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Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada
E 5855/06175

Oil and Gas
WIKEMIKONG UNCEDED RESERVE #26

Petrole et gaz

VOL: 2 (A) Encl.)
Date From ¥De: 4/06/58
Date To ¥A: 8/12/81

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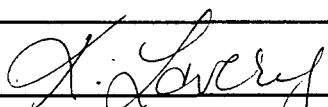
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Volume

1

J. D. Macgregor, P. Eng.
Petroleum Exploration Advisor

8 Cavalier Crescent,
THORNHILL, Ontario
L4J 1K5

February 16, 1981

Mr. S. A. Crandall
Director, Indian Minerals (East)
Department of Indian and Northern Affairs
1 Front Street West
TORONTO
M5J 1A4

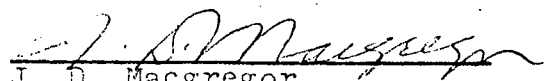
Dear Mr. Crandall:

RE - Petroleum Evaluation of Wikwemikong
Unceded Indian Reserve No. 26 - Contract
No. MIN 80/06

In accordance with Clause 9 of the above contract, I submit herewith six (6) copies of my final report on the petroleum evaluation of Wikwemikong Unceded Indian Reserve No. 26 in Manitoulin District, Province of Ontario.

Original drawings of all of the illustrations in the report have been placed in the map file in the Indian Minerals (East) office for permanent retention by that office.

Yours very truly,


J. D. Macgregor

PROPRIETARY

PETROLEUM EVALUATION *E3835*
of
THE WIKWEMIKONG UNCEDED INDIAN RESERVE NO.26
in
MANITOULIN DISTRICT, PROVINCE OF ONTARIO

by
J. D. Macgregor, P. Eng.
Petroleum Exploration Advisor
1981

E5855-06175

P R O P R I E T A R Y

Disclosure of the contents of this report is prohibited, except following granting of written approval by either the Chief of the Wikwemikong Indian Band or the Director of Indian Minerals (East) - Toronto.

PETROLEUM EVALUATION

of

THE WIKWEMIKONG UNCEDED INDIAN RESERVE NO. 26

in

MANITOULIN DISTRICT, PROVINCE OF ONTARIO

National Topographic System (NTS) Map Area:

41-H/12 and 13

Location: $45^{\circ} 45'$ N.Lat./ $81^{\circ} 45'$ W. Long.

J.D. Macgregor, P. Eng.,
Petroleum Exploration Advisor
1981

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Band Council Resolution No. 862 -
February 6, 1980.

APPENDIX B

Production of Manitoulin County Wells,
Prepared by MNR - Petroleum Section,
Province of Ontario.

Petroleum and Natural Gas Report by
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I. PREFACE

Wikwemikong Unceded Indian Reserve No. 26 occupies the eastern end of Manitoulin Island in Manitoulin District, Province of Ontario. The area of the Reserve is 105,300 acres (165 square miles). It is the largest Reserve in Southwestern Ontario with Paleozoic-age rock cover and related petroleum possibilities. The current chief is Mr. Ronald Wakegijig.

A Band Council Resolution (BCR) No. 862, dated February 6, 1980 (Appendix A), authorized the Indian Minerals (East) office in Toronto to commission the author (Contract No. MIN 80/06): "to initiate the exploration and evaluation work of the oil and gas potential of the Wikwemikong Reserve with the intention to develop feasible deposits".

The author gratefully acknowledges the courteous and helpful advice and assistance provided by the Ontario Ministry of Natural Resources (Petroleum Resources Section), London, Ontario, and the staff of Indian Minerals (East) office in Toronto.

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II. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1. Wikwemikong Indian Reserve occupies 165 square miles at the eastern end of Manitoulin Island.
2. It corresponds to the northern rim of the Michigan Basin with mean thickness of 800 feet of Paleozoic-age rocks, including Ordovician and Silurian Systems only.
3. 35 wells were drilled between 1863 and 1958 on the Reserve. Oil and gas showings were common. Some oil was produced. Well drilling and production records are very poor. Unlikely that total oil produced exceeded 20,000 barrels.
4. All oil showings and produced oil were from the Ordovician-age Trenton limestone/dolomite (now called Lindsay formation). Reservoir characteristics are poor. Porosity is low-grade and sporadic and permeability seems non-existent.
5. Oil source was the Lower Whitby black shale (Collingwood-Utica equivalent) which overlies the Trenton.
6. Inadequate reservoir facilities and absence of effective traps on the Wikwemikong Reserve downgrade petroleum prospects. Rated - 'Poor'.
7. Silurian pinnacle reefs are expected to underlie the offshore area. Prospects for offshore petroleum (oil and/or gas) are rated - 'Very Good'. Examination of ownership and administration of offshore petroleum rights are recommended on behalf of the Indian Bands of Manitoulin Island.

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III. INTRODUCTION

Wikwemikong Unceded Indian Reserve is identified on the Index Map (Figure 1). It is situated at the eastern end of Manitoulin Island, 15 miles off the northern shore of Lake Huron.

Manitoulin Island comprises part of the Niagara Escarpment which traverses Southwestern Ontario over a distance of some 400 miles from Niagara to Sault Ste Marie at the eastern end of Lake Superior (Figure 1). The Niagara Escarpment is a cliff up to 1,000 feet in height, sculpted from the south and west dipping Silurian-age sedimentary rock formations which are variably resistant to erosion. The rock formation components of the escarpment are identified on the stratigraphic chart (Figure 2). The softer Cataract Group occurs at the base of the escarpment and the harder, more erosion resistant Guelph-Lockport Group forms the top.

The Niagara Escarpment crosses Wikwemikong Indian Reserve in Karoni Township where the relief is about 300 feet. The crossing is shown on Figures 5 and 6, (two maps of the Reserve at Scale 1 inch = 1 mile), also on Figure 7, (geological cross section) and on Figure 8, (surface geological map).

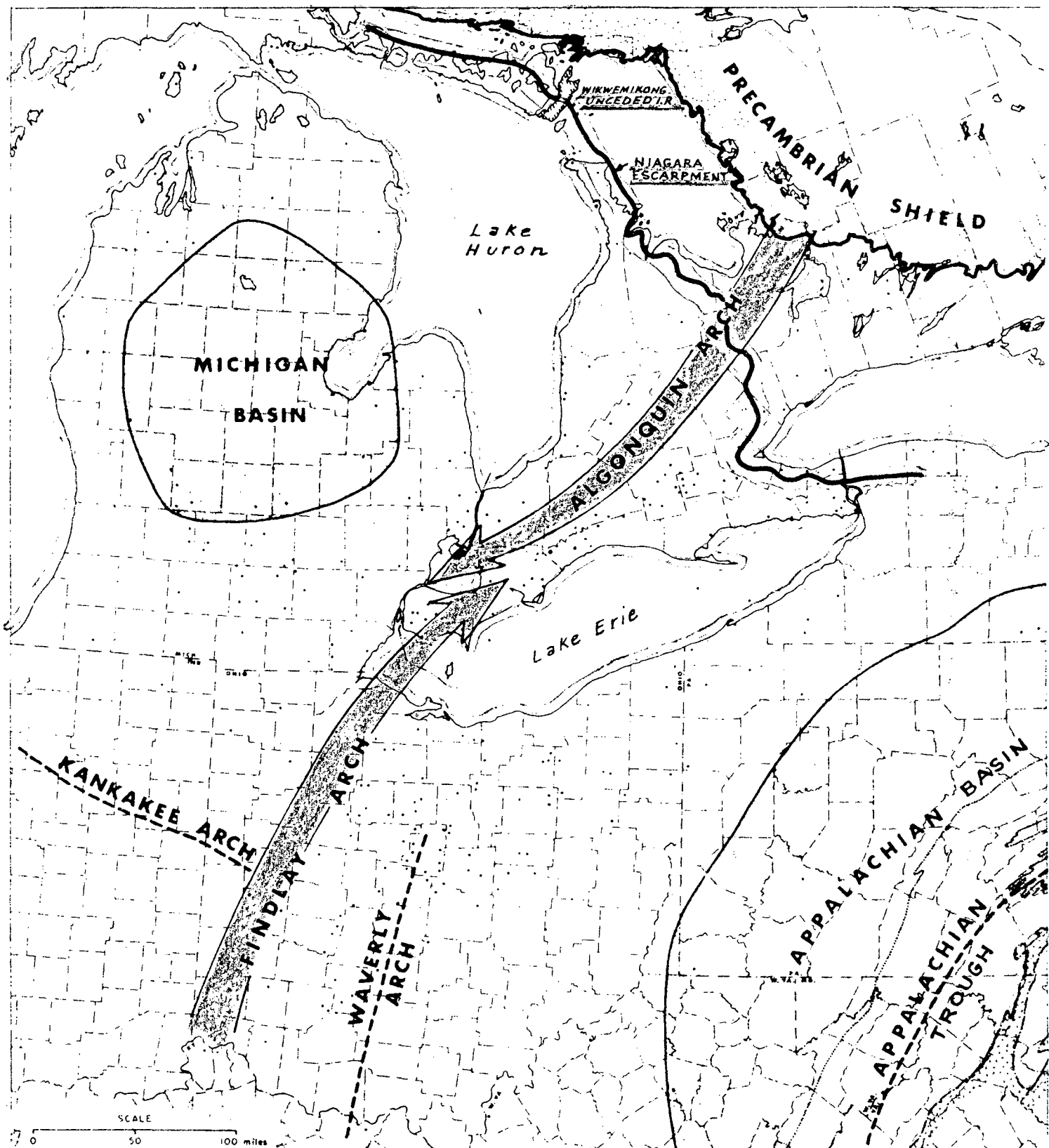
Manitoulin Island, including Wikwemikong Indian Reserve, is on the northern flank of the Michigan Basin, within about 20 miles of the basin's northern rim where Precambrian-age basement rocks outcrop (Figure 1).

Interest has been displayed in petroleum on Manitoulin Island at intervals dating back over more than 100 years. During various periods of interest, some 125 wells were drilled, without significant commercial results. 35 wells are reported to have been drilled on the Wikwemikong Reserve but not all of them can be located. 26 wells are identified on the maps (Figures 5 and 6) of this report, however, drilling, geological, testing, production and ultimate disposition records for all of the wells are either unavailable or of poor quality.

3(a)

GREAT LAKES AREA MAJOR GEOLOGICAL FEATURES

J. D. MACGREGOR 1980



AFTER ONTARIO MINISTRY OF NATURAL RESOURCES
PETROLEUM SECTION PAPER 71-2 by R.J. BRIGHAM

INDEX MAP - Figure 1 000995

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The available recorded history of drilling and production in 4 localities in eastern Manitoulin Island is summarized on the maps (Figures 5 and 6), including Kyto, Manitowaning, Wikwemikong and Cape Smith areas. It appears unlikely that cumulative oil production for any of these 4 areas exceeded 10,000 barrels.

IV. HISTORY OF PETROLEUM OPERATIONS

(Refer to Figures 6 and 7 and Appendix B for localities and history of drilling and production operations).

Jesuit missionaries discovered an oil spring on the south side of Smith Bay in the northern part of the Wikwemikong Indian Reserve in the mid 1600's. In the 1860's, 6 wells were drilled in the vicinity of the seepage but at unrecorded locations, down to depths of 524 feet. Some oil was produced before the supply failed, according to M.Y. Williams in his Summary Report for 1920 (see Bibliography). Williams reports the oil came from the Trenton which is overlain by black (petroliferous?) Utica Shale.

Also in the mid 1860's the Manitoulin Oil Company drilled 2 wells near Manitowaning which yielded showings of oil but no production.

In 1904-05, the Great Northern Oil and Gas Company drilled some 5 wells about 2 miles south of Wikwemikong village. The discovery well is reported to have produced 3,000 barrels of oil (see Appendix B). It appears unlikely that aggregate production from this site exceeded 10,000 barrels of oil.

In 1905-06, Benedum-Trees Oil Company of Pittsburgh, Pennsylvania drilled 3 wells at Manitowaning which were capable of producing oil, thereby identifying the Manitowaning oilfield. No production records were kept, however it appears the oil was used for restricted local needs only. The reservoir is the Trenton. Interest in the Manitowaning area resumed in the late 1930's and early 1940's when the following companies drilled a total of 14 wells: Ashland Oil and Refining, Ethredge-Olson Oil Development, Island Oils, Ivy Drilling, H.C. Gordon, Lew Kemp, Morris and Vigors, Manitowaning Oil, Manitoulin Oil and Gas and Sault Ste Marie Syndicate. Output was restricted but unrecorded, and used only for local purposes.

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Oil showings were encountered in wells drilled near Pike Lake in Bidwell Township in 1912 and were followed by renewed drilling activities in 1920 by the Kyto Oil Company. The Kyto oilfield failed to produce commercial quantities of oil. The reservoir for the showings was again the Trenton. Ashland Oil and Refining Company drilled various wells in the Kyto area between 1948-1950. Oil is reported to have flowed from one well, according to Liberty (see Bibliography).

In 1950, Great Lakes Carbon drilled 6 diamond drill holes on Wikwemikong Indian Reserve. Operator was George Shakel. Showings were reported but no production was established.

The latest, serious petroleum exploration venture on Manitoulin Island was by Imperial Oil Limited in 1956-58. 22 wells were drilled, 3 on the Wikwemikong Indian Reserve. All of the wells drilled to depths sufficient to test the Trenton. Depths varied from 160 feet to 1,177 feet. Frequent showings were reported but there were no commercial successes.

The history of petroleum ventures on Manitoulin Island concerning liquid petroleum, or oil, reveals persistent showings in the Trenton rocks (probably dolomite) but disappointingly poor production performance. The rock section under Manitoulin Island appears to be: "source - rich and reservoir - poor". Although production records were not kept, it appears unlikely that aggregate, all time oil production from wells on Manitoulin Island exceeded 50,000 barrels.

Frequent reports of showings of gas appear in the records of wells drilled on Manitoulin Island. There has never been any gas produced on a commercial scale. The gas showings occur in the Georgian Bay, Whitby and Trenton rocks.

A compilation of available production information concerning Manitoulin Island wells, prepared by the Ministry of Natural Resources of Ontario, is contained in Appendix B.

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All available recorded information concerning wells drilled on Manitoulin Island to 1937 is contained in M.Y. Williams' Preliminary Report No. 37-25 for the Geological Survey of Canada (see Bibliography). A copy of the section from the Williams report entitled "Petroleum and Natural Gas" is included in Appendix B.

V. REGIONAL GEOLOGY

Southwestern Ontario is the western component of the St. Lawrence Lowlands physiographic subdivision of Canada which extends from western Newfoundland to the eastern shores of Lake Huron and Georgian Bay. The East St. Lawrence Lowland corresponds to the northern part of the Gulf of St. Lawrence, including Anticosti Island; the Central St. Lawrence Lowland occupies the Ottawa-Montreal area; and the West St. Lawrence Lowland lies between Lake Huron (including Manitoulin Island) and Lakes Erie and Ontario. All 3 'St. Lawrence Lowland' physiographic areas are characterized by underlying Paleozoic-age sedimentary rocks which rest directly on ancient Precambrian crystalline rocks.

Paleozoic rocks underlie all of Southwestern Ontario from the north shore of Lake Huron - Georgian Bay - Lake Simcoe area (outcrop edge of the Precambrian Shield) southward, extending under Lakes Huron, Erie and Ontario into the adjacent states of Michigan, Ohio, Pennsylvania and New York (Figure 1).

Figure 2 is a stratigraphic section of the Paleozoic rocks exposed on the surface and underlying Manitoulin Island. Only 2 Systems are represented: Ordovician and Silurian. Mean thickness is 800 feet. Thickness at Wikwemikong Indian Reserve varies from less than 100 feet in the northern part of the Reserve to over 1200 feet in the south.

The principal lithologic characteristics of the 2 systems are:

Silurian --- Carbonate rocks (dolomite and limestone - generally dense, except the Guelph Formation which displays organic reefal porosity characteristics in outcrops at the southern end of the Wikwemikong Reserve), interbedded with infrequent, non-petroliferous shale beds.

Ordovician --- Carbonate rocks (dolomite and limestone with minor, local, discontinuous porosity, possibly fracture derived), interbedded with shale (black/petroliferous, grey, brown and red).

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Throughout Paleozoic time, marine seas occupied present day South western Ontario and the adjoining States of Michigan, Ohio and New York (see Figure 1). Paleozoic-age rocks were deposited in 2 basins in the area - the Michigan Basin and the Appalachian Basin which were/are separated by the Algonquin Arch. Manitoulin Island is near the northern rim of the Michigan Basin.

The Michigan Basin is an intracratonic depression into which sediments were deposited with only infrequent interruptions from Cambrian through Pennsylvanian time. It occupies 120,000 square miles in Michigan, Ohio, and Ontario. Sedimentary rock thickness in the deepest part of the basin is 14,000 feet and mean thickness in the basin is 5,000 feet. The total basin fill is 120,000 cubic miles of sedimentary rocks.

Oil and gas occur in Cambrian, Ordovician, Silurian, Devonian and Mississippian-age rocks in the Michigan Basin in the States of Michigan and Ohio, and in Southwestern Ontario.

In Michigan, oil and gas production to the end of 1978 by geologic age was:

	<u>Oil</u> (Millions Bbls.)	<u>Gas</u> (Billions C.F.)
Mississippian	2 (1%)	229 (17%)
Devonian	515 (67%)	120 (9%)
Silurian	133 (17%)	824 (60%)
Ordovician	<u>119 (15%)</u>	<u>197 (14%)</u>
	<u>769</u>	<u>1,370</u>

In the Ontario part of the Michigan Basin, the main petroleum reservoir is Silurian-age carbonate rocks of organic reefal origin. To the end of 1977, 8.7 million barrels of oil (16% of total Ontario oil production) and 744 Billion cubic feet of gas (93% of total Ontario gas production) had been produced from Silurian-age pools.

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Figure 3 is a map of the Michigan Basin with emphasis on Silurian-age oil and gas pools. The reservoirs for the Silurian pools in both Michigan and Ontario are carbonate reefs of organic origin which appear inclined to encircle the Michigan Basin, due to the influence of water depth in determining 'where' organic reefs are positioned. Present day petroleum exploration in Michigan and Southwestern Ontario is directed almost exclusively towards Silurian reef prospects in the 'Shelf' reef environment belt shown on the map. The 'Shelf' was a critical water depth environment in the Michigan Basin during Silurian time wherein marine organisms found compatible conditions for the building of habitat colonies (reefs). The reef builder organisms later provided source material for petroleum which subsequently migrated back into the porous reefal reservoir rocks to accumulate in oil and gas pools.

Currently, the emphasis of petroleum exploration in the State of Michigan is in the 'northern reef province' of Otsego, Montmorency and Presqu'ile Counties where surveys and drilling are extending the northern trend of Silurian reefal oil and gas pools out to the Lake Huron shore. Similarly in Southwestern Ontario, exploration is pursuing Silurian reef prospects in northern Lambton County and Huron County. The Silurian shelf facies of the Michigan Basin obviously bends between northern Michigan and Southwestern Ontario under Lake Huron and it appears nearly undeniable that petroleum bearing reefs underlie the lake waters on both sides of the international boundary.

Figure 4 is a geological cross section (A-B), 350 miles in length, from South to North through the Michigan Basin. It depicts the regional geologic restraints on petroleum opportunities at Manitoulin Island in comparison with areas in Michigan and Southwestern Ontario corresponding to deeper parts of the Michigan Basin.

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Cambrian-age rocks, which provide excellent reservoirs for oil pools along the northern side of Lake Erie in Southwestern Ontario, are not present under Manitoulin Island. As shown on the cross section, they 'wedge out' under Lake Huron. The part of the Silurian System which contains reefal reservoirs for oil and gas in Michigan and Southwestern Ontario is likewise absent at Manitoulin Island due to erosional truncation of the tilted rim of the basin.

The main sedimentary rock component of Manitoulin Island is the Ordovician System, including the Black River and Trenton Groups and the Whitby and Georgian Bay formations. These rock units will be examined in the 'Stratigraphy' and 'Structure' chapters of this report. Inescapable to the petroleum evaluation of Manitoulin Island, however, is the inferiority of Ordovician rocks as reservoirs for oil and gas in the Michigan Basin, compared with the porous sandstone and carbonate rocks of the Cambrian, Silurian and Devonian Systems.

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VI. STRATIGRAPHY

The preserved remnant of Paleozoic sedimentary rocks on the north flank of the Michigan Basin which corresponds to Manitoulin Island is restricted to Ordovician and Silurian-age rocks. Mean thickness of the section is 800 feet. Lithology and unit thicknesses of the sequence are summarized on Figure 2 and stratigraphic relationships are shown on Cross Section C-D (Figure 7).

The authority for the lithology and stratigraphy of the Paleozoic rocks of Manitoulin Island is the M.Y. Williams report of 1937 (see Bibliography). Following is an abbreviated summary identification of the rock units.

A. ORDOVICIAN

Black River Group

Basal Beds (called Lowville by Williams)

Red sandstone and shale, overlain by red and green limy beds.
Exposed in R.R. cuts on Cloche Peninsula.

Gull River (called Leray by Williams)

Soft, white limestone, capped by 'birdseye' limestone.
Exposed in R.R. cut near Swift Current at eastern end of Cloche Peninsula.

Bobcaygeon (called Black R. Limestone by Williams)

Dark colored limestone which weathers into soft, nodular masses. Exposed near Swift Current.

Trenton Group

Verulam (called Lower Trenton by Williams)

Dolomitic limestone. Highly fossiliferous. Green cast on bedding planes.

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Lindsay (called Upper Trenton by Williams)

Limestone - Dolomite. Fossiliferous. Interbedded shale. Sporadic, lowgrade porosity. Oil-bearing formation in the region. Exposed near Little Current.

Whitby Formation (Williams called the Lower Whitby - Collingwood and the Upper Whitby - Sheguiandah). The Lower Whitby (Collingwood) is dark grey to black, bituminous shale. It is the age equivalent of the bituminous Utica shale in New York State. Probable 'source' bed for petroleum in the upper Trenton Lindsay Formation. Exposed in a quarry north of Sheguianadah.

The upper Whitby (Sheguiandah) is shale and clay with minor limestone at the top. Fossiliferous.

Georgian Bay Formation (Williams used the biostratigraphic names Widwemikongaing and Kagawong for the Lower and Upper units respectively). Lower shale grading upwards into limestone and minor dolomite. Exposed in "clay cliffs" near Cape Smith. Limestones have minor dolomite content, but no reported porosity. The Kagawong member is partially reefal with a broad outcrop area, including exposures in Ohio and Indiana. No reports of petroleum.

B. SILURIAN

Manitoulin Formation

The second cliff-forming formation in the area, after the Guelph-Lockport. Dolomite which is blue-green on fresh surface. Locally developed biohermal reefs. No reported petroleum seepages.

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Cabot Head Formation

Corresponds to the Cataract Group in the Niagara Gorge. The lower member (Cabot Head Member) is red and green shale. The upper member is thin-bedded shaly dolomite. Comprises the escarpment face of the Niagara Escarpment.

Mindemoya Formation (called Wingfield Shale, overlain by Niagara Dolomite by Williams).

Wingfield is green, calcareous shale and Niagara Dolomite is grey, brown and dense.

Guelph-Lockport

Williams' lowermost member of this formation is called Fossil Hill which is dolomite and profusely fossiliferous with corals. Higher beds exposed on the western end of Fitzwilliam Island (now identified as Guelph) are described by Williams to be thin-bedded, platy, brown to grey dolomite with "perhaps some bituminous material". Williams concludes his description of the Guelph by suggesting "It is quite possible that Guelph strata may underlie Duck Islands".

Inspection of the Michigan Basin Map (Figure 3) reveals Duck Islands lie in the path of a possible northern extension of the Silurian Shelf facies which contains the petroleum-bearing reefs of northern Michigan. The reported showing of bitumen in the Guelph formation on Fitzwilliam Island represents a distinct encouragement for petroleum bearing reefs in Canadian waters in Lake Huron between Manitoulin Island and Michigan. Duck Islands will be used someday as a drilling platform to investigate these prospects. (A well was drilled on Great Duck Island in 1935 but only to a depth of 240 feet with inconclusive results).

VII. STRUCTURE

The predominant structural geologic characteristic of eastern Manitoulin Island and Wikwemikong Indian Reserve is a monoclinal inclination to the south into the Michigan Basin at 40 feet per mile ($1/3^{\circ}$). Figure 5 is a structure map of the Precambrian basement surface which, although based on only a dozen control points, shows a uniform, undisturbed dip to the south throughout the Wikwemikong I.R.

A spur of Precambrian-age rocks extends from east to west across the northern part of the Figure 5 map area, resulting in an interruption of the monoclinal regularity of the basement surface near the northern rim of the Michigan Basin. The spur or narrow ridge predated the Paleozoic rocks of Manitoulin Island and acted as a disjunction between the Paleozoic sediments deposited on either side of it.

Figure 7 is a geologic Cross Section (C-D), from south to north through Wikwemikong I.R. which displays the monoclinal attitude of eastern Manitoulin Island and the influence of the pre-Paleozoic ridge on the deposition and preservation of Paleozoic sedimentary rocks.

Figure 6 is a structure map of the top of the Trenton Group which shows the same monoclinal structural monotony throughout Wikwemikong I.R. as the Precambrian surface. Cross Section C-D shows a marked conformity between the structure of the Trenton surface compared with the Precambrian.

Figure 8 is a compilation of 2 surface geologic maps of Wikwemikong I.R. by Dr. B.A. Liberty (published by the Ontario Department of Mines in 1972). The monoclinal attitude of the Paleozoic rock section on eastern Manitoulin Island is clearly depicted, together with surface topographic relief induced by the Paleozoic rocks. (The scale of the surface geologic map at 1 inch = 1 mile is the same as the scale of the Precambrian and Trenton structure maps and the horizontal scale of Cross Section C-D). The line of profile for Cross Section C-D is shown on all of the 1 inch = 1 mile maps.

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The topographic profile of eastern Manitoulin Island is visibly revealed on Cross Section C-D with exposed Precambrian spires in the northern part, the flat lands west of the Wikwemikong Indian Reserve (corresponding to the outcrop of the comparatively soft Manitoulin formation), the Niagara Escarpment (held up by the competent dolomite rocks of the Mindemoya and younger formations) and the gradually rising relief in southern Wikwemikong I.R. where the erosion resistant dolomite of the Guelph-Lockport Group is preserved.

All of the foregoing maps and Cross Section C-D substantiate and affirm that the Paleozoic rock section continues to thicken south of Manitoulin Island under northern Lake Huron where continuously younger Paleozoic-age rock units will be found to be preserved. There appears to be little doubt that Middle Silurian reefs exist in the subsurface below northern Lake Huron and that they will someday be found to contain petroleum, comparable to similar-age reefs in northern Michigan and Southwestern Ontario. Depth of water at the international boundary is 300 feet.

Interpretation of the geologic structure of eastern Manitoulin Island based on perusal of all of the geologic reports concerning the area (see Bibliography), together with an evaluation of the results of wells drilled in the vicinity, have not revealed any geologic structural phenomena, either stratigraphic or tectonic, that are likely to influence the occurrence of significant accumulations of petroleum on Wikwemikong Indian Reserve.

VIII. PETROLEUM OCCURRENCE

The reputation held of Ordovician sedimentary rocks in the northern part of the Michigan Basin, including Southwestern Ontario, in relation to petroleum occurrence is: "source-rich and reservoir-poor". The Collingwood Shale is characteristically bituminous in Southwestern Ontario, as is its geologic age equivalent, the Utica Shale, in the Michigan Basin. This widespread petroleum source horizon appears not to be in communication with any porous reservoir rock formations in Southwestern Ontario into which it might have expelled the petroleum generated within it. By contrast, in the southern Michigan Basin, in the vicinity of the Findlay Arch (see Figure 1), the Trenton-age rocks suffered fracturing which created void space within which oil and gas from the Utica source horizon could accumulate. Consequently, in southern Michigan and northern Ohio, the Trenton is a prominent oil and gas reservoir horizon. In the northern Michigan Basin however, including Southwestern Ontario, the Trenton has not been found anywhere to be capable of providing reservoir accommodation for commercially producible petroleum reserves.

In eastern Manitoulin Island, the lower member of the Whitby Formation is the age equivalent of the Collingwood Shale and, like the Collingwood and the Utica, the Lower Whitby is bituminous and recognized as a petroleum source bed. The Trenton rocks however do not appear to provide any better reservoir facilities than elsewhere in Southwestern Ontario. All of the small oil occurrences in eastern Manitoulin Island that have been identified in this report occur in Trenton rocks where only inferior reservoir exists. There is no evidence to indicate the Trenton might provide better reservoir anywhere else in eastern Manitoulin Island. There are not any other rock horizons on eastern Manitoulin Island considered prospective for commercially producible oil or gas.

Offshore from eastern Manitoulin Island, it appears likely that the northern Michigan belt of Silurian reefs extends into Canadian waters and bends to the southeast to join with the northern extension of the Southwestern Ontario Silurian reef trend. The reservoir rocks are Guelph Formation pinnacle reefs. Prospects for petroleum bearing reefs in Canadian waters between eastern Manitoulin Island and Michigan are rated "Very Good".

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IX. CONCLUSIONS AND RECOMMENDATIONS

Wikwemikong Indian Reserve, at the eastern end of Manitoulin Island, has been undergoing sporadic petroleum investigations for over 100 years. In all, some 35 wells have been drilled at scattered localities on the Reserve. Showings of oil and gas have been commonplace in the Wikwemikong wells but none of the drilling has resulted in production operations of any significance. The latest drilling venture on the Wikwemikong Reserve was by Imperial Oil, 25 years ago.

Compilation of a reliable history of drilling for petroleum on Wikwemikong Indian Reserve is frustrated by conflicting reference information concerning company names, locations of wells drilled, numbers of wells, dates, depths, initial production rates and final results.


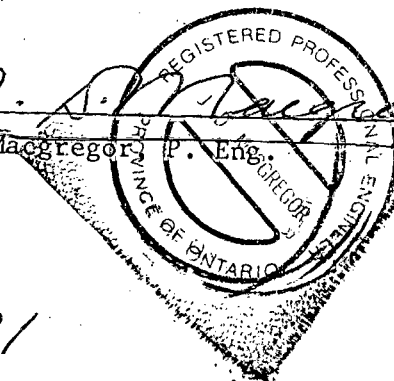
Despite the incomplete and unreliable well drilling records all of the oil and gas showings encountered in the Wikwemikong wells are judged to have been in (or closely associated with) Trenton-age limestone/dolomite rocks which appear to provide only poor petroleum reservoir facilities, including porosity and permeability. The black shale of the Lower Whitby Formation is bituminous and appears to provide petroleum source potential; but in order for producible pools of petroleum to exist, source beds have to have had access to reservoir rocks, which in turn have to be involved in trap configurations, either structural or stratigraphic. Neither reservoir beds nor competent traps appear to exist in the Ordovician-Silurian sequence of Paleozoic rocks on Wikwemikong Indian Reserve. Prospects for commercially producible petroleum on the Reserve are poor.

Offshore in the Canadian waters of northern Lake Huron, it appears likely that Silurian-age pinnacle reefs are present, corresponding to the linking of the northern Michigan Silurian reef belt with the Southwestern

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Ontario Silurian reef trend. Prospects for Petroleum in this segment of the circum-Michigan Basin Silurian reef belt are "very Good". It is recommended that ownership and administration of petroleum rights in this offshore area be investigated to determine the status of Indian rights thereto.

Respectfully submitted


J.D. Macgregor, P. Eng.


DATE:

February 16, 1981

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APPENDIX A

Indian and Northern Affairs Affaires indiennes et du Nord

BAND COUNCIL RESOLUTION
RÉSOLUTION DE CONSEIL DE BANDE

Chronological No. - Numéro chronologique

862

File Reference - N° de réf. du dossier

NOTE: The words "From our Band Funds" "Capital" or "Revenue", whichever is the case, must appear in all resolutions requesting expenditures from Band Funds.
NOTA: Les mots "des fonds de notre bande" "Capital" ou "revenu" selon le cas doivent paraître dans toutes les résolutions portant sur des dépenses à même les fonds des bandes.

THE COUNCIL OF THE WIKWEMIKONG UNCEDED INDIAN RESERVE
LE CONSEIL DE LA BANDE INDIENNE

AGENCY

DISTRICT MANITOULIN ISLAND

PROVINCE

ONTARIO

PLACE

NOM DE L'ENDROIT WIKWEMIKONG, ONTARIO

DATE

6
DAY - JOUR

FEBRUARY
MONTH - MOIS

AD 19

80

YEAR - ANNÉE

Current Capital Balance
Soldé de capital

\$

Committed - Engagé

\$

Current Revenue balance

Solde de revenu

\$

Committed - Engagé

\$

DO HEREBY RESOLVE:

DECIDE, PAR LES PRÉSENTES:

- That the Wikwemikong Band Council does hereby initiate the exploration and evaluation work of the oil and gas potential of the Wikwemikong Reserve with the intention to develop feasible deposits.

A quorum for this Band
Pour cette bande le quorum est

consists of
fixé à

Council Members
Membres du Conseil

CERTIFIED TRUE COPY

Snart Hart 80-07-16

Jean C. Mahagan
(Councillor - conseiller)
Alphonse Artois
(Councillor - conseiller)
David A. Peltier
(Councillor - conseiller)
Robert Carbone
(Councillor - conseiller)

Henry Peltier
(Chief - Chef)
Bruce
(Councillor - conseiller)
George
(Councillor - conseiller)
Emmanuel Kujawa
(Councillor - conseiller)

Alphonse Trudel
(Councillor - conseiller)
Christen Shawan
(Councillor - conseiller)
Maria Pitavarakis
(Councillor - conseiller)
James P. Peltier
(Councillor - conseiller)

FOR DEPARTMENTAL USE ONLY - RÉSERVÉ AU MINISTÈRE

Band Fund Code de du compte bande	2. COMPUTER BALANCES - SOLDES D'ORDINATEUR		3. Expenditure Dépenses	4. Authority - Autorité Indian Act Sec Art. de la Loi sur les Indiens	5. Source of Funds Source des fonds <input type="checkbox"/> Capital <input type="checkbox"/> Revenue Revenu
	A. Capital \$	B. Revenue - Revenu \$			
Recommended - Recommandable			Approved - Approuvable		
Date Recommending Officer - Reconnu par			Date Approving Officer - Approuve par		

APPENDIX B

PRODUCTION OF MANITOULIN COUNTY WELLS

<u>Well Name</u>	<u>Township</u>	<u>Lot</u>	<u>Concession</u>	<u>Production Data</u>
Sault Ste. Marie Synd. Jas. Marshal No. 3	Assiginack	44	I	1000 Bbls first winter 10 Mcfd
Island Oils Ltd. J. Marshal No. 4	Assiginack	44	I	5 BOPD
Benedum-Trees Oil Co. No. 3 Lehman	Assiginack	44	II	45 Bbls in 5 min.
Lew Kemp J. Marshal No. 1	Assiginack	44	II	0.5 Bbls/Day
Imperial No. 632 M.A. Ferguson	Bidwell	8	VIII	156 Mcfd
Imperial No. 631 J.R. Ferguson	Bidwell	8	IX	490 Mcfd 2-3 Bbls
Imperial No. 625 C.T. White	Bidwell	13	XII	20 Mcfd
Imperial Bidwell 628	Bidwell	18	XI	200 Mcfd
Imperial Campbell 678 A. Lewis	Campbell	16	III	21Mcfd at 300'
Gore Bay No. 2	Gordon	Southern part of Town of Gore Bay		100 Bbls Total
Imperial Oil No. 585	Gordon	20	W.R.	225 Mcfd
Jas. Purvis & Sons Ltd. No. 1	Gordon	20	W.R.	145 Mcfd
*W.P. Bullard Williams No. 9	Wikwemikong I.R.			100 Bbls/Hour
*Great Northern Oil & Gas Co. No. 1	Wikwemikong I.R.			3000 Bbls Total
*Gregory No. 2 Williams	Wikwemikong I.R.			32 BOPD
*Williams No. 11	Wikwemikong I.R.			100 BOPD
*Great Lakes Carbon No. 5	Wikwemikong I.R.			12 BOPD
*Imperial Oil Co. No. 666	Kaboni I.R.	1	B	65 Mcfd
E.R. Morris G McIvor No. 1	Sheguiandah	12	VI	350 Mcfd
Scott & Renwick Bonnie Lee No.1	Sheguiandah	16	VII	100 Mcfd
Imperial Oil No. 629	Sheguiandah	23	B	427 Mcfd

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<u>Township</u>	<u>Number of Wells</u>
Assiginack	24
Bidwell	15
Carnarvon	5
Clouche Island	1
Cockburn Island	4
Gordon	14
Great Duck Island	1
Howland	5
* Wikwemikong Indian Reserve	35
Tehkummah	2
Robinson	2
Sandfield	1
Sheguiandah	<u>16</u>
TOTAL	125

Prepared and distributed by the Ministry of Natural Resources - Petroleum
Resources Section, Province of Ontario. London, Ontario

* - Wikwemikong Indian Reserve

CHAPTER IV

Petroleum and Natural Gas

The Jesuit missionaries who first ministered to the Indians of Ekaentoton (Grand Manitoulin) island in 1648 probably knew of the presence of oil springs near the eastern end of the island. In his historical sketch, Mr. Major¹ says:

¹
Bibliography, No. 6, p. 64

"Parties in Montreal who had read in the relations des Jesuites that there existed in Grand Manitoulin Island, a mysterious spring flowing, as the Indians believed, from the entrails of the Great Manitou in which rock oil was found that cured all human diseases, started stealthily like Jason in pursuit of the golden fleece and they landed at Wekwemikong." The writer has failed to confirm the statement referred to but it is probable that, as stated by Major, the missionaries directed the early oil seekers to the oil spring near Wekwemikong on Smith bay.

T. Sterry Hunt, in his admirable paper "Notes on the History of Petroleum or Rock Oil" (4 (a), page 321) says: "On the Great Manitoulin island, also, according to Mr. Murray, a petroleum spring issues from the Utica slate"

Hunt repeats this statement (4 (b), page 252).

In the same report Robert Bell (page 179) says:

"Springs of petroleum have been found on the south side of Wekwemikong Bay, where three or four wells are now being sunk.... Surface oil is said to have been found at Bob's Portage, on the east side of Manitowaning bay, and also in She-gui-an-dah bay, and upon Strawberry island. A petroleum spring, on one of the islands north of Maple Point, is referred to in your

General Report of 1863."

Hunt, in his earlier report, refers to the oil that may be distilled from the Utica shale, and cites the occurrence of oil and bitumen in Trenton limestone. Bell (page 179) refers to the 1863 report (pages 523 and 790) which mentions a bituminous dolomitic limestone, a specimen of which had been brought from Grand Manitoulin island, containing about 8 per cent of solid bitumen or mineral pitch. In the Geology of Canada 1863, page 523, the following reference occurs:

"A brown crystalline porous magnesian limestone from the Grand Manitoulin island, had in like manner portions of asphaltum in its interstices, and contained from 7.4 to 8.8 per cent of soluble bitumen." (page 288) "..... the possibility of its (petroleum) occurrence in available quantities in some part of the Trenton formation should not be lost sight of"

The oil spring on the south side of Smith bay was visited by the writer in 1920 and described in his report of that year (11 (G), p. 27). It is located in a small bay just east of Sturgeon point and about 10 feet from the water's edge. The water, which shows no flow, is on a level with that of the bay, and high waves must wash into it. The surface was covered with a thick coating of oil. The distance from the town of Wekwemikong around the shore is nearly 4 miles. Antoine Trudeau, who owned the land, reported that one winter he saw a spring of oil coming up through the ice near the centre of Smith bay. A similar showing of oil was reported as having been seen by an Indian in Manitowaning bay somewhere near Ten Mile point.

Favourable conditions for the occurrence and accumulation of oil are indicated by the presence of the black Utica shale that overlies the Trenton limestone. This shale outcrops at Little Current and Sheguiandah, and at various other

places on the northeastern part of the island. Dipping to the south beneath the younger sediments it forms an effective cap rock for the Trenton limestone, which is the petroliferous formation. Similar relations occur in the Dover oil field west of Chatham, Ontario, and in the Trenton oil fields of Ohio.

The Utica shale is variously reported from the wells as being from 20 to 60 feet thick. It is a low-grade oil-shale, samples collected by the writer from near Little Current and Sheguiandah in 1920 yielding 8.1 and 4.8 Imperial gallons of petroleum a ton of shale on destructive distillation. Thus a relatively large reserve of hydrocarbons is present in the shale, and it is not surprising that some petroleum and natural gas occur in the underlying Trenton limestone.

Wekwemikong Indian Reserve. As is generally the case, the first wells were dug near the most prominent oil spring, that on the south side of Smith bay. Here the Manitoulin Oil Company, organized in Montreal, put down five wells. Of these Hunt says in part (4 (b), pp. 252-253): "One of the wells there sunk gave soil 10, shales 140, limestone 316 = 466 feet, at which depth the boring was suspended ----- At 220 feet from the surface a vein of oil was encountered, and another, six feet lower; the well has yielded, in all, seven or eight barrels of oil with much gas. This is designated by the Manitoulin Oil Company, as well No. 2, about two miles from which is No. 1. This, after 32 feet of soil, and 100 feet of black shale, penetrated 340 feet of the limestone, to which succeeded 52 feet of a red siliceous sandstone, the last 20 feet very hard. There the boring ceased. At 192 feet from the surface was met a vein of saline water, and at 193, 248, and 270 feet veins of oil. From this well 120 barrels of excellent petroleum have been obtained, but the supply has now ceased. At a position inter-

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mediate between the last two wells, is another, No. 5, which gave soil 21, shale, etc. 230, limestone 179 = 430 feet, the boring being still continued. A vein was struck in the limestone, 288 feet from the surface, and has given a few gallons of oil. At 92 feet, saline water was met with, less strong, however, than in the previous wells. Two other borings, Nos. 3 and 4, are now in progress. It is evident that these wells, penetrating the Hudson river and Utica formations, find the oil in the limestones of the Trenton group."

Hunt reports on the brine from well No. 1 as follows (page 272): The vein was met 192 feet from the surface and 60 feet in the Trenton limestone. "The water, as sent, to me, was intensely bitter and saline to the taste; it contained no trace of sulphates, nor yet barium nor strontium. It was not examined for bromides or iodides, which however, were probably present. The analysis of this water gave for 1000 parts -

Chloride of sodium	4.800
Chloride of potassium	.792
Chloride of calcium	12.420
Chloride of magnesium	3.650
	<hr/> 21.662

In most waters of this class, the proportion of chloride of potassium is small, rarely attaining to one-hundredth of the alkaline chlorides, but in the Manitoulin water it amounts to not less than 16.6 per cent, or more than 3.7 per cent of the entire solid matters, a proportion as great as in modern sea water."

In the files of the Geological Survey there are the records of three wells, marked Manitoulin, Algoma, 1863, driller, Jos. Ward. They apparently refer to Nos. 2, 1, and 5

as described by Hunt. The records differ so materially from those given as to cast much doubt upon their reliability. The discrepancies may be due to the interpretations by different drillers. The records are given for comparison.

No. 1. Location, cape Smith, south of Whiskey island and 200 feet from the shore.
Elevation 10 feet above lake Huron.

	Thickness Feet	Depth Feet
Surface	20	20
Shale	120	140
Limestone	370	510
Sandstone	40	550
Yield of oil	at 300 feet	

No. 2. Location, half-way between No. 1 and No. 3 and one-half mile south.

Elevation	Feet 656
Surface	15
Shale	110
Limestone	175
Depth	300

Yield of oil and water, "the largest flow on the Manitoulin."

No. 3. Location, 2 miles north (should be east by north) of No. 1, and about 200 feet from the shore ("South Mequimakong Mission").

Elevation 591 - A.M.T.

	Thickness Feet	Depth Feet
Surface	5	5
Shale	110	115
Limestone	285	400
Yield of oil	at 300 feet.	

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The writer saw the site of an old well about one-eighth of a mile east by north of the oil spring mentioned above. It is about 200 feet from the shore, about 10 feet above water-level, and the caved-in pit is about 18 feet across. Mr. Trudeau reported it drilled to a depth of about 300 feet, some fifty years previous to 1920, and to have struck oil. This well, marked No. 1 on the map, appears to be No. 1 as noted above, and probably No. 2 well described by Hunt. The writer is at a loss, however, to explain the reference to Whisky island, as he knows of no island along this shore, nor is any shown on any map or chart consulted. It may have been a sand or gravel bar appearing at very low water. Sites of wells No. 2 and No. 3 of the accompanying map were not seen by the writer, and their location is approximated from the description given above.

The inference may be drawn from these old records that the formational dip along the south side of Smith bay is from 10 to 12 feet a mile to the westward, and the top of the Trenton near the oil spring is about 140 feet below the level of lake Huron. The oil spring, and the oil reported as having been recovered, bear testimony to the petroliferous character of the Trenton and the brine, with its resemblance to marine water, suggests relative freedom from dilution by water from the bay. Oil is reported from depths between 35 and 185 feet in the Trenton limestone.

It is reported that the Manitoulin Oil Company gave up its operations because of difficulties with the Indians.

In 1905 the Northorn Oil and Gas Company, of Chicago, drilled six wells about 2 miles southeast of Wekwemikong (10, vol. XV). Three were producers and three dry holes. "The wells were drilled at an elevation of 155 feet above the lake, and

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produced in all about 500 barrels of oil, one well producing about 50 barrels in the first 12 hours after shooting." The lithological records, omitting the interpretation into formations, are as follows:

No. 1 well, elevation 736 feet A.M.T.

	Feet	
Limestone	50	
Light shale	250	
Grey shale	62	
Black shale	21	Top of Trenton at 383 feet.
Limestone	137	Gas at 398 feet.
Total depth	520	

No. 2 well.

	Feet	
Surface	34	
Limestone and shales	90	
Light shale	161	
Grey shale	65	
Black shale	9	Top of Trenton at 359 feet.
Limestone	50	Gas and oil at 380 feet.
Total depth	409	

No. 4 well.

	Feet	
Sand	15	
Limestone	50	
Light shale	250	
Dark shale	70	
Black shale	22	Top of Trenton at 407 feet.
Limestone	---	Salt water at 438 feet.

No. 5 well.

	Feet	
Sand	22	
Limestone	50	
Light shale	250	
Dark shale	94	Top of Trenton at 420 feet.
Black shale	12	Oil at 457 feet.

"No. 4 well is 640 feet northwest of No. 5. No. 1 is about the same distance northwest of No. 4, and No. 2 is about 500 feet northeast. Another well has been drilled northeast of No. 2 at an elevation of 55 feet, and the Huronian was struck at a depth of 625 feet. The oil is a very good quality, registering 36 Baume at 60 degrees."

J. Clarke and R. MacMillan, who worked on a number of the wells drilled near Wekwemikong, accompanied the writer to the locality, identified the wells, and furnished the following information.

No. 4. Near edge of swamp, below hill, drilled by Clement, from Sherbrooke, Quebec, about thirty years ago. This was a gusher for an hour or two, and the ground around is still saturated with oil. The casing still contains a light green oil, standing near the top. This and two or three neighbouring wells were pumped for a time. The well is said to be 450 feet deep and to contain 200 feet of 4⁵/₈ inch casing.

No. 5 was not visited.

No. 6. Known as Gregory No. 1, is situated below the hill east of the highway and south of the stream. This was pumped by means of a spring-pole and is bubbling gas still.

No. 7. Drilled by Gregory, produced much salt water.

No. 8. This is known as Gregory No. 2. This was a promising well and pumped 32 barrels the day it was abandoned (cf. J. Clarke, who worked on it). Oil was struck 17 feet in the Trenton. Gas and salt water were struck at first, but oil was produced after two hours of pumping.

No. 9. This well was drilled in 1906 by George Gregory of Petrolia, Mr. Buller of Chicago being manager. It is about 500 feet deep, and was drilled 31 feet into the Trenton. It started with salt water, but after pumping for three days it went over to oil and flowed 100 barrels of oil into the tank in less than 1 hour. It finally went over to brine.

No. 10. This well was drilled to the "granite" at 750 feet in depth, the Trenton being struck at 500 feet. An 8-inch hole was carried down and a little salt water was struck.

No. 11. Drilled by Gregory. It pumped 100 barrels of oil for 1 day and then filled with white sand and never pumped again.

Another well is situated about 400 feet southeast of No. 11, but no information was available.

These wells were drilled during 1905, 1906, and 1907.

It seems established that the wells visited include those described in the Report of the Bureau of Mines. The elevation (736 feet A.M.T.) there given corresponds reasonably well with the elevation (715) feet for the higher wells as obtained by the writer from aneroid readings. As the Indian land where these wells are located is entirely unsurveyed, considerable doubt remains in regard to the identity of the wells. This is unfortunate as the published report contains such definite logs that a relationship between productivity of wells and geological

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structure could be worked out were the identification certain. As it is, No. 2 well of the Northern Oil and Gas Company appears to be located on the highest structure, the other wells down the dip to the southwest being, however, the larger producers of oil. The general conclusion to be drawn is that the Trenton formation in this vicinity contains some oil, but that the tests at this locality were on "edge water," that is on the edge of the real accumulation. Whether that accumulation will prove commercial or not remains to be proved. Accurate information regarding the various wells drilled in this vicinity would be worth the cost of several new wells to a company starting a testing program.

Messrs. Clarke and MacMillan furnished the following information regarding other wells drilled on the Indian reserve.

Gregory drilled two or three wells out on Cape Smith. One was "a great gasser", but none produced oil.

No. 12. An old well west of the road about 4 miles southwest of Wekwemikong and now covered with stones. Gas pressure blew out the casing, and there was much salt water but very little oil.

Well No. 13 is situated about one mile farther southwest, and to the east on top of the hill. There is no record.

Well No. 14 was drilled near the shore and just south of the present gas station. The driller was Tom Rawlings, the depth about 450 feet, and a little salt water was struck. The first 300 feet of the drilling was through drift. Elevation above the bay about 10 feet.

Well No. 15 is situated on John King's farm between the barn and the road. The elevation is 50 feet above the bay. The depth was over 500 feet and salt water was struck.

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Well No. 16 is located near the Wokwomikongsing school, but no record is available.

Well No. 17 was situated about 4 miles southeast of South Bay Indian village by the shore of a little lake. There is no record of it, nor was it visited.

Well No. 18, known as the Gurley well, is one mile south of Manitowaning and just south of the elbow of the road to the Indian reserve. It struck much salt water and a show of oil.

There appear to have been several other wells drilled by the Northern Oil and Gas Company before 1912, when they were granted the oil rights on 50,000 acres of land on the Indian reserve east of Manitowaning. Senator Poirier's estate holds the oil rights on a strip of territory 9,334 feet wide, lying south of Smith bay and extending from near Manitowaning bay eastward to Georgian bay, the area containing 10,000 acres. The Northern Oil and Gas Company hold the rights on the adjoining area of the same size to the south. The remainder of their 40,000 acres includes the whole of the southern end of the peninsula, extending northward nearly to the head of South bay. Thus only the central part of the reserve and the extreme northern portions are available for exploration by other interests.

Manitowaning and Vicinity. In 1907 the Benedum-Trees Oil Company of Pittsburgh, Pa., drilled five test wells about 1½ miles west of Manitowaning, on lot 44, con. 2, Assiginack tp. Of these wells Nos. 1, 2, and 3 were pumped, and produced at least 500 barrels of oil. When the casing was pulled out of No. 1 oil rose within one foot of the top (cf. Wm. McCauley of Manitowaning). In 1912 oil was being drawn from No. 2 by local farmers, by means of a sand pump. In 1920 all three

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contained oil, and in 1935 oil was standing within 8 foot of the top of No. 2 and gas was bubbling through the oil. The log of No. 3 furnished by the Bonodum-Troos Oil Company is as follows:

	Foot	Depth Feet
Surface soil etc.	14	14
Richmond limestone	116	130
Grey shale	280	410
Collingwood shale	20	430
Trenton limestone	47	477
Oil and gas at 442 feet.		

This well is said to have produced 45 barrels of oil in fifteen minutes.

For well No. 4, situated south of the road, no record is available.

Well No. 5 was drilled by Clide Potts, for Bonodum-Troos. The well was finished with the men working ankle-deep in oil. It was plugged immediately near the top of the casing, after which it flowed out beneath and appeared at the surface some distance to the north. There was no water appearing with the oil (cf. Mr. McCauley).

The log of the well drilled on lot 45 (the Watson farm) is as follows:

	Feet	Depth Feet
Surface	6	6
Richmond limestone	124	130
Shale	175	305
Trenton limestone	261	566
Oil from 464 to 474 feet.		

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In 1920 H.C. Gordon drilled a well near the road. The Trenton limestone was struck at about 445 feet from the surface. At about 17 feet in the Trenton limestone considerable gas and a little oil were obtained. After shooting with dynamite considerable salt water was produced.

The Allan well was drilled by Wm. Allan of Campbellford for the Manitoulin Oil Company in 1929, the driller being R. MacMillan of Manitowaning. The record in the Geological Survey files is as follows:

	Feet
Surface	10
Brown and grey dolomite	200
Dark grey shale	170
Dark grey bituminous shale	30
Light grey dolomite	40

The depth was later recorded as 457 feet, and Mr. Marshall says it was drilled to 476 feet and that 18 feet of "oil sand" was penetrated.

The Marshall well was drilled in 1933 by John McCorkindale, 8th Street West, Owen Sound. The depth was 490 feet. Eighteen feet of "oil sand" was penetrated at 480 feet with a "strong flow of gas" and a showing of yellow oil. There was not enough water to drill with. The well was shot, but never cleaned out (cf. James P. Marshall, 1530 - 4th Avenue West, Owen Sound, the owner of the old Lehman farm, who accompanied the writer over the property in July 1935).

From the records of the three wells available it may be seen that there is a gentle dip of the formations toward the southwest.

The wells recorded above are marked 22 to 30 on the accompanying map.

-41-

Other wells in the vicinity of Manitowaning are described below, the numbers referring to the map notation.

No. 19. Near the southeast end of lot 35, con. II, Assiginack tp., on the farm formerly owned by Wm. Tucker. This well flowed gas for some years.

No. 20. Lot 30, con. II, Assiginack tp. A show of oil is reported.

No. 21. Lot 23, con. IV, Assiginack tp. No record.

No. 31 is known as the H.C. Gordon well No. 1, and was drilled by that gentleman in 1920 (11 (G), p. 28). "It is situated about 70 yards from the east line and 90 yards from the north line of lot 50, con. II, Assiginack tp. The top of the well is about 10 feet below the base of the Manitoulin dolomite, of the Cataract formation, as exposed a few rods away, and the log, taken by the writer, from samples, is as follows:

		Depth
	Feet	Feet
Surface	5	5
Hard, dark grey limestone and shale	360	365
Grey shale	20	385
Brown shale	65	450
Black shale	15	465
Trenton		
Grey, semicrystalline limestone	15	480
Calcareous shale	5	485
Semicrystalline limestone	65	550

This well was dry except for a small show of gas."

No. 32. Near the south end of lot 51, con. I, Assiginack tp. No record.

No. 33. Near the north end of lot 51, con. I, Assiginack tp. No record.

No. 34. About 85 yards from the west line and 30 yards from the south line of lot 22, con. I, Sheguiandah tp.

001032

-42-

Elevation about 645 feet A.M.T. By Senator Pascal Poirior.

Completed Feb. 9, 1932. Dry hole.

	Thickness
	Feet
Surface	11
Richmond limestone	34
Grey shale	280
Dark shale	69
Trenton limestone	40

Total depth	434

No water, perfectly dry hole.

No. 35. Near the middle of the east side of lot 20, con. I, Sheguiandah tp. No record.

No. 36. About 525 yards from the northwest corner and 40 yards from the west line of lot 6, con. II, Sheguiandah tp., on the farm of Andrew Lane. Elevation about 740 feet A.M.T. Commenced No. 1, 1906, completed May 27, 1907.

	Thickness	Depth
	Feet	Feet
Surface	10	10
Silurian	170	180
Limestone, shale, etc.	315	495
Collingwood shale	22	517
Trenton limestone	112	629
Gas and oil at 532 feet		

No. 37. Lot 4, con. XIV, Assiginack tp. Drilled by Gib Wallace for Manitowaning Oil Company. Depth 210 feet. The samples from this well in the Geological Survey have been examined by Mr. C.S. Evans, whose report is as follows:

-43-

Feet	
5 - 10	Fine- to medium-grained, buff-grey dolomite - a little chert in which are fragments of corals.
10 - 20	Fine to medium, grey dolomite - a little chert.
20 - 25	Fine to medium, grey limestone - grey, shaly limestone - a few fragments of brown bituminous shale - bryozoa.
25 - 30	Missing.
30 - 35	Fine to medium, grey limestone - grey, shaly limestone.
35 - 40	Missing.
40 - 45	Fine, grey dolomite.
45 - 55	Fine, grey, shaly limestone - grey shale, fossiliferous.
55 - 60	Medium-grained, buff dolomite.
60 - 65	As above, with some chert.
65 - 70	Fossiliferous, grey, shaly limestone.
70 - 115	Medium-grained, buff dolomite - some chert - few crinoid stems.
115 - 135	Fine, buff dolomite.
135 - 150	Fine, light grey dolomite.
150 - 155	Fine, buff-grey dolomite.
155 - 170	Fine, drab-grey, limy shale and shaly limestone - fossiliferous.
170 - 175	Medium buff dolomite.
175 - 195	Quite fine-grained, light grey dolomite and shaly dolomite - some greenish shale and a few sand grains.
195 - 210	Fine to medium, buff and grey dolomite.

The section is Lockport throughout unless the lower 20 feet include some Dyer Bay beds.

No. 38. About 40 yards east of the west line and 100 yards north of the south line of lot 21, con. XI; Sheguiandah tp. Elevation about 860 feet A.M.T. By Senator Poirier. Completed Jan. 23, 1932. A dry hole.

-44-

	Thickness
	Foot
Surface	1
Richmond limestone	50
Grey shale	255
Dark shale	92
Trenton limestone	125
Total depth	523

Gas 210 and 426 feet. Seepage of salt water at 523 feet.

Gas was bubbling up through fresh water in July 1935.

No. 39¹. Near the southwest corner, 100 feet from

¹ Ontario Dept. of Mines, vol. XLII, pt. V, 1933, p. 43.

each line of lot 24, con. XI, Sheguiandah tp. Elevation about 850 feet A.M.T. Drilled for Senator Poirier. Completed Jan. 7, 1932. Dry hole.

	Thickness
	Foot
Surface	1
Richmond limestone	40
Grey shale	272
Collingwood shale	60
Trenton limestone	37
Total depth	410

Show of gas 200 and 400 feet. Salt water at 400 feet.

No. 40¹. About 170 yards west of east line and 50 yards north of south line of lot 18, con. XIII, Sheguiandah tp. (Senator Poirier). Elevation about 870 feet A.M.T. Completed

¹ Ontario Dept. of Mines, vol. XLII, pt. V, 1933, p. 43.

-45-

March 19, 1932. Dry hole.

	Thickness
	Feet
Surface	5
Richmond limestone	47
Grey shale	282
Collingwood shale (black)	56
Trenton limestone	40
Total depth	430

Black water at 420 feet.

Wells Nos. 41 to 62. The Kyto Oil Field. In 1912 Senator Pascal Poirier started intensive drilling on lots 3 and 4, cons. VIII and IX, Bidwell tp. (11 (G), p. 28). "At least twenty wells were drilled at this locality, of which eleven are said to have produced oil, and three to have had traces of oil. The drilling contractor stated that some of these wells produced as much as 27 barrels a day for a short time. Four are reported as dry. Following is an analysis of a sample of oil from Renny Byers' farm, lot 3, con. IX, Bidwell tp., Green bay, Manitoulin island.

Specific gravity at 15.5° C.	- 0.864
Distillation -- continuous method.	
First drop	100° C.
Up to 150° C.	10%
150 - 200° C.	7%
200 - 250° C.	8%
250 - 300° C.	11%
300 - 350° C.	18%
Residue (by difference)	46%

Calorific value:

Calories per gram, gross	10600
B.T.U. per lb. gross	19080

Sulphur: 0.2 %." Sp. gr. Baume 32

001036

"During 1920, three wells were drilled on the old Poirior leases, No. 1 being dry, No. 2 producing some oil with a small amount of salty, sulphur water (at a depth of 403 feet), and No. 3 not being reported on. The top of the Trenton in No. 2 was struck at 384 feet 3 inches in depth or 10 feet higher than in No. 1. The log of No. 1 as determined by the writer from samples is as follows:

Well drilled by Kyto Oil Company, near southeast corner of lot IV, con. IX, Bidwell tp.

	Thickness	Depth
	Feet	Feet
Surface clay	5	5
Buff limestone	11	16
Grey shale	336	372
Black Utica shale	28	400
Light coloured, hard, semi-crystalline limestone	9	409
Show of oil at		418

No. 64. On the north end of lot 24, con. XI, Bidwell tp. Drilled by Senator Poirier. It finished in slate possibly 500 feet deep.

A well is also reported on lot 17, con. XII, Bidwell tp. No information.

No. 65. Near middle of south end of lot 34, con. I, Howland tp., drilled by Senator Poirier. The well stopped a few feet in the black Utica shale with no show of gas or oil.

No. 66. Providence Bay. At Providence bay, about 30 feet east of the road and 100 yards from the wharf. This well was drilled about 1906 by H.F. Slater of Toronto, who reported to the writer that he struck the Trenton limestone at about 960 feet from the surface and drilled about 100 feet into it when the tools were lost and never recovered. It is plugged with a wooden plug, but

escaping gas may still be burned. Elevation 25 feet above lake Huron.

Wells Nos. 67 to 70. Gore Bay. In 1909 four wells were drilled in the southern part of the town of Gore Bay. Mr. Ben Johnson, still resident in Gore Bay, worked with the drillers, Brako and Buchanan, and furnished the following information.

The most northerly well produced no oil. No. 2, on Mr. Brett's property, and No. 3 pumped 100 barrels of oil between them, along with much black water. Tools were lost in No. 3 and the well was abandoned. Mr. Brett piped his well to his machine shop and used the gas for some time.

Well No. 4 was shot and produced no oil afterward.

The following record in the files of the Geological Survey is probably that of well No. 3. Elevation about 610 feet A.M.T.

	Thickness	Depth
	Feet	Feet
Drift	1	1
Limestone	45	46
Blue shale	89	135
Limestone	1	136
Shale	29	165
Limestone	1	166
Blue shale	90	256
Brown shale	60	316
Black shale	15	331
Trenton limestone	250	581

Oil was struck at 425 feet.

A log made by Mr. C.S. Evans from samples 447-23 in the Geological Survey follows. As the depth to the Trenton is 19 feet greater than in the log given above, the well is probably

-48-

No. 4 which starts at a higher level.

Feet	
0 - 10	Medium-grained, light grey and grey, dolomitic limestone.
10 - 60	Medium-grained, grey dolomite.
60 - 85	As above, with some shaly dolomite.
85 - 270	Grey shale with some limy bands.
270 - 275	Grey shale with a little brownish shale.
275 - 350	Brown, bituminous shale.
350 - 400	Medium-grained, somewhat dolomitic limestone-grey.
400 - 515	Medium-grained, grey limestone.
515 - 525	Medium-grained, grey limestone and shaly limestone.
525 - 535	Medium-grained, grey limestone.
535 - 545	Medium-grained, grey limestone - a little green shale - a few rounded sand grains in limestone.
545 - 555	Medium-grained, grey limestone and dark grey, shaly limestone.
555 - 585	Medium-grained, grey limestone - some shaly limestone.
585 - 605	Medium-grained, grey limestone - dark grey, shaly limestone - some sand grains.
605 - 675	Medium-grained, grey and dark grey limestone - shaly limestone - some green shale - fair amount of sand grains.
675 - 695	Coarse, well-rounded sand grains (all quartz).
695 - 700	Quartz grains and weathered granite.

Bottom of well.

This may be interpreted as:

	Feet
Richmond	0 - 85
Grey shale	85 - 275
Dark shale	275 - 350
Trenton and lower formations	350 - 675
Basal sandstone	675 - 695
Sandstone and weathered granite	695 - 700

-49-

Mr. Johnson also reported a well on the rear of lot 13, range VIII, Gordon tp., and one on Alex Purvis' farm about $1\frac{1}{2}$ miles west of town, both of which were dry.

No. 71. Lot 10, West range, Gordon tp. This is reported by Mr. Ben Johnson of Gore Bay as having been a dry well.

No. 72. On the northwest corner of lot 20, con. XI, Robinson tp., 2.5 miles north of Silverwater corners and 40 feet east of the road allowance. Mr. Alex Kemp of Silverwater reports that this well was drilled in 1908 or 1909 by Brake and Buchanan for Mr. Alexander of Oklahoma. Fresh water was struck at 66 feet. No oil or gas were struck, but when finished at a depth of 1,074 feet it filled with salt water.

Following are two analyses of oil (11 (G), p. 30):

A - lot 44, con. XI, Assiginack tp., B - M.W. Brett's farm, lot 6, north side of Hall street, Gore Bay - probably well No. 2.

	A	B
At 15.5° C. specific gravity	0.877	0.881
Distillation continues		
First drop	220° C.	180° C.
Up to 250°	10%	9%
250 - 300°	20%	19%
300 - 350°	18%	18%
Residue (by difference)	52%	54%

Note: The yield obtained between 300 and 350 degrees is uncertain owing to the tube of the condenser being clogged with the wax formed. This holds for both samples.

Calorific value -	A	B
Calories per gram gross	10790	10800
B.T.U. per pound gross	19430	19440
Sulphur	0.2%	0.2%

The specific gravity in degrees Beaume is 29.6 for A and 28.9 for B.

001040

-50-

Great Duck Island. Well No. 73 is situated about one-quarter of a mile north of the little harbour on Great Duck island, which is in the small bay opposite Outer Duck island. The well was started in 1935 by Detroit and Windsor interests, the driller being E. Randall of Petrolia. Later his brother, Fred, took over the drilling and he has furnished the following record:

	Foot
Sand and gravel	to 152
Boulders	152 - 162
Gravel and sand	162 - 190
Hard clay	190 - 230
Gravel	230 - 240
Loose white sand	240 - 243

Water occurs in all the sediments except the hard clay or "hardpan."

Elevation of the top of the well above lake Huron about 25 feet.

Conclusions to be Drawn from Drilling

The drilling recorded above has demonstrated the presence of small accumulations of petroleum at four localities on Manitoulin island, viz.: near Wekwemikong; west of Manitowaning; southeast of Pine lake; and at Gore bay. The writer is of the opinion that the Pine Lake and Manitowaning areas have been sufficiently tested, and are not of commercial value. As the Wekwemikong field appears to have been abandoned while still producing oil, a small production might be obtained from one or two of the abandoned wells, or from new wells drilled near by. Some of the wells have never been properly plugged, and water has doubtless damaged the field. No large production is indicated.

-51-

The Gore Bay wells are typical of "edgewater" conditions, such as might be expected from their location on the margin of the monocline described under "Structure". Their oil and gas content are good auguries for production from the structure nearby.

The wild-cat wells scattered over the rest of the island show practically no promise, but it must be remembered that several of them did not penetrate the Collingwood shalo, and of the rest the records are very unsatisfactory.

In order to explore this region in a satisfactory manner it is necessary to determine whether the oil accumulations occur on anticlines or in synclines and then to test the most promising structures.

In his 1920 report the writer concluded that the petroleum of Manitoulin island was not accompanied by normal salt water, and that "the best oil wells are located well within the syncline." F. Sterry Hunt emphasized the similarity to sea water exhibited by the brine from the Cape Smith wells; and salt water has been reported from various other wells. No samples being available the evidence is inconclusive, as most observers fail to distinguish between salt water and sulphur water. A number of the wells stand full of water at the present time, but this is mostly of surface origin and so is essentially fresh.

There is also the problem, raised in the previous report, as to whether the oil and water occur at the same horizon. As important as this problem is, it cannot be answered satisfactorily at the present time. The history of the field, however, suggests that there was some saline water in association with the petroleum. The relation of the test wells to structure is not as clearly determined as could be wished, due to the lack

of a sufficient number of reliable well logs (See discussion below). Having reviewed the available evidence, however, and especially that furnished by the wells at Gore bay, where the structure is clearly defined, the writer feels obliged to differ with his previous conclusion, and to decide that oil is most likely to occur on Manitoulin island on the higher structures, in accordance with the normal law of anticlinal accumulation. In regard to the effect of bay water upon oil accumulation at the localities tested, it may be noted that the wells most likely to be so affected are those located at Cape Smith, and yet it was from these very wells that T. Sterry Hunt obtained the brine referred to above. That oil has escaped into the bay is shown by the Cape Smith spring, and the records cited above. The wells near Ten Mile point were in the writer's judgment doomed to be non-productive because of the nearby outcrop of the Trenton formation below the bay. It hardly seems probable, however, that the wells near Manitowaning, Pine lake, or Gore bay, have been seriously affected by bay water.



Ministry of
Treasury and
Economics

Frost Building
Queen's Park
Toronto, Ontario
M7A 1Y7

56190-5585 E

By messenger

Indian Minerals (East) Directorate
1 Front Street West
Suite 302
Toronto, Ontario
M5J 1A4

Attention: Mr. P. Croal

PETER

PER YOUR TELEPHONE
CONVERSATION WITH
ALISON COKE RE: THE
WILLIAM KLENK PROPOSAL,
PLEASE FIND THE
ATTACHED INFORMATION.

David Blumie

001045

Application

CONFIDENTIAL



Ministry of
Northern
Affairs

Hon. Leo Bernier
Minister
David Hobbs
Deputy Minister



Northern Ontario Regional
Economic Development Program

NOR-DEV

Employment Incentive Program

Applicant

☐ Group

☐ Limited company

☐ Partnership

☐ Sole Proprietor

Name

William C. Klenk, B.S., M.B.A.

Address

R.R. #1, Manitowaning

Ontario, Canada

Person to Contact:

William C. Klenk

Position

Telephone 1/705/859-3789

1/313/885-1900

Ownership

☐ Canadian

☒ Foreign See Giffin
letter

Date business commenced

and/or incorporated: 1976 - As a Research Project

Describe

(a) nature of the business Producing (by pumping) brine and crude oil; up-
grading brine for use on roads.

(b) products Salt, brine and crude oil, natural gas and products
derived therefrom.

(c) markets Brine - Ontario Ministry of Transportation & Municipalities
Crude Oil - Ontario Refineries

**Describe in general terms
the project including
estimated costs**

1. To set up 20 existing well with equipment. To pump oil and
brine. 2. To upgrade brine for road application. 3. To apply
on roads. 4. To provide the Ontario MTC summer brine and winter
salt at at least a 10%-20% saving (at current price) on up to 4
million gallon/year.

Location

Twp.

Assiginack

District

Manitoulin Island

Bidwell and Sheguiandah

Effect of the project on:-

Employment -

Present labour force

After project completion 7 full time jobs. 10 - 20 part-time jobs.

Plus sub contractors.

please turn over

001046

Estimated Project Costs	Land (100-200.. acres)	\$ Please see Proforma
	Building (... 2400 .sq. ft.)	\$
	Machinery - new	\$
	- used	\$
	Tooling, dies	\$
	Office equipment	\$
	Vehicles	\$
	Working capital	\$
	Other (specify)	\$
	Contingency	\$
	TOTAL	\$

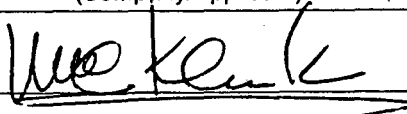
Financing proposed	Equity by owners (new)	\$ None
	From Company resources	\$3,000,000 estimated reserves
	From other sources (specify)	\$ None
		\$
		\$
		\$
	SUB TOTAL	\$
	Balance of funds required	\$ 520,000 1/2 NOR-DEV, 1/2 NODC or other
	TOTAL	\$

Principal Shareholders, Management, Directors* <i>*Identify Directors by asterisk before name. If a partnership, list partners and percentage of interest of each; of a sole proprietorship, give details of Owner.</i>	Full name	William C. Klenk	Age	52	Position	Owner-operator
	Citizenship	U.S.A.	No. of shares held	Common Preferred		Proprietorship
	Full name		Age		Position	
	Citizenship		No. of shares held	Common Preferred		
	Full name		Age		Position	
	Citizenship		No. of shares held	Common Preferred		
	Full name		Age		Position	
	Citizenship		No. of shares held	Common Preferred		
	Full name		Age		Position	
	Citizenship		No. of shares held	Common Preferred		
	Full name		Age		Position	
	Citizenship		No. of shares held	Common Preferred		

If financial assistance is authorized, I hereby agree that a public announcement relating to the project may be made.

Date August 3, 1984 (Company/Applicant)

(Authorized Signature)



(Title) Owner-Operator

Forward applications to:

NOR-DEV
c/o Ministry of Northern Affairs
10 Wellesley Street East
Tenth Floor
TORONTO, Ontario
M4Y 1G2

001047



Peat, Marwick, Mitchell & Co.
Chartered Accountants
Suite 700
200 Queens Avenue
London, Ontario N6A 1J3
(519) 672-4880

William Klenk
P.O. Box 36446
Gross Point Farms
Michigan
48236

We have prepared the accompanying proforma cash flow of Mr. William Klenk, a proprietorship engaged in the operation of a brine and oil recovery project on Manitoulin Island, Ontario, Canada for the periods ending December 31, 1984 to December 31, 1988 from information supplied to us by you. In order to prepare this proforma cash flow we made a review consisting primarily of inquiry, comparison and discussion of such information.

We do not express an opinion as to whether the actual results for the forecast periods will approximate those forecasted because the proforma cash flow is based on assumptions made by you regarding future events which, by their nature, are not susceptible to independent substantiation.

In our opinion, however, this proforma cash flow properly reflects the assumptions used in its preparation for the periods ended December 31, 1984 to December 31, 1988.

DRAFT

London, Canada
July 31, 1984

Chartered Accountants

WILLIAM KLENK MANITOULIN ISLAND BRINE AND OIL RECOVERY PROJECT - PROFORMA CASH FLOW 1984 TO 1988
PAGE3

31-Jul-

INCOME TAXES - PROPRIETOR @ 0.50	762648	770850	764813
AMOUNT AVAILABLE FOR DEBT REPAYMENT	762648	770850	764813
DEBT, BEGINNING OF YEAR	519139	0	0
DEBT, END OF YEAR	0	0	0

ASSUMPTIONS:

1. ANNUAL RATE OF INFLATION FOR 1986 TO 1988 ESTIMATED TO BE 5% .
2. EMPLOYEE BENEFITS AND PAYROLL TAXES ESTIMATED AT 10% OF GROSS PAYROLL.
3. COMMERCIAL OPERATIONS TO COMMENCE NOVEMBER 1, 1984.
4. DISTRIBUTION OF ROYALTIES TO OUTSIDERS IS ESTIMATED AT ONE THIRD OF GROSS REVENUE LESS FREIGHT.
5. RATIO OF PRODUCTION BRINE TO SALEABLE BRINE IS THREE TO ONE.
6. SUFFICIENT OIL RESERVES EXIST TO SUPPORT AT LEAST SIX BARRELS PER DAY DAY PER WELL PRODUCTION.

OFORMA CASH FLOW 1984 TO 1988

31-Jul-84

762648	770850	764813	758473	
-762648	770850	764813	758473	SEE ACCOMPANYING LETTER FROM PEAT,
				MARWICK, MITCHELL, AND CO., CHARTERED
519139	0	0	0	ACCOUNTANTS, DATED JULY 31, 1984.
0	0	0	0	

\$

5% .

SS PAYROLL.

THIRD

E.

LS PER DAY

WILLIAM KLENK MANITOULIN ISLAND BRINE AND OIL RECOVERY PROJECT - PROFORMA CASH FLOW 1984 TO 1988
PAGE2

31-Ju

PHASE B: OPERATION OF WELLS

NUMBER OF WELLS:

20

(3)

INCOME:

OIL -PRODUCTION PER DAY IN BBL. 6
-BARREL PRICE IN DOLLARS 40
-PAYMENT TERMS 60 DAYS
-# OF PUMPING DAYS PER YEAR 300

1440000 1440000 1440000

BRINE -PRODUCTION PER DAY AS (5)
RATIO OF BRINE TO OIL 9 : 1
-GALLON PRICE IN DOLLARS 0.40
-PAYMENT TERMS SEMI-ANNUAL

1512000 1512000 1512000

GROSS REVENUE

2952000 2952000 2952000

OPERATING EXPENSES:

WAGES AND BENEFITS

(1), (2)

FIXED
OFFICE
ADMINISTRATIVE/DRAWINGS

89100 93555 98233
12100 12705 13340
48000 50400 52920

ENERGY

GASOLINE - TRUCKS
PROPANE - JACKS
HYDRO

9000 9450 9923
12000 12600 13230
14400 15120 15876

TELEPHONE

6000 6300 6615

TRAVEL, ACCOMMODATION

7200 7560 7938

INSURANCE

4200 4410 4631

LEGAL

6000 6300 6615

ACCOUNTING

6000 6300 6615

OFFICE SUPPLIES

4000 4200 4410

FIELD SUPPLIES AND MATERIALS

12000 12600 13230

INTEREST

27904 0 0

FREIGHT

277200 277200 277200

ROYALTY DISTRIBUTION

(4)

891600 891600 891600

SUB-TOTAL

1426704 1410300 1422375

NET INFLOW (OUTFLOW)

1525296 1541700 1529625

001051

-34

1988

1440000

1512000

2952000

SEE ACCOMPANYING LETTER FROM PEAT,
MARWICK, MITCHELL, AND CO., CHARTERED
ACCOUNTANTS, DATED JULY 31, 1984.

103144
14007
55566

10419
13892
16670

6946

8335

4862

6946

6946

4631

13892

0

277200

891600

1435054

1516946

001052

WILLIAM KLENK MANITOULIN ISLAND BRINE AND OIL RECOVERY PROJECT - PROFORMA CASH FLOW 1984 TO 1988
PAGE 3

31-Jul-8

INCOME TAXES - PROPRIETOR @ 0.50	316848	319613	319013
	-----	-----	-----
AMOUNT AVAILABLE FOR DEBT REPAYMENT	316848	319613	319013
	-----	-----	-----
DEBT, BEGINNING OF YEAR	519139	202291	0
	-----	-----	-----
DEBT, END OF YEAR	202291	0	0
	=====	=====	=====

ASSUMPTIONS:

1. ANNUAL RATE OF INFLATION FOR 1986 TO 1988 ESTIMATED TO BE 5% .
2. EMPLOYEE BENEFITS AND PAYROLL TAXES ESTIMATED AT 10% OF GROSS PAYROLL.
3. COMMERCIAL OPERATIONS TO COMMENCE NOVEMBER 1, 1984.
4. DISTRIBUTION OF ROYALTIES TO OUTSIDERS IS ESTIMATED AT ONE THIRD OF GROSS REVENUE LESS FREIGHT.
5. RATIO OF PRODUCTION BRINE TO SALEABLE BRINE IS THREE TO ONE.
6. SUFFICIENT OIL RESERVES EXIST TO SUPPORT AT LEAST SIX BARRELS PER DAY DAY PER WELL PRODUCTION.

1-Jul-84

13	312673	

13	312673	SEE ACCOMPANYING LETTER FROM PEAT, MARWICK, MITCHELL, AND CO., CHARTERED
0	0	ACCOUNTANTS, DATED JULY 31, 1984.

0	0	
=====		

31-Jul-84

PHASE B: OPERATION OF WELLS

1985 1986 1987 198

NUMBER OF WELLS: 20 (3)

INCOME:

OIL	-PRODUCTION PER DAY IN BBL.	3	
	-BARREL PRICE IN DOLLARS	40	
	-PAYMENT TERMS 60 DAYS		
	-# OF PUMPING DAYS PER YEAR	300	\$

720000 720000 720000 720000

BRINE	-PRODUCTION PER DAY AS	(5)
	RATIO OF BRINE TO OIL	9 : 1
	-GALLON PRICE IN DOLLARS	0.40
	-PAYMENT TERMS	SEMI-ANNUAL

756000 756000 756000 75

GROSS REVENUE

1476000 1476000 1476000 1476000

OPERATING EXPENSES:

	(1), (2)
WAGES AND BENEFITS	

FIXED	89100	93555	98233	10
OFFICE	12100	12705	13340	1
ADMINISTRATIVE/DRAWINGS	48000	50400	52920	5

ENERGY

GASOLINE - TRUCKS	9000	9450	9923	1
PROPANE - JACKS	12000	12600	13230	1
HYDRO	14400	15120	15876	1

TELEPHONE	6000	6300	6615
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TRAVEL, ACCOMODATION	7200	7560	7938
----------------------	------	------	------

INSURANCE	4200	4410	4631
-----------	------	------	------

LEGAL	6000	6300	6615
-------	------	------	------

ACCOUNTING	6000	6300	6615
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	4000	4200	4410
OFFICE SUPPLIES			

FIELD SUPPLIES AND MATERIALS	12000	12600	13230	1
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INTEREST	27904	10873	0
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FREIGHT	138600	138600	138600	1.
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ROYALTY DISTRIBUTION	(4)	445800	445800	445800	4.
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SUB-TOTAL	842304	836773	837975	84
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NET INFLOW(OUTFLOW)	633696	639227	638025	63
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TO 1988

31-Jul-84

1985	1986	1987	1988
720000	720000	720000	720000
756000	756000	756000	756000
1476000	1476000	1476000	1476000
89100	93555	98233	103144
12100	12705	13340	14007
48000	50400	52920	55566
9000	9450	9923	10419
12000	12600	13230	13892
14400	15120	15876	16670
6000	6300	6615	6946
7200	7560	7938	8335
4200	4410	4631	4862
6000	6300	6615	6946
6000	6300	6615	6946
4000	4200	4410	4631
12000	12600	13230	13892
27904	10873	0	0
138600	138600	138600	138600
445800	445800	445800	445800
842304	836773	837975	850654
633696	639227	638025	625346

SEE ACCOMPANYING LETTER FROM PEAT,
MARWICK, MITCHELL, AND CO., CHARTERED
ACCOUNTANTS, DATED JULY 31, 1984.

INCOME TAXES - PROPRIETOR @ 0.50	19848	14426	8776
AMOUNT AVAILABLE FOR DEBT REPAYMENT	19848	14426	8776
DEBT, BEGINNING OF YEAR	519139	499491	485065
DEBT, END OF YEAR	499491	485065	476289

ASSUMPTIONS:

1. ANNUAL RATE OF INFLATION FOR 1986 TO 1988 ESTIMATED TO BE 5% .
2. EMPLOYEE BENEFITS AND PAYROLL TAXES ESTIMATED AT 10% OF GROSS PAYROLL.
3. COMMERCIAL OPERATIONS TO COMMENCE NOVEMBER 1, 1984.
4. DISTRIBUTION OF ROYALTIES TO OUTSIDERS IS ESTIMATED AT ONE THIRD OF GROSS REVENUE LESS FREIGHT.
5. RATIO OF PRODUCTION BRINE TO SALEABLE BRINE IS THREE TO ONE.
6. SUFFICIENT OIL RESERVES EXIST TO SUPPORT AT LEAST SIX BARRELS PER DAY DAY PER WELL PRODUCTION.

PROJECT - PROFORMA CASH FLOW 1984 TO 1988

31-Jul-84

	19648	14426	8776	2673
PAYMENT	19648	14426	8776	2673 SEE ACCOMPANYING LETTER FROM PEAT, MARWICK, MITCHELL, AND CO., CHARTERED
	519139	499491	485065	476289 ACCOUNTANTS, DATED JULY 31, 1984.
\$	499491	485065	476289	473616

ATED TO BE 5% .

AT 10% OF GROSS PAYROLL.

984.

ATED AT ONE THIRD

THREE TO ONE.

ST SIX BARRELS PER DAY

(3)

1985	1986	1987	1988
240000	240000	240000	240000

(5)

252000	252000	252000	252000
492000	492000	492000	492000

SEE ACCOMPANYING LETTER FROM PEAT,
MARWICK, MITCHELL, AND CO., CHARTERED
ACCOUNTANTS, DATED JULY 31, 1984.

1), (2)

89100	93555	98233	103144
12100	12705	13340	14007
48000	50400	52920	55566

9000	9450	9923	10419
12000	12600	13230	13892
14400	15120	15876	16670

6000	6300	6615	6946
------	------	------	------

7200	7560	7938	8335
------	------	------	------

4200	4410	4631	4862
------	------	------	------

6000	6300	6615	6946
------	------	------	------

6000	6300	6615	6946
------	------	------	------

4000	4200	4410	4631
------	------	------	------

12000	12600	13230	13892
-------	-------	-------	-------

27904	26848	26072	25601
-------	-------	-------	-------

46200	46200	46200	46200
-------	-------	-------	-------

(4)

148600	148600	148600	148600
452704	463148	474447	486654
39296	28852	17553	5346

PHASE A: SITE SELECTION, CLEAN OUT, FRACTURE AND PUT ON PRODUCTION

=====

NUMBER OF WELLS: 20

=====

ACTIVITIES:

1. SELECTION:

- a) GEOLOGY OPINION
- b) ZONE OPINION
- c) SURVEY
- d) BOND

2. CLEAN OUT

3. FRACTURE

4. SET WITH SUBMERSIBLE PUMPS

5. SET WITH DOWN HOLE PUMPS

6. WINTERIZE PUMP JACKS

7. PREPARATION OF PONDS
- EXCAVATION, FORMING, LINING, COVERS

8. EVAPORATORS

9. PROCESS CONSULTANT

10. ACQUISITION OF FACILITIES

- a) OFFICE, SHOP AND LABORATORY
(INCLUDING LAND AND BUILDING)
- b) SHOP EQUIPMENT
- c) LAB EQUIPMENT
- d) OFFICE EQUIPMENT
- e) TRUCKS, TRAILER

CONTINGENCIES - 10%

INTEREST @ 0.13 %

OUTSIDE CONTRACTORS

(INCLUDING OUTSIDE LABOUR)

MATERIALS

LOCAL

LABOUR CON

\$

5000

5000

6000

20000

20000

20000

20000

10000

35000

20000

65000

20000

4000

2000

5000

5000

10000

12000

18000

10000

20000

\$

61000

151000

120000

SIDE CONTRACTORS CLUDING OUTSIDE LABOUR)	MATERIALS	LOCAL LABOUR	CANADIAN CONSULTANTS	OTHER	BONDS	TOTAL 1984
5000						5000
5000						5000
6000						6000
					10000	10000
20000		20000				40000
20000	20000	10000				50000
	35000	20000		15000		70000
	65000	20000		15000		100000
	4000	2000				6000
5000	5000	10000				20000
	12000	18000				30000
			12500			12500
	10000	20000		20000		50000
				10000		10000
				10000		10000
				5000		5000
				35000		35000
						46450
						8189
61000	151000	120000	12500	110000	10000	519139

SEE ACCOMPANYING LETTER FROM PEAT,
MARWICK, MITCHELL, AND CO., CHARTERED
ACCOUNTANTS, DATED JULY 31, 1984.

Giffen, Pensa

Barristers, Solicitors and Notaries Public

J.A. Giffen, QC.
D.W. Lewis
P.M. Ledroit
K.M. Trussler
A.J. Campbell

C.M.V. Pensa, QC.
G.D. Wilson
E.M. Perlmutter
D.B. Williams
J.R. Adams

478 Waterloo Street
London, Canada
N6B 2P6

P.O. Box 2160
London, Canada
N6A 4E3

Telephone (519) 673-1910
Telex 064-78585

August 2, 1984

Mr. William Klenk
R. R. #1
Manitowaning
Manitoulin Island
Ontario, Canada
POP 1NO

Dear Mr. Klenk:

We have had an opportunity to review the pro forma cash flow statement prepared by the London, Ontario office of Peat, Marwick, Mitchell & Co., Chartered Accountants, dated July 31, 1984.

As we understand it, the commercial operations of your project on Manitoulin Island will commence on or about November 1, 1984.

I also assume that as of the commencement date, you will be a resident Canadian for tax purposes and will be causing to be incorporated one or more Ontario corporations which will be controlled by resident Canadians, and which corporation or corporations will be Canadian controlled private corporations for Canadian income tax purposes.

I understand that you will be rolling the assets referred to in the Peat, Marwick pro forma cash flow statement into a corporation or corporations. I also understand that there may be a corporation that will run the oil operation, a corporation that will run the brine operation, and possibly a corporation to run the service operation, all of which corporations will be controlled by Canadian resident persons.

The result of having the income being owned by such corporations for Canadian income tax purposes, and in accordance with the laws as they now exist, could reduce the income taxes payable by at least \$50,000.00, and quite possibly much more. This will of course have the effect of increasing the amount available for debt repayment under

...2

- 2 -

Giffen, Pensa

the pro forma cash flow prepared by Peat, Marwick.

As of the date of this letter you are a sole proprietor and all of the assets are owned by you, but I understand that they are going to be dealt with in accordance with the foregoing. Accordingly, any applications that you sign now will have to show you as a sole proprietor, subject to the provisions of this letter.

I have advised you that it appears to be the policy of the Provincial Government of Ontario, and the of the Government of Canada, to create as much employment as possible. I have advised you that this certainly appears to be the thrust, for example, of the present Federal political campaigns on behalf of all of the parties.

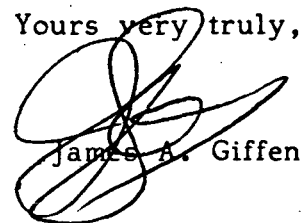
I have also advised you that it will be of great assistance to you in obtaining your landed immigrant status and ultimately your Canadian citizenship that your commercial operations create employment for Canadians.

I have been personally involved as a lawyer in the oil and gas industry, and also in brine disposal in Ontario, for over a quarter of a century, and I have had during that period extensive exposure to the practical side of oil and gas operations and brine operations in Ontario. It is clear from such experience that if the project that you are undertaking is brought to fruition, it will create substantial employment for local people engaged in your commercial operations.

As I understand it, the MTC have been testing your brine, and if these brine tests are favourable, then one of the results may be in savings to the Ontario Government.

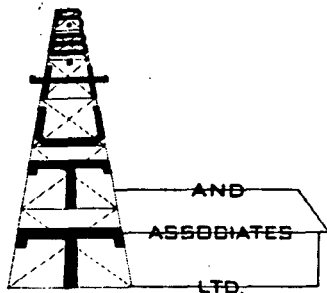
If I can be of any further assistance in the matter, or if any third party wishes further assistance, please have him contact me at the above number.

Yours very truly,



James A. Giffen

JAG:BC



R. B. HUTT & ASSOCIATES LTD.
GEOLOGICAL CONSULTING

P.O. BOX 7067, POSTAL STATION E, LONDON, ONTARIO N5Y 4J9
[519] 433-1055

July 24, 1984

Mr. William Klenk
P.O. Box 36446
Grosse Pointe Farms MI 48236

Dear Bill:

In February of 1984 you had eight of the old wells in your area logged by Computalog of Chatham Ont. This has permitted a partial evaluation of the reserves that underlie your acreage. Six wells were logged at Manitowaning yielding five useful logs, and one each in the Green Bay and Turtle Lake areas. In the short time available since your request, the logs have not been analysed in detail, but some calculations have been made.

The oil would appear to have its origin in the Collingwood and to be trapped in the limestones of the Trenton Cobourg formation where dolomitization forms the porosity.

From the logs the average porosity is about 6%. Net pay would appear to vary from 7 to 16 feet but for calculation is averaged at 8 feet of effective pay. Water saturation is estimated at 40% which may be somewhat low. Ashrinkage factor of .75 because of the gassy nature of the oil is assumed. Finally, with a conversion factor of 7758 to convert acre-feet to barrels, and applying the figures to a 10 acre drainage area we arrive at the following equation:

$$10 \times 8 \times .06 \times .6 \times .75 \times 7758 = 16757 \text{ barrels}$$

Of this approximately 1/3 or 5530 barrels is recoverable by conventional means. At a value of \$40 Cdn. per barrel this would have a value of \$221,196 Cdn.

Permeability is low with the wells presently capable of about one barrel per day. It is likely that a fracture treatment would improve permeability allowing initial yields of about 25 barrels per day dropping off over several months to the 5 barrel range.

- 2 -

Similarities to Petrolia are striking. Initial productions are about the same. Both produce from dolomitized limestone at a depth of about 450 feet. The seal is an overlying shale. It may be expected to have a similar long producing lifetime.

The wells have all been completed with a long open hole section. This has resulted in the production of considerable quantities of highly saline brine with the oil. As you know, the original intention was to case the wells properly then selectively perforate to maximize the oil-water ratio and eliminate the brine production. Since you have been able to find a market for the brine, it may be desirable to produce a good quantity from the oil wells or by converting one or more of the poorer wells to straight brine production. There would appear to be a sufficient quantity of high saline brine for you to supply all the markets that you are able to develop. You are better able at this time to evaluate the economics of this part of your operation.

These conclusions are based on averages, and not from a detailed study of the area. Some of the assumptions may not be valid, but at this time it is felt that this represents a fair evaluation of your present producing areas.



R.B. Hutt

OCTOBER 18, 1983

NATIONAL

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teasier.

Is you want, in
tions, and
it for you. No
, no waiting—
nt service.
undy on your
e buying
s Bonds. And
onals make it

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ee: 1-800-222-9670
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one: (416) 889-8100
ee: 1-800-268-9446/9
OWN
one: (416) 961-6177
IN
one: (416) 482-7123
TREET
one: (416) 869-8242
one: (902) 895-5446
UVER
one: (604) 687-2699
RIA
one: (604) 382-4261
EG
one: (204) 942-6141

Manitoulin oil shipped south

Special to The Globe and Mail

MANITOWANING, Ont. — The first shipment of crude to be exported from Ontario's most northern oil patch in almost 40 years has revived Manitoulin Island's dormant petroleum industry, a Michigan oil man says.

William Klenk, an oil operator licenced by

Ontario, said the 29,000 litres of oil delivered to an Imperial Oil Ltd. refinery in Sarnia last week marks the start of an expanding oil industry here.

"I consider myself Ontario's northernmost oil producer and I intend to continue this work," Mr. Klenk said. He hired a geologist seven years ago to determine whether the

old oilfields in this area could be reworked. "We expect other shipments to be made next year and then we'll continue to ship on a regular basis," he added.

Oil production first occurred here in the late 1800s and ceased in the 1940s, Mr. Klenk said. While local records are incomplete, the last known ship-

ment of 18,000 litres was produced in 1945.

Mr. Klenk described the oil on Manitoulin Island as being "of excellent quality," and has an agreement with a Sudbury oil dealer to purchase the brine byproducts.

Using some of the original drilling equipment and experimenting with a submersible pump, the drill crew was able to reach oil in a dolomite deposit at about 160 metres. The area being drilled is at the northern tip of the Michigan oil basin, Mr. Klenk said.

Mr. Klenk said he intends to lease additional property to be used as drill sites and experiment with different types of drilling equipment.

Suit settled in Manitoba over death

WINNIPEG (CP) — Manitoba Hydro has settled a claim by the family of a trapper who drowned when his snowmobile fell through the ice of a northern Manitoba lake three years ago.

The family of Saul Kirkness of Split Lake claimed the corporation was responsible for the accident because Hydro projects interfered with the natural flow of water at the lake.

The family argued this made winter travel on certain parts of Split Lake unsafe. Terms of

Dack's CANAROCK



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a Canadian Kangaroo?

IN A SENSE, YES!

Few leathers compare with genuine Australian kangaroo for both durability and suppleness. Here you can see one of our finest Canadian made shoes combining this unique leather with Dack craftsmanship to produce footwear without equal in comfort, style, durability and value.

Also available — 9" zipper boot sizes 7 to 13 — fittings B, D, F.

3-eyelet plain toe, sizes 7 to 12 — fittings B, D, E.



7 Stores in Toronto

16 Adelaide St. W. at Yonge 1470 Yonge St. at St. Clair
8 Richmond St. E. at Yonge 101 Richmond St. W.
2 Bloor St. W. (Cumberland Terrace) Toronto-Dominion Centre
The Atrium — enter from Dundas St. West
across from Eaton Centre

OTHER RETAIL LOCATIONS

Victoria — Vancouver — Edmonton — Calgary — Regina — Winnipeg —

TORONTO STAR
Sunday,
February 5, 1984

PEOPLE

Midwinter secrets of Manitoulin

By Frank Jones Toronto Star

MANITOULIN — Where the Great Spirit lives. That's how the Indians have always seen this 100-mile-long (160 km) island in the top corner of Georgian Bay that looks on the map like a piece of Swiss cheese.

Rod Frost, an islander who gave up the certainties of a teaching career for the uncertain rewards of fixing horsedrawn buggies, had a different image for me. "Manitoulin is like a ship," he said, tugging his pipe out of his mouth. "In summer she's tied up at the dock and people are coming and going all the time. In winter . . ." He looked out of the farmhouse window at the empty, snow-packed highway. "In winter she casts off and we're adrift."

Exactly. And that's what brought photographer Dick Loek and myself here in midwinter. To discover the secret Manitoulin that the thousands of tourists who flock here in summer — from American millionaires in liner-sized cruisers to humble campers in elderly cars — never see.

When the Chi-Cheemaun (means Big Canoe), a ferryboat that runs from South Baymouth to Tobermory, ties up in the fall, Manitoulin is cut off to the south. No city skiers crowd its roads, no winter cottagers come here for weekends. The only way out is the two-hour drive across the single-lane bridge

(marked by the only stoplight on the island) and through the La Cloche Mountains to Sudbury.

Only in winter does the real Manitoulin emerge — a strange, and unique place with its own sense of self that I will try to convey today and in my columns running in The Star this week from Monday to Thursday.

At South Baymouth, less than 100 yards from where the tourists rev their engines and roar off the Chi-Cheemaun in summer, deer wait for the hunters' volleys to die away and then tip-toe forward, shy and elegant as girls at ballet class, to eat hay put out for them by Kathleen Dinsmore.

She is an amazing woman of independent spirit who through the 1940s and 1950s would go south to the city to earn money doing housework in the winter so that she could come home and build cottages single-handedly in the summer.

As we watched her carry a bucket of oats out for the deer last week, she stumbled in the snow. "There's some days when the weather's bad that I don't know if I'll manage to get back to the house," she said. "I am 84. That's

about the time to slack off."

She won't, I know. Any more than Allan Morphet, a 71-year-old fisherman who lives in Little Current at the north end of the island, will until they drag him off his fishing boat.

He has a modern radio aboard. "I never bothered to hook it up," he said. "It's nice and quiet out there."

Allan reckons he can pick out city folk walking along the street in Little Current any time, even without looking at their clothes. "Their faces is all drawn up," he said.

It's a place to be yourself. Some islanders may take this the wrong way, but a woman who once worked in a home for the retarded told me that when she arrived on the island that's what it reminded her of. She didn't mean the people

were slow. She meant the people on Manitoulin live in that home other without nishies.

Handicapped stance, have an because they're s as problems. And ance may account of inventors and island.

"At its best Manitoulin is freedom of spirit to match. "In summer wind's up I go south down I go fishing. Wheale, an artist, idyllic hours he spends his easel. "In winter hour a day."

Wheale's remark of the pink rocks \$5,000 or more is



DICK LÖCK/TORONTO STAR

How do you spot the city folk on Manitoulin?
'Their faces is all drawed up' one fisherman says.
But you don't see them at all in winter, when the
island has a secret life that tourists never know.



When the hunters fade away in the fall, quiet herds of deer come out on Manitoulin Island, to feed on the oats Kathleen Dinsmore, 84, provides. Another year-round resident, Bill Klenk, is developing oil on the island, working on 30 wells drilled years ago.

were slow. She meant that the people on Manitoulin, just like the people in that home, accept each other without noticing the blemishes.

Handicapped people, for instance, have an easier time here because they're seen as people not as problems. And that easy acceptance may account for the number of inventors and eccentrics on the island.

At its best Manitoulin allows a freedom of spirit you'd find hard to match. "In summer when the wind's up I go sailing. When it's down I go fishing," said Evan Wheale, an artist, summing up the idyllic hours he spends away from his easel. "In winter I go skiing an hour a day."

Wheale's remarkable paintings of the pink rocks in this area fetch \$5,000 or more in Toronto. Their

surfaces worn and fissured by the actions of ice and wind over thousands of years, the rocks are an everyday reminder of how ancient this island is.

"You figure," said Bill Klenk, a Detroit businessman who has fallen under the spell of Manitoulin, "people have lived here for 4,000 years, and that's going back as far as the pyramids of Egypt."

Klenk, who invented epoxy glue, is working on an ingenious scheme to develop oil on the island. He has purchased rights to some 30 oil wells drilled in decades gone by and abandoned at a time when oil fetched low prices and is busy cleaning them out and putting them into production. He delivered his first 100 barrels last summer, and has a contract to supply a million gallons of brine, a by-product from the wells, which will

be used for settling dust and clearing snow from highways around Sudbury.

Anywhere else they'd say Bill Klenk was crazy. Not in Manitoulin.

It's a place where progress is the bank deciding to stay open during the lunch hour and where the big construction project is fellows working on government grants to fix up the old spar fences that zigzag up and down the hills.

But before you pick up stakes and head for what you think is a little bit of paradise, you'd better hear about the other side. Most of the people who make big plans and come here to live the simple life don't stay too long. It's an island, and as Ingemar Bergman told us in his movies, islands are places of

See MANITOULIN/page C2

Northern Affairs Offices

Atikokan
123 Marks Street
(807) 597-2701

Blind River
13 Lawton Street
(705) 356-2226

Chapleau
31 Birch Street East
(705) 864-1515

Cochrane
181 Sixth Avenue
(705) 272-4274

Dryden
34A King Street
(807) 223-5231

Elliot Lake
10 Brunswick Walk
(705) 848-7133

Espanola
Espanola Shopping Mall
Hwy. 6 South
(705) 869-1532

Fort Frances
529 Mowat Avenue
(807) 274-5329

Geraldton
305 Main Street
(807) 854-0286

Hearst
904 George Street
(705) 382-4358

Ignace
200 Beaver Street
(807) 934-2260

Iroquois Falls
253 Ambridge Drive
(705) 232-4001

Kapuskasing
Model City Mall
(705) 335-8008

Kenora
12 Main Street South
(807) 468-5548

Kirkland Lake
32A Prospect Avenue
(705) 567-3291

Marathon
Peninsula Building
(807) 229-1153

Mindemoya
King & Young Streets
(705) 377-5396

Moosonee
Main Street
(705) 336-2991

New Liskeard
310 Whitewood Avenue
(705) 647-7391

North Bay
267 Main Street West
(705) 472-3911

Rainy River
408 Atwood Avenue
(807) 852-3287

Red Lake
242 Howey Street
(807) 727-2870

Sault Ste. Marie
444 Queen Street East
(705) 254-6623

Sioux Lookout
42 King Street
(807) 737-1318

Sturgeon Falls
191 Main Street
(705) 753-2900

Sudbury
1st Floor
199 Larch Street
(705) 675-4451

Thunder Bay
428 East Victoria Avenue
(807) 475-1425

Timmins
83 Wilson Avenue
(705) 267-1401

Wawa
27 Gold Street
(705) 856-2354

Regional Offices

Sault Ste. Marie
Suite 301
421 Bay Street
Sault Ste. Marie, Ontario
P6A 1X3

Kenora
12 Main Street S
Kenora, Ontario
P9N 1S7

Area Offices

Sudbury
4th floor
199 Larch Street
Sudbury, Ontario
P3E 5P9

Thunder Bay
435 James St. S.
Thunder Bay, Ontario
P7E 8E3

Program material also available at local Northern Ontario offices of the following ministries:

Ministry of Industry and Trade, Ministry of Tourism and Recreation and Ministry of Natural Resources.



Ministry of
Northern
Affairs

Hon. Les Borman
Minister
David Hobbs
Deputy Minister



Document disclosed under the Access to Information Act -
Document divulgué en vertu de la Loi sur l'accès à l'information
Northern Ontario Regional
Economic Development Program

NOR-DEV



*Economic development
assistance for Northern
Ontario business,
industry and tourist
operators*

A Message from the Honourable Leo Bernier

Minister of Northern Affairs



I take pleasure in introducing NOR-DEV, a new program of economic development assistance for Northern Ontario.

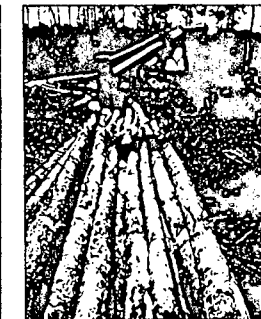
NOR-DEV includes four major programs: assistance to business to create new employment; grants for infrastructure and other services for municipalities and small scale industries; aid for planning and feasibility studies and expanded marketing for tourist operators; and funding to expand or diversify the use of the north's natural resources.

NOR-DEV joins two other economic development programs offered by the Ministry of Northern Affairs: the Northern Community Economic Development Program and AgriNorth, a cost shared program with the Ministry of Agriculture and Food.

Offices where this brochure and NOR-DEV application forms are available are listed on the back cover. My staff and I look forward to working with you on the continued economic development and diversification of Northern Ontario.

*Leo Bernier
Minister of Northern Affairs*

Contents



- 1 Employment Incentives Program 2*
- 2 Industrial Infrastructure Program 9*
- 3 Resource Diversification and Development Program 15*
- 4 Tourism Development Program 19*

Planning and Feasibility Studies Subprogram 20

Tourist Facilities Marketing Subprogram 23

Program guidelines



1 Employment Incentives Program

1 *Employment Incentives Program*

Purpose

The program is intended to offer assistance to establish, expand or modernize small business operations to promote economic development in Northern Ontario.

Type and level of assistance

1. The assistance is in the form of interest-free forgivable performance demand loans.
2. The program may provide assistance up to the lesser of the following maximums:
 - a) 50 percent of the approved capital costs;
 - b) \$100,000.
3. Applicants for projects eligible for assistance under this program, but requiring assistance totalling more than \$100,000, may be considered.
4. Any assistance project which involves a private sector economic development activity eligible for contributions from other existing federal or provincial programs, may receive contributions under the terms of both such programs and this program, provided that the combined total of such contributions does not exceed 50 percent of the approved capital costs of the undertaking, unless otherwise approved by the Ministry of Northern Affairs.

1 *Employment Incentives Program*

Eligibility

1. To be eligible for consideration under this program:
 - a) The project shall be located within the territorial districts of Northern Ontario: Algoma, Cochrane, Kenora, Manitoulin, Parry Sound, Rainy River, Sudbury, Thunder Bay, Timiskaming and that portion of the district of Nipissing lying north, west and south of Algonquin Provincial Park.
 - b) The project shall be a commercial activity involving one or more of the following:
 - i) *natural resource harvesting;*
 - ii) *quarrying;*
 - iii) *manufacturing;*
 - iv) *processing;*
 - v) *marketing, wholesaling or warehousing of local products;*
 - vi) *repair and other services for the foregoing.*
 - vii) *production and marketing of fish, including fish farming;*
 - c) The project shall indicate satisfactory commercial and financial viability.
 - d) The project must be owned by:
 - i) *a limited company;*
 - ii) *a registered cooperative;*
 - iii) *a registered partnership; or*
 - iv) *a registered proprietorship.*

1 Employment Incentives Program

- e) The project shall provide additional net economic benefits including the reinforcement of the general policies and priorities of the Province concerning the expansion and diversification of economic activities in Northern Ontario;
 - f) The project shall require assistance to proceed satisfactorily. Therefore, application for assistance shall be made while the project is still in the planning stages. Contractual commitments made in respect of any project not yet approved may be ineligible for funding;
 - g) The project shall include equity which normally shall not be less than 20 percent of the total capital costs of the undertaking plus the net book value of the existing fixed assets of the applicant: in no case shall the required equity level be less than 10 percent of the approved capital costs of the project;
 - h) The project shall use Canadian material, machinery and equipment and consulting and other professional services to the extent to which such items are procurable and consistent with economy and efficiency;
 - i) The project shall be insured satisfactorily against loss by fire, flood and other acts beyond the control of the applicant;
 - j) The project shall meet the relevant control standards of appropriate regulatory bodies;
2. Under certain conditions where the net economic benefits warrant such consideration, the Ministry of Northern Affairs

1 Employment Incentives Program

may authorize assistance for the acquisition or relocation of an existing facility.

Disbursement of funds

1. Up to 25 percent of the forgivable loan offered will be advanced:
 - a) when construction begins or when equipment and materials are ordered;
 - b) when the required equity has been invested; and
 - c) when security has been received to cover the amount received.
2. Any advance payment received in excess of allowable assistance, based on actual approved cost, must be refunded immediately.
3. The remainder of the loan will be forwarded once an acceptable support statement of incurred and approved expenditures is received, a site inspection visit by an official of the implementing agency has proved satisfactory, and when security has been received to cover the total amount loaned.

Loan forgiveness

1. 50 percent of the loan may be forgiven one year after the project is in operation, and the balance may be forgiven one year from then, provided that:
 - a) the supporting statement of the actual expenditures has been submitted as required; and

1 Employment Incentives Program

- b) the general terms and conditions under which the loan was granted have been met.

2. Upon forgiveness, the related security will be released.

Non-performance

1. Should performance of the business be determined to be inadequate during the first two years, forgiveness of the loan outstanding may be deferred wholly or partially or refused at the discretion of the Ministry of Northern Affairs.
2. Upon refusal of forgiveness, demand for repayment will be made and the loan will forthwith commence to bear interest at the prime bank rate in effect at that date for the remainder of the period during which the loan is outstanding.

Definitions

1. "Capital Costs" means the actual cost, up to the fair market value, of:
 - a) new buildings;
 - b) existing buildings together with the costs of modifications and/or renovations where applicable;
 - c) production machinery, new or used;
 - d) office furniture and equipment;

1 Employment Incentives Program

- e) leasehold improvements;
- f) land improvements;
- g) tools and dies where the cost is capitalized;
- h) production vehicles;
- i) design, freight, and installation incurred in connection with the foregoing.

2. "Approved Capital Costs" means those capital costs which represent essential components of the project upon which assistance can be based.

3. "Equity" means the aggregate of:

- a) the share capital;
- b) earned surplus;
- c) contributed surplus;
- d) other surplus or deficit accounts;
- e) shareholders' loans that are subordinated to all other liabilities; and
- f) the proprietor's or partners' capital accounts;

less such accounts that, in the opinion of the Management Committee, unreasonably inflate the net worth of the applicant.

4. "Security" means signed loan agreements, personal guarantees or other documentation satisfactory to and required by the Management Committee at the time of authorization of assistance for a project.

1. Employment Incentives Program

Program guidelines

Implementation

Delivered by the Northern Ontario Development Corporation.
Application forms available from the Ministry of Northern Affairs
and the Ministry of Industry and Trade offices.



2 Industrial Infrastructure Program

2 Industrial Infrastructure Program

Purpose

To assist in removing specific physical constraints to the development of identified small-scale private sector projects. Assistance may include mapping, power and water supply, waste disposal, access and other public services.

Type and level of assistance

In the case of assistance to the private sector, funding will be in the form of interest-free forgivable loans, up to a maximum of 50 percent of approved capital costs or \$100,000, whichever is the lesser. Private sector projects will be handled through the Northern Ontario Development Corporation.

In the case of assistance to the public sector, such as municipalities, funding will be in the form of grants, normally not exceeding 75 percent of approved capital costs or \$200,000, whichever is the lesser. Public sector projects will be handled through the Ministry of Northern Affairs.

Eligibility

To be eligible for consideration under this program:

1. Projects must be located within the territorial districts of Northern Ontario: Algoma, Cochrane, Kenora, Manitoulin, Parry Sound, Rainy River, Sudbury, Thunder Bay,

2 Industrial Infrastructure Program

Timiskaming and that portion of the district of Nipissing lying north, west and south of Algonquin Provincial Park.

The municipal governments of Timmins, North Bay, Sault Ste. Marie, Thunder Bay, and the Regional Municipality of Sudbury are not eligible. Applications from the private sector within those communities may be considered.

2. Projects shall result in establishing or expanding commercial activities involving one or more of the following:
 - i) *natural resource harvesting;*
 - ii) *quarrying;*
 - iii) *manufacturing;*
 - iv) *processing;*
 - v) *marketing, wholesaling or warehousing of local products;*
 - vi) *repair and other services for the foregoing.*
3. Proposals shall indicate satisfactory commercial and financial viability of the business(es) to be developed as a result of the assistance requested, as well as an indication that additional net economic benefits will accrue.
4. Application for assistance must be made while the project is still in the planning stages. Contractual commitments made in respect of any project not yet approved may be ineligible for funding.
5. The proponent's financial participation in the project shall not be less than 10 percent of the approved capital costs of the undertaking.

2 Industrial Infrastructure Program

-
6. The project shall meet the relevant control standards of appropriate regulatory bodies.
-

Disbursement of funds

1. In the case of assistance to the private sector, up to 25 percent of the forgivable loan offered will be advanced:
 - a) when construction begins or when equipment and materials are ordered;
 - b) when the required equity has been invested;
 - c) when security has been received to cover the amount advanced.
2. In the case of assistance to public bodies, 50 percent of the grant will be advanced as in 1) above.
3. Any advance payment received in excess of allowable assistance, based on actual approved costs, must be refunded immediately.
4. In the case of assistance to the private sector, the remainder of the loan will be forwarded once an acceptable supporting statement of incurred and approved expenditures is received; a site inspection visit by an official of the implementing agency

2 Industrial Infrastructure Program

confirms that the project is in compliance with the approved undertaking; and when security has been received to cover the total amount loaned.

5. In the case of assistance to public bodies, the final 50 percent of the grant will be forwarded upon verification that the project is completed.

Loan forgiveness

1. 50 percent of the loan may be forgiven one year after the project is completed and the balance may be forgiven one year from then, provided that:
 - a) the business or businesses for which the undertaking was intended is/are operating;
 - b) the general terms and conditions under which the loan was granted have been met.
2. Upon forgiveness, the related security will be released.

Non-performance

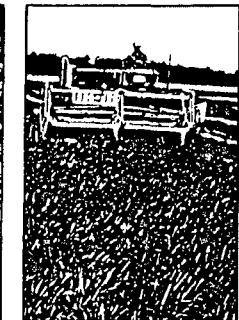
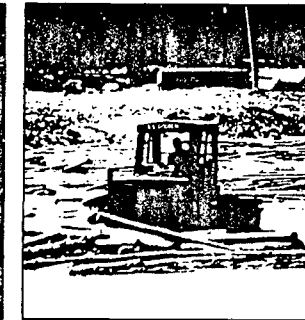
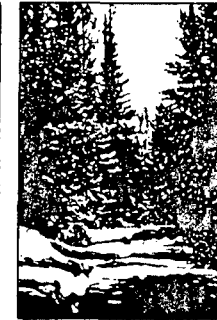
1. Upon refusal of forgiveness, demand for repayment will be made and the loan will forthwith commence to bear interest at the prime bank rate in effect at that date for the remainder of the period during which the loan is outstanding.

2 Industrial Infrastructure Program

Implementation

Public sector projects delivered by the Ministry of Northern Affairs. Private sector projects delivered by the Northern Ontario Development Corporation. Application forms available from the Ministry of Northern Affairs and the Ministry of Industry and Trade offices.

Program guidelines



3 *Resource Diversification and Development Program*

3 *Resource Diversification and Development Program*

Purpose

To encourage the undertaking of investment and pre-investment studies, and demonstration projects for small scale commercial activities with identified potential that will expand or diversify the use of natural resources.

Type and level of assistance

Funding under this program to persons in the private sector will be in the form of financial contributions towards the assessment of investment opportunities.

Contributions of up to 75 percent of the approved cost of the project may be made to a maximum of \$75,000.

Eligibility criteria

1. The investment opportunities being analysed must be located within the territorial districts of Northern Ontario: Algoma, Cochrane, Kenora, Manitoulin, Parry Sound, Rainy River, Sudbury, Thunder Bay, Timiskaming and that portion of the district of Nipissing lying north, west and south of Algonquin Provincial Park.
2. The investment opportunities must be in the areas of natural resource harvesting, extraction, processing and marketing, or in the areas of new or expanded uses for natural resources.

3 *Resource Diversification and Development Program*

3. Individuals, corporations or groups may make application for assistance under this program.
4. Costs of the proposed project incurred prior to the date of application will not be eligible. Costs of the proposed project incurred after the date of the application and prior to approval may not be eligible, subject to Ministry of Northern Affairs discretion.

Implementation

1. Projects under this program will usually be in the form of consultant studies or demonstration projects involving applied technical research. Guidance to consultants will be provided by the proponent and by the Ministry of Natural Resources together with such other persons as may be deemed appropriate by the Ministry of Northern Affairs.

With respect to research and development projects, the Ministry of Northern Affairs shall obtain technical advice from the appropriate provincial agency.

2. Contracts for projects shall be awarded and supervised in accordance with procedures specified in the Ontario Government Manual of Administration.
3. All reports produced shall become the property of Ontario.
4. In those cases where the study produces information, or includes information of a confidential nature, the Ministry of Northern Affairs may hold back such confidentialities for such time as it deems appropriate.

3 Resource Diversification and Development Program

5. Delivered by the Ministry of Northern Affairs/Ministry of Natural Resources.

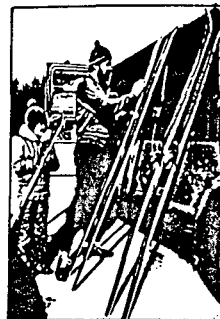
Disbursement of funds

Payments for studies will be made on the basis of progress claims, substantiated by invoices for costs incurred. These payments will be in the cost-sharing proportion established between the Ministry of Northern Affairs and the proponent.

A holdback from the final payment shall be retained until the final study report of the consultant has been received by the Ministry of Northern Affairs.

Application forms may be obtained from the Ministry of Northern Affairs and the Ministry of Natural Resources offices.

Program guidelines



4 Tourism Development Program

*Planning and Feasibility Studies
Subprogram*

*Tourist Facilities Marketing
Subprogram*

4 *Tourism Development Program*

Planning and Feasibility Studies Subprogram

Purpose

The intent of this subprogram is to provide assistance for feasibility and planning studies to stimulate investment in the development or expansion of tourism projects of potentially regional significance.

Type and level of funding

Funding under this subprogram will be in the form of financial contributions toward planning studies and the assessment of investment opportunities.

Proposals may be submitted by groups, organizations or by persons in the private sector.

Contributions may be made up to 100 percent of the actual cost of the project depending upon the degree of proprietary interest in the results of the study.

Eligibility criteria

1. The investment opportunities being analysed must be located within the territorial districts of Northern Ontario. This includes the districts of Algoma, Cochrane, Kenora, Manitoulin, Parry Sound, Rainy River, Sudbury, Thunder Bay, Timiskaming and that portion of the district of Nipissing lying north, west and south of Algonquin Provincial Park.
2. The investment opportunities shall relate to specific tourism projects that have the potential to be of regional significance.

4 *Tourism Development Program*

'Regionally significant' is generally understood to mean attractions that have the capacity to draw tourists into the region, from Southern Ontario, across provincial boundaries or from outside of Canada.

3. Individuals, corporations or groups may make application for assistance under this subprogram.
4. Costs of the proposed project incurred prior to the date of application will not be eligible. Costs of the proposed project incurred after the date of the application and prior to approval may not be eligible, depending on the Ministry of Northern Affairs discretion.

Implementation

1. Projects under this subprogram will usually be in the form of consultant studies. Guidance to the consultants will be provided by the proponent and the Ministry of Northern Affairs together with such other persons as may be deemed appropriate.
2. Contracts for professional services shall be awarded and supervised in accordance with standard procedures specified in the Manual of Administration.
3. All reports produced by consultants shall become the property of the Province of Ontario.
4. In those cases where the study produces information, or includes information of a confidential nature, the Ministry of Northern Affairs may hold back such confidentialities for such time as it deems appropriate.

4 Tourism Development Program

5. Delivery by the Ministry of Tourism and Recreation.
Application forms available from the Ministry of Northern Affairs and the Ministry of Tourism and Recreation offices.

Disbursement of funds

Payments for studies will be made on the basis of progress claims, substantiated by invoices for costs incurred. These payments will be in the cost-sharing proportion established between the Ministry of Tourism and Recreation and the proponent.

A holdback from the final payment shall be retained until the final study report of the consultant has been accepted by the Ministry of Northern Affairs.

4 Tourism Development Program

Tourist Facilities Marketing Subprogram

Purpose

The intent of this subprogram is to assist tourist operators to develop or expand their marketing programs in an effective manner in order to improve their incomes, to create additional employment opportunities and stimulate related economic activities.

Type and level of assistance

1. The assistance is in the form of conditional grant contributions.
2. The program may provide assistance up to the lesser of the following maximums over two years:
 - a) 50 percent of the approved marketing costs;
 - b) \$50,000

Projects under \$4,000 will not be eligible for funding.

Eligibility

1. To be eligible for consideration under this subprogram:
 - a) The project must be located within the territorial districts of Northern Ontario: Algoma, Cochrane, Kenora, Manitoulin, Parry Sound, Rainy River, Sudbury, Thunder Bay, Timiskaming and that portion of the district of Nipissing lying north, west and south of Algonquin Provincial Park. The intent of the Program is to limit project participation to

4 Tourism Development Program

the rural areas, excluding the cities of Thunder Bay, Sault Ste. Marie, Timmins and North Bay, and the Regional Municipality of Sudbury.

- b) Proposals eligible for funding under this subprogram shall include establishments eligible for official registration in the Tourism Ontario grading program, and those accommodation tourist establishments which may in future qualify for registration under the Tourism Ontario grading program.
- c) The proposal shall demonstrate that the implementation of the marketing plan will improve the viability of the operation.
- d) The proposal shall demonstrate that the budget for the marketing plan is in addition to the past year's marketing budget.
- e) Costs of the proposed marketing plan incurred prior to the date of the application will not be eligible. Costs of the proposed marketing plan incurred after the date of application and prior to approval may not be eligible, depending on the Ministry of Northern Affairs discretion.
- f) In implementing this marketing plan, the proponent shall give preference, where applicable, to Canadian companies and suppliers.

4 Tourism Development Program

-
- g) Government owned and/or operated facilities are not eligible for participation under this subprogram.

- h) The proposal shall include:

- i) *description of the tourist facility including number of accommodation units, location, capacity and type;*
- ii) *proof of registration in good standing in the Tourism Ontario Accommodation Grading Program;*
- iii) *a brief resume of business and management background;*
- iv) *current operating statement and balance sheet;*
- v) *description including costs of previous year's marketing plan and assessment of its results;*
- vi) *a description of the proposed marketing plan identifying the increase in promotional spending and including the following items:*
 - *purpose;*
 - *past and potential markets including target markets;*
 - *proposed strategies, rationale and media to be used;*
 - *estimated budget and time schedule;*
 - *financial arrangements.*

Disbursement of funds

1. Up to 50 percent of the conditional grant contributions offered may be advanced upon approval of the project.
2. The remainder of the grant contributions will be disbursed upon proof that the applicant has incurred and paid his total share of the approved costs and that the approved marketing plan has been implemented.

4 Tourism Development Program

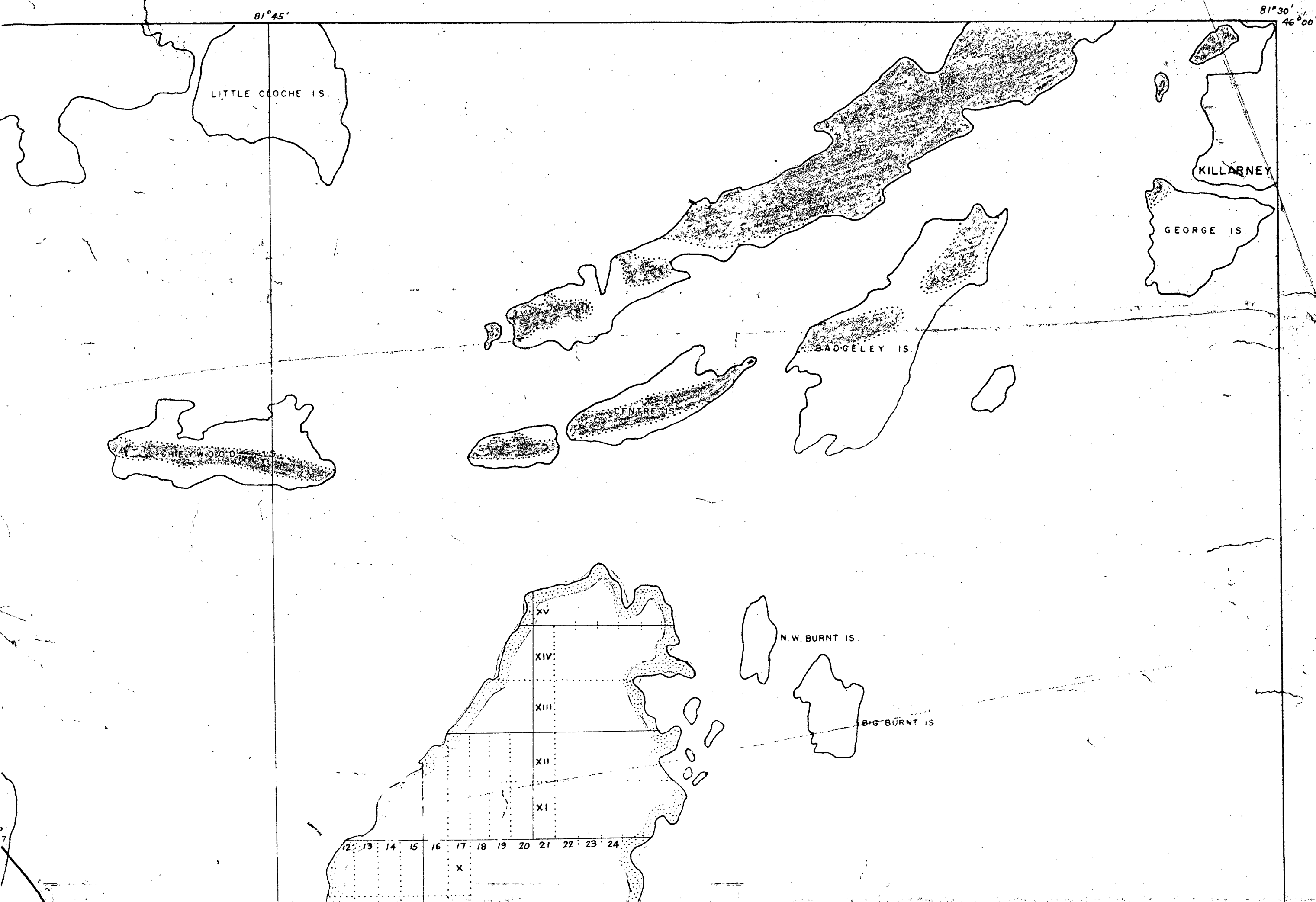
-
3. Any advance payment received in excess of allowable assistance, based on actual approved costs, must be refunded immediately.
 4. Projects shall be completed within the time schedule outlined in the proposed marketing plan or within two years, whichever is the lesser.
 5. Project cost overruns are not eligible for assistance.
-

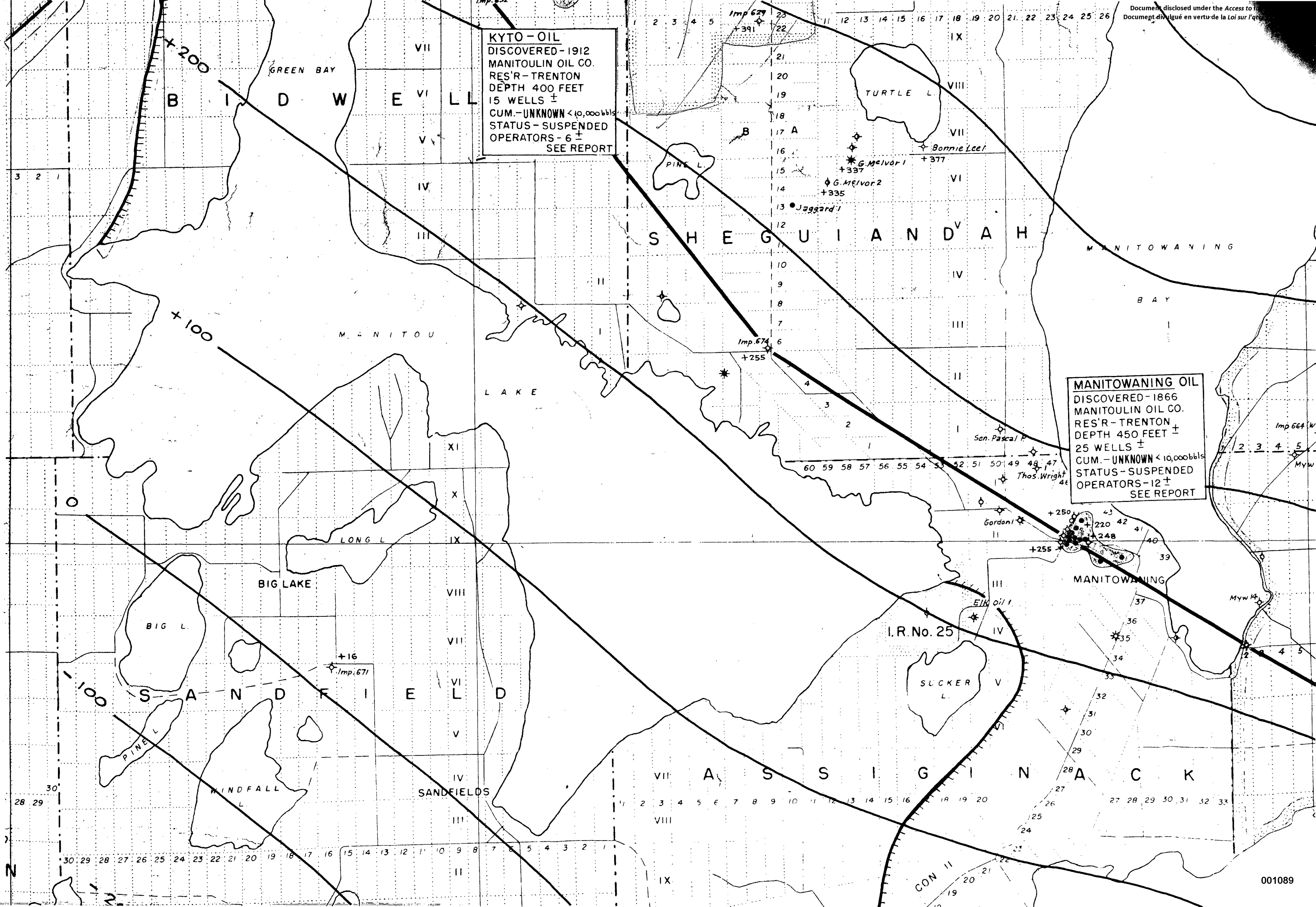
Implementation

Delivery by the Ministry of Tourism and Recreation. Application forms available from the Ministry of Northern Affairs and the Ministry of Tourism and Recreation offices.

E 5855-06175
"WIKWEMIKONG Indian Reserve #26
MANITOWIN District
MAP File etc "

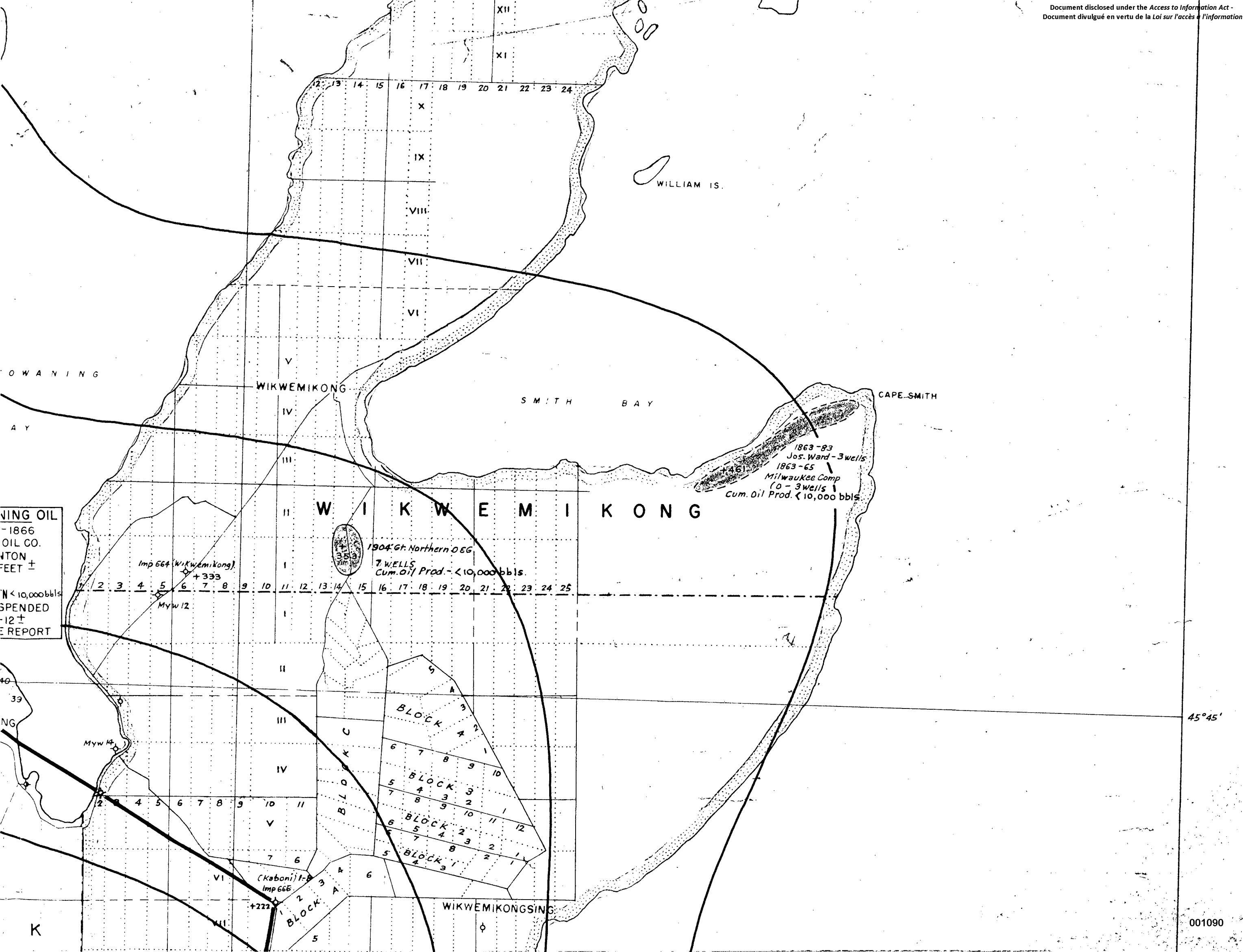


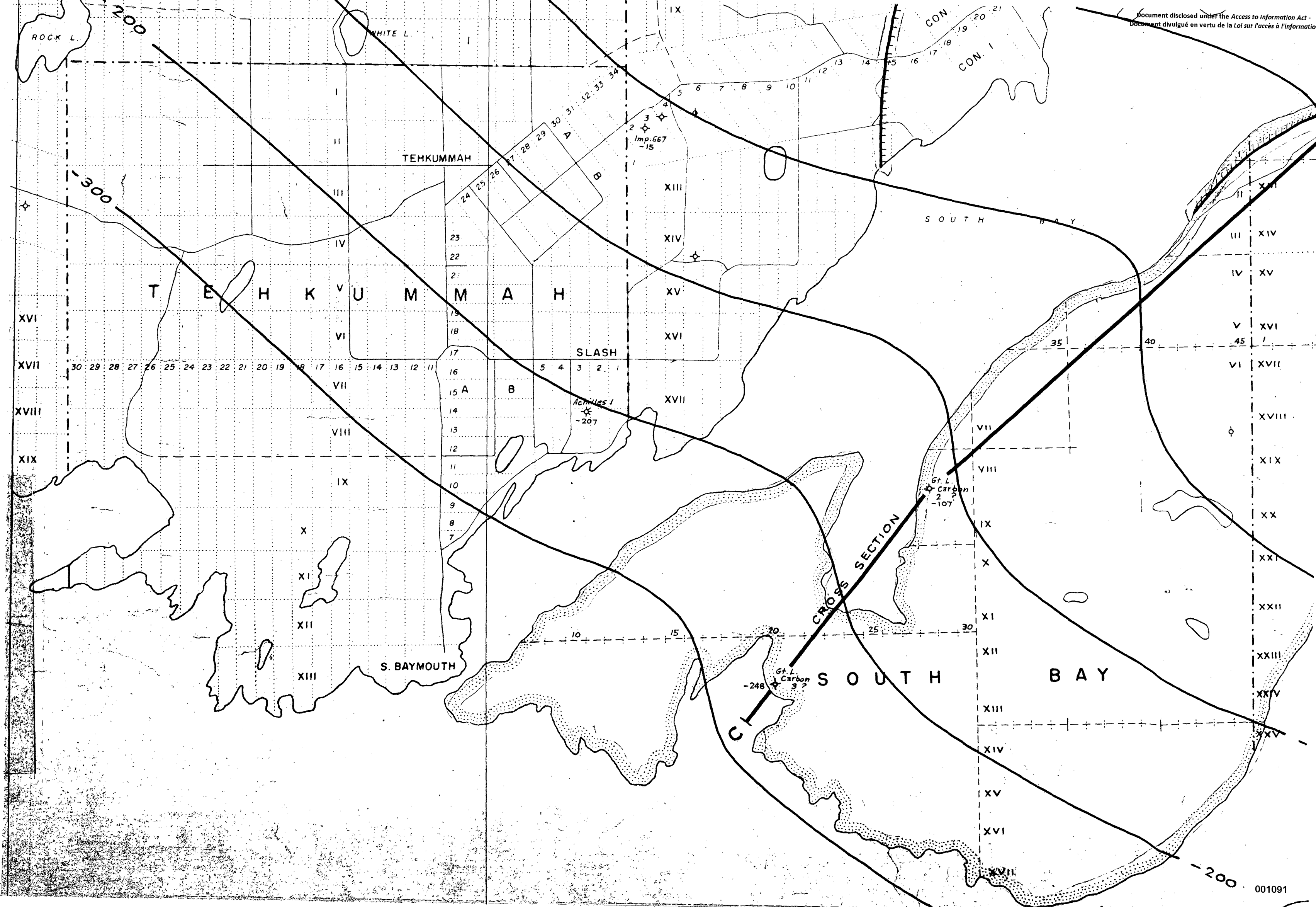


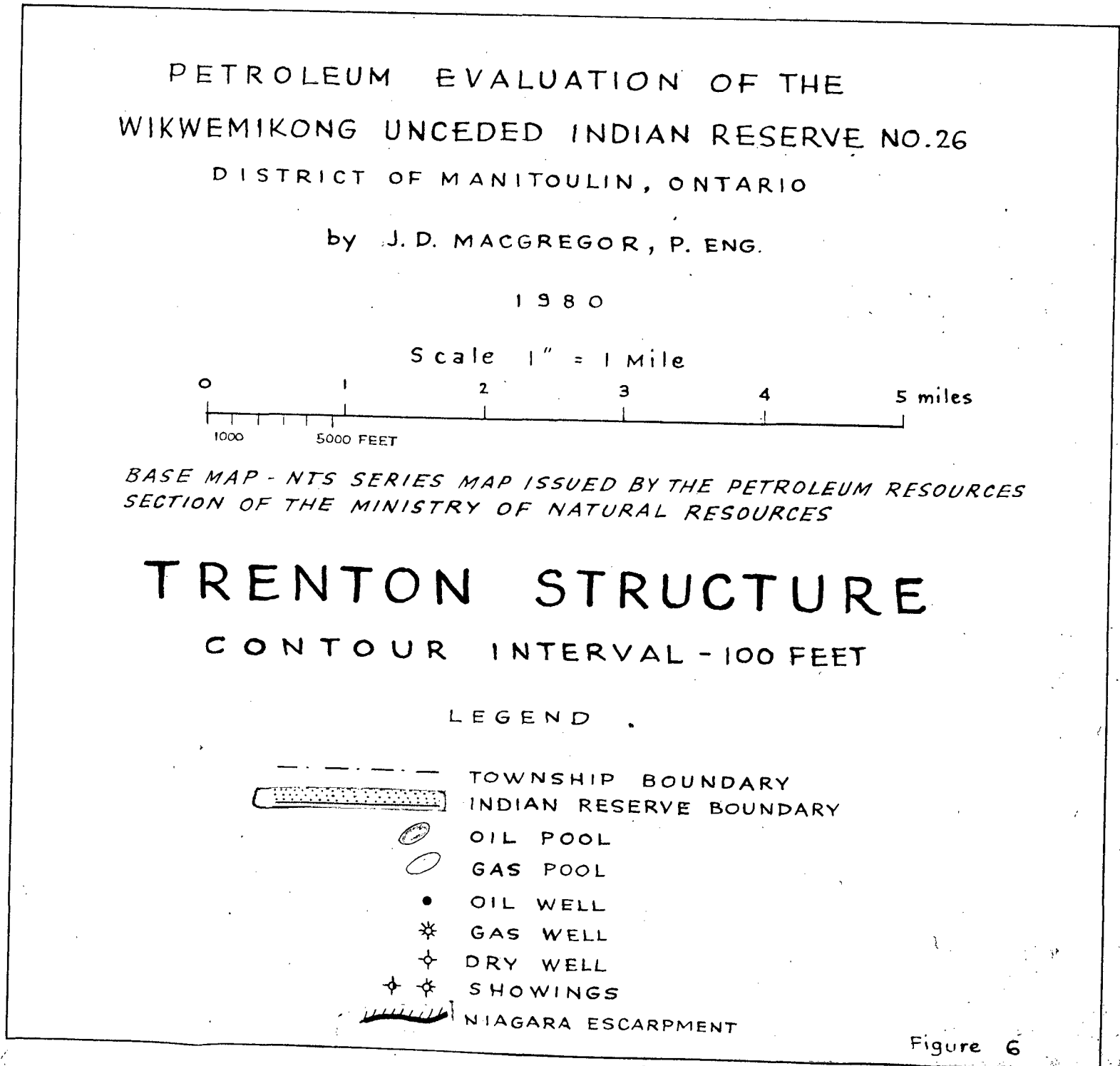
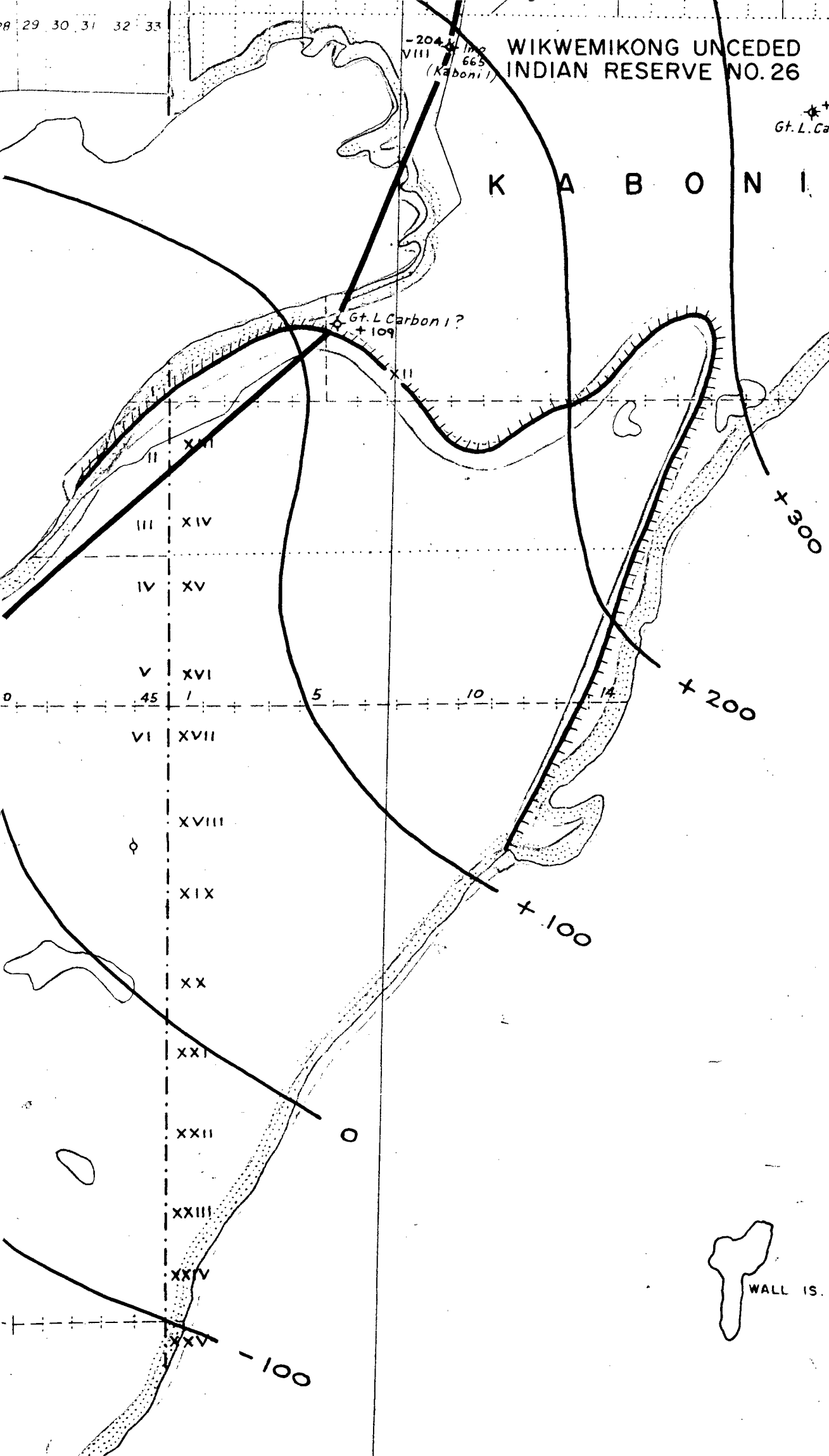


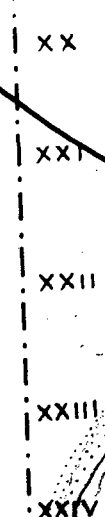
KYTO-OIL
DISCOVERED-1912
MANITOULIN OIL CO.
RES'R-TRENTON
DEPTH 400 FEET
15 WELLS ±
CUM.-UNKNOWN <10,000 bbls
STATUS-SUSPENDED
OPERATORS-6 ±
SEE REPORT

MANITOWANING OIL
DISCOVERED-1866
MANITOULIN OIL CO.
RES'R-TRENTON
DEPTH 450 FEET ±
25 WELLS ±
CUM.-UNKNOWN <10,000 bbls
STATUS-SUSPENDED
OPERATORS-12 ±
SEE REPORT









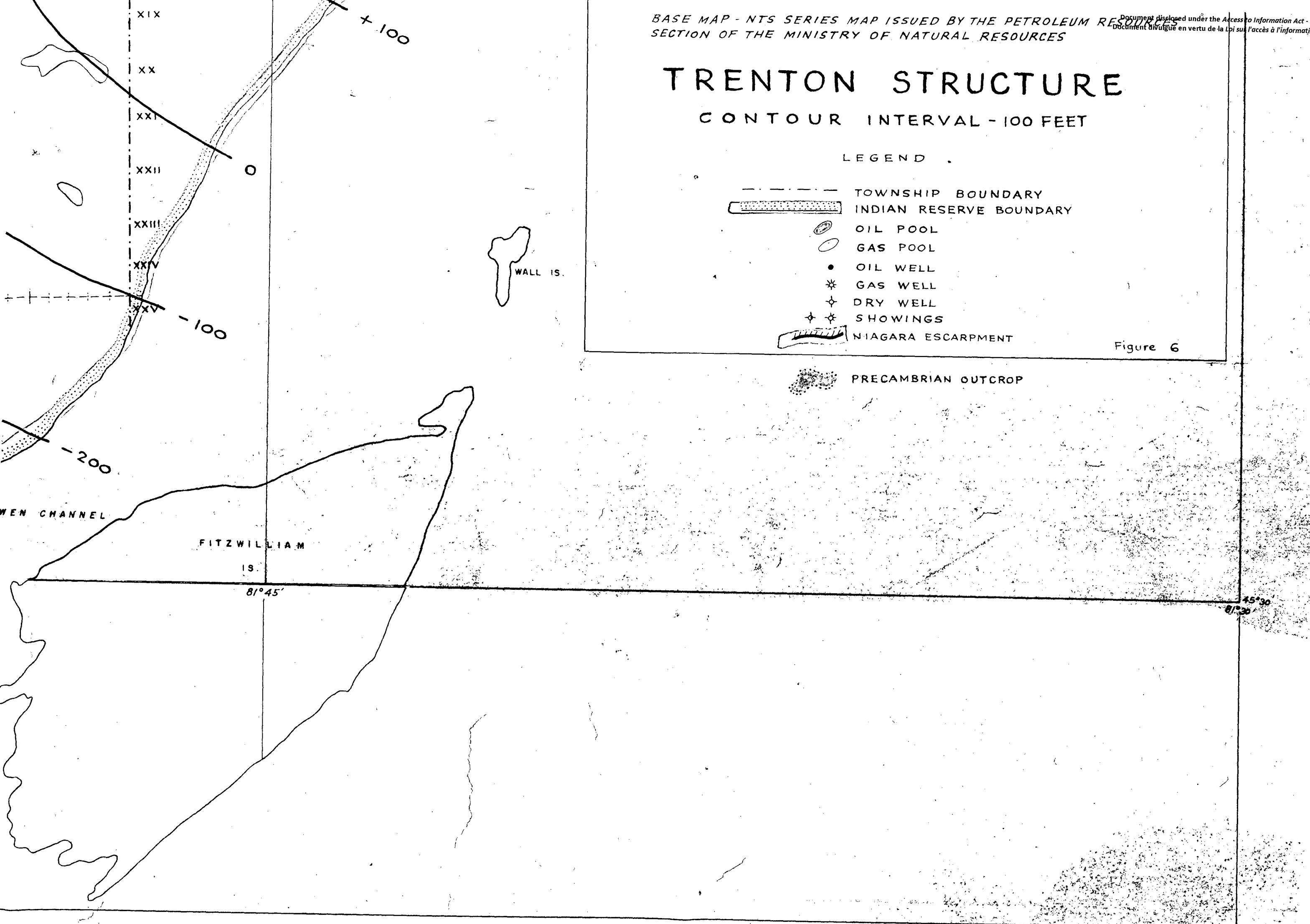
TRENTON STRUCTURE

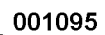
CONTOUR INTERVAL - 100 FEET

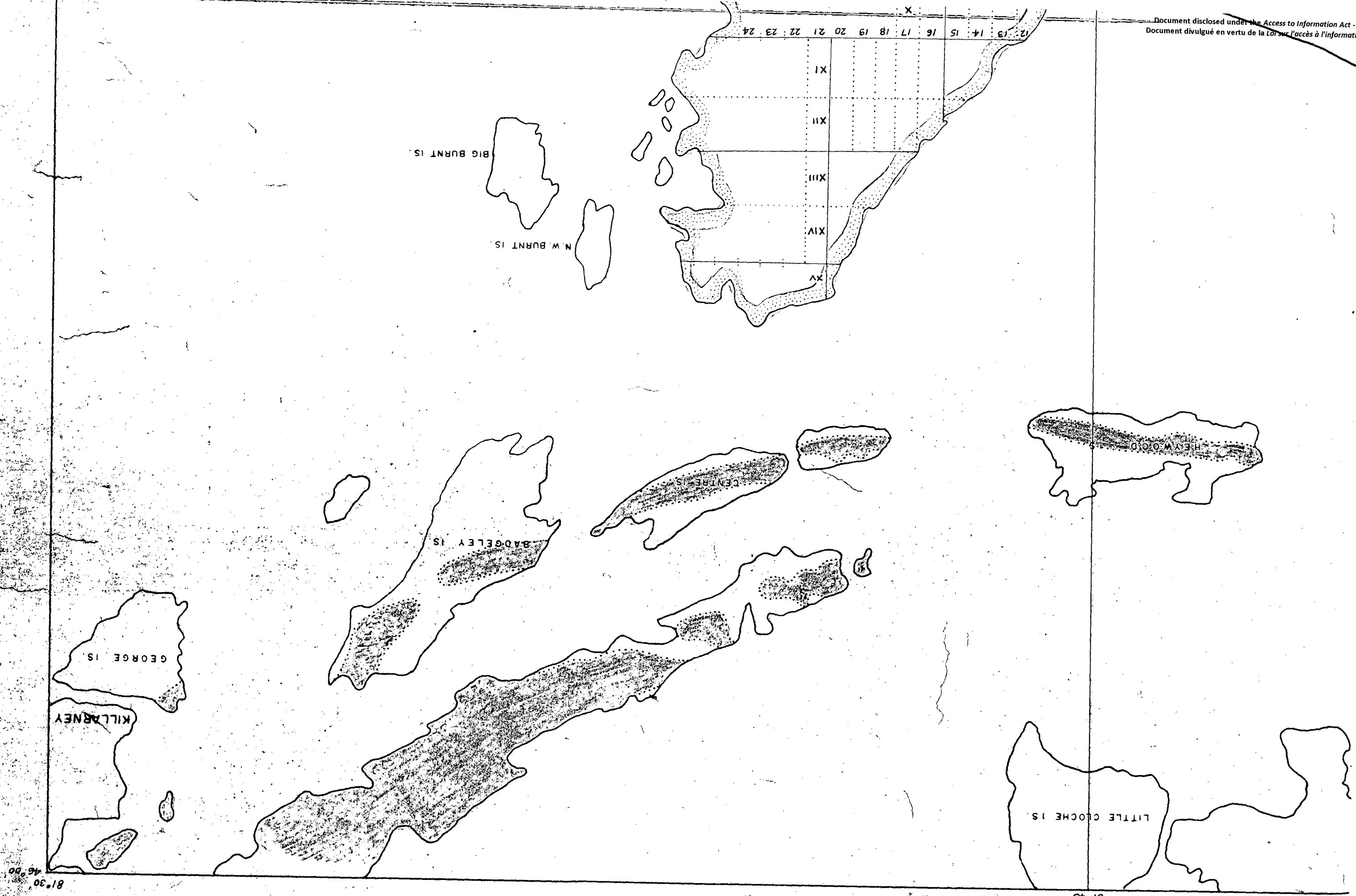
LEGEND

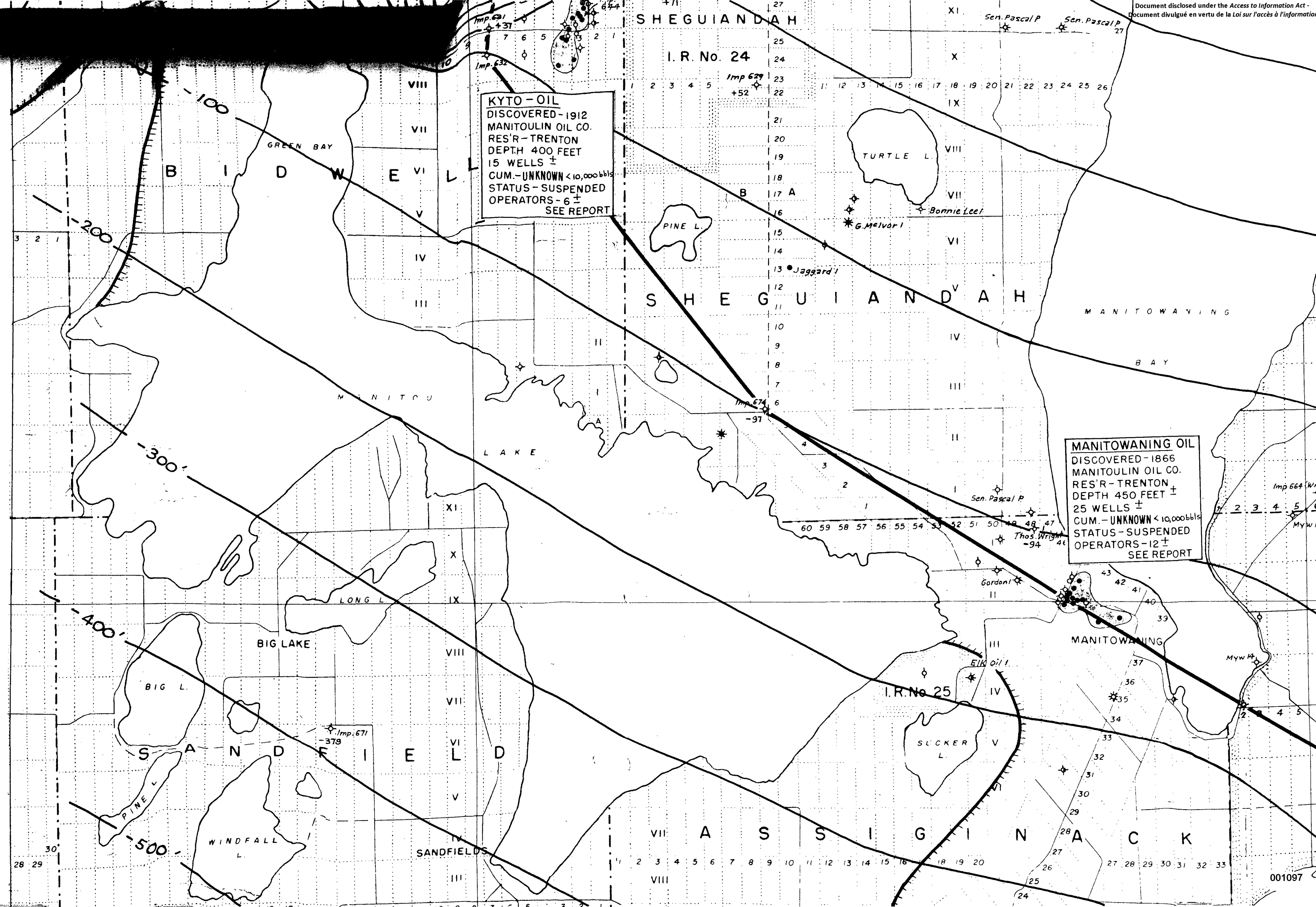
- TOWNSHIP BOUNDARY
- ▨ INDIAN RESERVE BOUNDARY
- OIL POOL
- GAS POOL
- OIL WELL
- * GAS WELL
- ✦ DRY WELL
- ✦ ✦ SHOWINGS
- ▨ NIAGARA ESCARPMENT

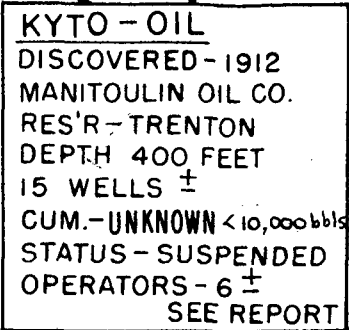
Figure 6



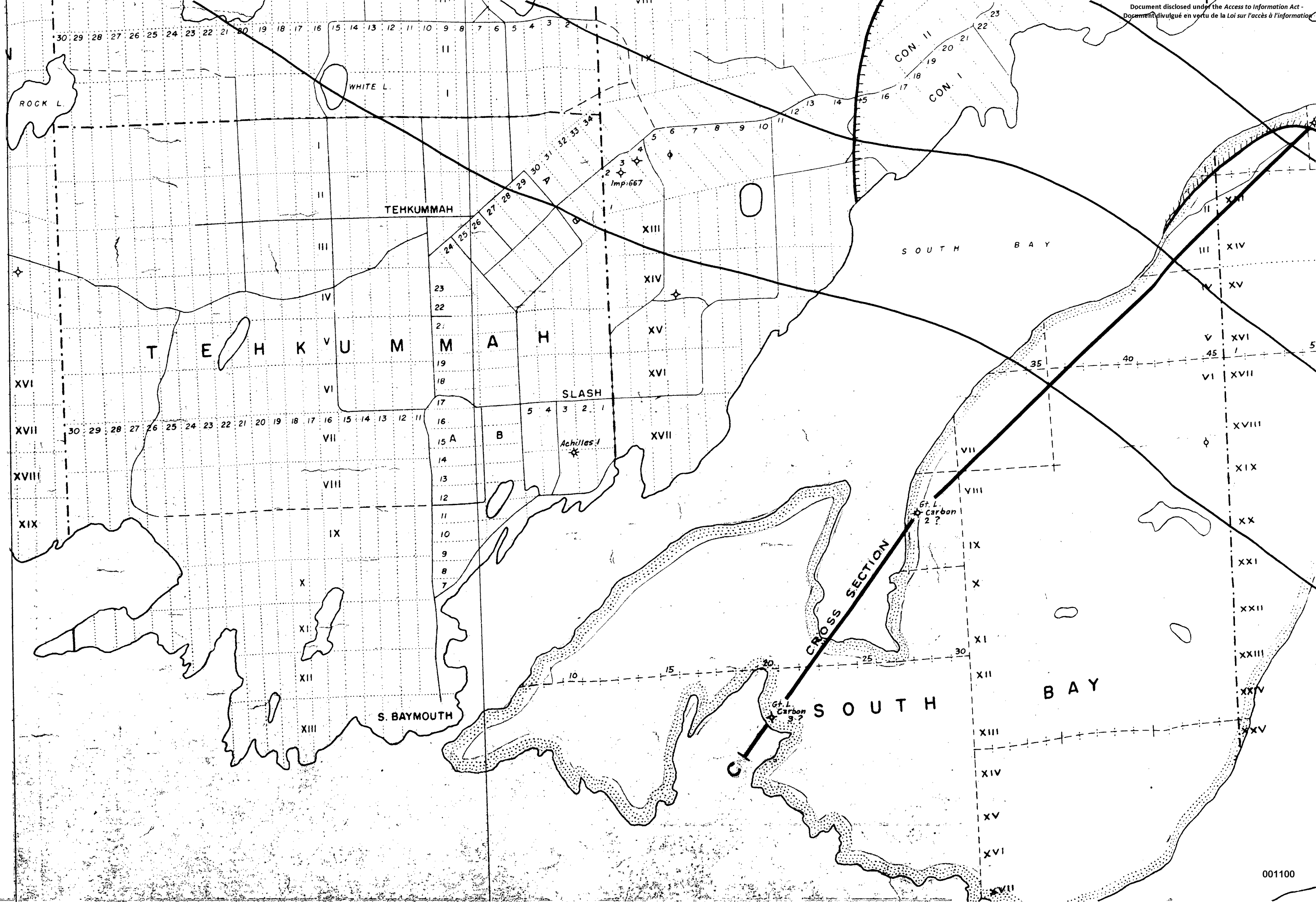


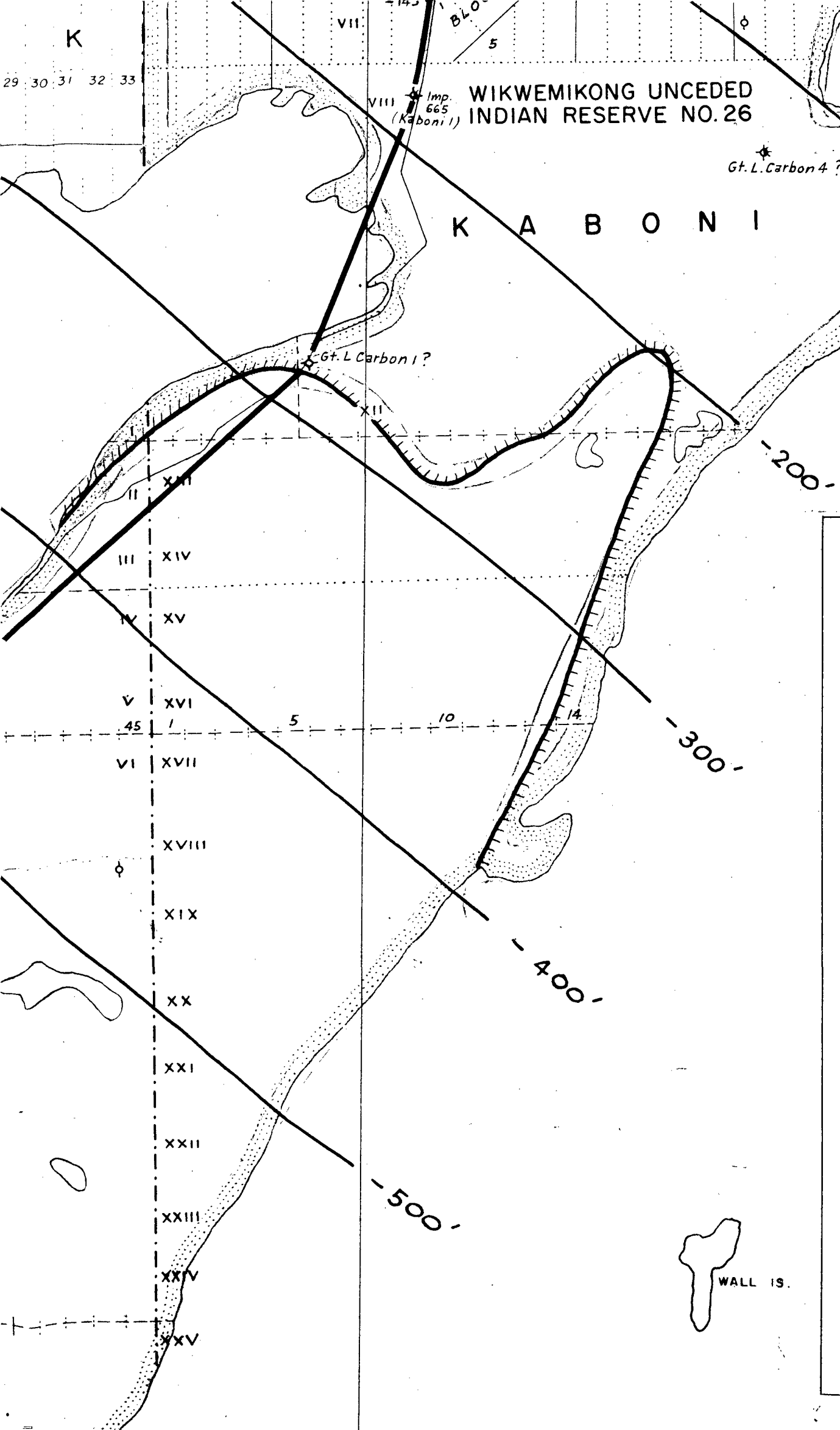






MANITOWANING OIL
DISCOVERED - 1866
MANITOULIN OIL CO.
RES'R - TRENTON
DEPTH 450 FEET \pm
25 WELLS \pm
CUM. - UNKNOWN $< 10,000$ bbls
STATUS - SUSPENDED
OPERATORS - 12 \pm
SEE REPORT





PETROLEUM EVALUATION OF THE WIKWEMIKONG UNCEDED INDIAN RESERVE NO. 26

DISTRICT OF MANITOULIN, ONTARIO

by J. D. MACGREGOR, P. ENG.

1980

Scale 1" = 1 Mile



BASE MAP - NTS SERIES MAP ISSUED BY THE PETROLEUM RESOURCES
SECTION OF THE MINISTRY OF NATURAL RESOURCES

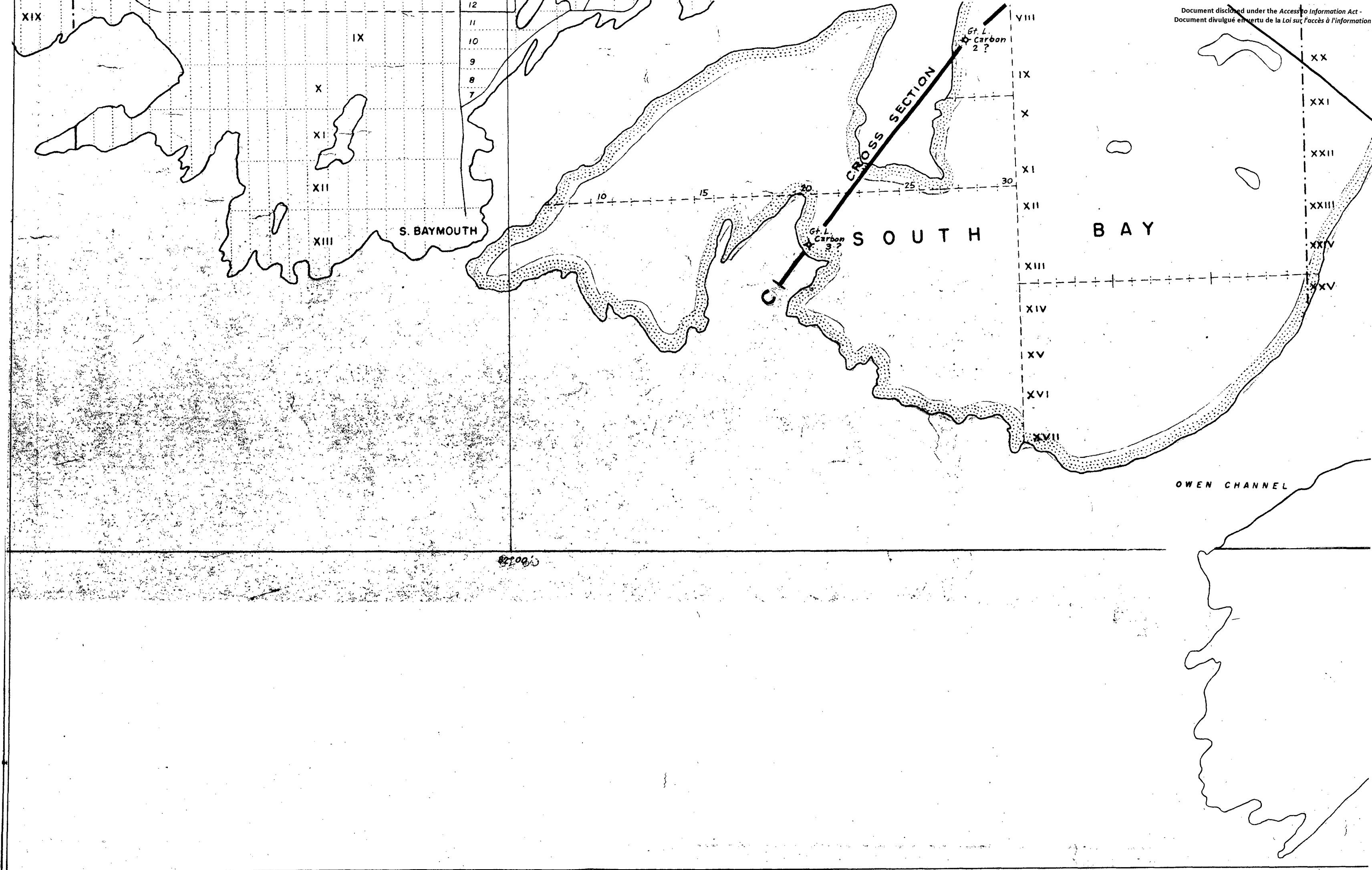
PRECAMBRIAN STRUCTURE

CONTOUR INTERVAL - 100 FEET

LEGEND

- TOWNSHIP BOUNDARY
- Indian Reserve Boundary
- OIL POOL
- GAS POOL
- OIL WELL
- GAS WELL
- DRY WELL
- SHOWINGS
- NIAGARA ESCARPMENT

Figure 5



BASE MAP - NTS SERIES MAP ISSUED BY THE PETROLEUM RESOURCES
SECTION OF THE MINISTRY OF NATURAL RESOURCES

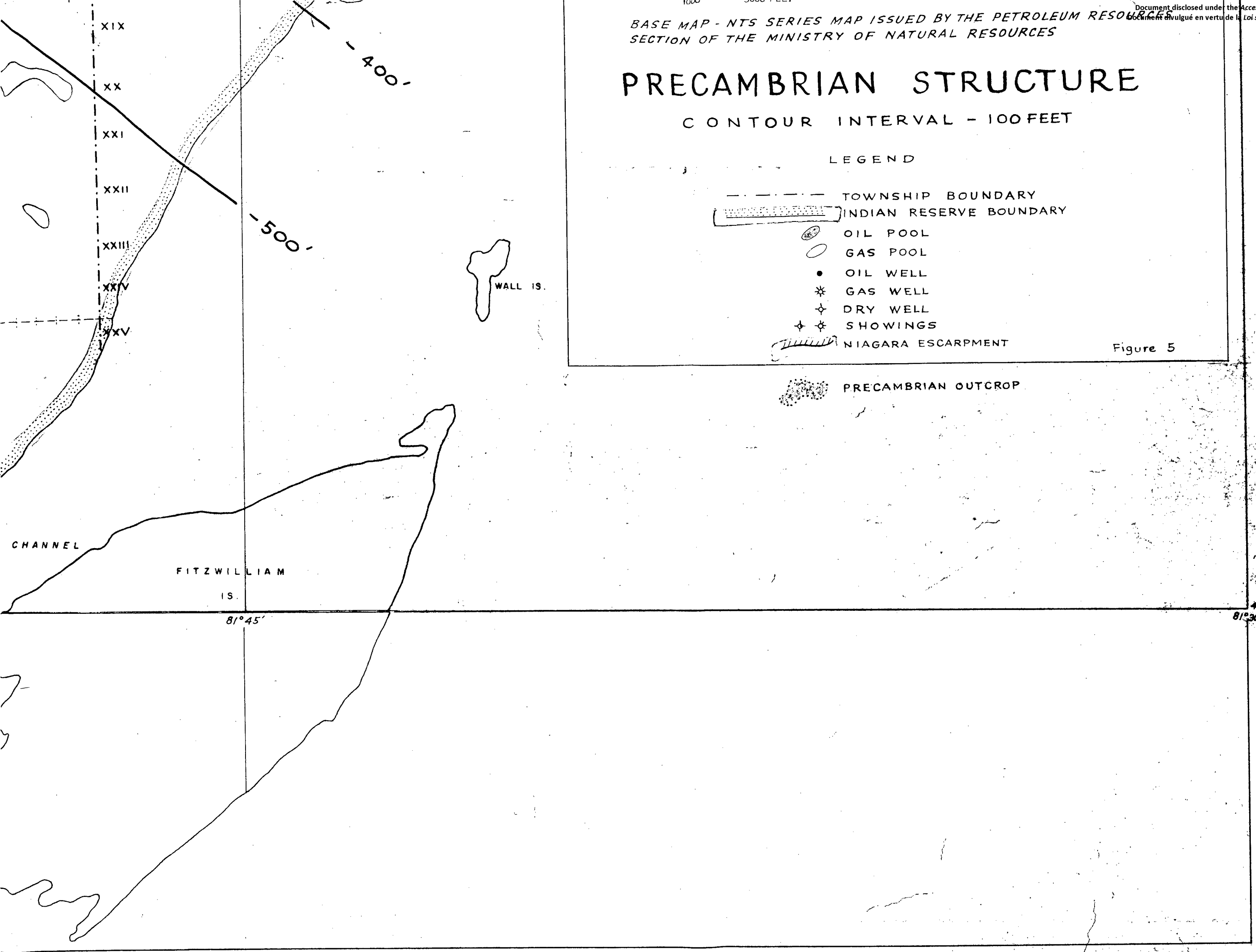
PRECAMBRIAN STRUCTURE

C O N T O U R I N T E R V A L - 1 0 0 F E E T

LEGEND

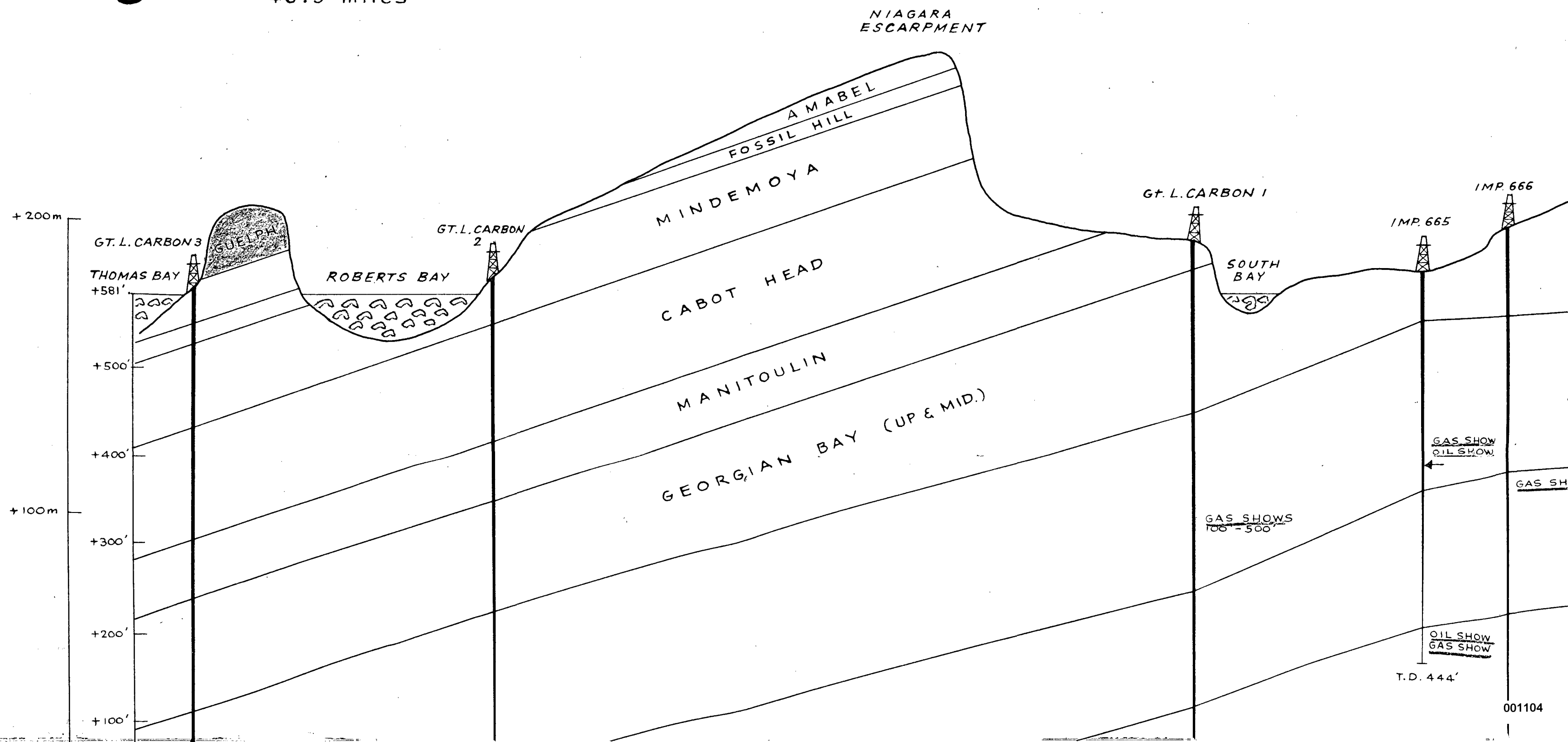
- TOWNSHIP BOUNDARY
- [Patterned Box] INDIAN RESERVE BOUNDARY
- [Stippled Circle] OIL POOL
- [Empty Circle] GAS POOL
- [Dot] OIL WELL
- [Star] GAS WELL
- [Cross] DRY WELL
- [Star with Cross] SHOWINGS
- [Hatched Line] NIAGARA ESCARPMENT

Figure 5

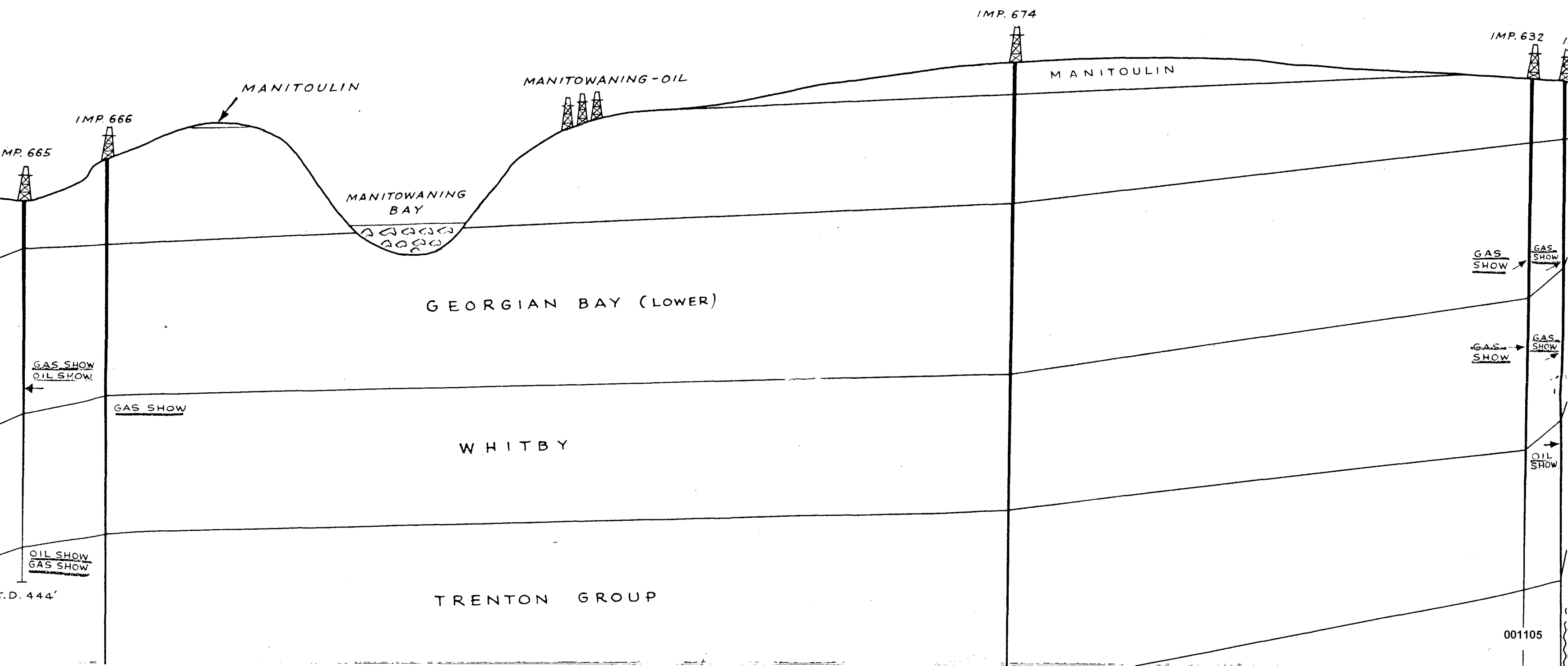


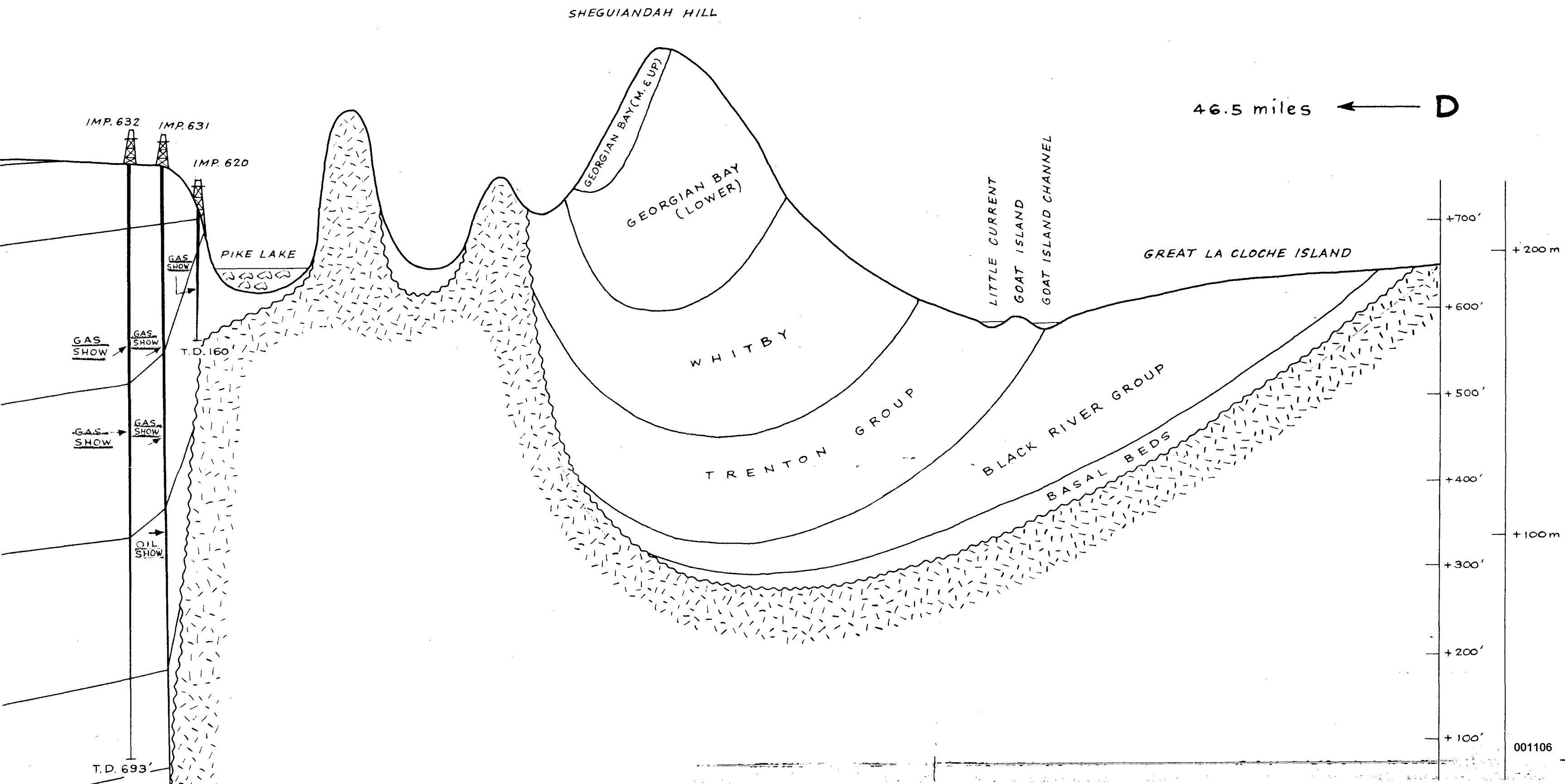
M

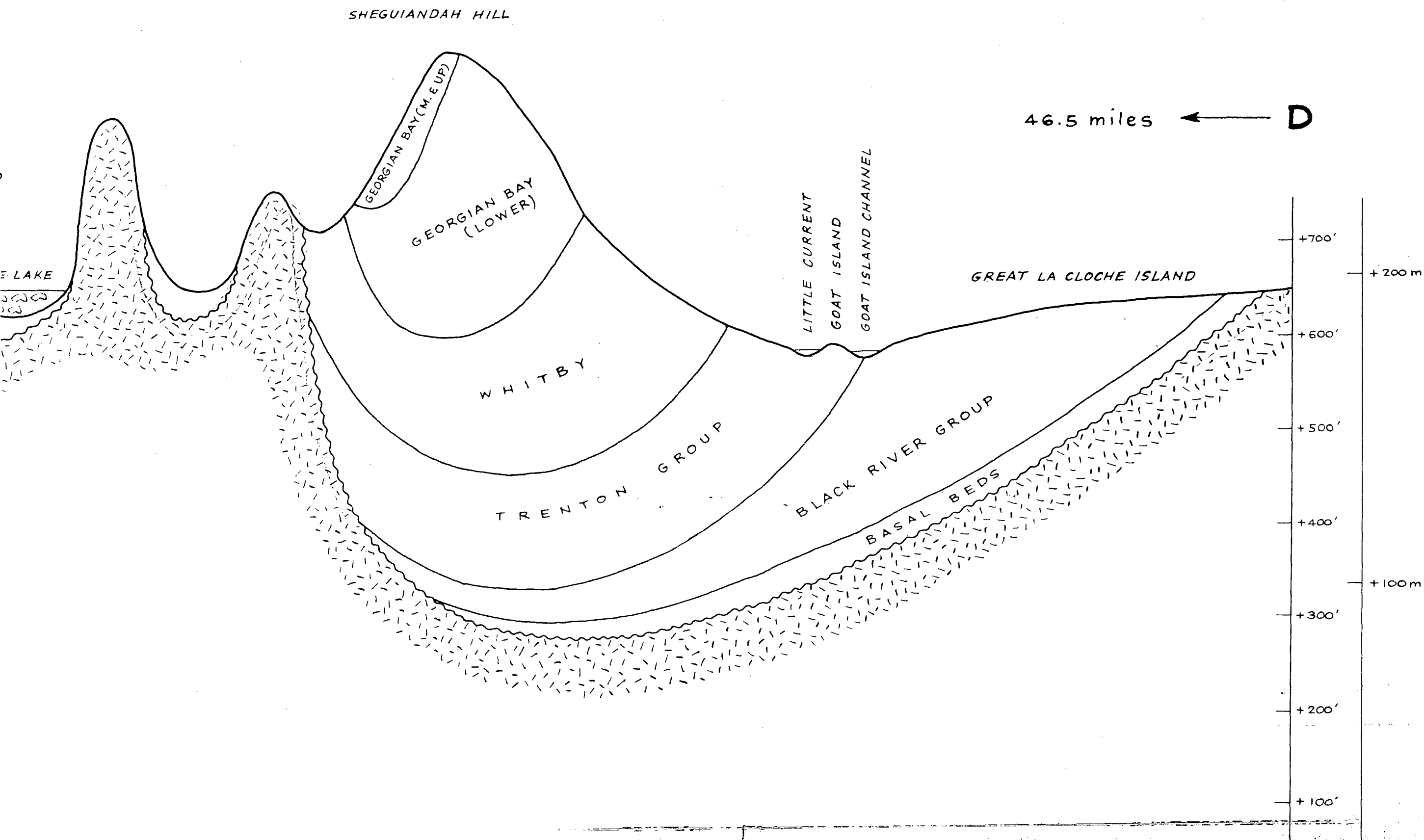
C → 46.5 miles

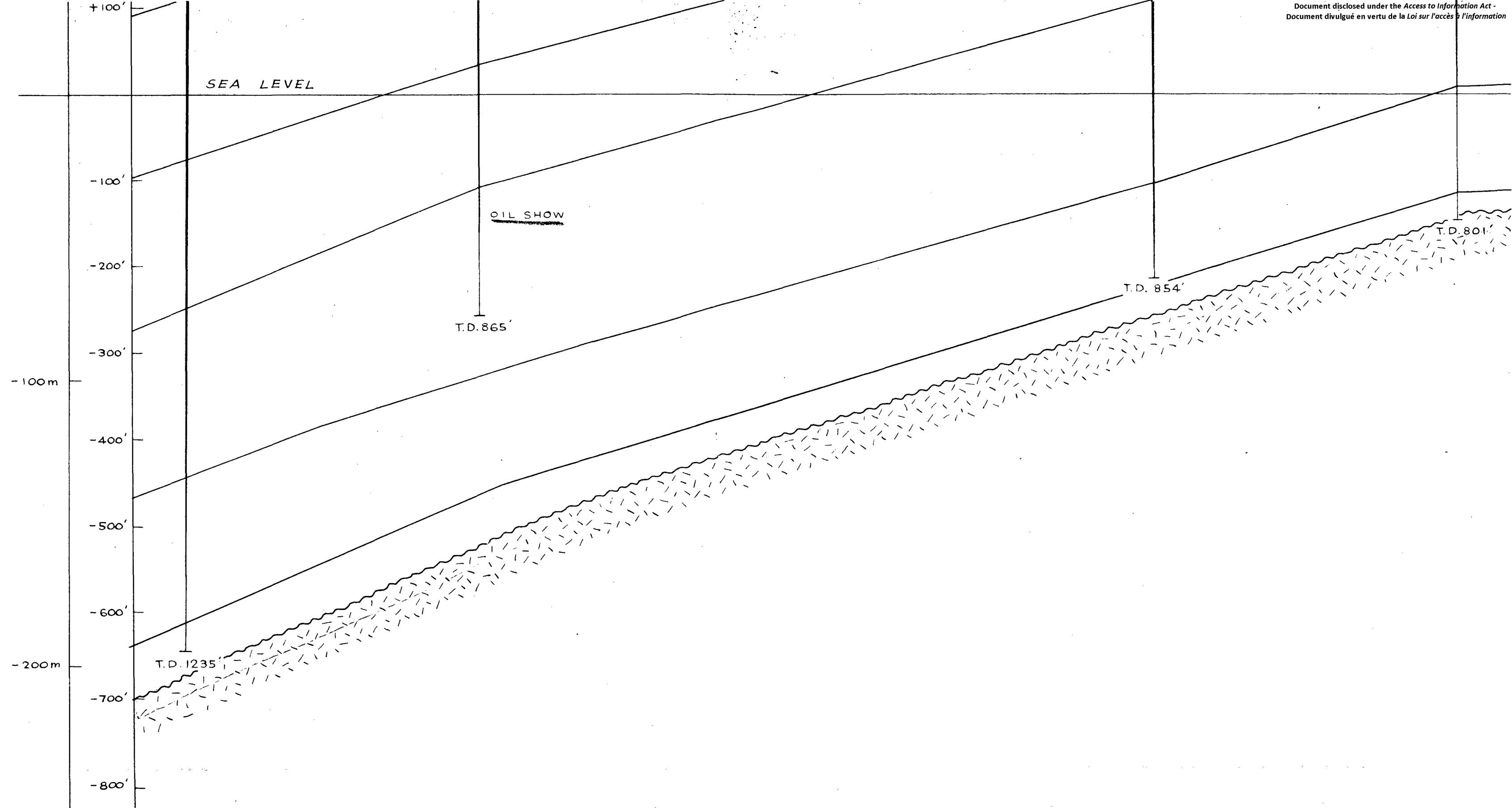


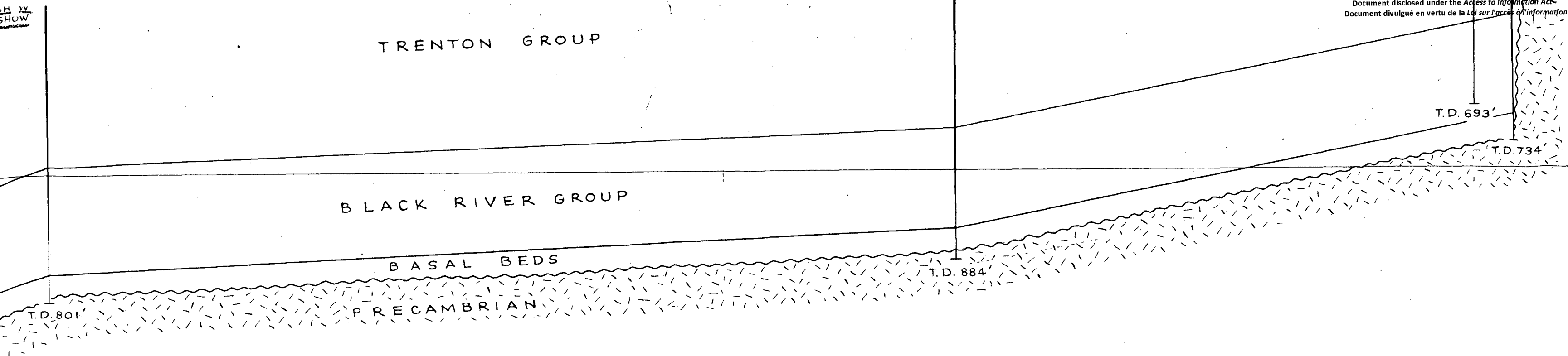
MANITOULIN ISLAND

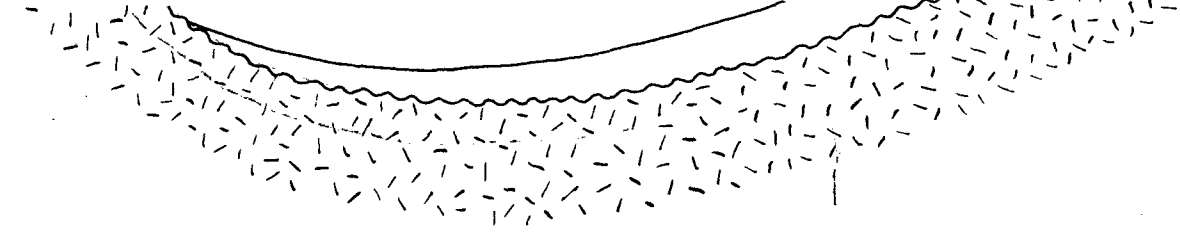








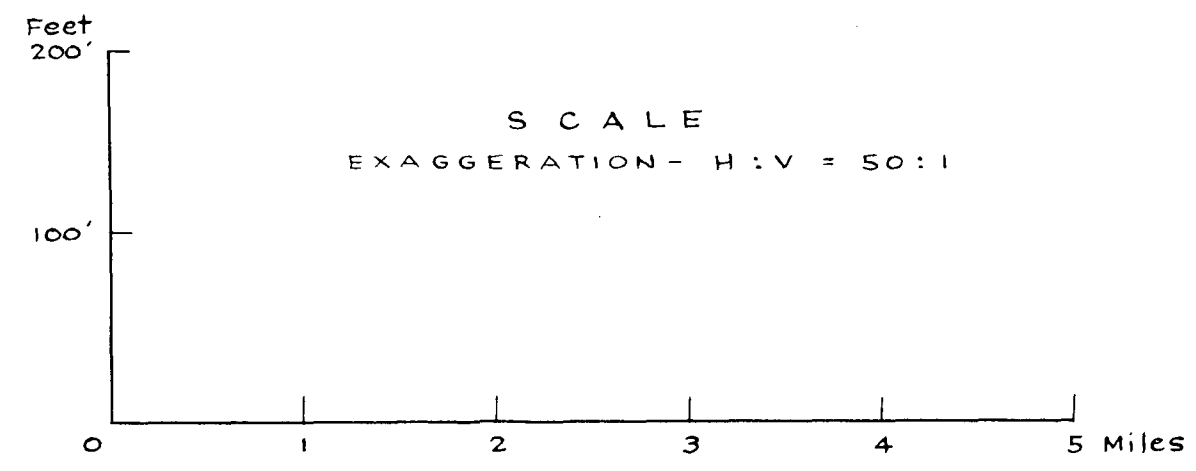




SEA LEVEL

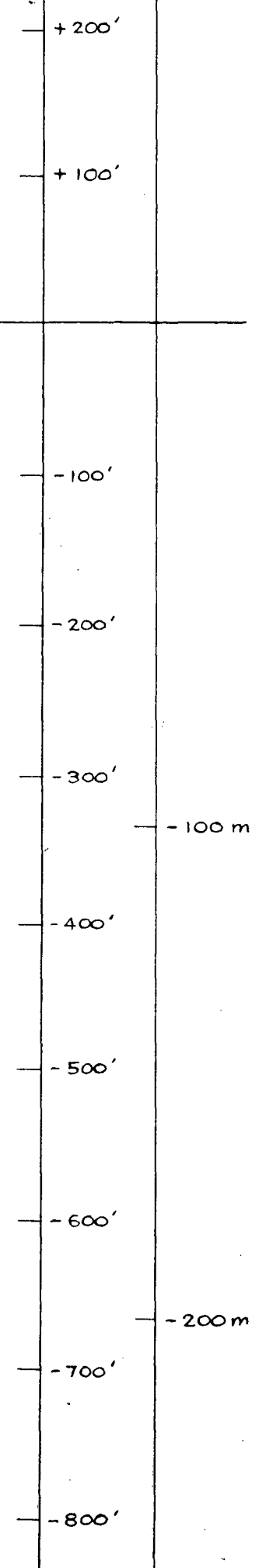
MANITOULIN ISLAND CROSS SECTION

* BASED ON 'ONTARIO DIVISION OF MINES' GEOLOGICAL MAPS OF MANITOULIN ISLAND No's 2247 AND 2249 AND DRILLED WELL INFORMATION



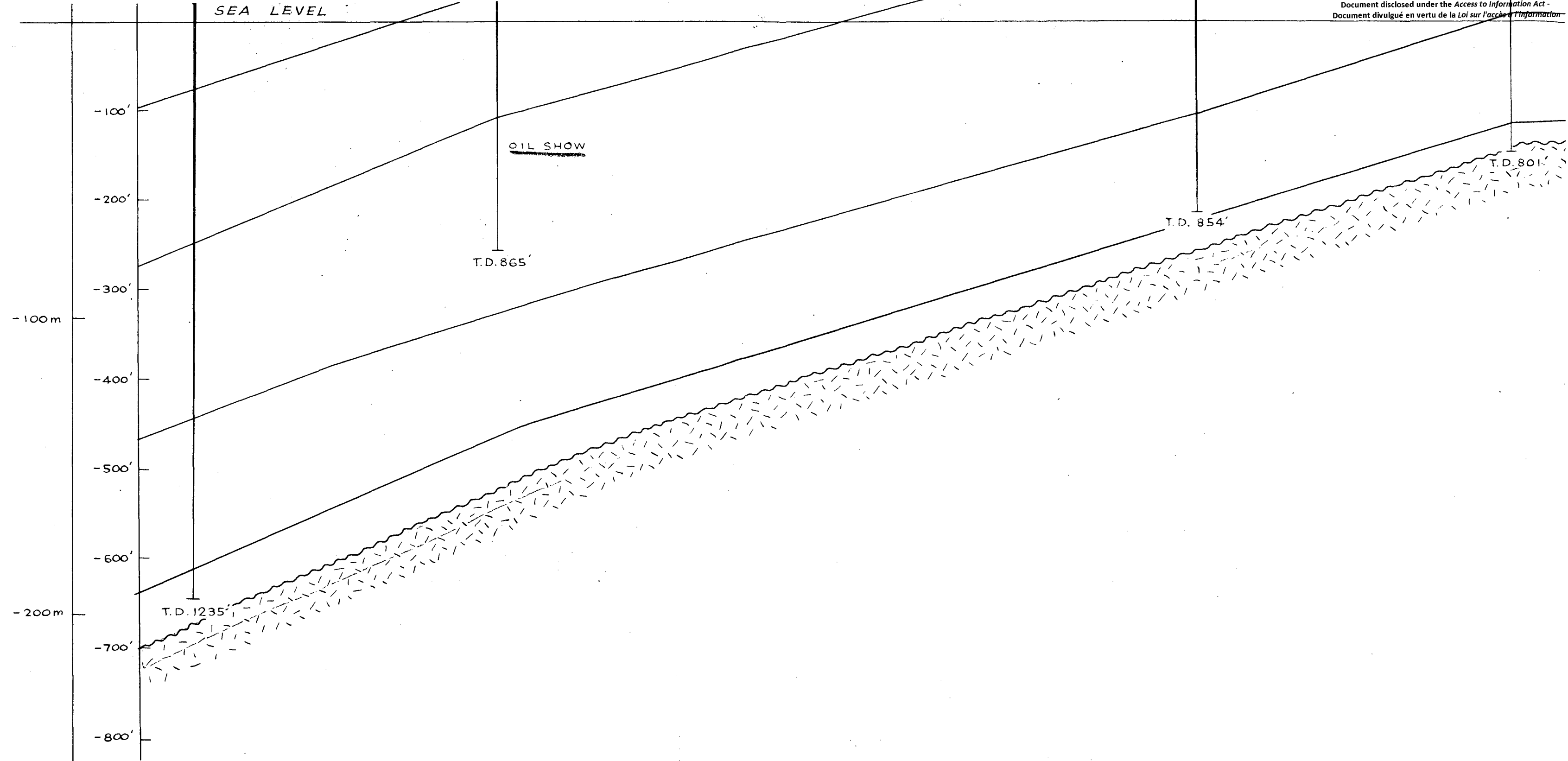
J.D. MACGREGOR
1980

Fig. 7



* STRATIGRAPHY OF MANITOULIN ISLAND

ERA	SYSTEM	SERIES	GROUP	FORMATION (Lithostratigraphic Units)	Alternate bio- stratigraphic Units	S.W. Ontario
P.C.	SILURIAN	MIDDLE		GUELPH-AMABEL		Guelph - Lockport Group
				FOSSIL HILL MINDEMOYA		Clinton Group
		LOWER		CABOT HEAD Dyer Bay Mbr. Cabot Head Mbr.		Cataract Group
				MANITOULIN		



BLACK RIVER GROUP

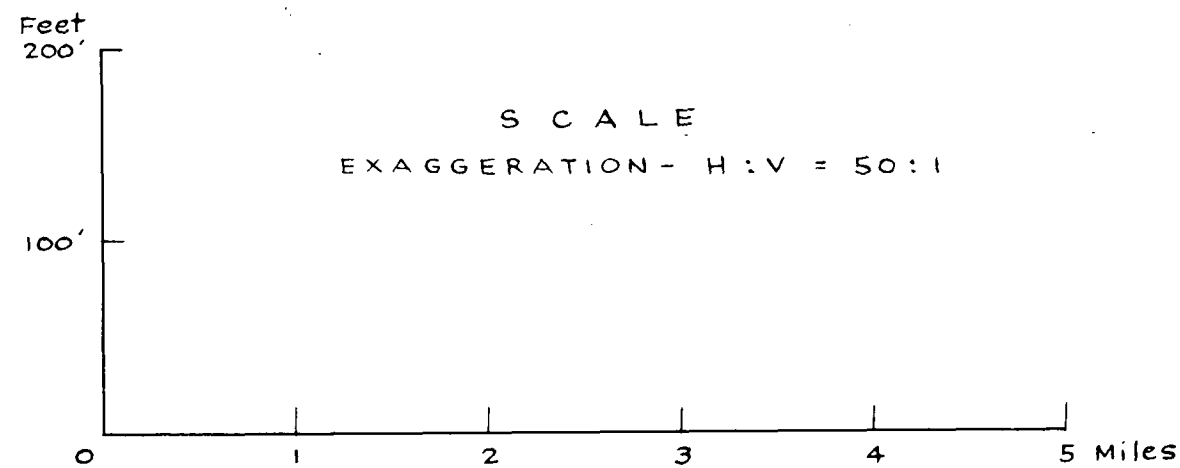
BASAL BEDS

PRECAMBRIAN

T.D. 884

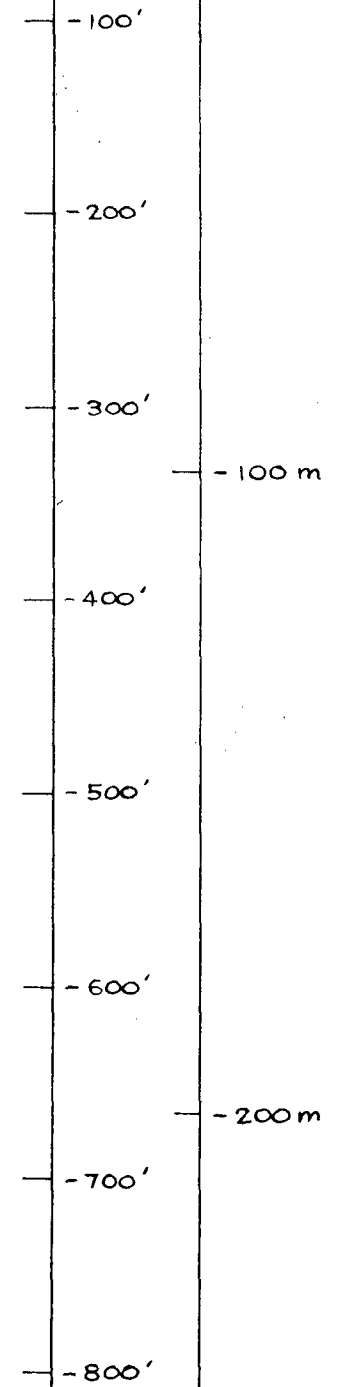
MANITOULIN ISLAND CROSS SECTION

* BASED ON 'ONTARIO DIVISION OF MINES' GEOLOGICAL MAPS
OF MANITOULIN ISLAND No's 2247 AND 2249 AND DRILLED
WELL INFORMATION



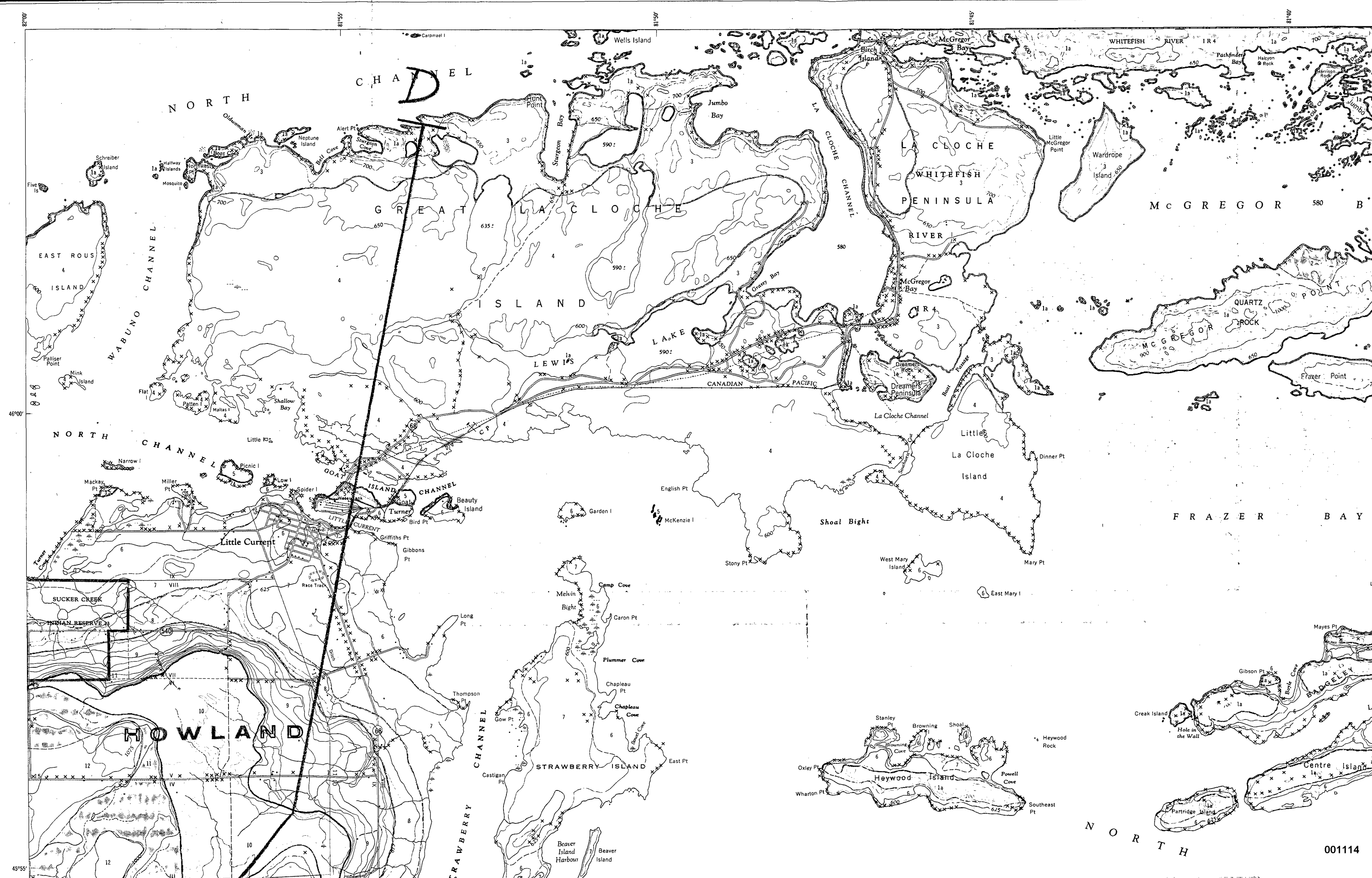
J.D. MACGREGOR
1980

Fig. 7



* STRATIGRAPHY OF MANITOULIN ISLAND

ERA	SYSTEM	SERIES	GROUP	FORMATION (Lithostratigraphic Units)	Alternate bio- stratigraphic Units	S.W. Ontario	
PALEOZOIC	SILURIAN	MIDDLE		GOBEL AMABEL		Guelph - Lockport Group	
				FOSSIL HILL MINDEMOYA		Clinton Group	
		LOWER		CABOT HEAD Dyer Bay Mbr. Cabot Head Mbr. MANITOULIN		cataract Group	
	ORDOVICIAN		UPPER		GEORGIAN BAY Upper Middle Lower	Kagawong Widwemikongsing	Queenston Meaford - Dundas
				WHITBY Upper Lower	Sheguindah Collingwood	Blue Mountain Collingwood	
		MIDDLE	TRENTON	LINDSAY VERULAM		Trenton Group	
	BLACK RIVER		BOBCAYGEON GULL RIVER BASAL BEDS		Shadow Lake		
					PRECAMBRIAN		



Map 2247
Little Current Area



LEGEND

PALEOZOIC SILURIAN

GUELPH FORMATION†

18 Tan, finely crystalline dolostone and finely granular dolostone.

AMABEL FORMATION†

17 Grey and blue, finely crystalline and sub-lithographic dolostone; bioherms.

FOSSIL HILL FORMATION†

16 Medium brown, finely and medio crystalline dolostone; patch and platform reefs.

MINDEMOYA FORMATION

15 Grey and light brown, lithographic to finely crystalline dolostone; thin biostromes.

CABOT HEAD FORMATION#

14 Dyer Bay Member: bluish, finely crystalline dolostone with shale; Wingfield Member: brownish-grey, finely crystalline dolostone with shale; St. Edmund Member: brown, finely crystalline dolostone with shale.

13 Cabot Head (restricted) Member: red shale, with green shale and green dolostone; latter two increase westwards.

MANITOULIN FORMATION

12 Brown and grey, finely crystalline dolostone; patch and platform reefs.

ORDOVICIAN GEORGIAN BAY FORMATION

11 Upper Member, Upper Submember: brown and grey, finely crystalline limestone and dolostone.

10 Upper Member, Lower Submember: bluish grey, fine-grained argillaceous limestone.

9 Lower Member: greyish blue shale with thin interbeds of finely crystalline limestone and dolostone.

WHITBY FORMATION

8 Upper Member: grey and brown, soft shale.

7 Lower Member: black fissile shale, minor black limestone; calcareous and petrolierous; fossiliferous.

LINDSAY FORMATION

6 Grey, finely crystalline limestone, minor dolostone, some sub-lithographic limestone.

VERULAM FORMATION

5 Grey and bluish grey, finely to medio crystalline limestone; minor shale, fossiliferous and thin bedded.

SYMBOLS

- x Bedrock outcrop.
- Geological boundary.
- Oil or gas well.
- Quarry.
- International boundary.
- Township or Indian Reserve boundary.

For other conventional signs refer to 1:50,000 National Topographic Map System.

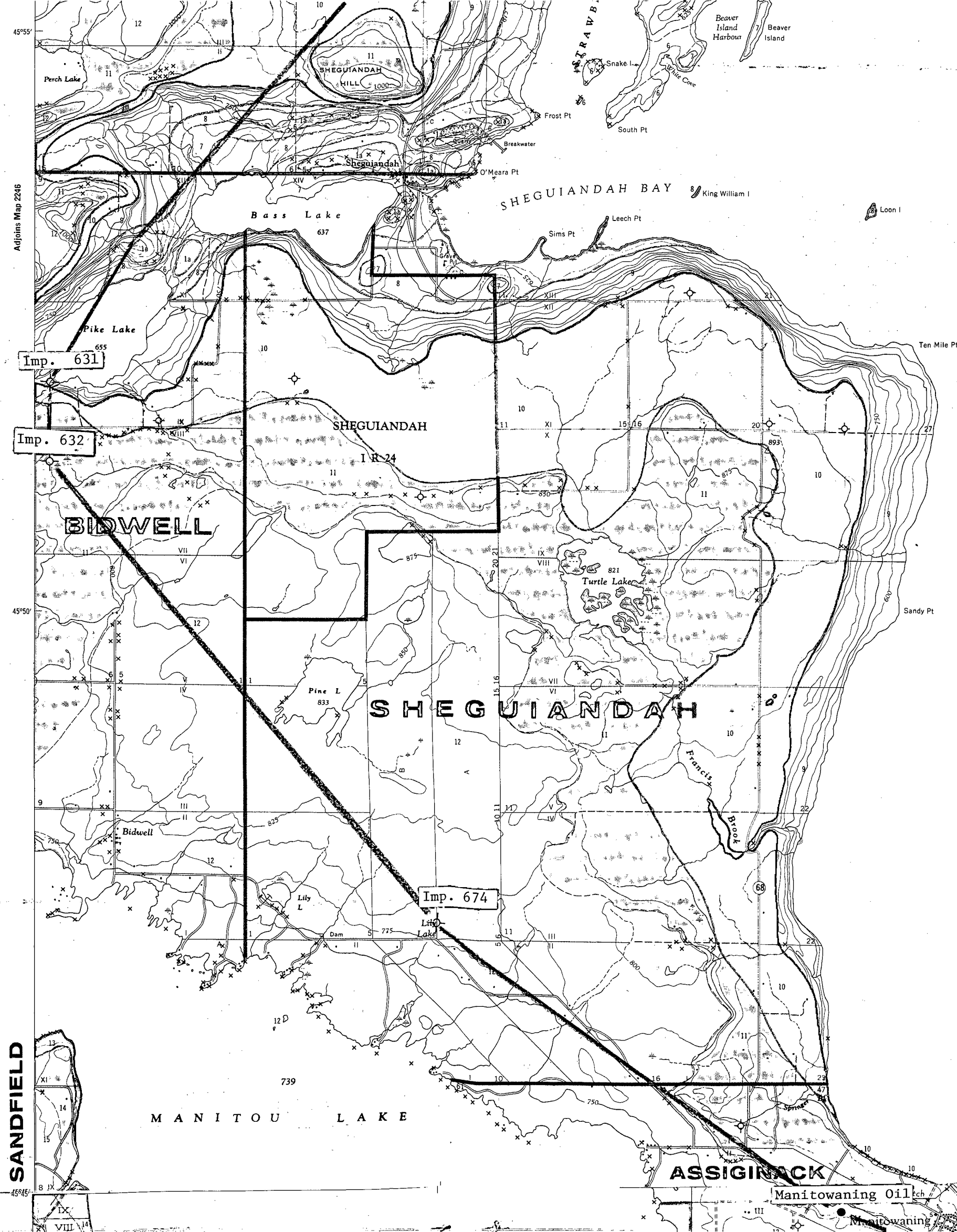
SOURCES OF INFORMATION

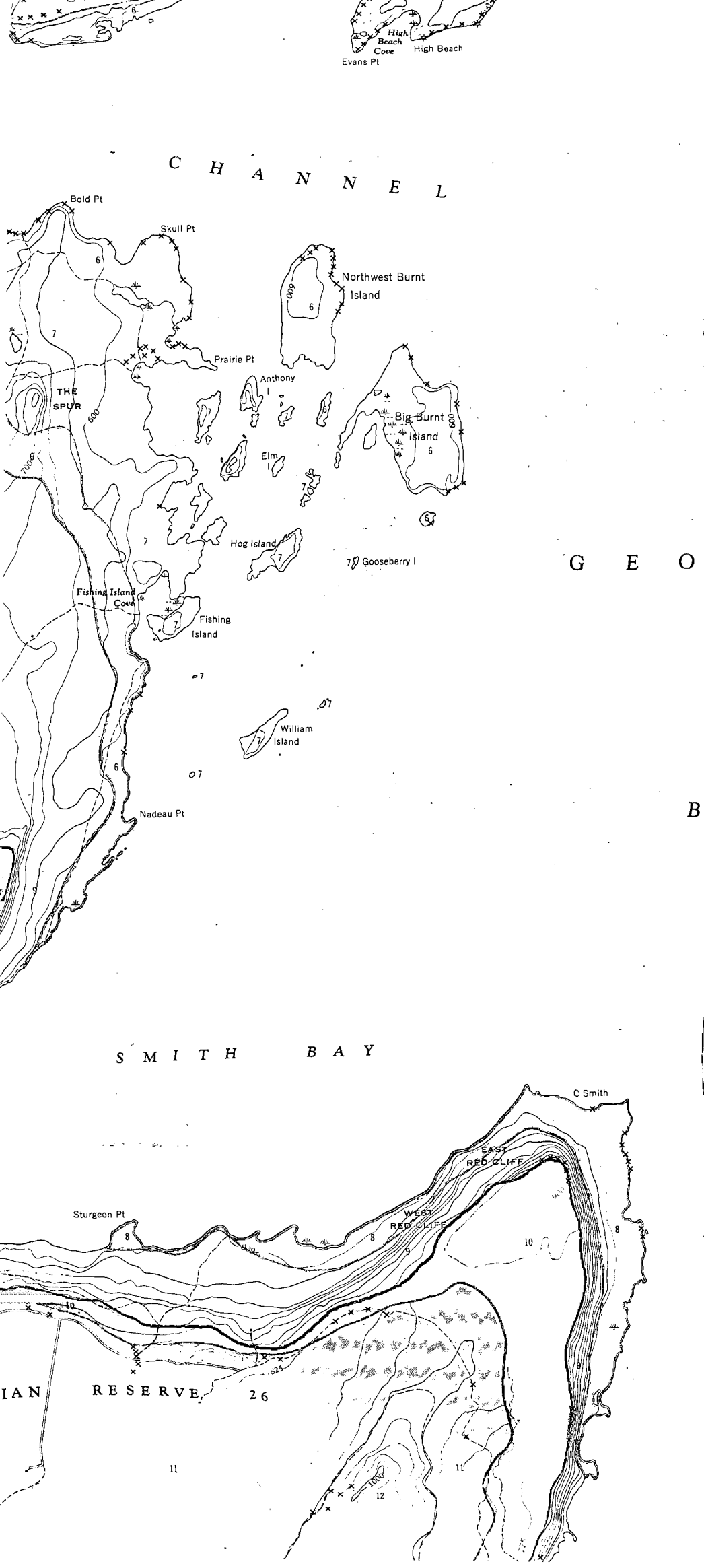
Geology by B. A. Liberty, 1954-1957, Geological Survey of Canada; 1966-1971, Department of Geological Sciences, Brock University, Ontario.

Map 20-1957, Manitoulin Island, Geological Survey of Canada, 1957.

Cartography by M. J. Colman, C. Karpotas, and assistants.

001115





- 6 Grey, finely crystalline limestone, some sublithographic limestone.
- 5 Grey and bluish grey, finely to medio crystalline limestone; minor shale, fossiliferous and thin bedded.
- 4 Grey and brownish grey, finely crystalline and sublithographic limestone; fossiliferous.
- 3 Upper Member: grey, lithographic limestone; Lower Member: dark grey, finely granular and finely crystalline argillaceous limestone and dolostone.
- 2 Red and green mottled red shale; may be very conglomeratic.

- 1b Killarney red and grey granite.
- 1a Lorrain grey and white quartzite and fine-grained sandstone.

*This refers to classification in Liberty and Bolton, Geological Survey of Canada, Memoir 360.

†These formations are mapped on some of the adjoining sheets (see Index) of the Manitoulin Island Area.

Geology of the Manitoulin Island Area, Ontario, Canada; 1966-1971, Department of Geological Sciences, Brock University, Ontario.

Map 20-1957, Manitoulin Island, Geological Survey of Canada, 1957.

Cartography by M. J. Colman, C. Karpets, and assistants, Ontario Department of Mines and Northern Affairs, 1972.

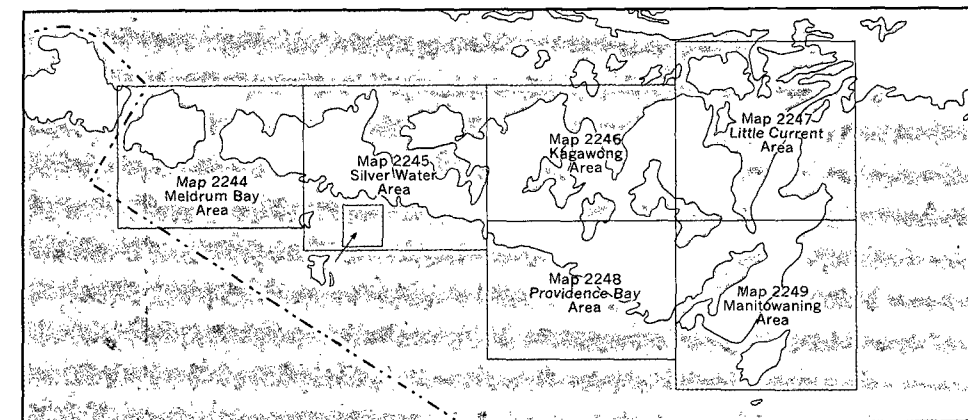
Base map derived from 1:50,000 sheets of the National Topographic System with additional information by B. A. Liberty, and from the Ontario Department of Transportation and Communications.

NOTES

For additional information refer to: Geological Guidebook No. 4, "Geology and Scenery; North Shore of Lake Huron", Ontario Department of Mines and Northern Affairs, 1972.

Magnetic declination in the area was 7°30'W., 1970.

Maps published in co-operation with the Geological Survey of Canada under whose auspices the geology was mapped by B. A. Liberty, 1954-1957.



Index to the adjoining maps of the Manitoulin Island Area



ONTARIO DIVISION OF MINES

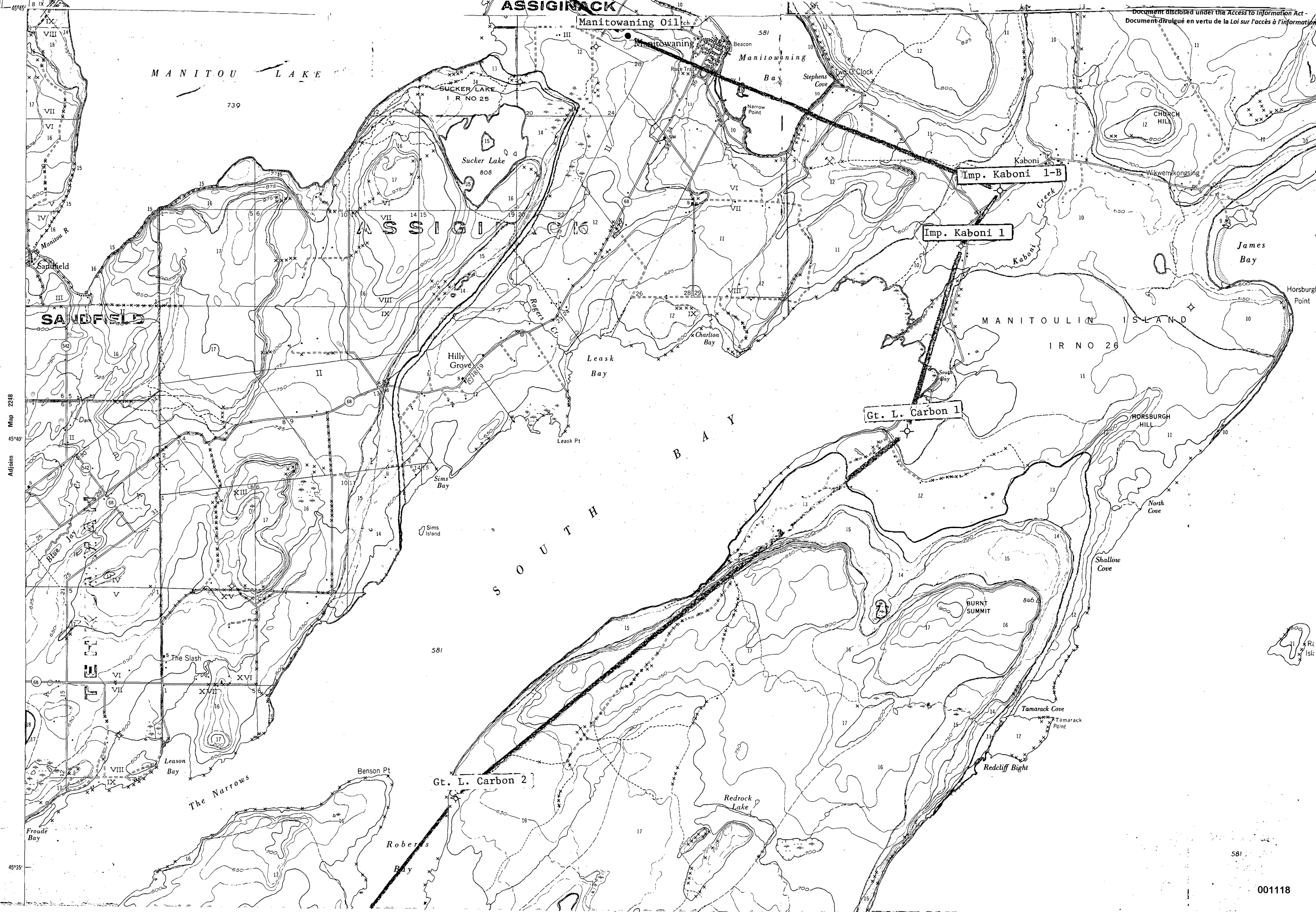
HONOURABLE LEO BERNIER, Minister of Natural Resources
W. Q. MACNEE, Deputy Minister of Natural Resources
G. A. Jewett, Executive Director, Division of Mines
E. G. Pye, Director, Geological Branch

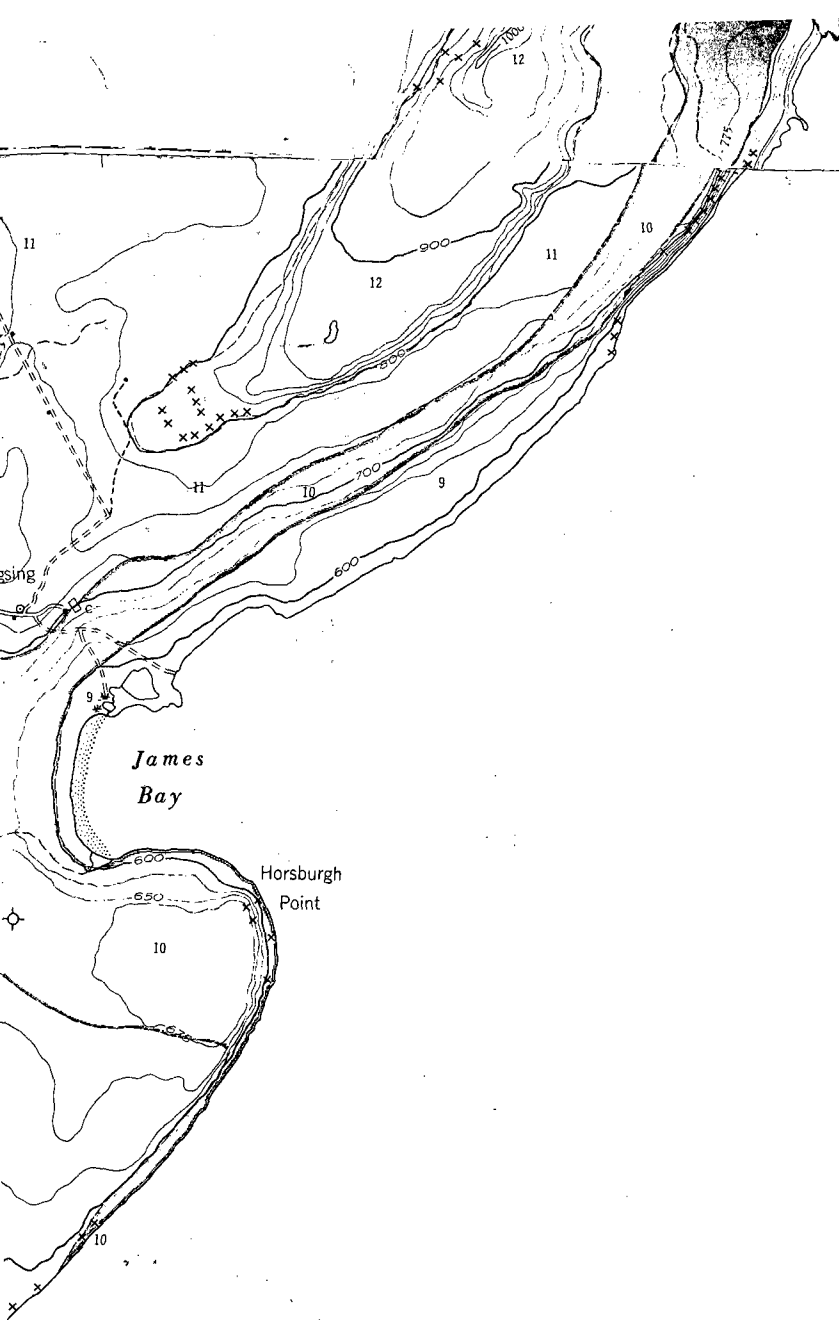
Map 2247

LITTLE CURRENT AREA

MANITOULIN DISTRICT

Scale 1: 63,360 or 1 Inch to 1 Mile



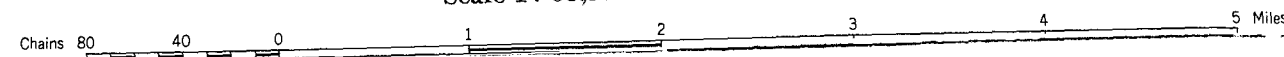


G E O R G I A N



B A Y

Scale 1: 63,360 or 1 Inch to 1 Mile



LEGEND

PALEOZOIC SILURIAN GUELPH FORMATION

18 Tan, finely crystalline dolostone and finely granular dolostone.

AMABEL FORMATION

17 Grey and blue, finely crystalline and sub-lithographic dolostone; bioherms.

FOSSIL HILL FORMATION

16 Medium brown, finely and medio crystalline dolostone; patch and platform reefs.

MINDEMOYA FORMATION

15 Grey and light brown, lithographic to finely crystalline dolostone; thin biostromes.

CABOT HEAD FORMATION^a

14 Dyer Bay Member: bluish, finely crystalline dolostone with shale; Wingfield Member: brownish-grey, finely crystalline dolostone with shale; St. Edmund Member: brown, finely crystalline dolostone with shale.

13 Cabot Head (restricted) Member: red shale, with green shale and green dolostone; latter two increase westwards.

MANITOULIN FORMATION

12 Brown and grey, finely crystalline dolostone; patch and platform reefs.

ORDOVICIAN- GEORGIAN BAY FORMATION

11 Upper Member, Upper Submember: brown and grey, finely crystalline limestone and dolostone.

10 Upper Member, Lower Submember: bluish grey, fine-grained argillaceous limestone.

9 Lower Member: greyish blue shale with thin interbeds of finely crystalline limestone and dolostone.

WHITBY FORMATION[†]

8 Upper Member: grey and brown, soft shale.

7 Lower Member: black fissile shale, minor black limestone; calcareous and petroliferous; fossiliferous.

LINDSAY FORMATION[†]

6 Grey, finely crystalline limestone, minor dolostone, some sublithographic limestone.

VERULAM FORMATION[†]

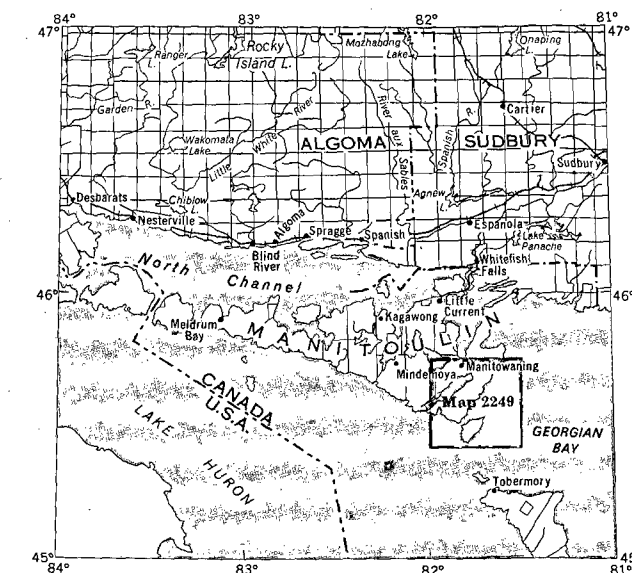
5 Grey and bluish grey, finely to medio crystalline limestone; minor shale, fossiliferous and thin bedded.

BOBCAYGEON FORMATION[†]

4 Grey and brownish grey, finely crystalline and sublithographic limestone; fossiliferous.

GULL RIVER FORMATION[†]

3 Upper Member: grey, lithographic limestone; Lower Member: dark grey, finely granular and finely crystalline argillaceous limestone and dolostone.



Scale, 1 inch to 50 miles
N.T.S. reference 41 H/12, 41 H/5

SYMBOLS

- Bedrock outcrop.
- Geological boundary.
- Oil or gas well.
- Quarry.
- International boundary.
- Township or Indian Reserve boundary.

For other conventional signs refer to 1:50,000 National Topographic Map System.

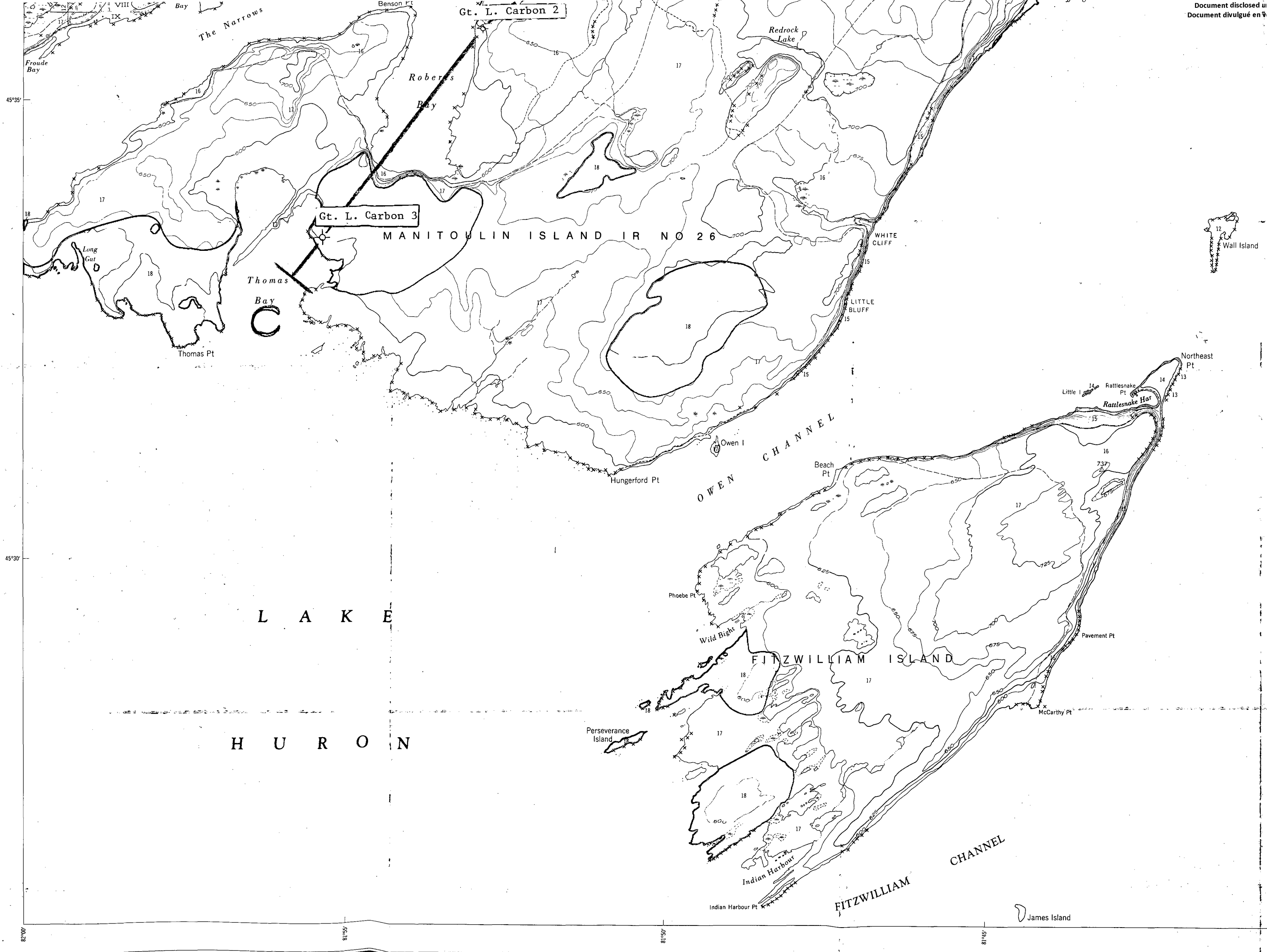
SOURCES OF INFORMATION

Geology by B. A. Liberty, 1954-1957, Geological Survey of Canada; 1966-1971, Department of Geological Sciences, Brock University, Ontario.

Map 20-1957, Manitoulin Island, Geological Survey of Canada, 1957.

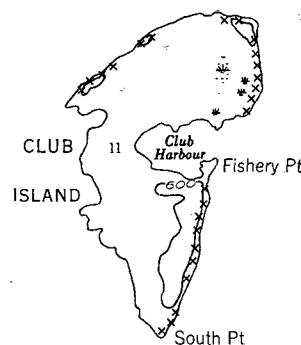
Cartography by M. J. Colman, C. Karpetas, and assistants, Ontario Department of Mines and Northern Affairs, 1972.

Base map derived from 1:50,000 sheets of the National Topographic System with additional information by B. A. Liberty, and from the Ontario Department of Transportation and Communications.



B A Y

581



45°35'

45°30'

- oolstone, some subitnographic limestone.
- VERULAM FORMATION†**
- 5 Grey and bluish grey, finely to medio crystalline limestone; minor shale, fossiliferous and thin bedded.
- BOBCAYGEON FORMATION†**
- 4 Grey and brownish grey, finely crystalline and subitnographic limestone; fossiliferous.
- GULL RIVER FORMATION†**
- 3 Upper Member: grey, lithographic limestone; Lower Member: dark grey, finely granular and finely crystalline argillaceous limestone and dolostone.
- BASAL BEDS†**
- 2 Red and green mottled red shale; may be very conglomeratic.

UNCONFORMITY

**PRECAMBRIAN
PROTEROZOIC**

- 1b Killarney red and grey granite.†
- 1a Lorrain grey and white quartzite and fine-grained sandstone.†

†This refers to classification in Liberty and Bolton, Geological Survey of Canada, Memoir 360.

†These formations are mapped on some of the adjoining sheets (see Index) of the Manitoulin Island Area.

Canada; 1966-1971, Department of Geological Sciences, Brock University, Ontario.

Document disclosed under the Access to Information Act -
Document divulgué en vertu de la Loi sur l'accès à l'information
Map 20-1957, Manitoulin Island, Geological Survey of Canada, 1957.

Cartography by M. J. Colman, C. Karpetas, and assistants, Ontario Department of Mines and Northern Affairs, 1972.

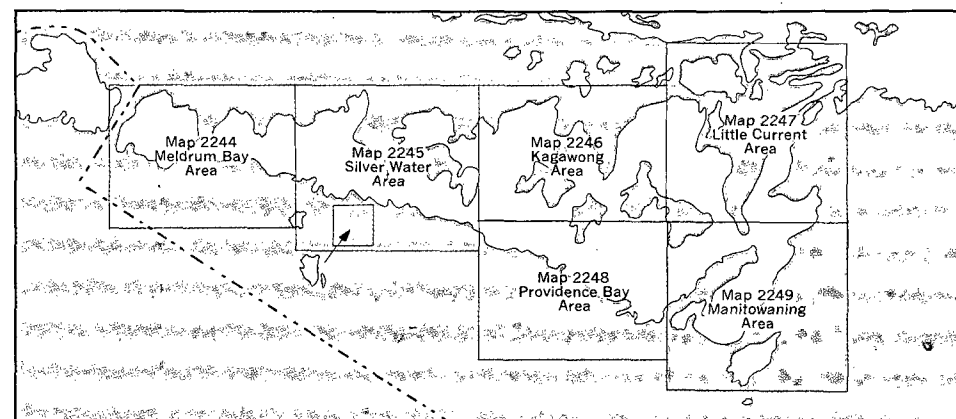
Base map derived from 1:50,000 sheets of the National Topographic System with additional information by B. A. Liberty, and from the Ontario Department of Transportation and Communications.

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For additional information refer to: Geological Guidebook No. 4, "Geology and Scenery; North Shore of Lake Huron", Ontario Department of Mines and Northern Affairs, 1972.

Magnetic declination in the area was 7°W., 1970.

Maps published in co-operation with the Geological Survey of Canada under whose auspices the geology was mapped by B. A. Liberty, 1954-1957.



Index to the adjoining maps of the Manitoulin Island Area



**ONTARIO
DIVISION OF MINES**

HONOURABLE LEO BERNIER, Minister of Natural Resources

W. Q. MACNEE, Deputy Minister of Natural Resources

G. A. Jewett, Executive Director, Division of Mines

E. G. Pye, Director, Geological Branch

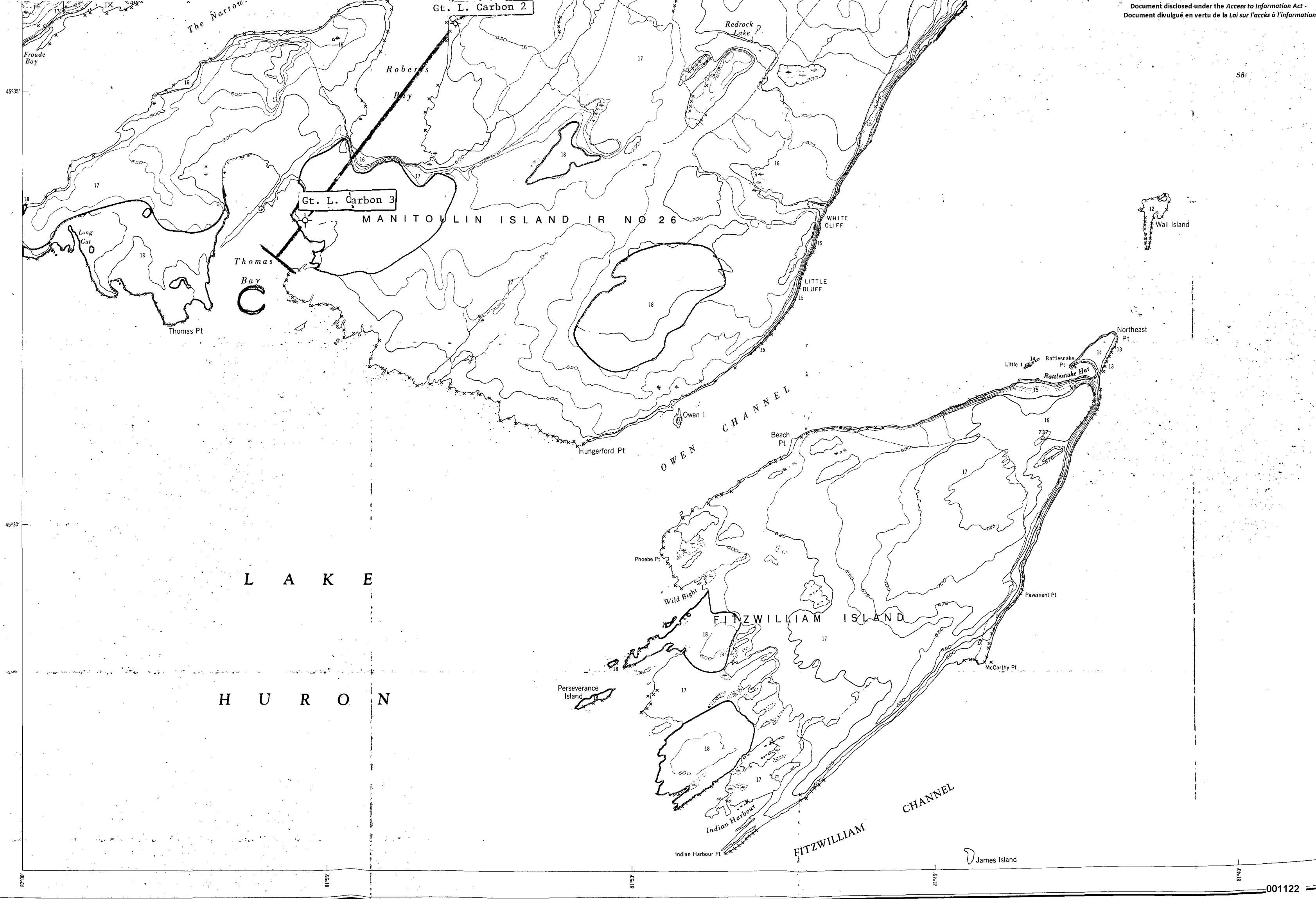
Map 2249

MANITOWANING AREA

MANITOULIN DISTRICT

Scale 1: 63,360 or 1 Inch to 1 Mile

001121



BOBCAYGEON FORMATION†

4

4 Grey and brownish grey, finely crystalline and subliothographic limestone; fossiliferous.

GULL RIVER FORMATION†

3

3 Upper Member: grey, lithographic limestone; Lower Member: dark grey, finely granular and finely crystalline argillaceous limestone and dolostone.

BASAL BEDS†

2

2 Red and green mottled red shale; may be very conglomeratic.

UNCONFORMITY

PRECAMBRIAN

PROTEROZOIC

1b

1b Killarney red and grey granite.†

1a

1a Lorrain grey and white quartzite and fine-grained sandstone.†

^aThis refers to classification in Liberty and Bolton, Geological Survey of Canada, Memoir 360.

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Cartography by M. J. Coleman. Catalogued under the Access to Information Act - Ontario Department of Mines and Northern Affairs, 1979. Document catalogue en vertu de la Loi sur l'accès à l'information

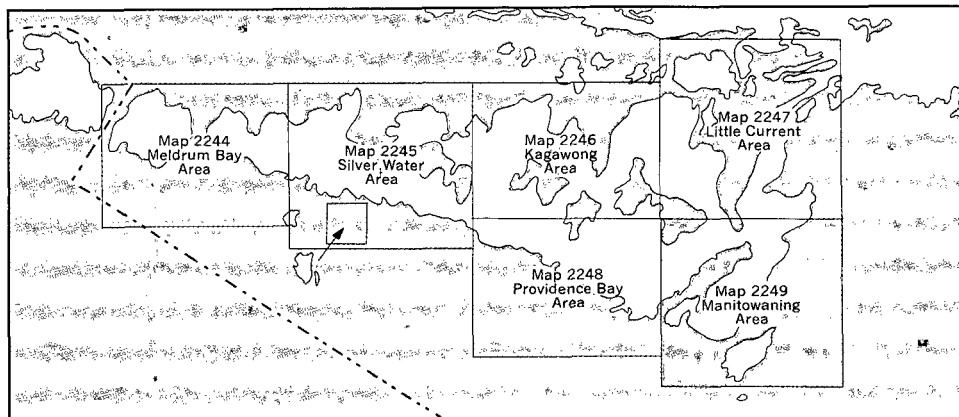
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ONTARIO
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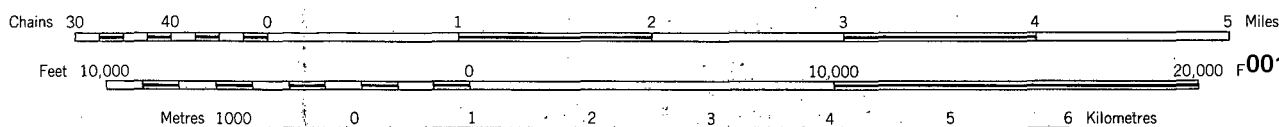
E. G. Pye, Director, Geological Branch

Map 2249

MANITOWANING AREA

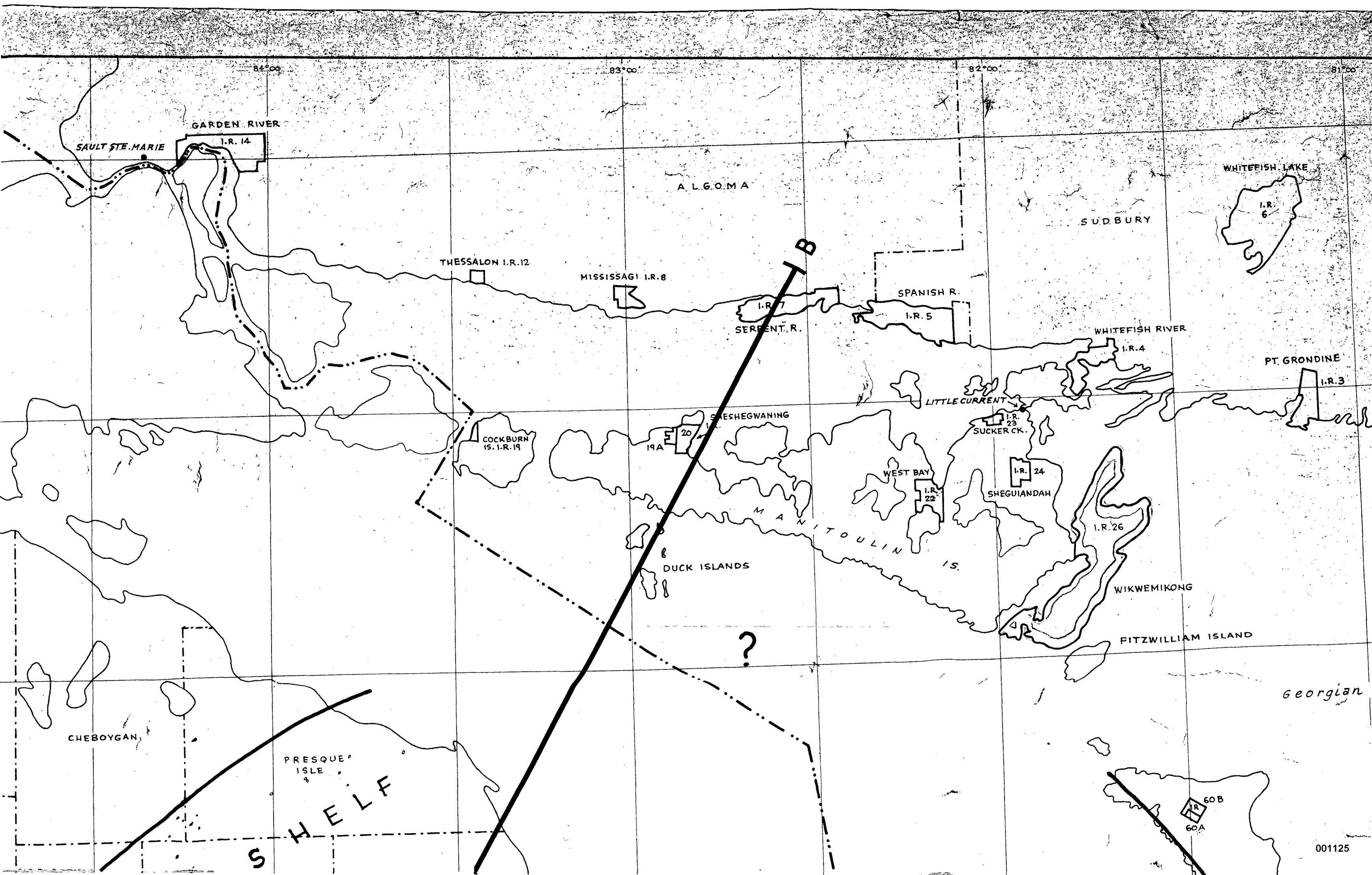
MANITOULIN DISTRICT

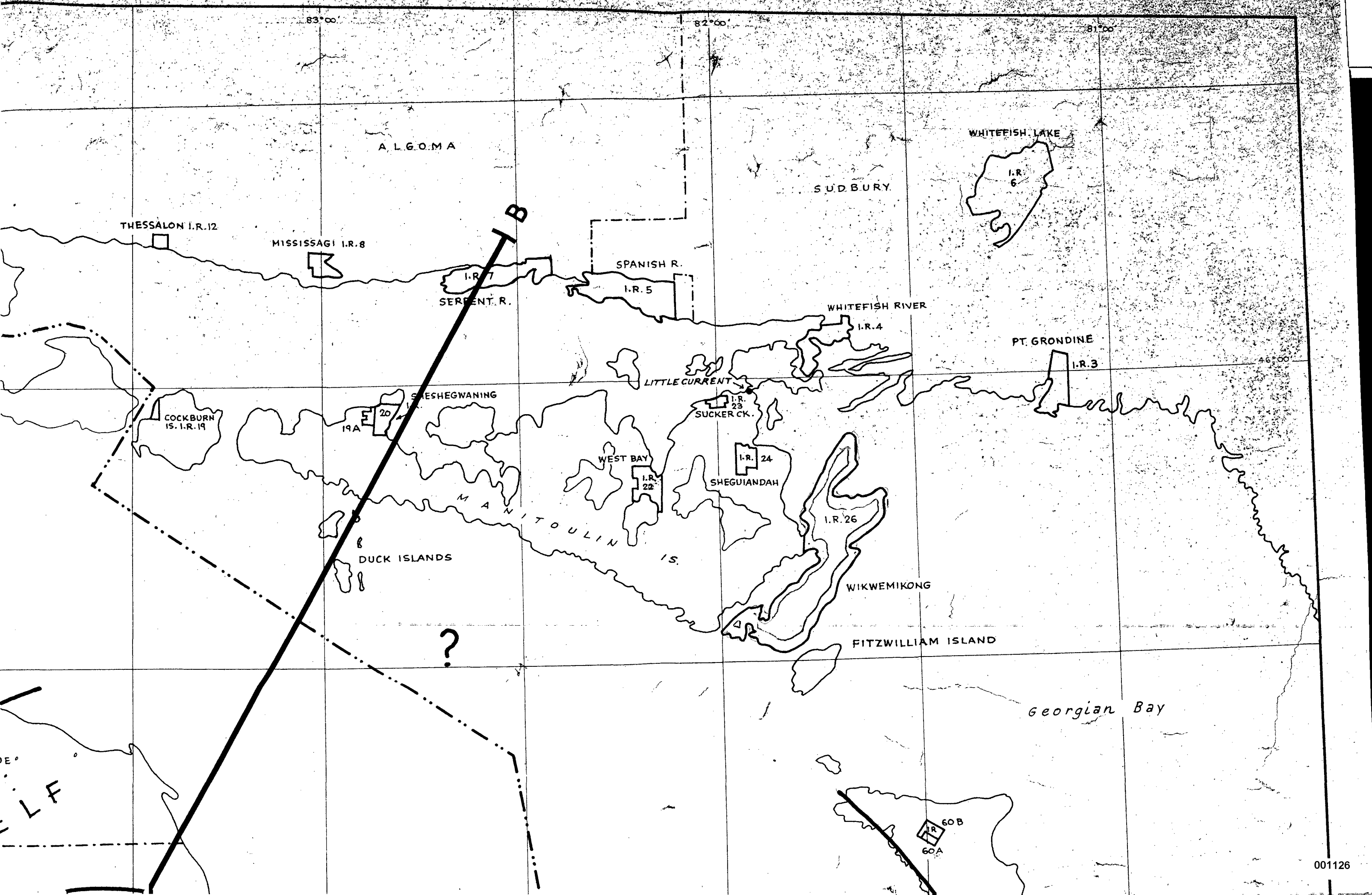
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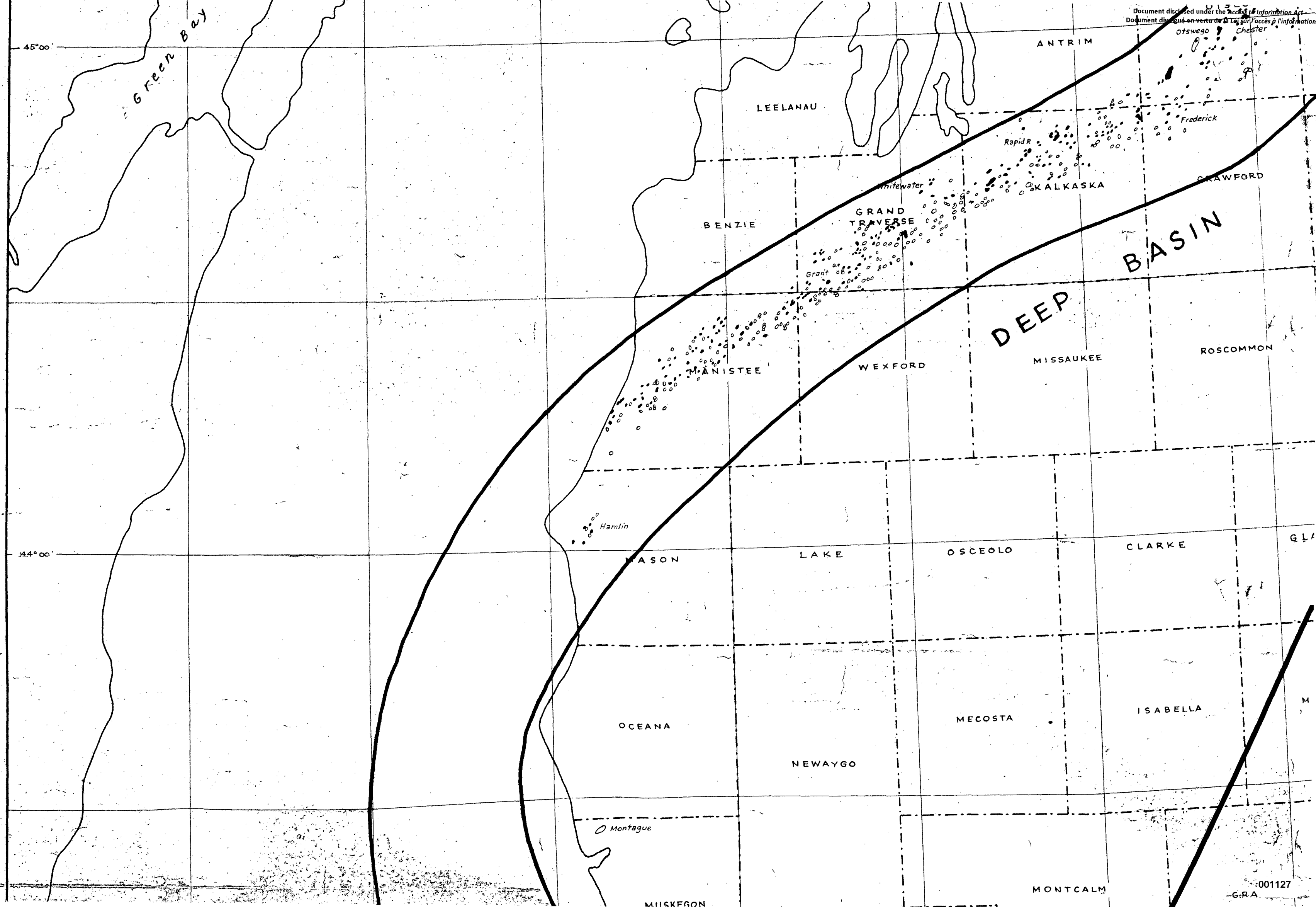


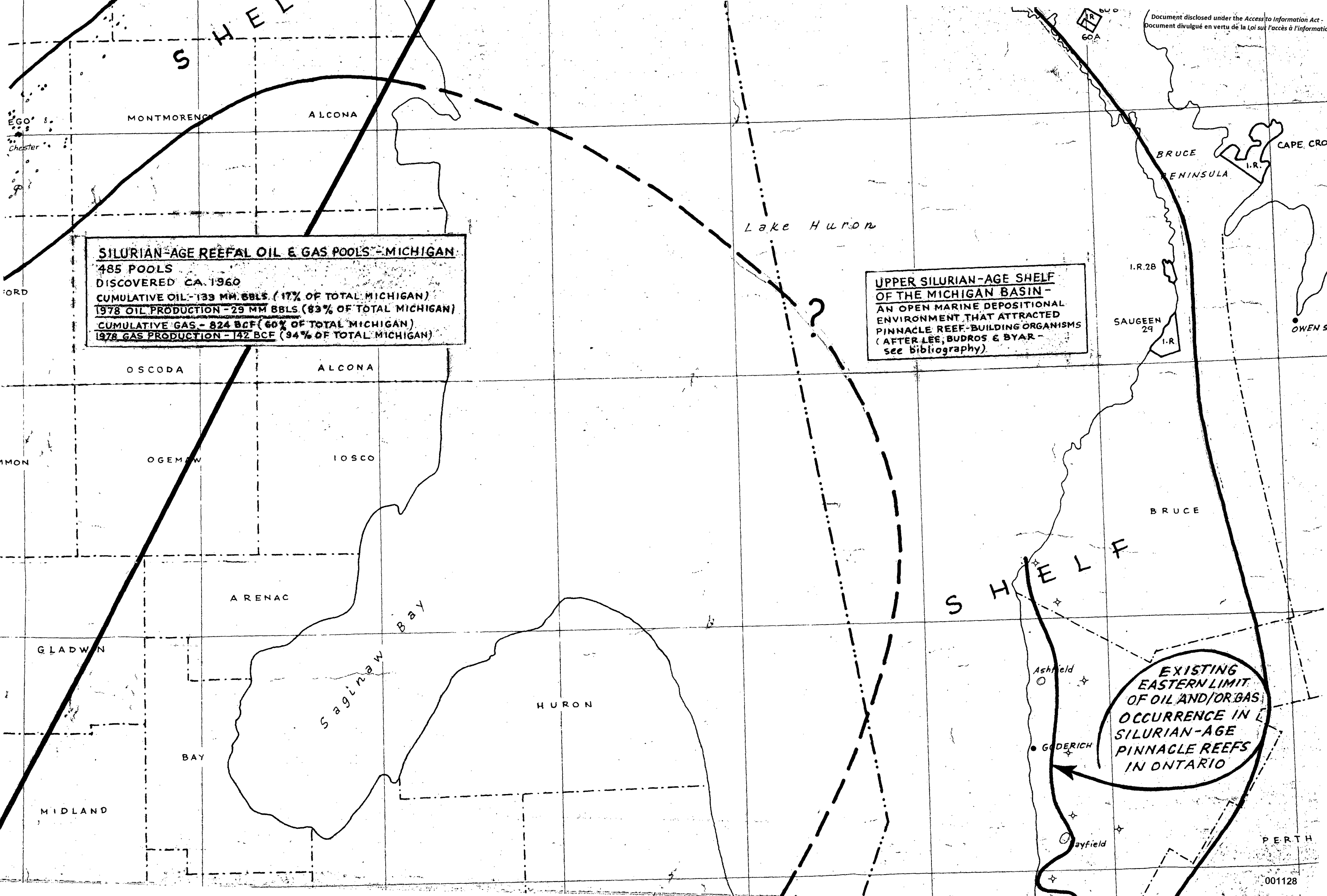
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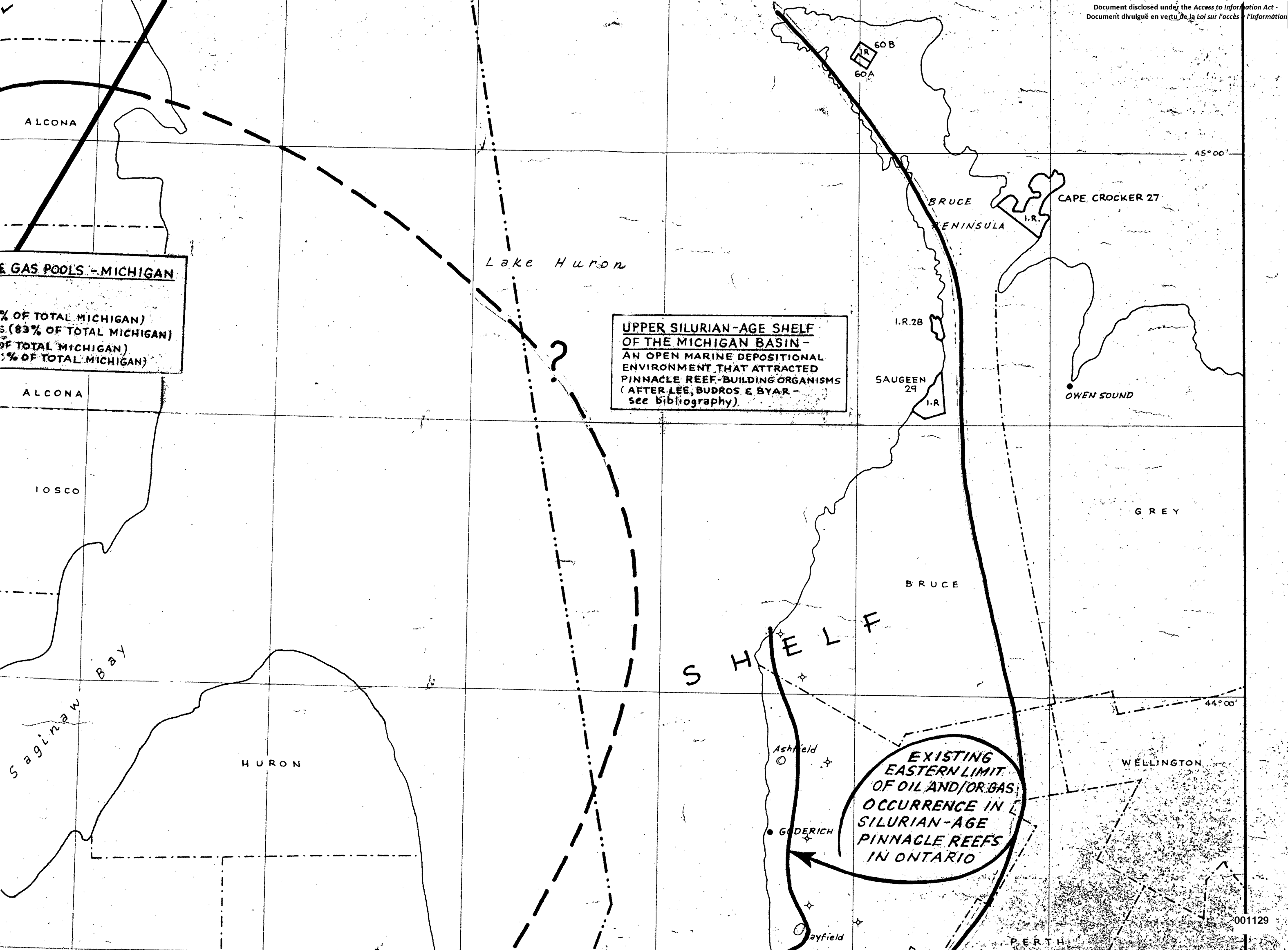








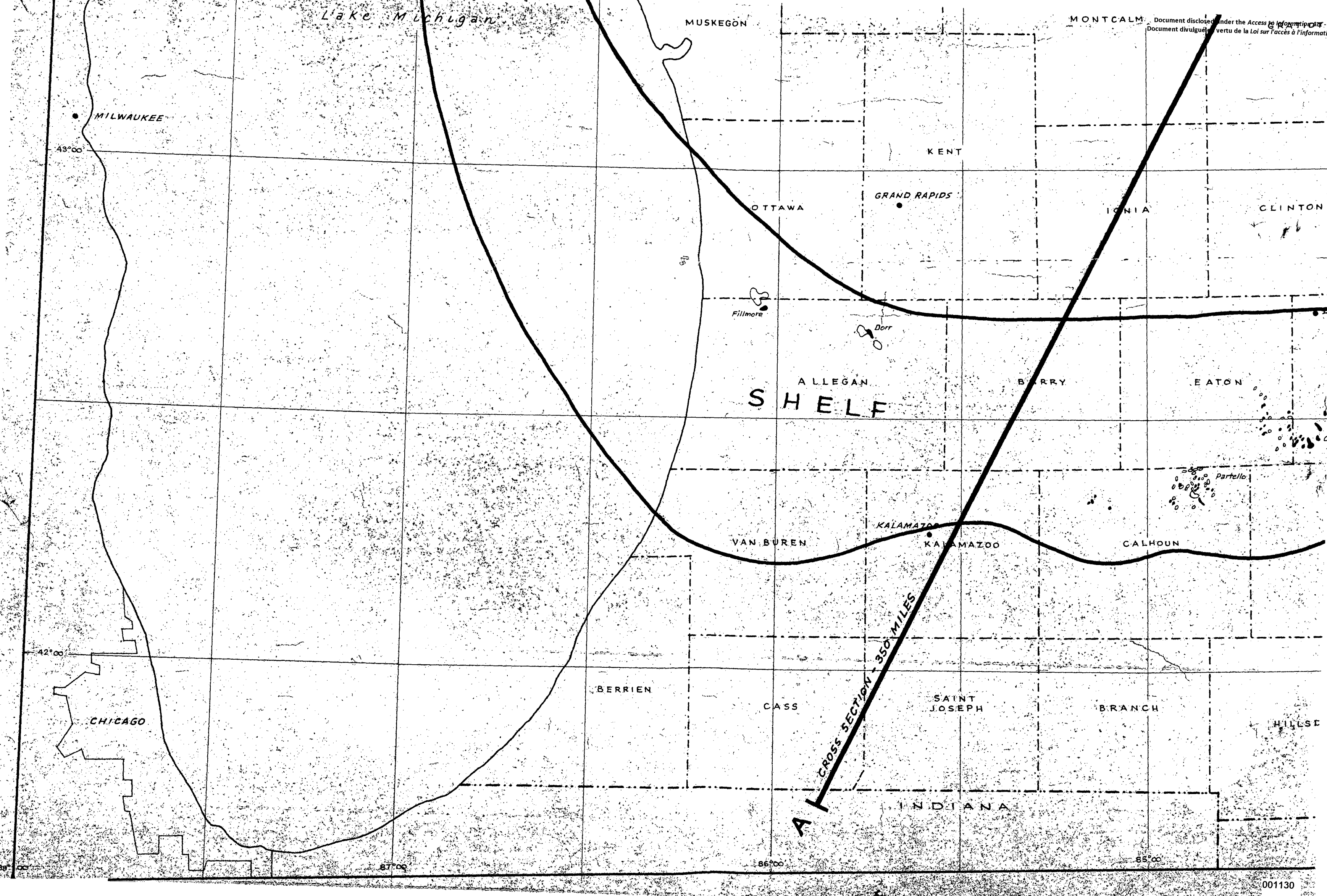


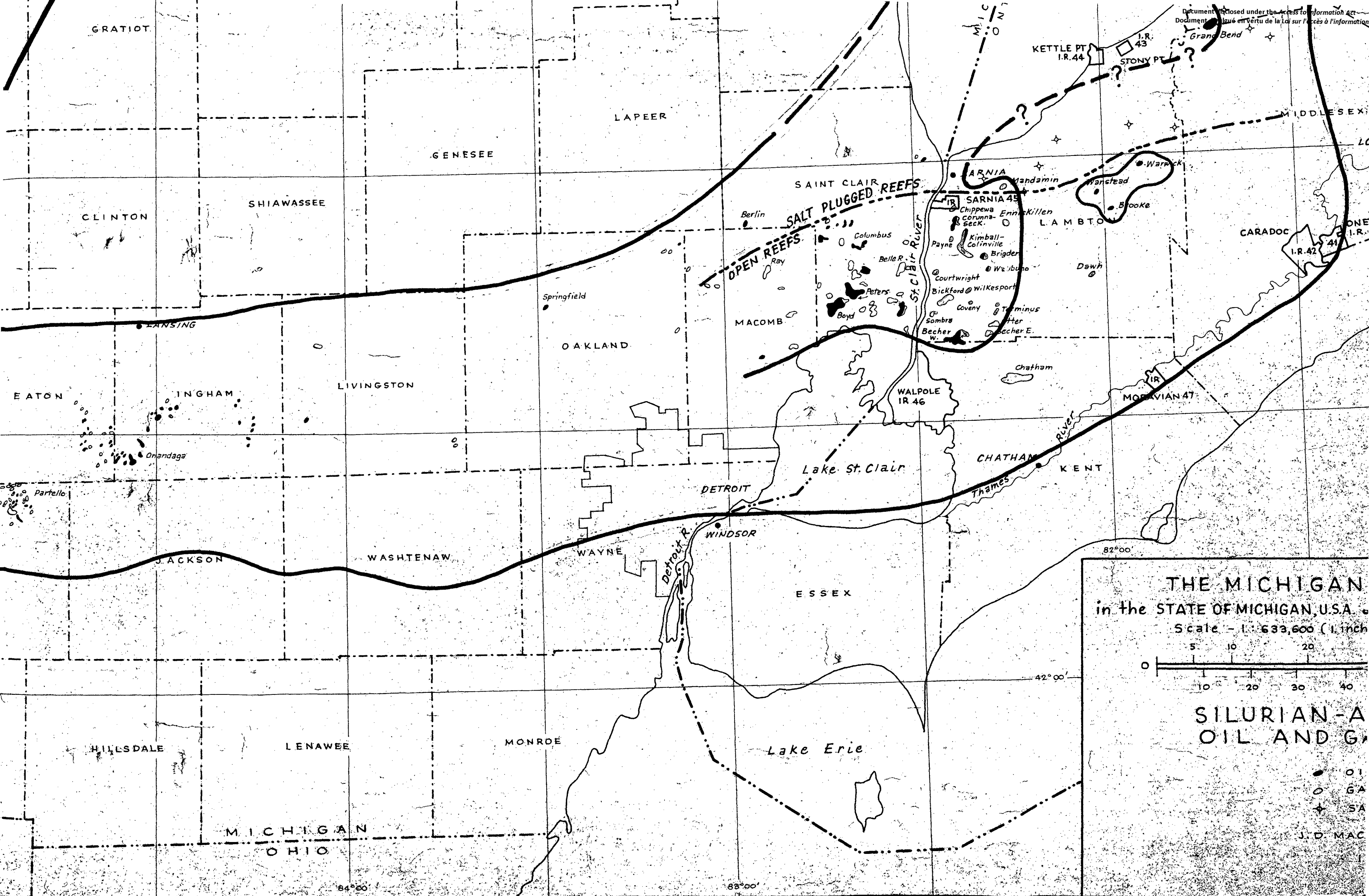


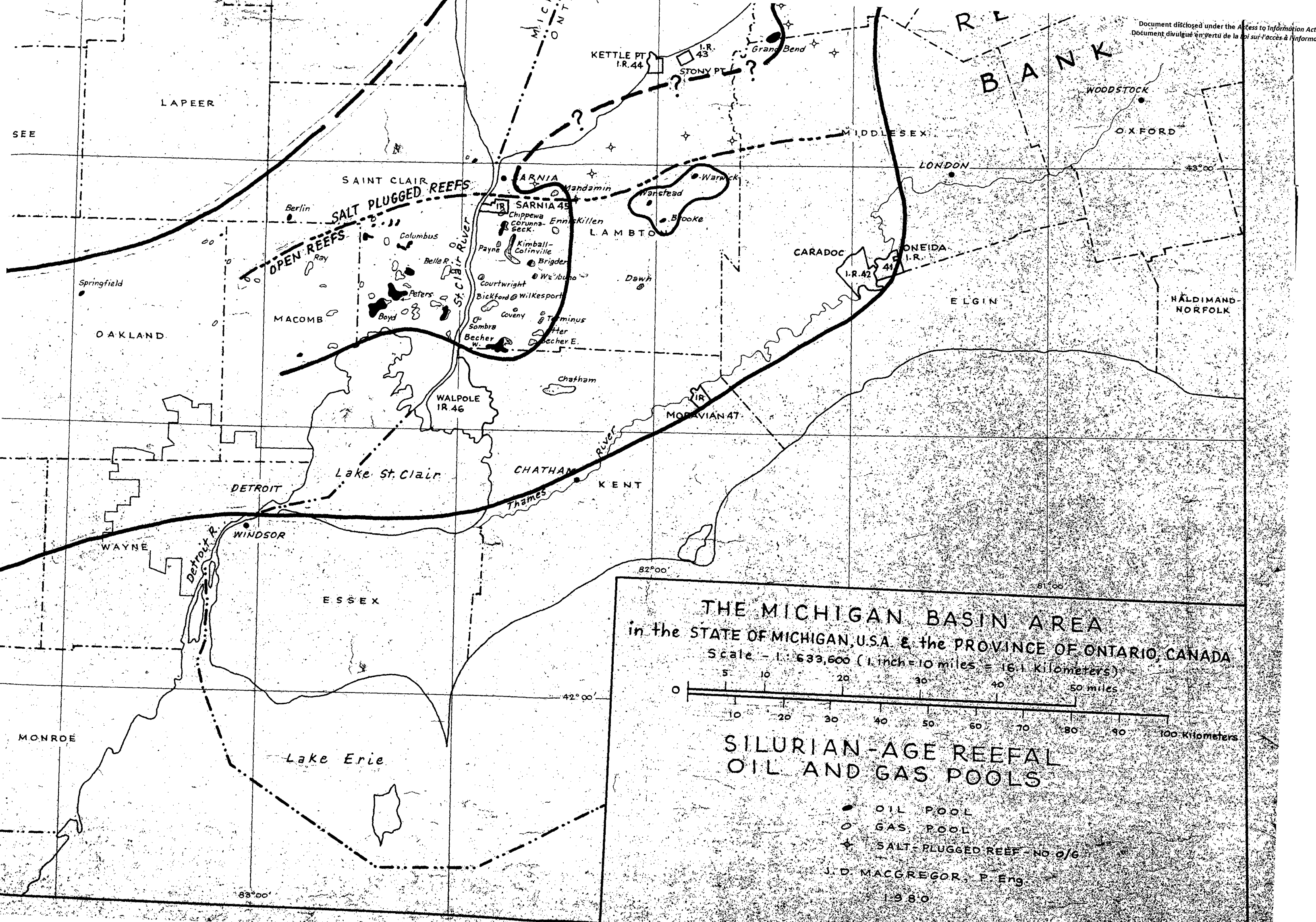
GAS POOLS - MICHIGAN
% OF TOTAL MICHIGAN)
S. (83% OF TOTAL MICHIGAN)
% OF TOTAL MICHIGAN)
% OF TOTAL MICHIGAN)

**UPPER SILURIAN-AGE SHELF
OF THE MICHIGAN BASIN -
AN OPEN MARINE DEPOSITIONAL
ENVIRONMENT THAT ATTRACTED
PINNACLE REEF-BUILDING ORGANISMS
(AFTER LEE, BUDROS & BYAR -
see bibliography).**

**EXISTING
EASTERN LIMIT
OF OIL AND/OR GAS
OCCURRENCE IN
SILURIAN-AGE
PINNACLE REEFS
IN ONTARIO**



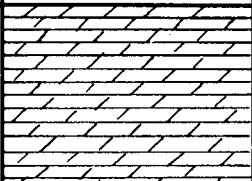
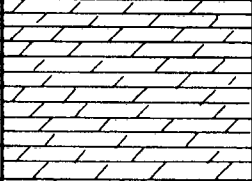
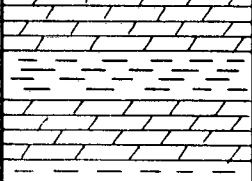
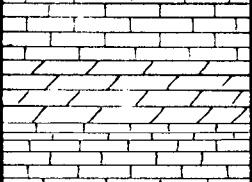



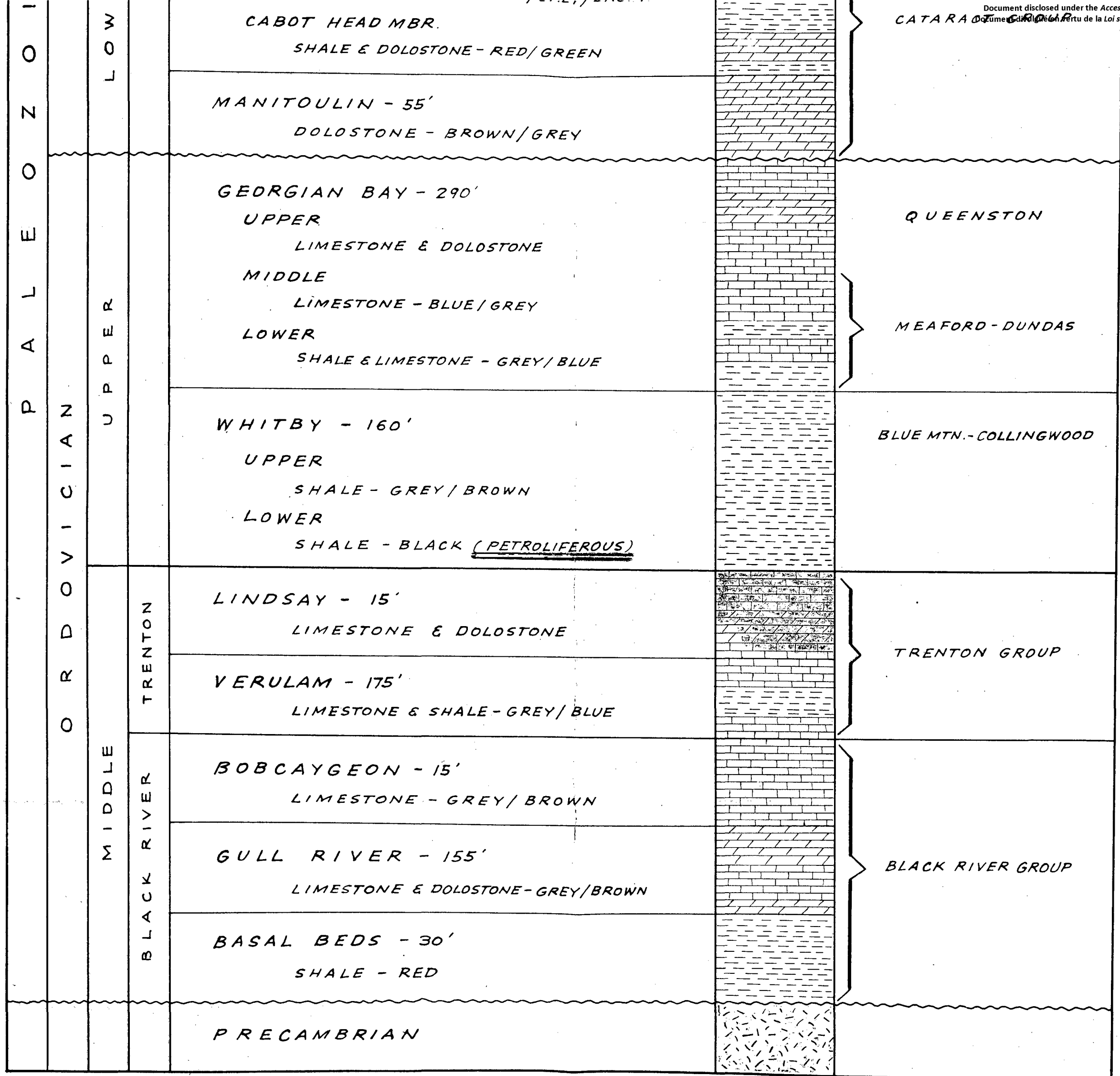


STRATIGRAPHY OF MANITOULIN ISLAND

(LITHOGRAPHIC UNITS)

Source : Ontario Division of Mines - Geological Maps of Manitoulin Island No's 2247 and 2249

ERA	SYSTEM	SERIES	GROUP	FORMATION - MEAN THICKNESS (FEET) LITHOLOGY		AGE EQUIVALENT IN S.W. ONTARIO
A L E O Z O I C	S I L U R I A N	M I D D L E		GUELPH - 10' DOLOSTONE - GREY/YELLOW		GUELPH-LOCKPORT GROUP
				AMABEL - 175' DOLOSTONE - GREY/BLUE		
				FOSSIL HILL - 120' DOLOSTONE - BROWN		CLINTON GROUP
				MINDEMOYA - 75' DOLOSTONE - GREY/BROWN		
		L O W E R		CABOT HEAD - 125' DYER BAY MBR. DOLOSTONE & SHALE - BLUE/GREY/BROWN CABOT HEAD MBR. SHALE & DOLOSTONE - RED/GREEN		CATARACT GROUP
				MANITOULIN - 55' DOLOSTONE - BROWN/GREY		
		U P P E R		GEORGIAN BAY - 290' UPPER LIMESTONE & DOLOSTONE		QUEENSTON
				MIDDLE LIMESTONE - BLUE/GREY		
				LOWER SHALE & LIMESTONE - GREY/BLUE		
						MEAFORD-DUNDAS



QUEENSTON

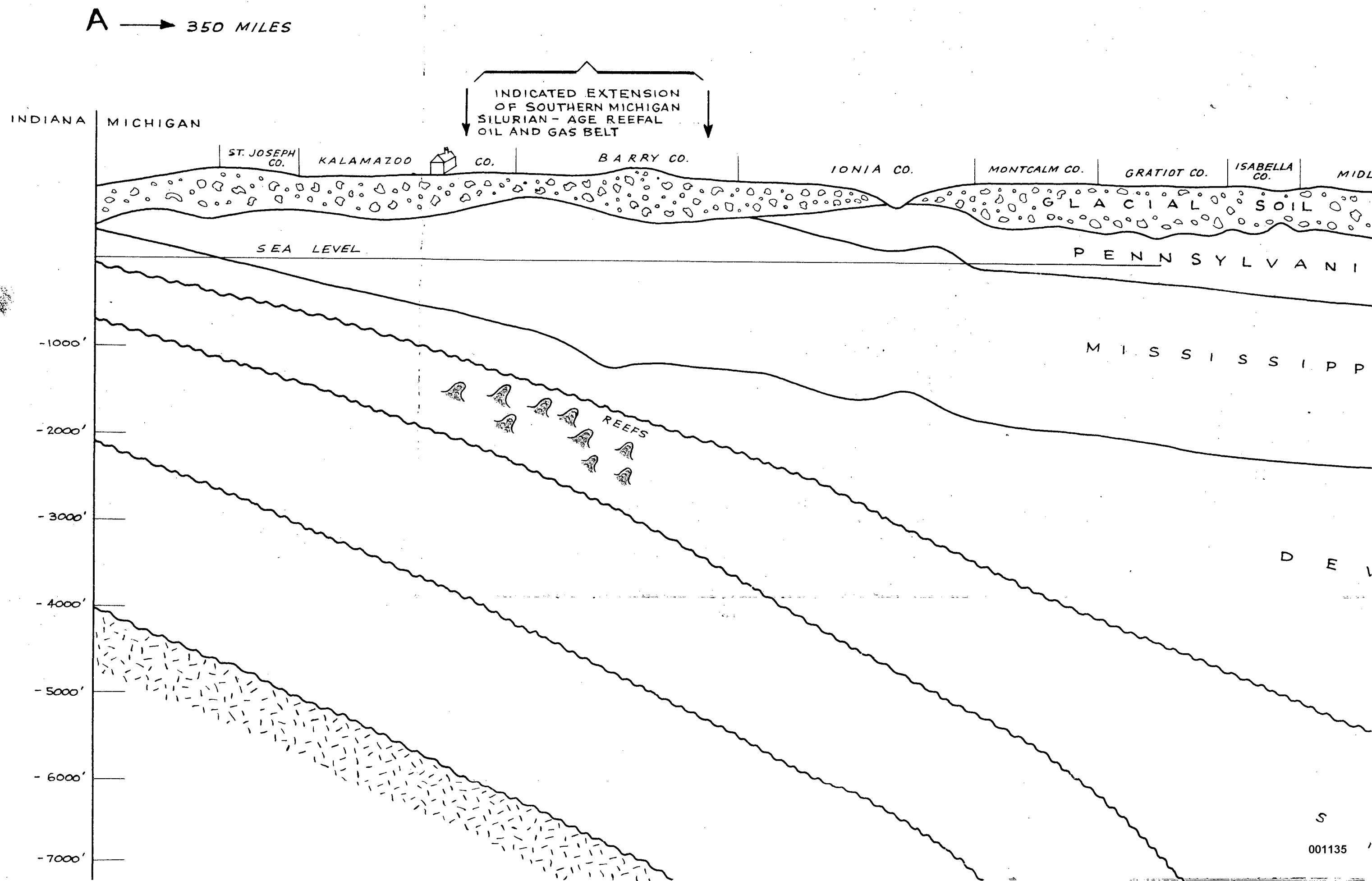
MEAFORD - DUNDAS

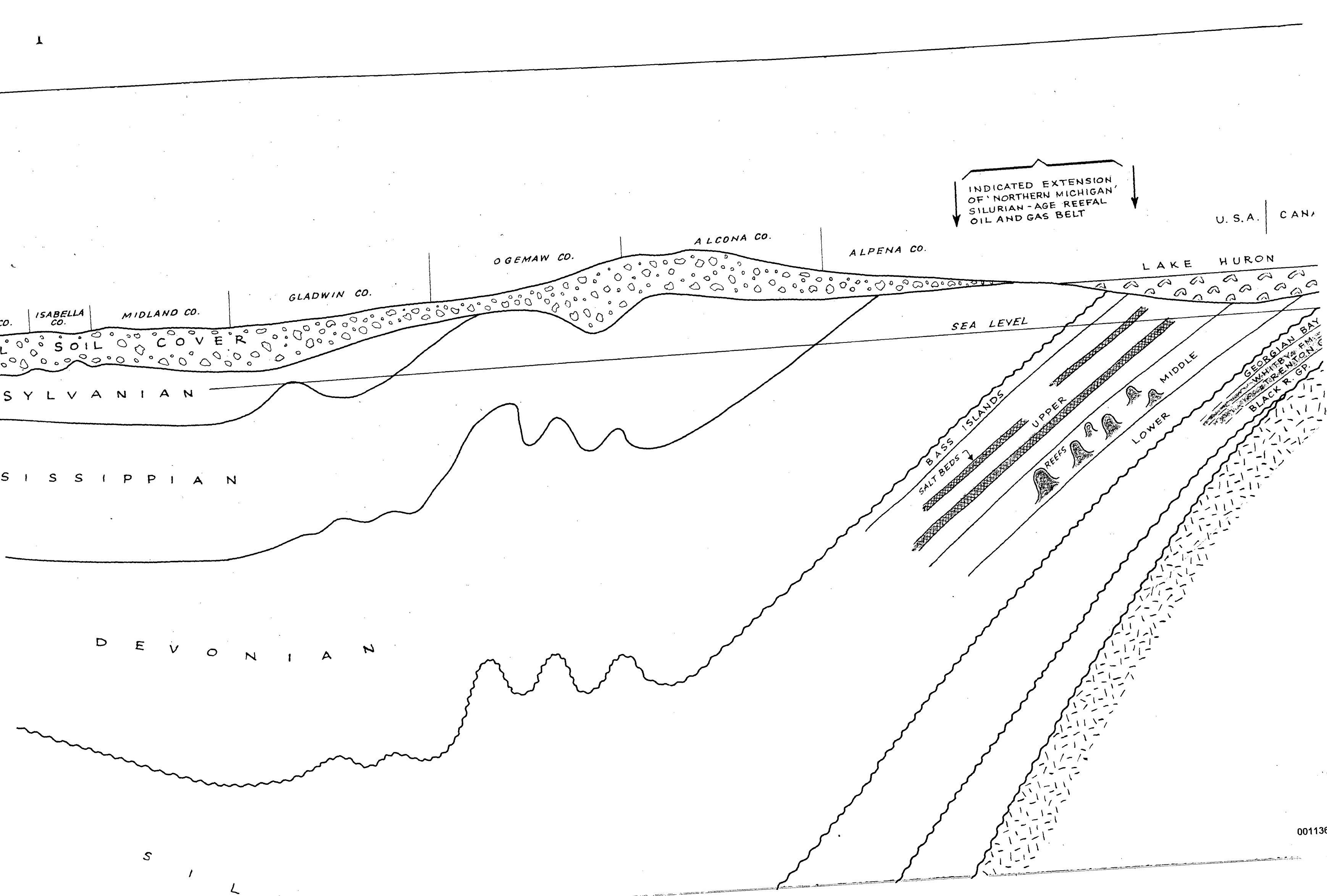
BLUE MTN. - COLLINGWOOD

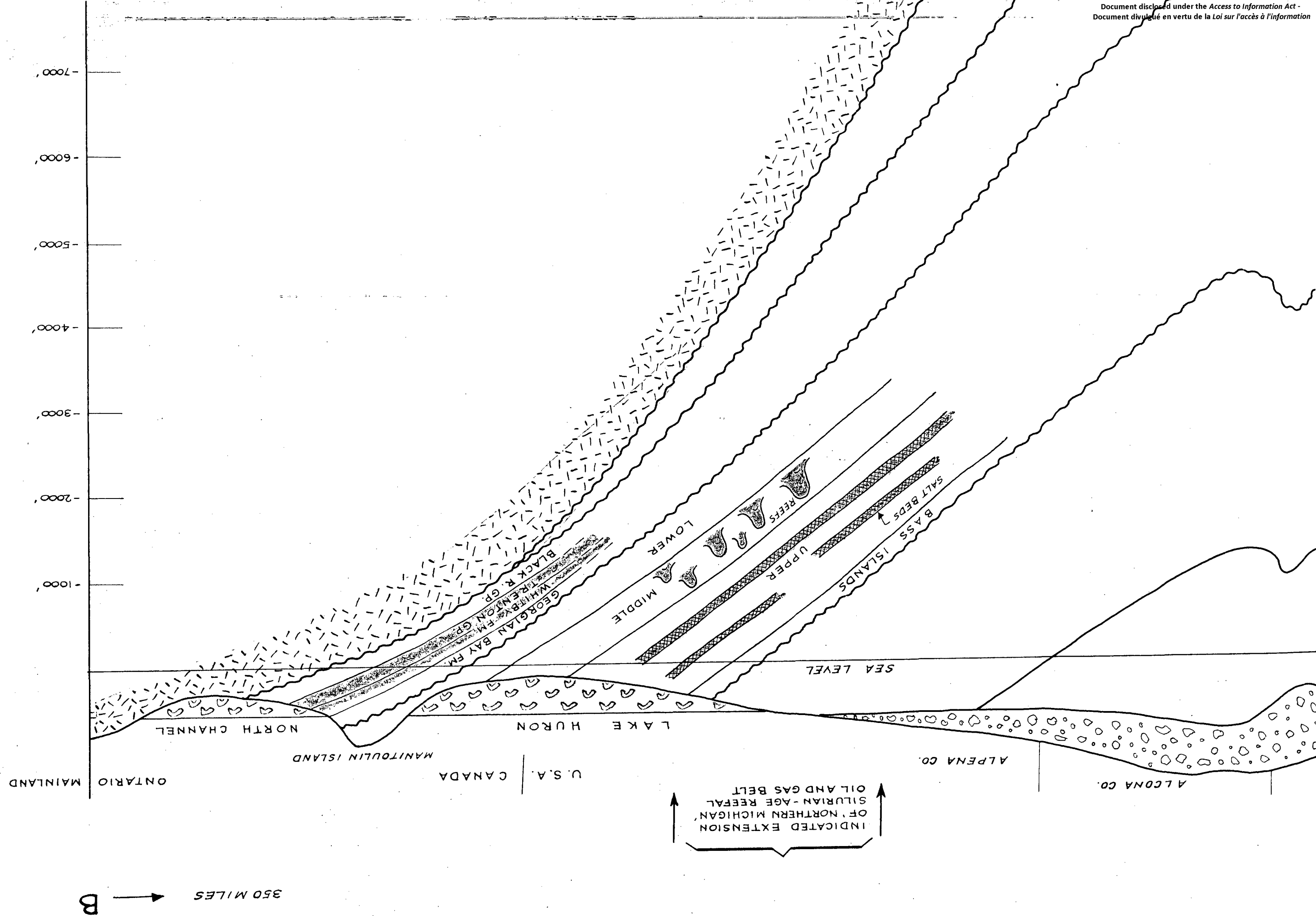
TRENTON GROUP

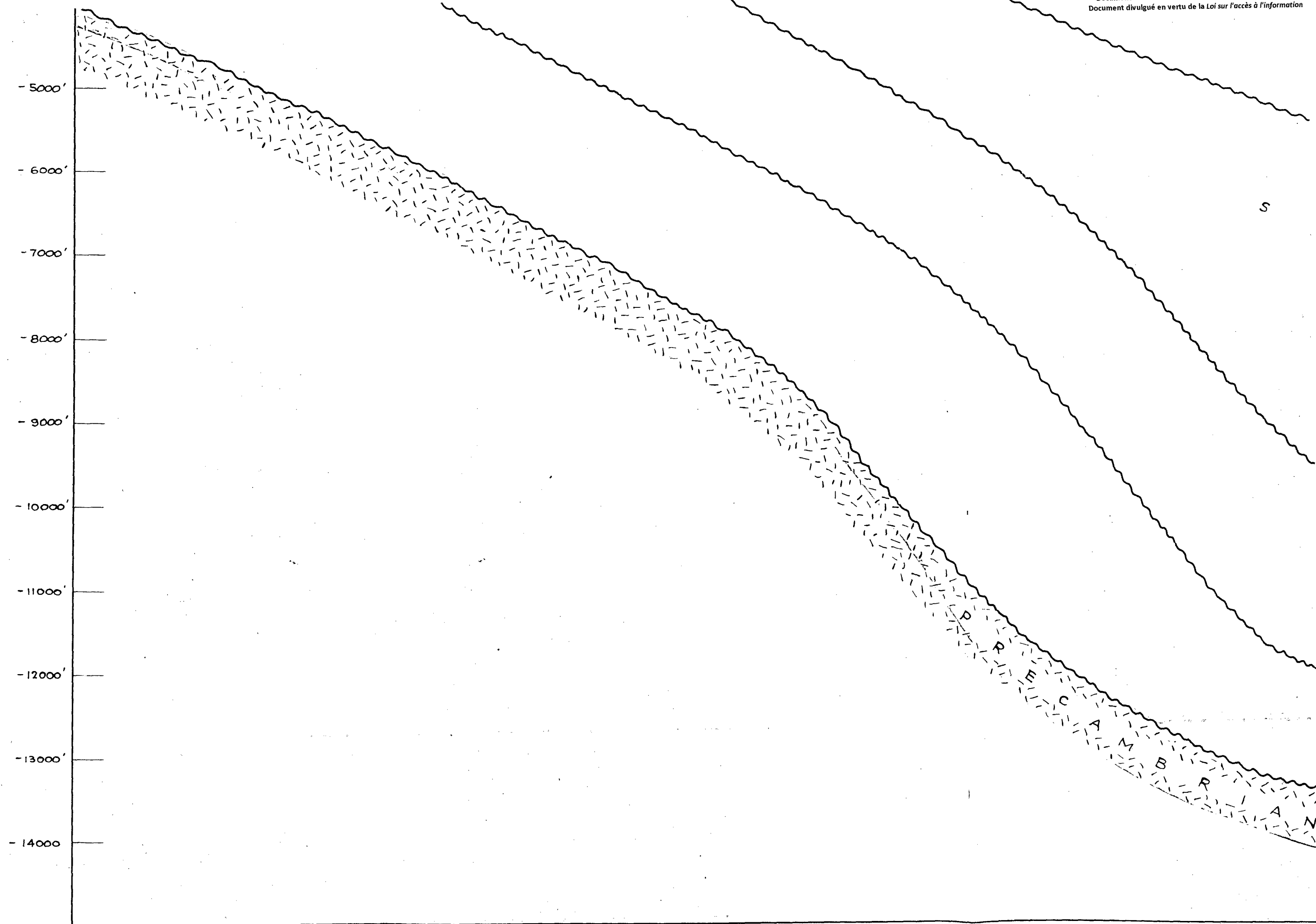
BLACK RIVER GROUP

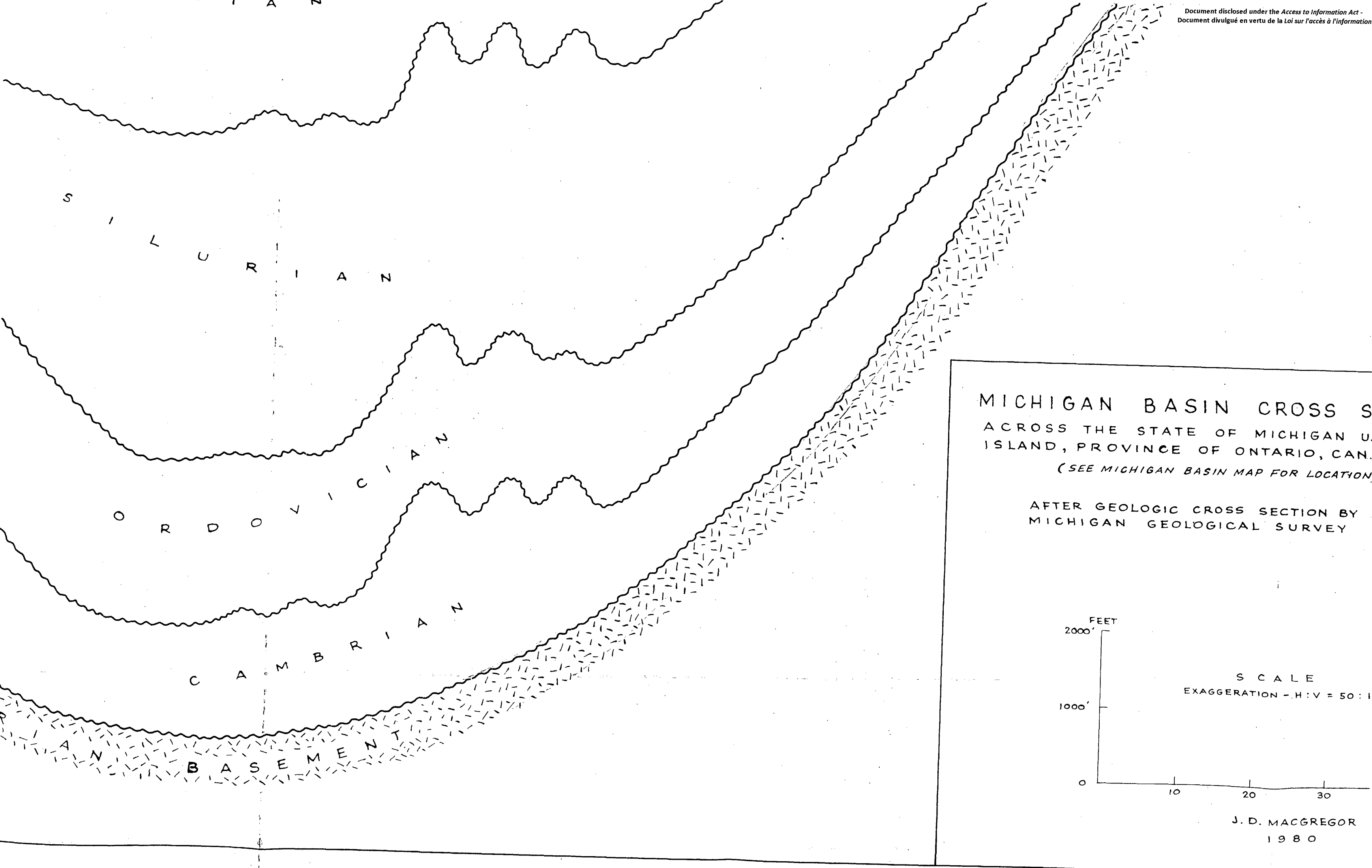
Figure 2











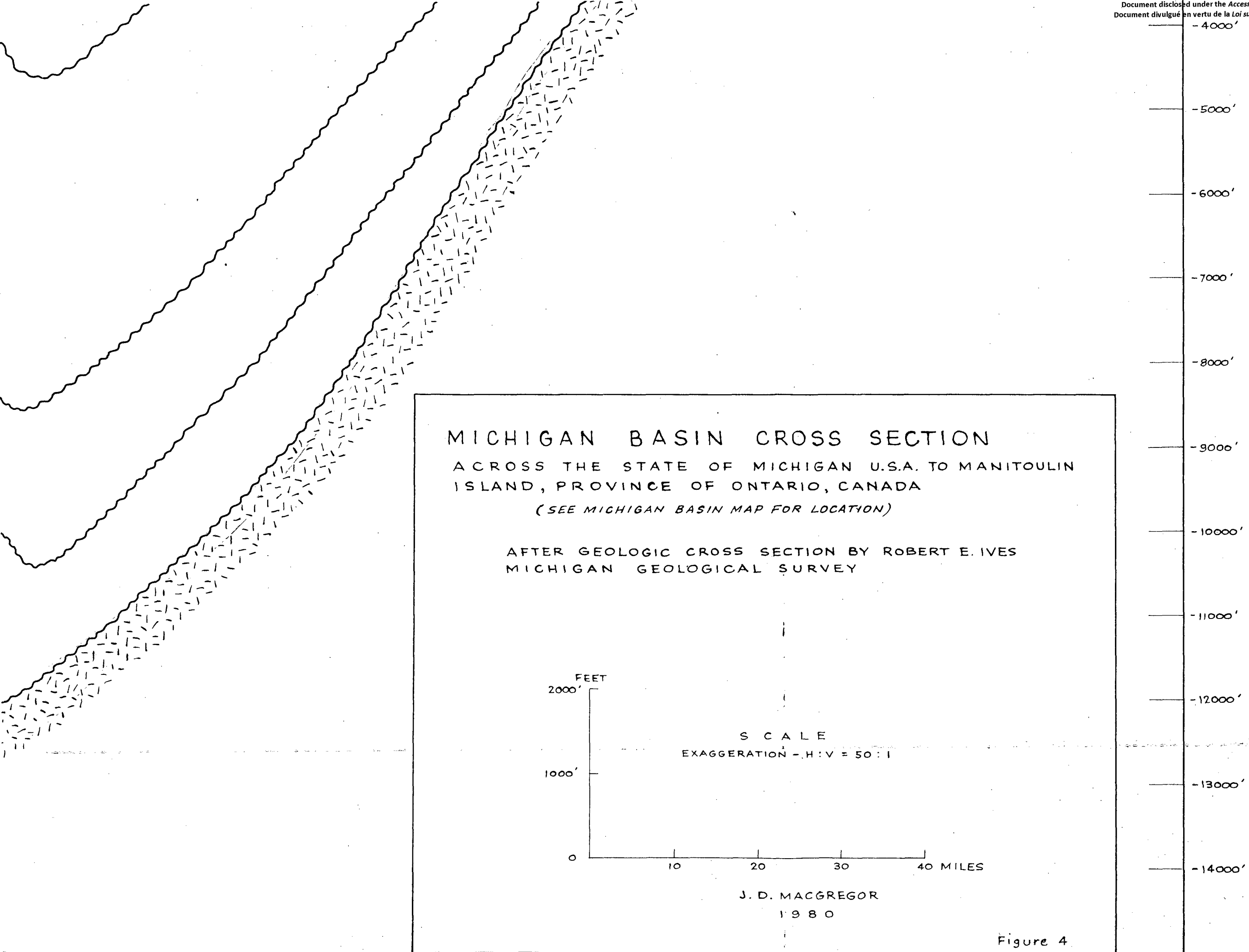


Figure 4