANICS**
- 1 Unsubdivided metavolcanics.
- IF Iron formation.

*Only relevant sections of the legend shown on Maps 2233, 2234, 2235, and 2236 have been indicated.





LEGEND

CENOZOIC^c
RECENT
 Swamp and stream deposits.
PLEISTOCENE
 Glacial drift, gravel, sand, silt, and clay.
 UNCONFORMITY

PRECAMBRIAN^d
PROTEROZOIC
KEWEENAWAN
 INTRUSIVE IGNEOUS ROCKS
 6 Diabase.

INTRUSIVE CONTACT
SIBLEY GROUP^g
 5 Unsubdivided sedimentary rocks.
 5f Calcareous mudstone, limestone, dolomite, and calcareous shale, (red and purple).
 5g Algal limestone, dolomite, and associated shale beds.
 5d Mudstone and shale, red to purple with spotted zones.
 5c Red sandstone, siltstone, and silty mudstone.
 5b Sandstone, buff-white to pink, quartz-rich, minor intraformational conglomerate.
 5a Basal conglomerate.

UNCONFORMITY
ARCHEAN
FELSIC IGNEOUS AND METAMORPHIC ROCKS
 4a Albite granite, muscovite-biotite-albite granite.
 4b Quartz monzonite.
 4c Quartz diorite.
 4d Hornblende granite gneiss.
 4e Pegmatite.

HYBRID ROCKS
 3 Migmatite.

INTRUSIVE CONTACT
METASEDIMENTS
 2 Unsubdivided metasediments.
 2a Biotite-quartz-feldspar gneisses and schists.
 2b Gneissite.
 2c Andalusite-biotite-quartz-feldspar gneiss.
 2d Hornblende-biotite-quartz-feldspar gneiss.
 2e Garnet-biotite-quartz-feldspar gneiss.
 IF Iron Formation.

METAVOLCANICS
 1 Unsubdivided metavolcanics.
 1a Meta to intermediate metavolcanics: hornblende and chlorite schists.
 1b Metavolcanics with some metasediments.
 IF Iron Formation.

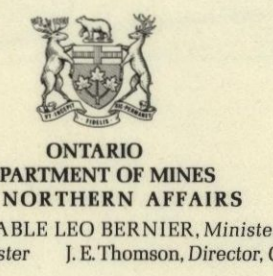
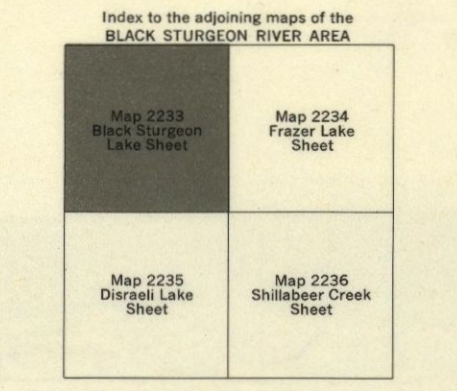
Cu Copper.
 Fe Iron.
 ma Marl.
 Ti Titanium.
 U Uranium.

^aUnconsolidated deposits. Cenozoic deposits are represented by the higher coloured areas of the map.
^bBedrock geology. Outcrops and inferred extensions of each rock unit are shown respectively in deep and light tones of the same colour. Where, in places, a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.
^cThis rock assemblage is grouped stratigraphically, 10 occurs on some of the adjoining sheets (see index) of the Black Sturgeon River Area.

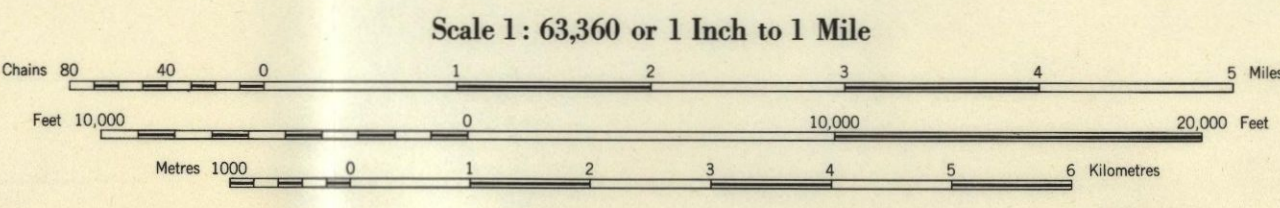
SOURCES OF INFORMATION
 Geology by M. E. Coates and assistants, 1967.
 Geology not tied to survey lines.
 Preliminary map P. 402, Black Sturgeon Lake Area, issued 1968; scale 1 inch to 1 mile.
 Ontario Department of Mines, Geological Survey of Canada, aeromagnetic maps 21095, 21105, 21165, 21195.
 Cartography by C. A. Harris and assistants, Ontario Department of Mines and Northern Affairs, 1971.
 Base maps derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests.
 Magnetic declination in the area was 0° in 1965.

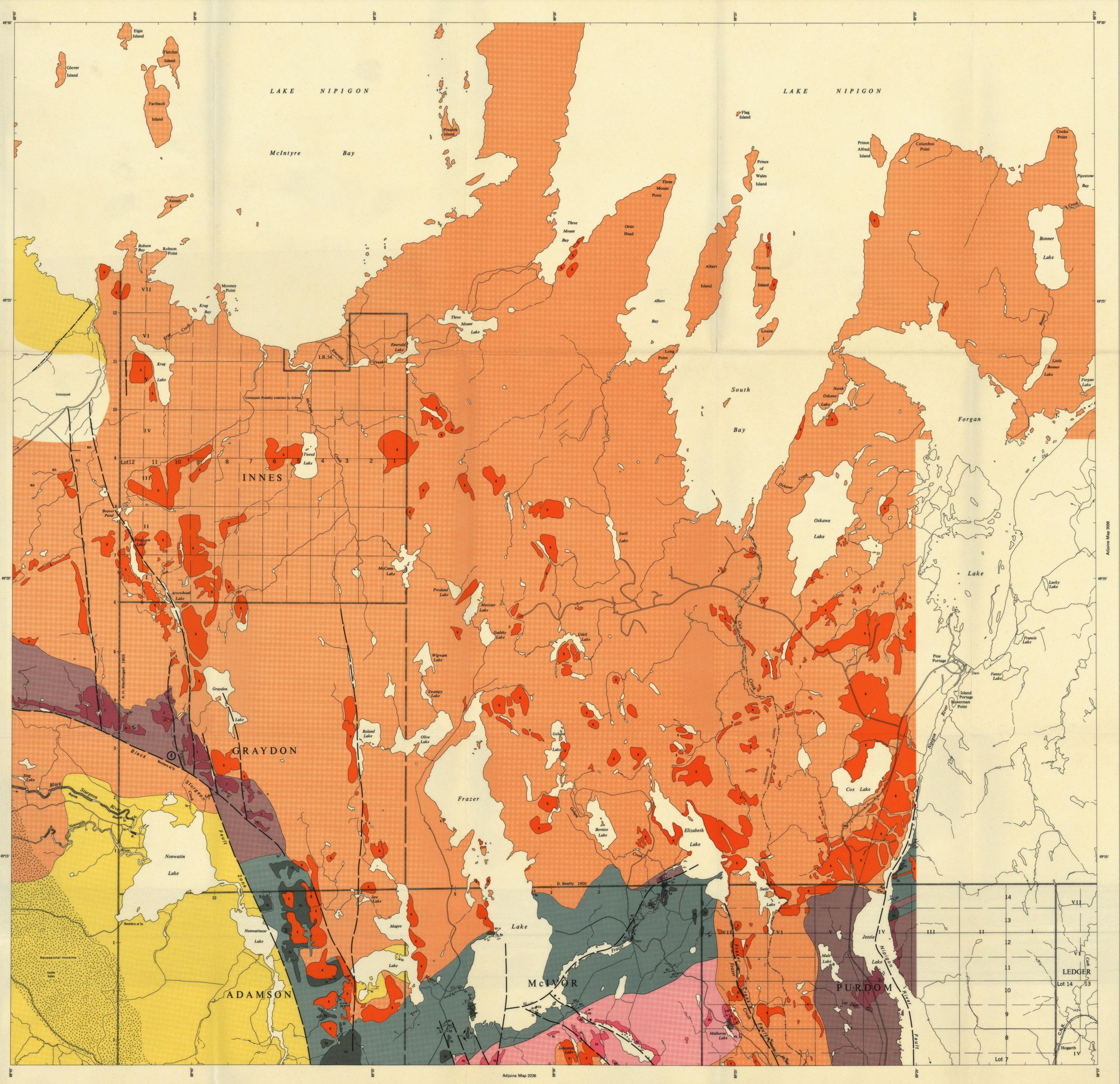
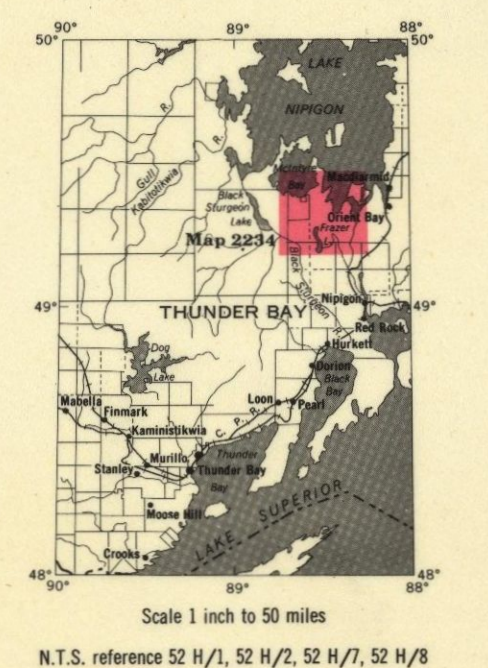
LIST OF PROPERTIES AND OCCURRENCES
 1. Sturgeon Escarpment occurrence.
 2. Territory Mining Co. Ltd. (1969).
 3. West Shore occurrence.
 Ownership of properties as of December 31, 1967. Date in square brackets refers to year of last major work. For further information see report.

- SYMBOLS**
- Glacial striae.
 - Esker.
 - Small bedrock outcrop.
 - Area of bedrock outcrop.
 - Bedding, horizontal.
 - Bedding, top unknown; (inclined, vertical).
 - Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).
 - Bedding, top (arrow) from cross bedding; (inclined, vertical, overturned).
 - Schistosity; (horizontal, inclined, vertical).
 - Gneissosity; (horizontal, inclined, vertical).
 - Bandings; (horizontal, inclined, vertical).
 - Lineation with plunge.
 - Geological boundary, observed.
 - Geological boundary, position interpreted.
 - Geological boundary, deduced from geophysics.
 - Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
 - Lineament.
 - Jointing; (horizontal, inclined, vertical).
 - Drag folds with plunge.
 - Drill hole; (vertical, inclined).
 - Muskeg or swamp.
 - Motor road. Provincial highway number encircled where applicable.
 - Other road.
 - Trail, portage, winter road.
 - Magnetic attraction.
 - Township boundary, base or meridian line, with milepost, approximate position only.
 - Township boundary, unsurveyed.
 - Location of mining property, unsurveyed. See list of properties and occurrences.



Map 2233
BLACK STURGEON LAKE SHEET
 THUNDER BAY DISTRICT





LEGEND

CENOZOIC^a
RECENT
Swamp and stream deposits.
PLEISTOCENE
Glacial drift, gravel, sand, silt, and clay.
UNCONFORMITY

PRECAMBRIAN^b
PROTEROZOIC
KEWEENAWAN
INTRUSIVE IGNEOUS ROCKS
6 Diabase.
INTRUSIVE CONTACT
SIBLEY GROUP^c
5 Unsubdivided sedimentary rocks.
5f Calcareous mudstone, limestone, dolomite, and calcareous shale (red and purple).
5g Algal limestone, dolomite, and associated shale beds.
5f Mudstone and shale, red to purple with spotted zones.
5g Red sandstone, siltstone, and silty mudstone.
5h Sandstone, buff to white to pink, quartz-rich, minor interformational conglomerates.
5i Basal conglomerate.
UNCONFORMITY

ARCHEAN
FELSIC IGNEOUS AND METAMORPHIC ROCKS
4a Albitic granite, muscovite-biotite-albite granite.
4b Quartz monzonite.
4c Quartz diorite.
4d Hornblende granite gneiss.
4e Pegmatite.
HYBRID ROCKS
3 Migmatite.

INTRUSIVE CONTACT
METASEDIMENTS
2 Unsubdivided metasediments.
2a Biotite-quartz-feldspar gneisses and schists.
2b Greywacke.
2c Amphibole-biotite-quartz-feldspar gneiss.
2d Hornblende-biotite-quartz-feldspar gneiss.
2e Garnet-biotite-quartz-feldspar gneiss.
If Iron Formation.
METAVOLCANICS
1 Unsubdivided metavolcanics.
1a Mafic to intermediate metavolcanics; hornblende and chlorite schists.
1b Metavolcanics with some metasediments.
If Iron Formation.

UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.

UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.

UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.

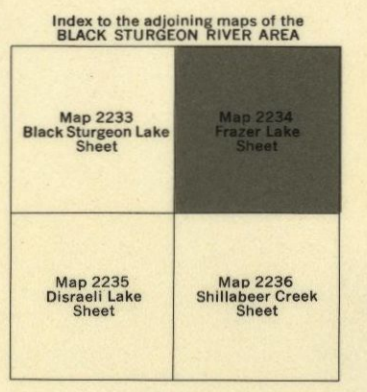
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.

UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.
UNCONFORMITY
If Iron Formation.

- SYMBOLS**
- Glacial striae.
 - Esker.
 - Small bedrock outcrop.
 - Area of bedrock outcrop.
 - Bedding, horizontal.
 - Bedding, top unknown; (inclined, vertical).
 - Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).
 - Bedding, top (arrow) from cross bedding; (inclined, vertical, overturned).
 - Schistosity; (horizontal, inclined, vertical).
 - Gneissosity; (horizontal, inclined, vertical).
 - Bandings; (horizontal, inclined, vertical).
 - Lineation with plunge.
 - Geological boundary, observed.
 - Geological boundary, deduced from geophysics.
 - Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
 - Lineament.
 - Jointing; (horizontal, inclined, vertical).
 - Drag folds with plunge.
 - Drill hole; (vertical, inclined).
 - Muskeg or swamp.
 - Motor road. Provincial highway number circled where applicable.
 - Other road.
 - Trail, portage, winter road.
 - Magnetic attraction.
 - Township boundary, base or meridian line, with milepost, approximate position only.
 - Township boundary, unsurveyed.
 - Location of mining property, unsurveyed. See list of properties and occurrences.

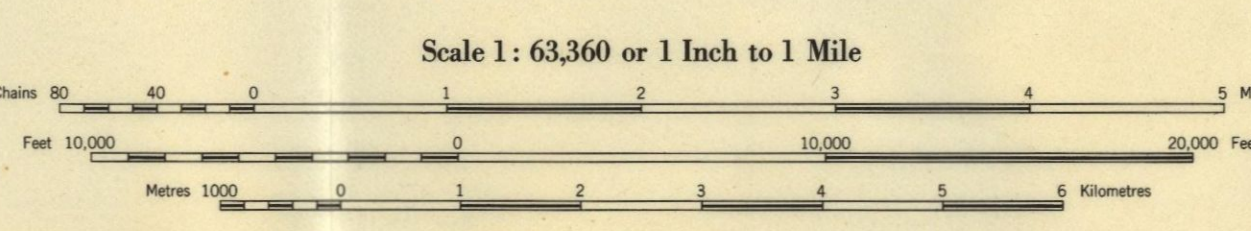
SOURCES OF INFORMATION
Geology by M. E. Coates and assistants, 1967. Geology not tied to surveyed lines.
Preliminary map P. 463, Black Sturgeon Lake Area, issued 1968; scale 1 inch to 1 mile.
Ontario Department of Mines, Geological Survey of Canada, aeromagnetic maps 21195, 21196, 21260, 21276.
Cartography by C. A. Harris and assistants, Ontario Department of Mines and Northern Affairs, 1971.
Base maps derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests. Magnetic declination in the area was 0° in 1965.

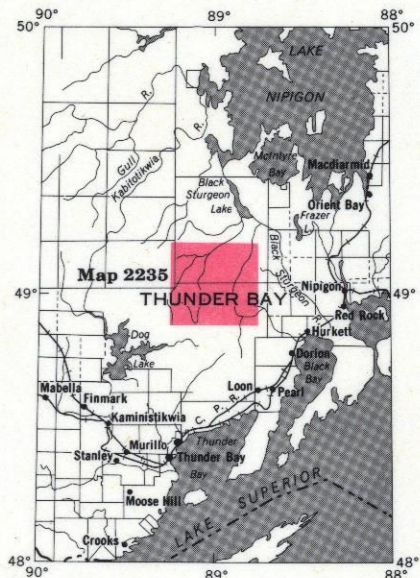
LIST OF PROPERTIES AND OCCURRENCES
4. Sturgeon Escarpment occurrence.
Ownership of properties as of December 31, 1967. For further information see report.



ONTARIO
DEPARTMENT OF MINES
AND NORTHERN AFFAIRS
HONOURABLE LEO BERNIER, Minister
D. P. Douglas, Deputy Minister | E. Thomson, Director, Geological Branch

Map 2234
FRAZER LAKE SHEET
THUNDER BAY DISTRICT





Scale, 1 inch to 50 miles
N.T.S. reference S2 A/14, S2 A/15, S2 H/2, S2 H/3

LEGEND

CENOZOIC*
RECENT
Swamp and stream deposits.
PLEISTOCENE
Glacial drift, gravel, sand, silt, and clay.

UNCONFORMITY

PRECAMBRIAN[†]
PROTEROZOIC
KEWEENAWAN
INTRUSIVE IGNEOUS ROCKS

6 Diabase.

INTRUSIVE CONTACT
SIBLEY GROUP[‡]
5 Unsubdivided sedimentary rocks:
5a Calcareous mudstone, limestone, dolomite, and calcareous shale, (red and purple).
5b Algal limestone, dolomite, and associated shale beds.
5c Mudstone and shale, red to purple with spotted zones.
5d Red sandstone, siltstone, and silty mudstone.
5e Sandstone, buff-white to pink, quartz-rich, minor intraformational conglomerate.
5f Basal conglomerate.[‡]

UNCONFORMITY

ARCHEAN
FELSIC IGNEOUS AND METAMORPHIC ROCKS
4a Aplitic granite, muscovite-biotite-albite granite.
4b Quartz monzonite.
4c Quartz diorite.[‡]
4d Hornblende granite gneiss.[‡]
4e Pegmatite.[‡]

HYBRID ROCKS
3 Migmatite.

INTRUSIVE CONTACT
METASEDIMENTS
2 Unsubdivided metasediments.[‡]
2a Biotite-quartz-feldspar gneisses and schists.
2b Gneiss.[‡]
2c Andalusite-biotite-quartz-feldspar gneiss.[‡]
2d Hornblende-biotite-quartz-feldspar gneiss.[‡]
2e Garnet-biotite-quartz-feldspar gneiss.[‡]

1f Iron Formation.[‡]

METAVOLCANICS
1 Unsubdivided metavolcanics.
1a Metas to intermediate metavolcanics; hornblende and chlorite schists.
1b Metavolcanics with some metasediments.

1f Iron Formation.[‡]

DE Copper.
FE Iron.
MA Magnetite.[‡]
TI Titanium.[‡]
U Uranium.[‡]

*Unconsolidated deposits. Cenozoic deposits are represented by the lighter colored areas of the map.
†Backrock geology. Outcrops and inferred extensions of each rock unit are shown respectively in deep and light tones of the same colour. Where, in places, a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.
‡This rock assemblage is grouped stratigraphically.
‡Occurs on some of the adjoining sheets (see index) of the Black Sturgeon River Area.

SOURCES OF INFORMATION
Geology by M. E. Coates and assistants, 1967.
Geology not tied to surveyed lines.
Preliminary map P. 482, Black Sturgeon Lake Area, issued 1966, scale 1 inch to 1 mile.
Ontario Department of Mines, Geological Survey of Canada, aeromagnetic maps 2106G, 2106G, 2117G, 2118G.
Cartography by C. A. Harris and assistants, Ontario Department of Mines and Northern Affairs, 1971.
Base maps derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests. Magnetic declination in the area was 0° in 1965.

LIST OF PROPERTIES AND OCCURRENCES
5. Algoma Steel Corp. Ltd., The Algoma Ore Division
6. Commerce Nickel Mines Ltd.
7. Falconbridge Nickel Mines Ltd.
8. Greatly magnetite occurrence.
9. McAleer, William, and Gilbert, Weldon P.
10. Minoclet occurrence.
11. Walley Ranta option.
12. Sturgeon Lake Group.
Ownership of properties as of December 31, 1967. For further information see report.

- SYMBOLS**
- Glacial striae.
 - Esker.
 - Small bedrock outcrop.
 - Area of bedrock outcrop.
 - Bedding, horizontal.
 - Bedding, top unknown; (inclined, vertical).
 - Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).
 - Bedding, top (arrow) from cross bedding; (inclined, vertical, overturned).
 - Schistosity; (horizontal, inclined, vertical).
 - Gneissosity; (horizontal, inclined, vertical).
 - Bandings; (horizontal, inclined, vertical).
 - Lineation with plunge.
 - Geological boundary, observed.
 - Geological boundary, position interpreted.
 - Geological boundary, deduced from geophysics.
 - Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
 - Lineament.
 - Jointing; (horizontal, inclined, vertical).
 - Drag folds with plunge.
 - Drill hole; (vertical, inclined).
 - Muskeg or swamp.
 - Motor road. Provincial highway number encircled where applicable.
 - Other road.
 - Trail, portage, winter road.
 - Magnetic attraction.
 - Township boundary, base or meridian line, with mileposts, approximate position only.
 - Township boundary, unsurveyed.
 - Location of mining property, unsurveyed. See list of properties and occurrences.

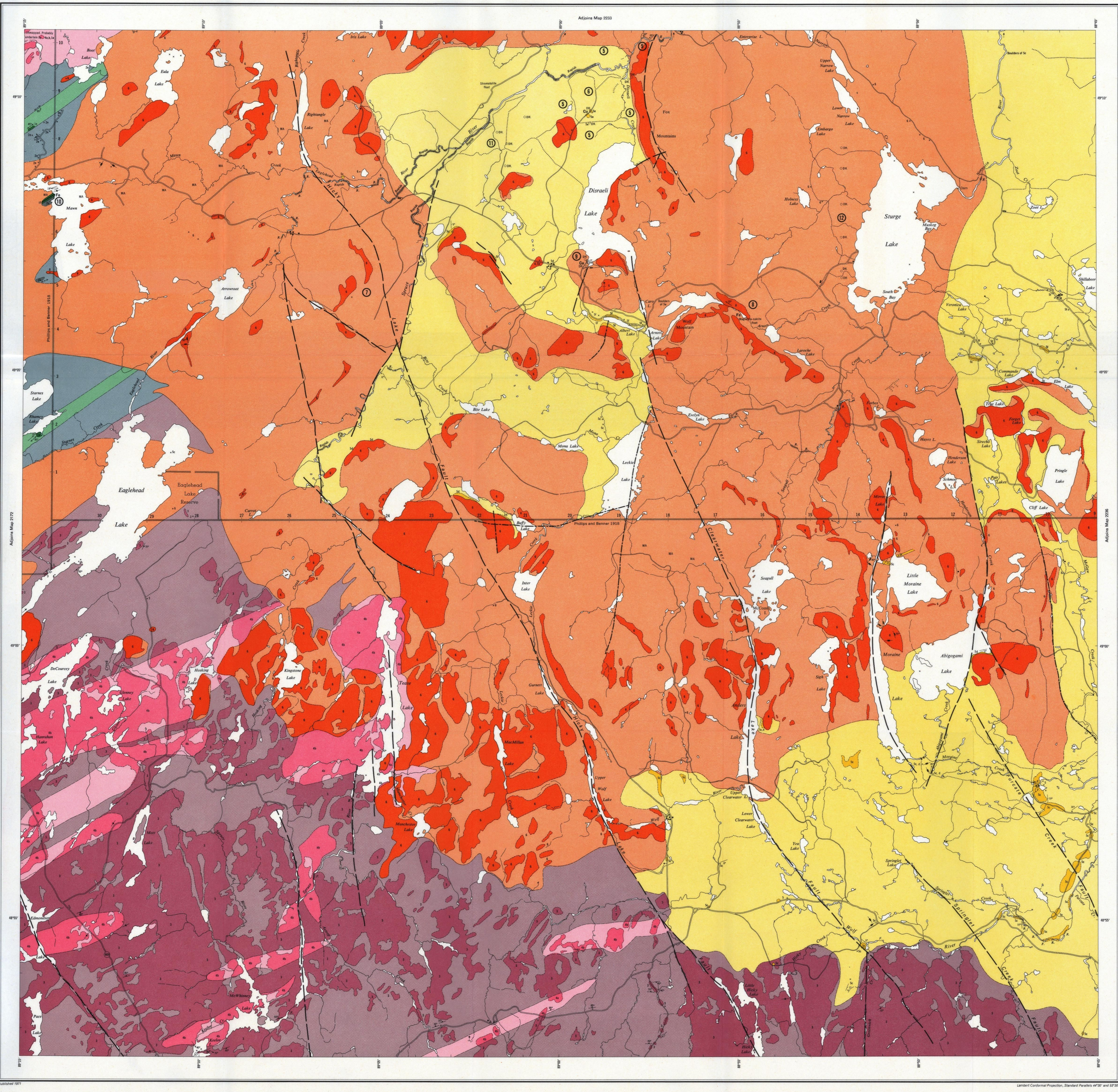
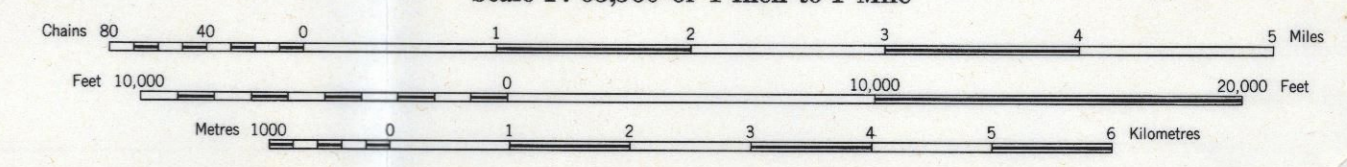
Index to the adjoining maps of the BLACK STURGEON RIVER AREA

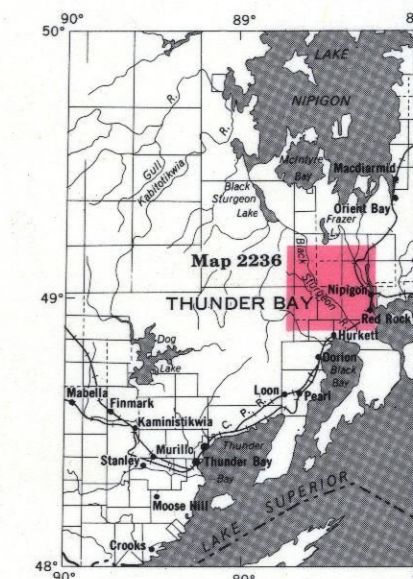
Map 2233 Black Sturgeon Lake Sheet	Map 2234 Frederic Lake Sheet
Map 2235 Disraeli Lake Sheet	Map 2236 Shillabee Creek Sheet

ONTARIO
DEPARTMENT OF MINES
AND NORTHERN AFFAIRS
HONOURABLE LEO BERNIER, Minister
D. P. Douglass, Deputy Minister | J. E. Thomson, Director, Geological Branch

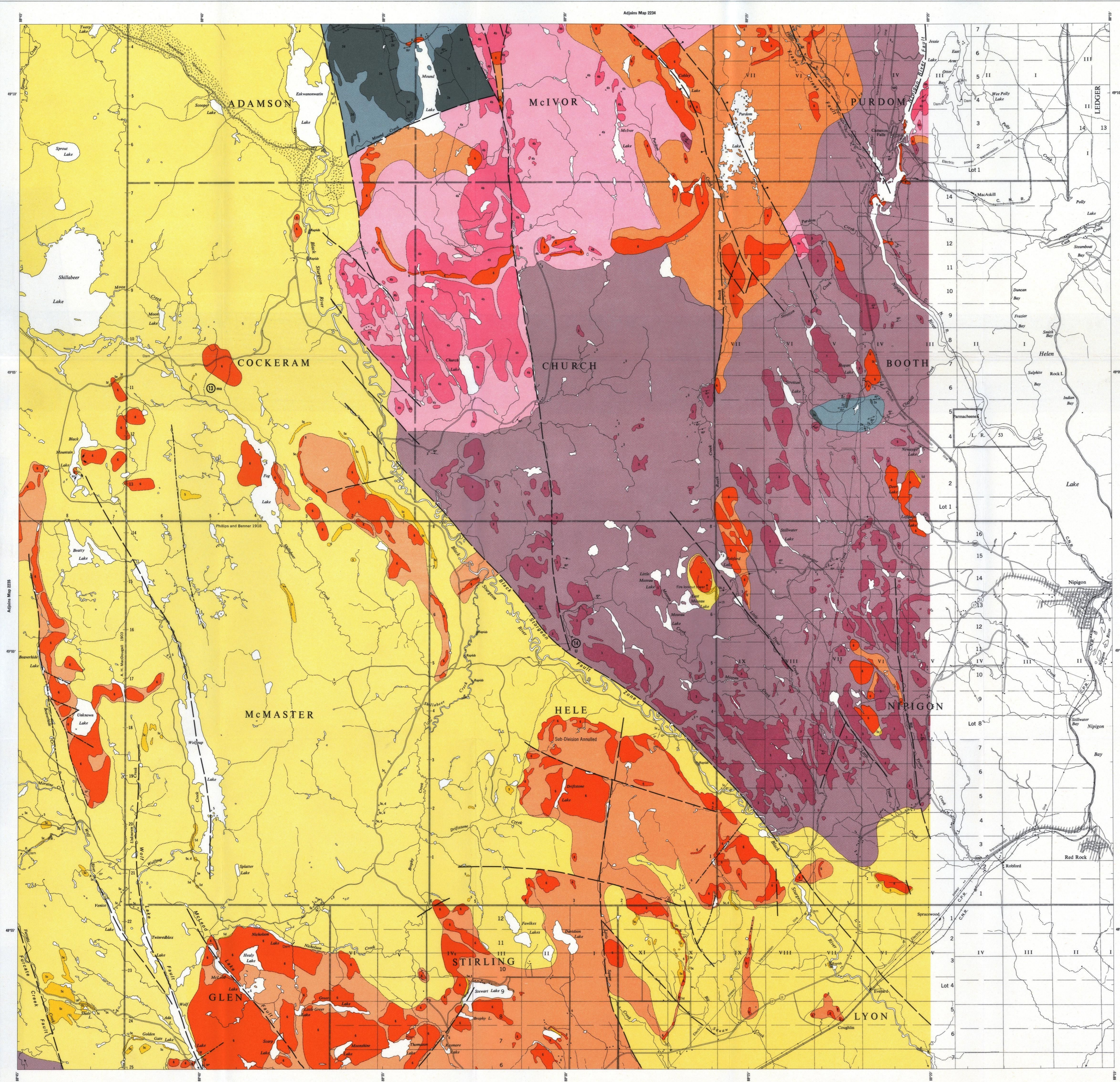
Map 2235
DISRAELI LAKE SHEET
THUNDER BAY DISTRICT

Scale 1: 63,360 or 1 inch to 1 mile





Scale, 1 inch to 50 miles
N.T.S. reference S2 A/15, S2 A/16, S2 H/1, S2 H/2



LEGEND

- CENOZOIC***
- RECENT
Swamp and stream deposits.
 - PLEISTOCENE
Glacial drift, gravel, sand, silt, and clay.
- UNCONFORMITY
- PRECAMBRIAN***
- PROTEROZOIC**
- KEWENAWAN**
- INTRUSIVE IGNEOUS ROCKS**
- 6 Diabase.
- INTRUSIVE CONTACT**
- SIBLEY GROUP†**
- 5 Unsubdivided sedimentary rocks, of Carboniferous, Devonian, and Silurian age, and calcareous shale, (red and purple).
 - 5a Algal limestone, dolomite, and associated shale beds.
 - 5b Mudstone and shale, red to purple with spotted zones.
 - 5c Red sandstone, siltstone, and silty mudstone.
 - 5d Sandstone, buff-white to pink, quartz-rich, minor interformational conglomerate.
 - 5e Basal conglomerate.
- UNCONFORMITY
- ARCHEAN**
- FELSIC IGNEOUS AND METAMORPHIC ROCKS**
- 4a Albite granite, muscovite-biotite-albite granite.
 - 4b Quartz monzonite.
 - 4c Quartz diorite.
 - 4d Hornblende granite gneiss.
 - 4e Pegmatite.
- HYBRID ROCKS**
- 3 Migmatite.
- INTRUSIVE CONTACT**
- METASEDIMENTS**
- 2 Unsubdivided metasediments.
 - 2a Biotite-quartz-feldspar gneisses and schists.
 - 2b Greywacke.
 - 2c Andalusite-biotite-quartz-feldspar gneiss.
 - 2d Hornblende-biotite-quartz-feldspar gneiss.
 - 2e Garnet-biotite-quartz-feldspar gneiss.
- IF Iron Formation.
- METAVOLCANICS**
- 1 Unsubdivided metavolcanics.
 - 1a Mafic to intermediate metavolcanics; hornblende and chlorite schists.
 - 1b Metavolcanics with some metasediments.
- IF Iron Formation.

- SYMBOLS**
- Glacial striae.
 - Esker.
 - Small bedrock outcrop.
 - Area of bedrock outcrop.
 - Bedding, horizontal.
 - Bedding, top unknown; (inclined, vertical).
 - Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).
 - Bedding, top (arrow) from cross bedding; (inclined, vertical, overturned).
 - Schistosity; (horizontal, inclined, vertical).
 - Gneissosity; (horizontal, inclined, vertical).
 - Bandings; (horizontal, inclined, vertical).
 - Lineation with plunge.
 - Geological boundary, observed.
 - Geological boundary, position interpreted.
 - Geological boundary, deduced from geophysics.
 - Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
 - Lineament.
 - Jointing; (horizontal, inclined, vertical).
 - Drag folds with plunge.
 - Drill hole; (vertical, inclined).
 - Musking or swamp.
 - Motor road. Provincial highway number encircled where applicable.
 - Other road.
 - Trail, portage, winter road.
 - Magnetic attraction.
 - Township boundary, base or meridian line, with mileposts, approximate position only.
 - Township boundary, unsurveyed.
 - Location of mining property, unsurveyed. See list of properties and occurrences.

SOURCES OF INFORMATION

Geology by M. E. Coates and assistants, 1967. Geology not tied to surveyed lines.

Preliminary map P. 462, Black Sturgeon Lake Area, issued 1966; scale 1 inch to 1 mile.

Ontario Department of Mines, Geological Survey of Canada, aeromagnetic maps 2106G, 2106C, 2111G, 2116G.

Cartography by C. A. Harris and assistants, Ontario Department of Mines and Northern Affairs, 1971.

Base maps derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests.

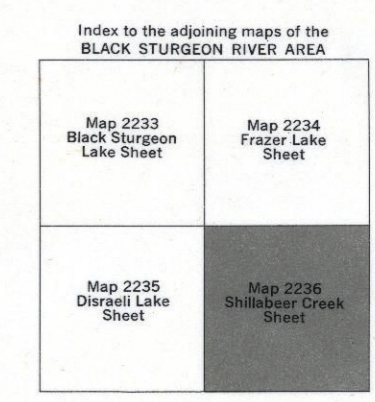
Magnetic declination in the area was 0° in 1965.

LIST OF PROPERTIES AND OCCURRENCES

13. Greasy marl occurrence.

14. Hele Township occurrence.

Ownership of properties as of December 31, 1967. For further information see report.



ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS
HONOURABLE LEO BERNIER, Minister
D. P. Douglas, Deputy Minister | J. E. Thomson, Director, Geological Branch

**Map 2236
SHILLABEER CREEK SHEET
THUNDER BAY DISTRICT**

