ONTARIO
DEPARTMENT OF MINES

LAKE TIMISKAMING RIFT VALLEY

By

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MISCELLANEOUS PAPER 39

1970

First Printing 1970
Reprinted 1972

Publications of the Ontario Department of Mines and Northern Affairs
and price list
are obtainable through the
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Parliament Buildings, Queen's Park, Toronto, Ontario
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FIGURES

LAKE TIMISKAMING RIFT VALLEY

by

H.L. Lovell[1] and T.W. Caine[2]

A distinct bedrock-controlled topographic feature extends from near Témiscamingue, Quebec, northwest to the Kapuskasing Gravity High in the vicinity of Smooth Rock Falls, with its breadth between the Net Lake Fault near Timagami and the Quinze Dam Fault east of Ville Marie, Quebec. For this feature the writers propose the name "Lake Timiskaming Rift Valley".

The postulated existence of the "Lake Timiskaming Rift Valley" (Figure 1), a typical example of a rift valley as described by Freund (1966), is based on a seven-year study of information available from geological maps and reports for Ontario and Quebec; mineral exploration data; airphoto mosaics of the National Air Photo Library and Operation Overthrust; aeromagnetic maps (1 inch equals 1 mile) released by the Geological Survey of Canada; gravity maps (1 inch equals 4 miles, and 1 inch equals 20 miles) prepared by the Dominion Observatory, Ottawa; surficial geology maps of the Ontario Department of Lands and Forests and the Geological Survey of Canada; and literature from various sources. The study is prompted by the recognition of remarkable similarities between the Lake Timiskaming area and the African rift system: the long parallel faults with vertical offsets; the valley of the Paleozoic outlier of

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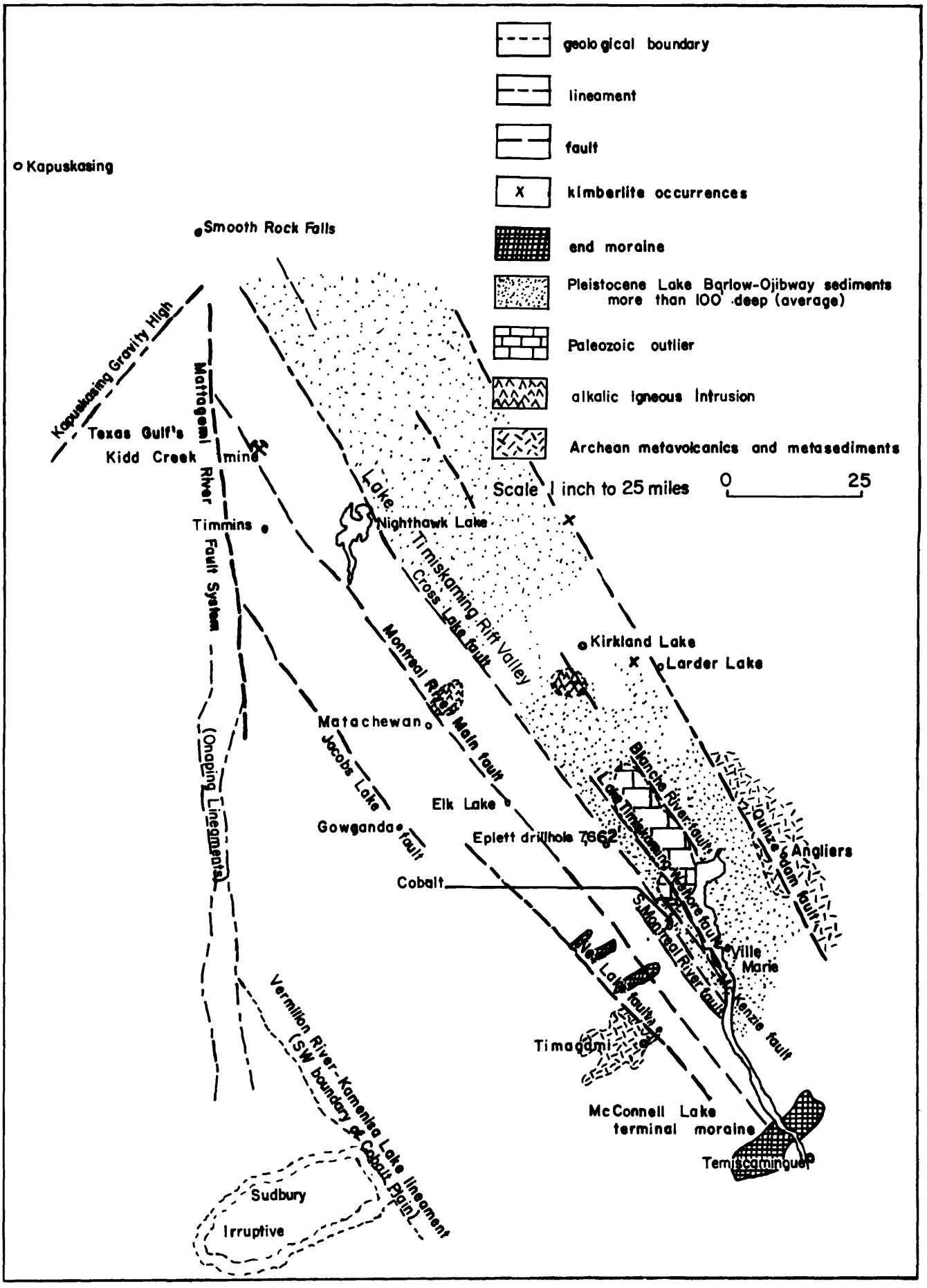

Figure 1: The Lake Timiskaming Rift Valley

Lake Timiskaming and the Little Clay Belt; the swarms of Nipissing Diabase intrusions probably representing mobilization of material of the earth's mantle after crustal thinning; the mention of kimberlite in Michaud Township in Ontario Dept. Mines, Vol. LVII, pt. 4, p. 13; the discovery of kimberlite east of Kirkland Lake in Upper Canada gold mine and of concentrations of pyrope garnets in several localities from Ville Marie, Quebec to Kirkland Lake, Ontario (Lee 1965 and 1968); and the possibility that the intense earthquake in 1935 near Témiscamingue, Quebec (Smith 1966) occurred along one of the Lake Timiskaming system of faults and consequently that the Lake Timiskaming faults might be deep enough to have tapped diabase and kimberlite from the mantle.

Kumarapeli and Saull (1966, p. 648) show the Ottawa-Bonnechere branch of the St. Lawrence Valley rift system bifurcating near Mattawa, with one branch extending through Lake Nipissing and the other branch extending through Lake Timiskaming. Doig (1970) correlates the rift system with an alkaline rock province linking Europe and North America. Extending northwest from Lake Timiskaming towards the well-known Kirkland Lake area of alkaline rocks (Cooke and Moorhouse 1968) is a Paleozoic outlier (the only known Paleozoic rocks within 140 miles), which was described by Hume (1925). The Paleozoic outlier occupies a long narrow trough, the surface expression of which has parallel northwest-trending sides. The southwestern limit of the outlier is the McKenzie Fault (Thomson 1964), the rocks on the northeast side of which dropped down. The main control of the southwestern edge of the outlier, however, is the fault escarpment along the west shore of the northern part of Lake Timiskaming. This fault, 40 miles long, strikes parallel to the McKenzie Fault and dips 65°NE (Agaunico Mine files of the ODM, Kirkland Lake). The Paleozoic

formations on its northeast side are displaced 770 to 1,000 feet down into the Wabi River valley (Hume 1925, p. 48, and Agaunico Mine files of the ODM, Kirkland Lake). The northeastern boundary of the Paleozoic outlier is the Blanche River valley, which contains a vertically offset fault that strikes parallel to the Lake Timiskaming West Shore Fault (Thomson 1965, p. 43). The Paleozoic outlier, therefore, occupies a valley controlled by northwest-trending down-dropped blocks centred on Lake Timiskaming (Figure 2). The full extent of the valley is indicated by the accompanying topographic information (Figures 3 and 4).

The Little Clay Belt, fertile agricultural soil laid down by Pleistocene glacial Lake Barlow-Ojibway, occupies a broader zone of down-dropped blocks than that occupied by the Paleozoic outlier. The northeastern edge of the Little Clay Belt, striking roughly parallel to the Lake Timiskaming West Shore Fault, extends from the Quinze Dam Fault (Imreh 1970) in the Province of Quebec to the vicinity of Larder Lake, Ontario. The southwestern edge of the Little Clay Belt is, for most of its length, controlled by the next major fault southwest of and parallel to the Lake Timiskaming West Shore Fault, the Cross Lake Fault. The Cross Lake Fault extends from Lake Timiskaming 170 miles northwest to the Mattagami River Fault System (Kirwan 1969) south of Smooth Rock Falls (Bennett, Brown, and George 1968), occurring as part of a broad strong fault zone east of Timmins (Leahy 1969a and b). The dip of the Cross Lake Fault is 65°NE (Ninacs 1967, p. 53), and the movement across it is dip-slip. At the Sycee Cobalt Mine, shown on Figure 5, the Archean-Proterozoic unconformity on the northeast side of the fault is displaced 44 feet downward; southwest of Kirkland Lake, the indicated vertical displacement is 3 kilometres (Gibb and van Boeckel 1970, p. 163). In the middle of Cross Lake is the

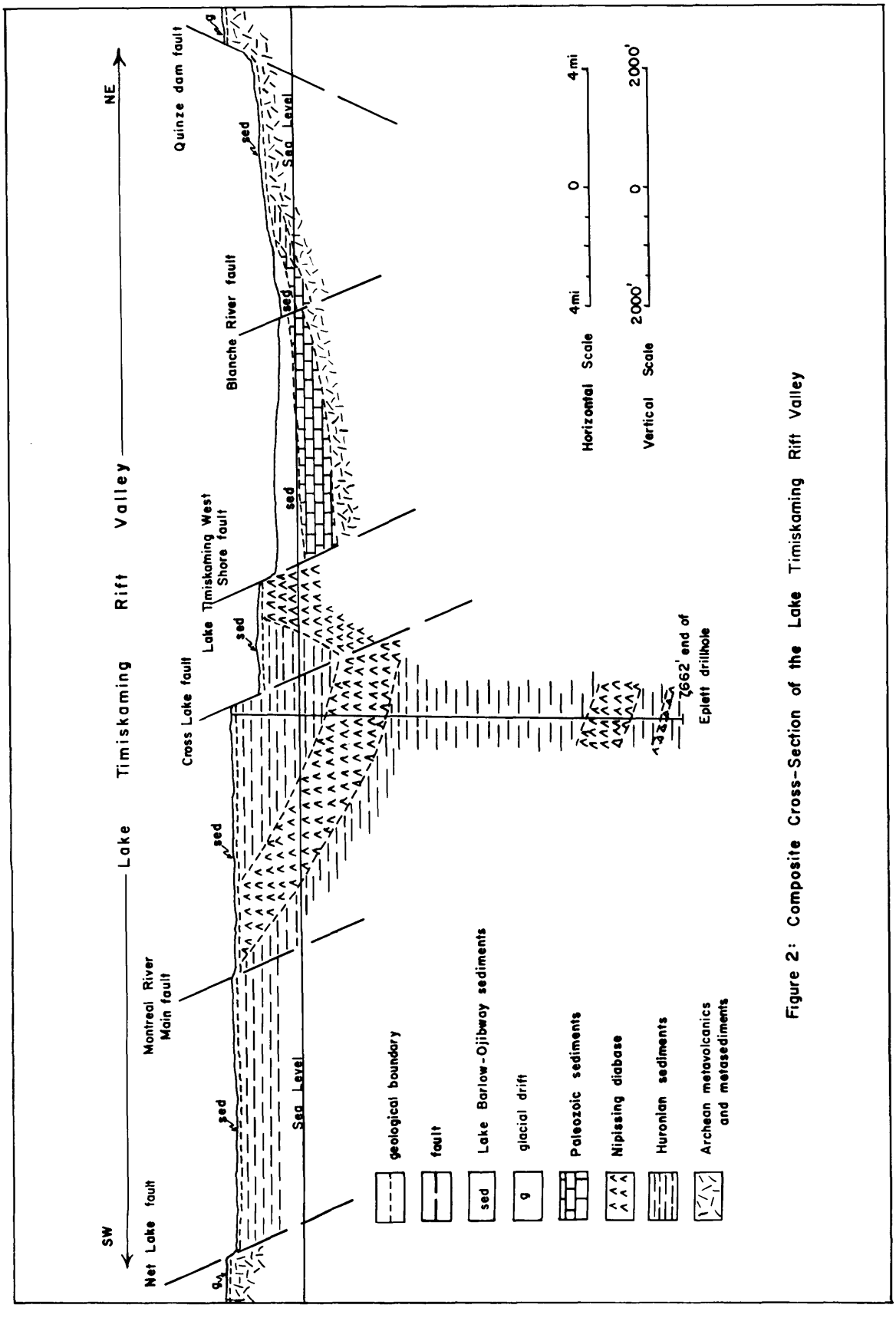

Figure 2: Composite Cross-Section of the Lake Timiskaming Rift Valley

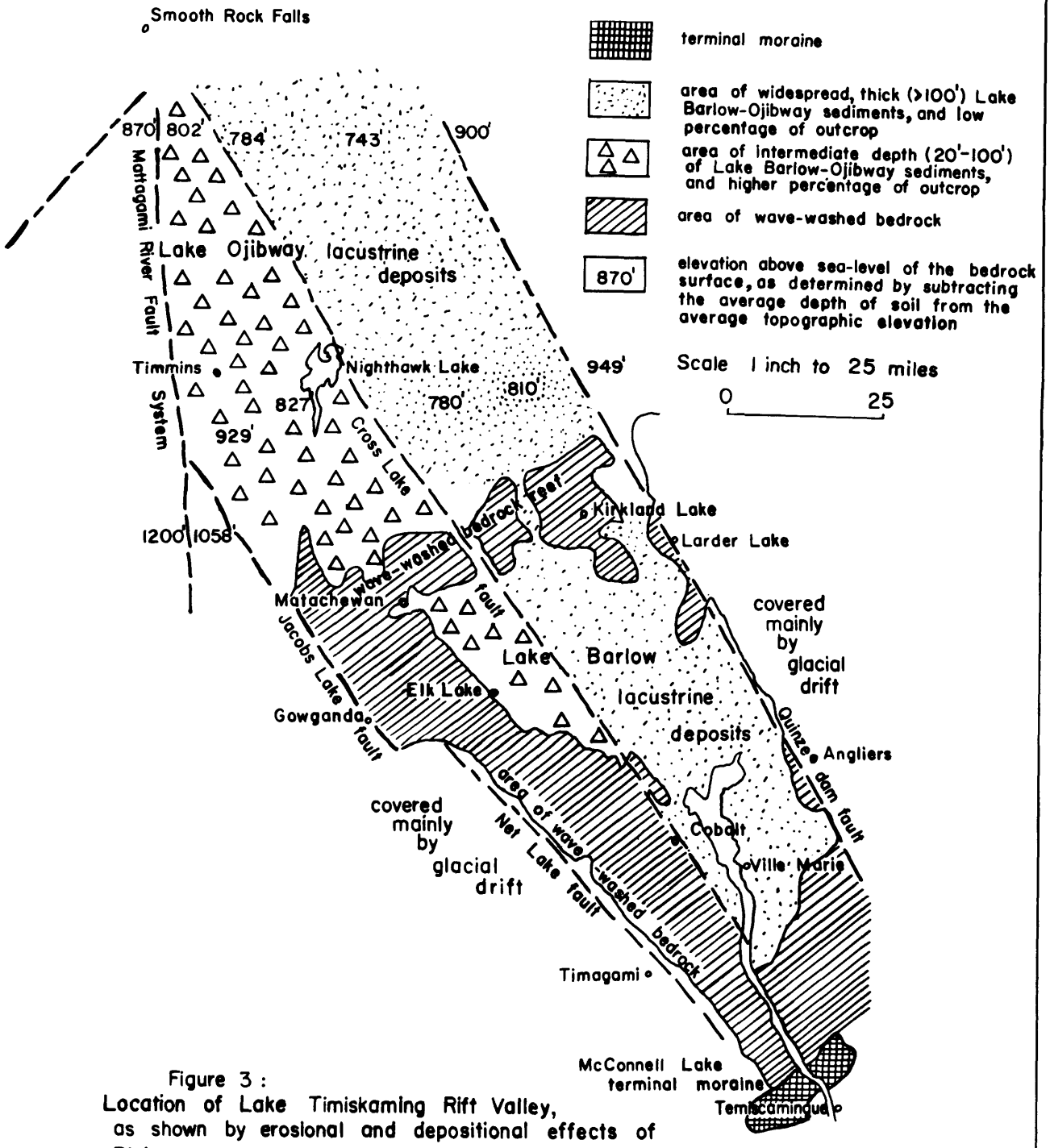

Figure 3 :
Location of Lake Timiskaming Rift Valley, as shown by erosional and depositional effects of Pleistocene glacial Lake Barlow-Ojibway

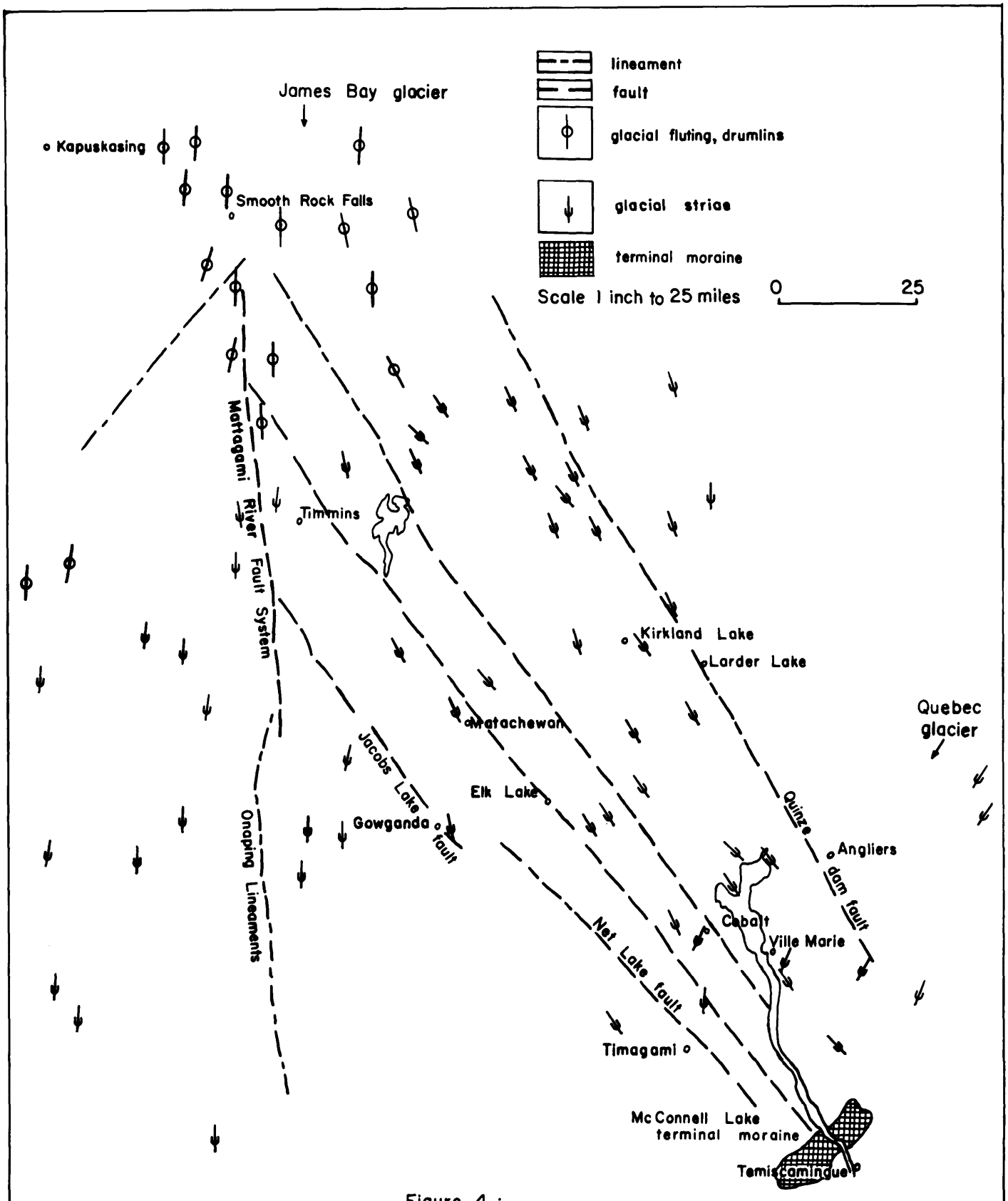

Figure 4 :

Diversion of advancing glaciers by the Lake Timiskaming Rift Valley, as indicated by glacial striae and drumlins.

cone-shaped Nipissing Diabase intrusion most productive of the Cobalt area's silver ore (Figures 5, 6 and 7).

The Nipissing Diabase centred on Cross Lake is one of many roughly cone-shaped hypersthene gabbro-quartz diorite-granophyre intrusions in northeastern Ontario. The productive Nipissing Diabase intrusion at Gowganda, for example, has been described as a "cone sheet" by Hester (1967), and the "basin and arch" structures (Thomson 1957, p. 386) are confirmed as being dominantly primary (Symons 1970). A general model proposed for the intrusions is shown in Figure 8. The writers suggest that many or all their feeders are in faults of the system that caused the Lake Timiskaming Rift Valley.

Southwest of the Cross Lake Fault is the parallel fault followed by the southern part of the Montreal River (Thomson and Savage 1965), and farther southwest is the parallel Montreal River Main Fault (Ginn et al. 1964). The Montreal River Main Fault extends for at least 180 miles, from Lake Timiskaming southeast of Timagami to the Mattagami River Fault System northwest of Timmins (George 1967 and Figure 2 in Kirwan 1969). At Elk Lake, Ontario, it forms the extreme western limit of the Little Clay Belt farmland laid down by Pleistocene glacial Lake Barlow-Ojibway. The following are transected by or close to the Montreal River Main Fault: the silver deposits of the Elk Lake area; the former gold and copper-molybdenum mines at Matachewan; the nickel and asbestos deposits of Eldorado and Langmuir Townships south of Timmins; the gold deposits of the Porcupine; and the Kidd Creek Mine of Texas Gulf Sulphur Company.

The next major fault southwest of the Montreal River Main Fault contains Net Lake, on which the new Timagami townsite is situated.

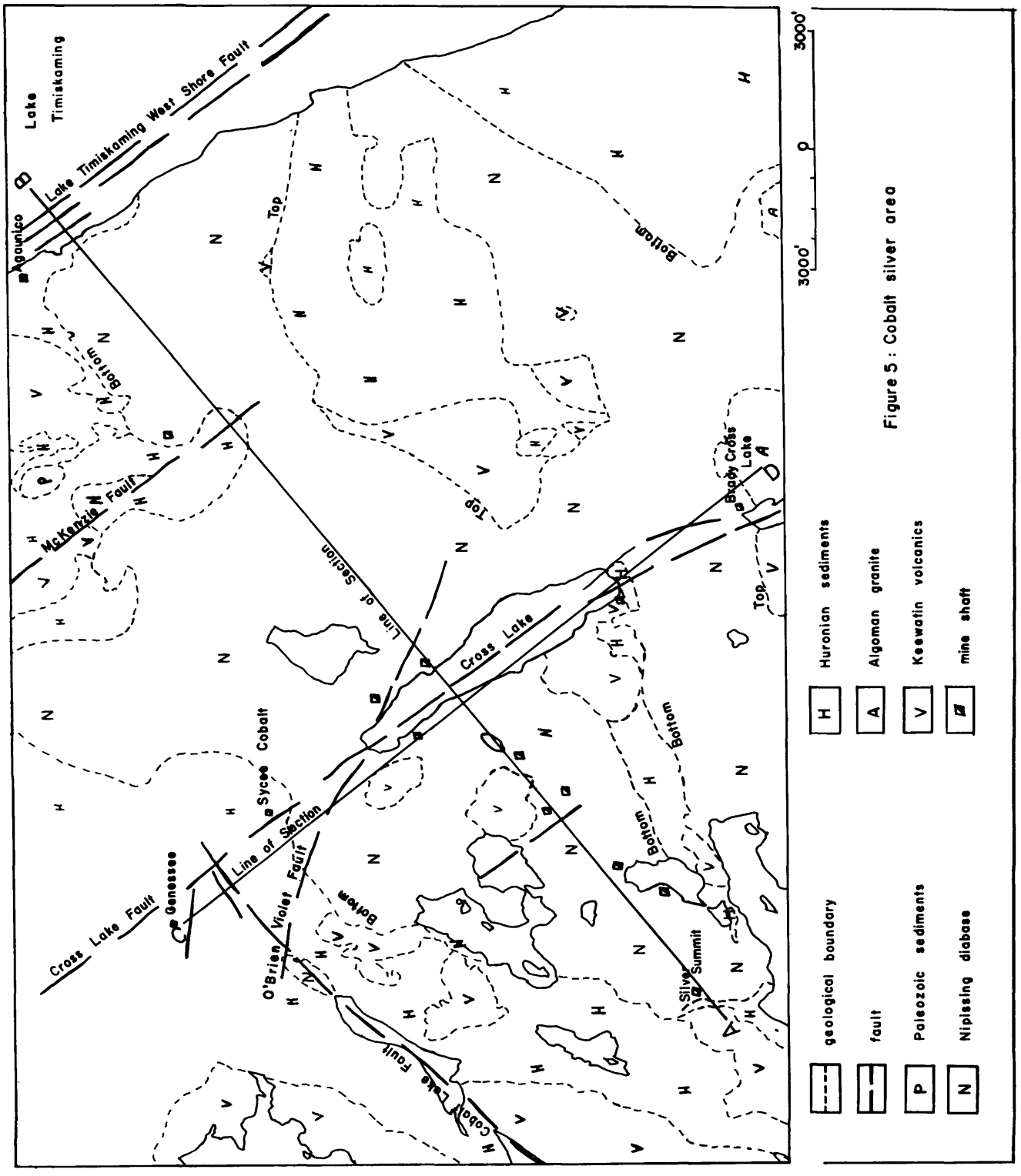

Figure 5 : Cobalt silver area

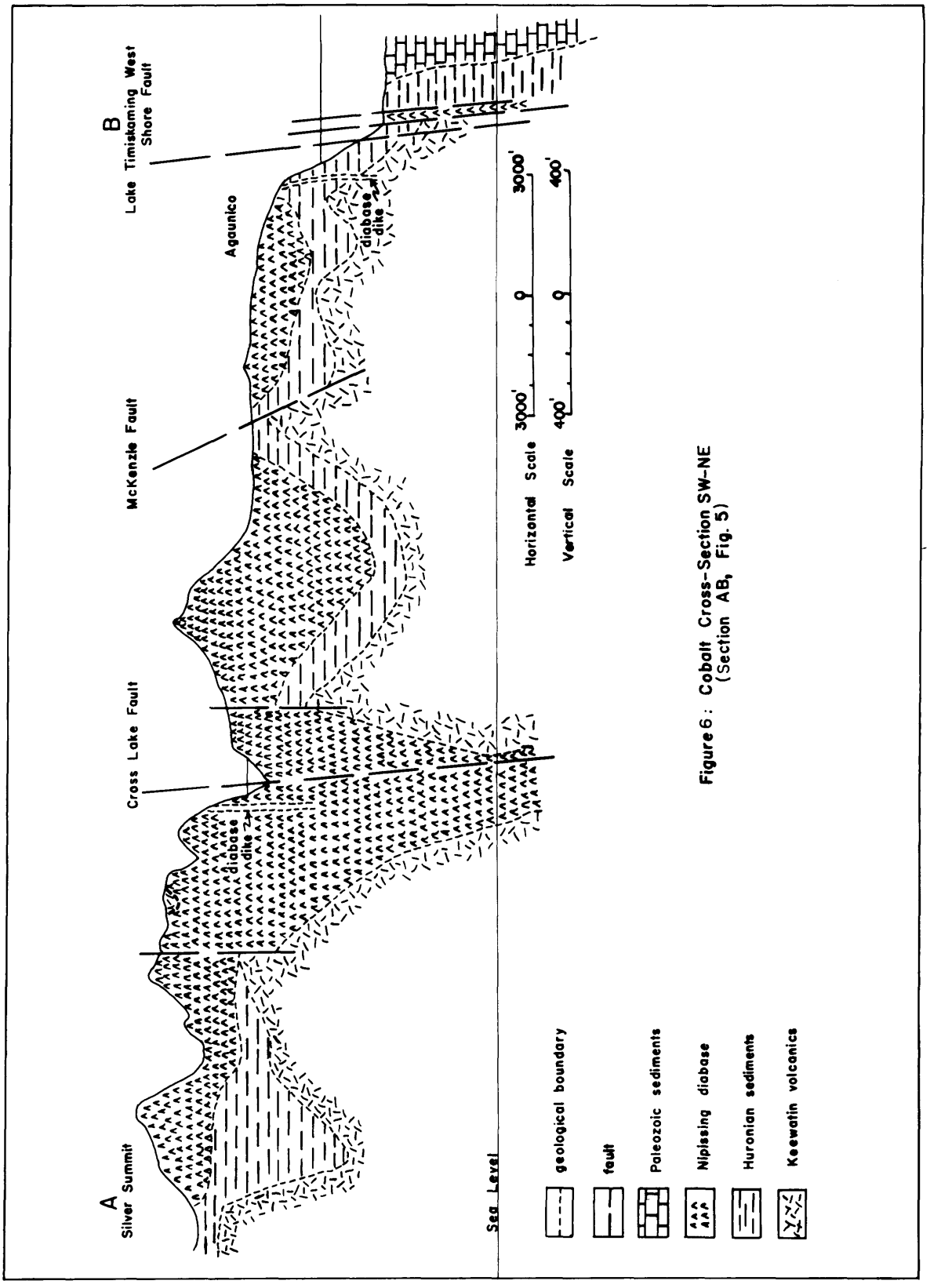

Figure 6: Cobalt Cross-Section SW-NE
(Section AB, Fig. 5)

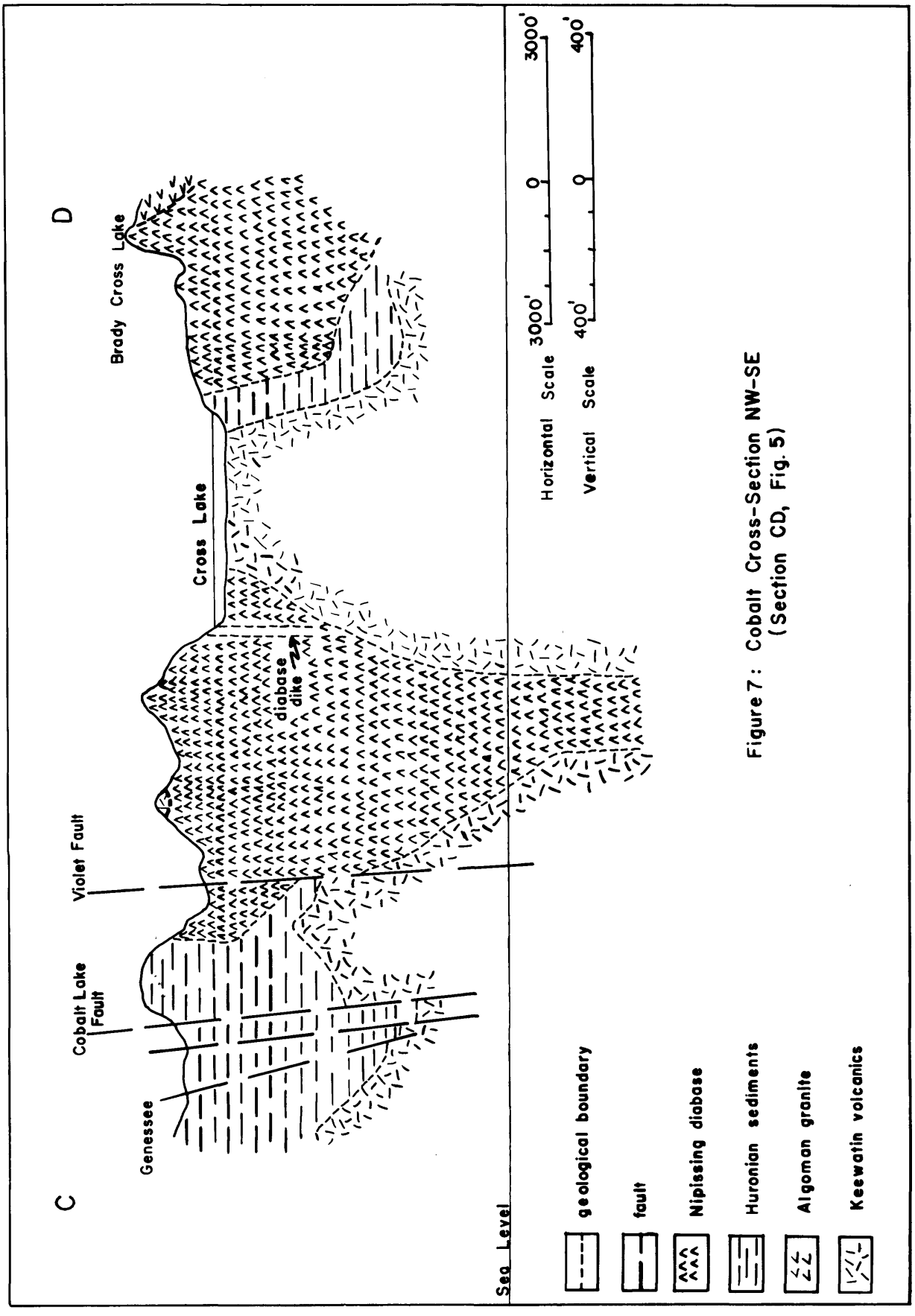

Figure 7: Cobalt Cross-Section NW-SE
(Section CD, Fig. 5)

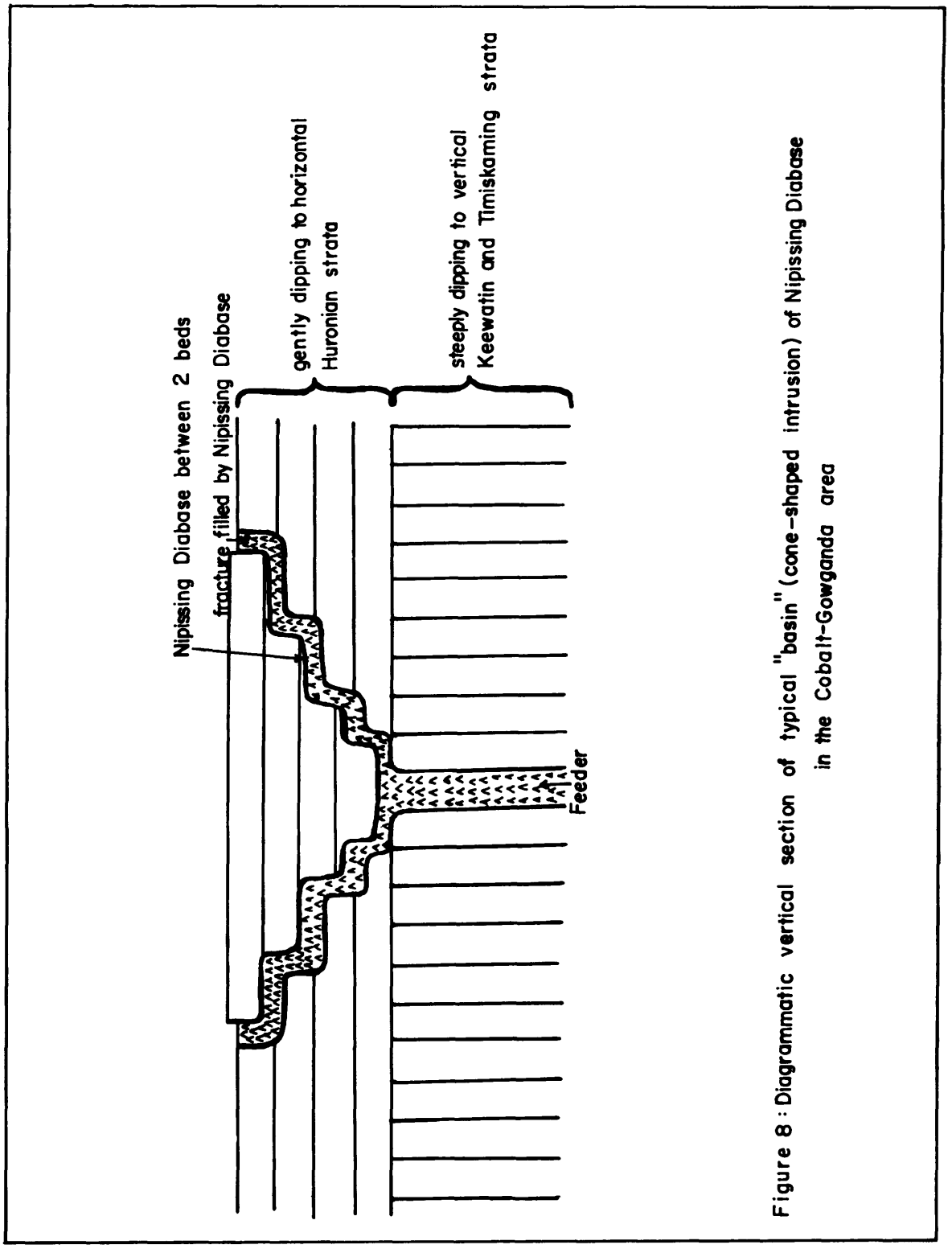

Figure 8 : Diagrammatic vertical section of typical "basin" (cone-shaped intrusion) of Nipissing Diabase in the Cobalt-Gowganda area

The northwestward projection of this fault forms the approximate southwestern boundary of: the bare bedrock south of Elk Lake eroded by wave action of glacial Lake Barlow-Ojibway, the lacustrine deposits south of Nighthawk Lake, and the terminal moraines about 15 miles southwest of Cobalt (Boissonneau 1965; see Figure 1); and the Proterozoic rocks against the Archean metavolcanics and metasediments of the Timagami area (Thomson and Savage 1965). From the Net Lake Fault northwest to the Mattagami River Fault System, the faults of the Lake Timiskaming rift system are "en echelon", a feature characteristic of rift valleys (Freund 1966, p. 331). In the Gowganda silver mining area, for example, the most prominent fault of the rift system is the one through Jacobs Lake (McIlwaine 1966), southwest of the projected extension of the Net Lake Fault.

The series of parallel northwest-striking faults of the Lake Timiskaming Rift Valley system extends to the southwestern boundary of the Cobalt Plain (the McLaren Lake Fault, Thomson 1960, and parallel faults near Wanapitei Lake), and possibly the entire Cobalt Plain occupies a regional graben. The most distinct and best-documented faults and the most pronounced topographic expression, however, occur in the type locality described above, - the long narrow trough-like valley that was formed by the sinking of blocks of the earth's crust between fault zones of approximately parallel strike, and that is centred on Lake Timiskaming.

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