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Geology of the Lower Shebandowan Lake Area District of Thunder Bay

By

J. A. Morin

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ABSTRACT

This geological report summarizes the geology of the Lower Shebandowan Lake area, including Hagey and Conacher Townships, and the area north to Latitude 48° 42′, District of Thunder Bay. The map-area is about 55 miles west of Thunder Bay.

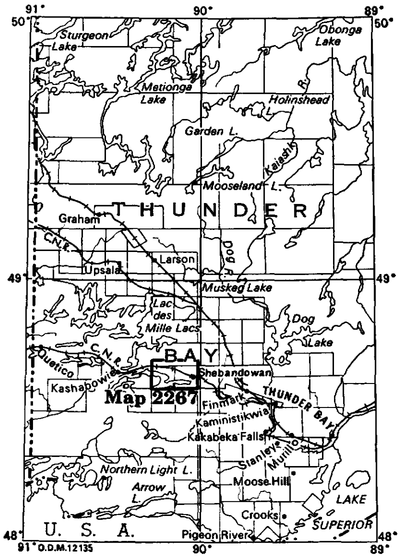

Figure 1–Key map, showing location of the Lower Shebandowan Lake area. Scale 1 inch to 50 miles.

Much of this area is underlain by mafic to intermediate metavolcanics, primarily basalt and andesite, with minor felsic flows and interbedded metasediments. Sills of gabbro and peridotite intrude the metavolcanics. Metamorphic grade increases from upper greenschist facies in the southern metavolcanics, to almandine-amphibolite facies in the north.

A fault separates the metavolcanic-metasedimentary sequence from the Kashabowie Group metasediments and a large granitic body in the northern part of the map-area. The fault is the eastward extension of the Postans Fault. The Kashabowie Group is comprised of northeast-trending greywacke, minor thin cherty layers, and biotite-quartz-feldspar schists derived from these. The granite batholith shows migmatitic contact relationships with the Kashabowie Group, and may have formed as a result of partial anatexis of the Kashabowie metasediments.

Foliation is developed only in the less competent units of the metavolcanics. The metavolcanics and related metasediments lie on the north limb of an easterly trending isoclinal anticline, whose axial plane dips nearly vertically.

The Shebandowan copper-nickel mine (The International Nickel Company of Canada Limited) is located in the southwestern corner of Hagey Township, between the southern boundary of the Shebandowan Lake Stock and the Crayfish Creek Fault. Major ore minerals include pyrrhotite, pentlandite, pyrite, and chalcopyrite, in a sulphide breccia. Small amounts of polydymite, platinum, palladium, bravoite, violarite, and millerite have been reported. The orebody is associated with a peridotite sill, enclosed in the metavolcanics.

A number of small gold-bearing quartz and quartz-feldspar porphyries are scattered around the borders of the Shebandowan Lake Stock. At the present time, none of these are being worked.

Geology of the Lower Shebandowan Lake Area

District of Thunder Bay

by

J. A. Morin[1]

INTRODUCTION

PRESENT GEOLOGICAL SURVEY

The map-area dealt with in this report comprises Hagey and Conacher Townships, and the area northward to Latitude 48° 42′. The centre of the map-area is located about 55 miles west of Thunder Bay. Access to different parts of the area is provided by Highway 11, the paved road to the Shebandowan Mine, the private road to Drift Creek, the road to Upper Sabrina Lake, and various bush roads and roads to summer lodges on Lower Shebandowan Lake. Access by water is provided by Lower Shebandowan Lake and Drift Lake.

Geological field mapping of the area was done during the summer of 1970. The purpose of the survey was to accurately delimit the rock formations, including those underlying the area around the Shebandowan Mine (The International Nickel Company of Canada Limited). The scale of mapping was 1 inch to ¼ mile. Pace and compass methods were employed, with traverses spaced about ¼ mile apart north of Lower Shebandowan Lake, 800 feet apart south of Lower Shebandowan Lake, and 400 feet apart in the Shebandowan Mine area. Lines south of Lower Shebandowan Lake, cut by INCO at 400-foot intervals for geological and geophysical surveys, were used extensively by the author and his assistants. Field data was plotted on acetate overlays on aerial photographs, and later plotted on a 1 inch to ¼ mile cronaflex base map sheet provided by the Cartography Section, Ontario Division of Lands.

Early exploration work in the area was concerned with gold and iron ore, whereas later interest has focused on base metals associated with mafic intrusions. INCO is developing the Shebandowan copper-nickel mine, at the southwest corner of Lower Shebandowan Lake. The mine is expected to start production of Cu-Ni ore by the fall of 1972.

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[1]Graduate student, Department of Geological Sciences, University of Saskatchewan, Saskatoon. Manuscript accepted for publication by the Chief Geologist, 12 January 1972.

ACKNOWLEDGMENTS

The author thanks The International Nickel Company of Canada, the Shebandowan Mine geologist, Mr. Gary Davis, and the assistant mine geologist, Mr. Jim Vance, for conducting him on an underground tour of the Shebandowan Mine. Their assistance and cooperation in discussions concerning mine geology are gratefully acknowledged.

Special thanks are due Mr. and Mrs. Uno Hagglund, of Cedar Hill Camp, for providing accomodations during the field season. The author acknowledges the competent field assistance rendered by his senior assistant, Mr. W. D. Bond, and his junior assistants, Mr. G. D. Trick, and Mr. W. D. Birk, each of whom did some independent mapping.

PREVIOUS GEOLOGICAL WORK

The map-area adjoins, and partly includes, the Kashabowie area to the west, that was mapped by Hodgkinson for the Ontario Department of Mines at a scale of 1 inch to ½ mile (Hodgkinson 1968). Earlier geologists who commented on the area include W. McInnes (1899), J. G. Cross (1920), and R. J. Watson (1928). T. L. Tanton mapped the Shebandowan area for the Geological Survey of Canada at a scale of 1 inch to 1 mile (Tanton 1938). His map has been used extensively by prospectors in the area.

TOPOGRAPHY

Topography of the map-area is low and undulating, with relief not exceeding 100 feet; most hills are about 50 feet high. The drainage pattern is immature, with many muskeg swamps. Streams and lakes in the northern two-thirds of the map-area drain into Lower Shebandowan Lake. The streams and lakes south of Hagey and Conacher Townships drain south, into the Matawin River. Swamp River is locally called Mud River.

The area is characterized by abundant glacial drift and a few eskers. Bedrock is obscured in most places by glacial drift, especially in the area north of Highway 11. The Shebandowan Lake Stock and the Kashabowie Group metasediments are poorly exposed.

GENERAL GEOLOGY

PRECAMBRIAN ROCKS

The area is underlain by east-trending metavolcanics and metasediments of Precambrian age. Metamorphic grade varies from upper greenschist facies in the south to almandine-amphibolite facies in the northern part of the map-area.

Table 1 — TABLE OF LITHOLOGIC UNITS FOR THE LOWER SHEBANDOWAN LAKE AREA

CENOZOIC

Recent

Lake, stream, and swamp deposits

Pleistocene

Sand, gravel, clay

Unconformity

PRECAMBRIAN

LATE MAFIC INTRUSIVE ROCKS

Diabase

Intrusive Contact

ARCHEAN

INTRUSIVE ROCKS

Felsic Intrusive Rocks

Quartz diorite, white muscovite-biotite granite, white pegmatite, pink porphyritic granite, pink biotite granite, quartz porphyry, quartz-feldspar porphyry, feldspar porphyry, migmatite, porphyritic hornblende syenite

Intrusive Contact

Mafic and Ultramafic Intrusive Rocks

Gabbro, anorthositic gabbro, peridotite, hornblendite, lamprophyre

Intrusive Contact

METAVOLCANICS AND METASEDIMENTS

Kashabowie Group

Greywacke, biotite-quartz-feldspar schist

Felsic Metavolcanics

Rhyolite, porphyritic rhyolite, dacite, porphyritic dacite

Metasediments

Conglomerate, arkose, argillite, cherty sediments

Mafic to Intermediate Metavolcanics

Andesite, basalt, coarse-grained basalt and andesite, pillowed andesite, pillow breccia, porphyritic andesite, amygdaloidal andesite, tuff, lapilli tuff, tuff breccia, iron formation.

Metavolcanics extend north and south of Lower Shebandowan Lake. They are intermediate to mafic in composition, with minor felsic members. There are few pyroclastic rocks in the sequence. Pillowed lavas indicate that the top of the volcanic sequence faces north.

South of Lower Shebandowan Lake, the older metavolcanic sequence contains about 3,000 feet of metasediments, consisting of conglomerate, arkose, and argillite. Thin beds of iron formation are interbedded with the metavolcanics. A thick sequence of greywacke overlies the metavolcanics in the northern part of the area. It was named the Kashabowie Group by Hodgkinson (1968).

Narrow gabbro and peridotite sills intrude the metavolcanics and metasediments. A quartz diorite stock (the Shebandowan Lake Stock) occurs in the western part of the area. The edge of a large granite mass in the northern part of the area is in migmatitic gradational contact with the Kashabowie Group metasediments. Quartz-feldspar porphyry dikes are intrusive to the metavolcanics. A few diabase dikes intrude the northern granite mass.

Metavolcanics and Metasediments

MAFIC AND INTERMEDIATE METAVOLCANICS

The mafic and intermediate metavolcanics are highly altered. The flows have been reduced to assemblages of shreddy, fine-grained chlorite, hornblende, sericite, saussurite, and carbonate, with a few coarse-grained feldspar phenocrysts; a mineral assemblage typical of greenschist facies metamorphism. Primary structures in the lavas include pillows, aquagene breccia, amygdules, and vesicles. Layered and graded bedding are present in water-laid pyroclastic rocks.

The metavolcanic sequence extends from south of Lower Shebandowan Lake to the northwestern and central-eastern parts of the map-area. Coarse-grained andesite and basalt occur throughout the sequence. The coarse-grained basalt weathers pale brown, and has a medium-grained ophitic texture.

Flows with porphyritic phases occur south of Lower Shebandowan Lake. They are predominantly massive, fine-grained andesite that is light to dark green in colour. A porphyritic andesite south of the Shebandowan Mine Number 2 Shaft exhibits feldspar phenocrysts that are partly to completely replaced by zoisite. The phenocrysts range from ½ inch to 3 inches in diameter. A coarse-grained andesite occurs on the north shore of Hoestrom Lake. It weathers pale grey to pale green, and has a medium-grained ophitic texture.

Iron formation occurs in beds about 20 feet thick, interbedded with the intermediate lava flows south of Lower Shebandowan Lake. The iron formation consists of bands of jasper and magnetite about ⅓ inch thick. Magnetite forms more than 50 percent of some beds. Small-scale similar folds are present in the iron formation. The bands appear to be unfractured; therefore the folds probably reflect primary slump deformation, and formed when the bands were soft and ductile (Photo 1). The iron formation is not a good horizon marker, as individual bodies tend to be discontinuous. In some places, ground magnetometer data has been used to extend the boundaries of iron formations in the map-area.

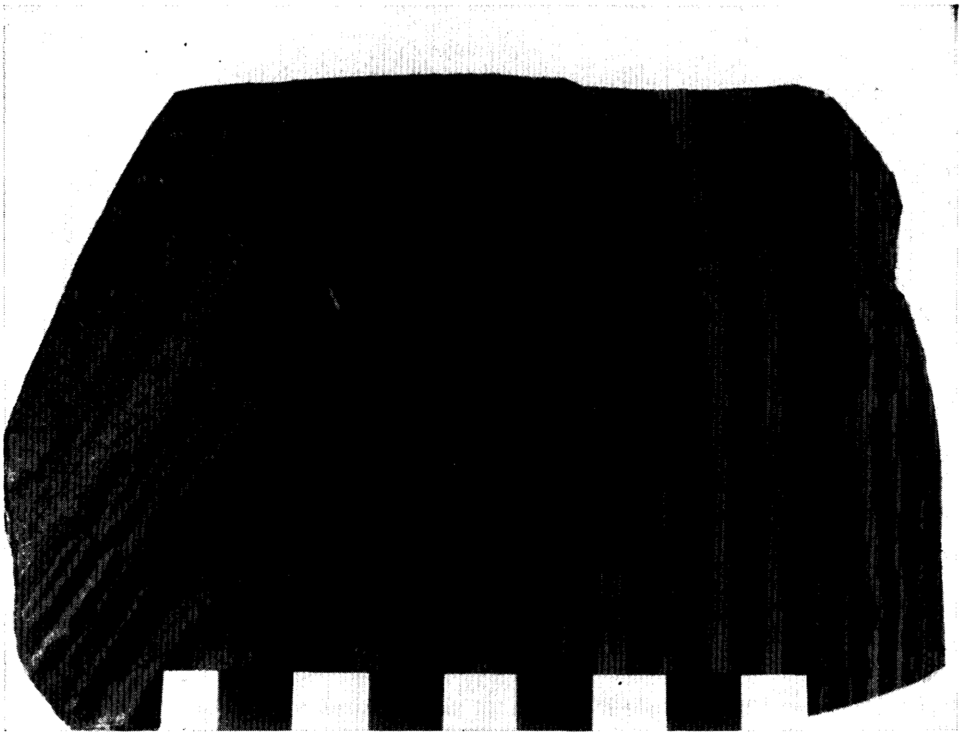

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Photo 1–Similar fold in typical banded iron formation, consisting of alternating magnetite and jasper.

North of Lower Shebandowan Lake occurs a series of interbedded flows and pyroclastics. Pillowed flows indicate submarine extrusion of the lava. The pillows are well preserved, and provide excellent top determinations. The top of the sequence faces north. Aquagene breccia occurs along Highway 11, one mile southeast of Pistol Lake (Photo 2). The breccia apparently formed internally within a submarine lava flow.

Highly epidotized and carbonatized basalt occurs south of Mathe Lake in Hagey Township. This unit weathers grey-green to pink in colour, and is black on the fresh surface. Epidote and pyrite veins fill fractures in the basalt. Contacts between the basalt and nearby intermediate metavolcanics are poorly defined. One-quarter mile west of Pistol Lake, there is a small area of silicified basalt and amygdaloidal lava that contains evenly distributed ellipsoidal amygdules of chlorite and quartz.

Three thousand to four thousand feet of pyroclastics occur near the top of the metavolcanic sequence, north of Lower Shebandowan Lake. The pyroclastics include fine-grained tuff, lapilli tuff, and tuff breccia. Bedding is generally well-developed in the fine-grained tuff. Graded bedding, with laminae which range from ⅛ inch to 4 inches thick, is present in water-laid tuff exposed along the road to Upper Sabrina Lake, in the northwestern part of the area.

East of Swamp River the tuff is white to pale green on the weathered surface. Clusters of small felsic fragments and minerals give the tuff a knobby appearance. This tuff has a 'pseudo-porphyritic' texture that may have misled others to term it a porphyritic flow.

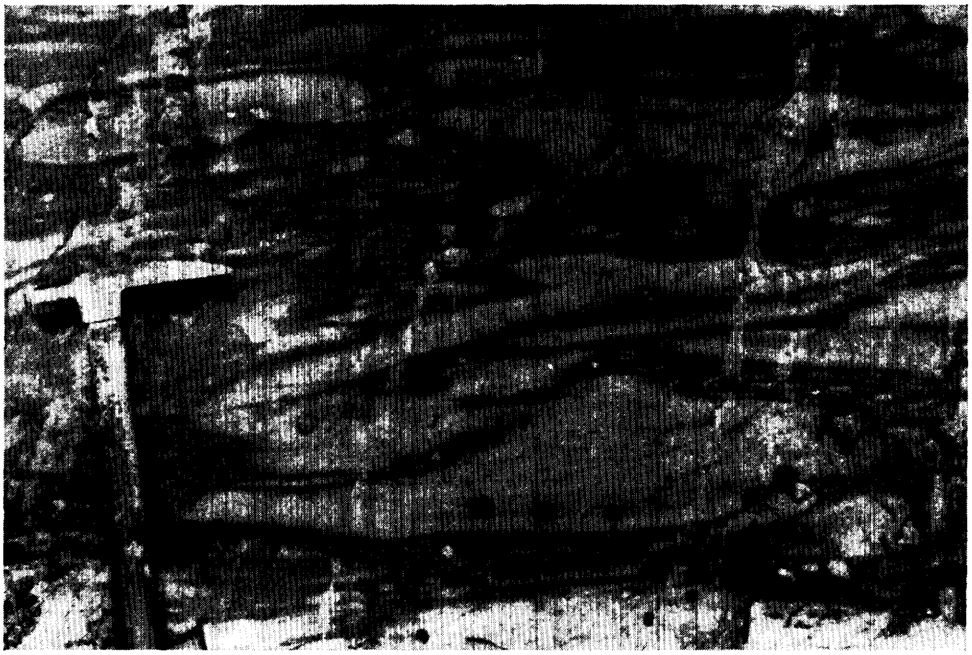
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Photo 2–Aquagene flow breccia; Highway 11, 1 mile southeast of Pistol Lake.

Typical intermediate tuff breccia occurs northeast of the easternmost part of the Swamp River. It consists of elongated, lenticular, pale red felsic clasts in a darker, more mafic matrix. The clasts vary in length, and occupy 50 to 70 percent of the rock.

METASEDIMENTS SOUTH OF LOWER SHEBANDOWAN LAKE

Metasediments occur enclosed in the intermediate metavolcanics south of Lower Shebandowan Lake. They include conglomerate, arkose, argillite, and minor cherts, and vary in thickness from 500 feet in the western part of the area, to 4,500 feet in the eastern part.

The conglomerate is of two types. The most common variety is an oligomictic, orange-brown rock that contains angular to subangular clasts of pink hornblende trachyte (Photo 3). The matrix contains grains of sericitized feldspar and hornblende. In the Shebandowan Mine area, the oligomictic conglomerate is thin with a chlorite-rich matrix, and looks like a volcanic tuff-breccia.

The second type of conglomerate is polymictic, with clasts of granodiorite, jasper, chert, argillite, and andesite, embedded in a highly chloritic matrix. It is less widely distributed than the oligomictic conglomerate. The polymictic conglomerate outcrops south of the east end of Lower Shebandowan Lake.

Arkose occurs interbedded with the other metasediments, and weathers to an orange-brown colour. The thickness and extent of the arkose beds were not deter-

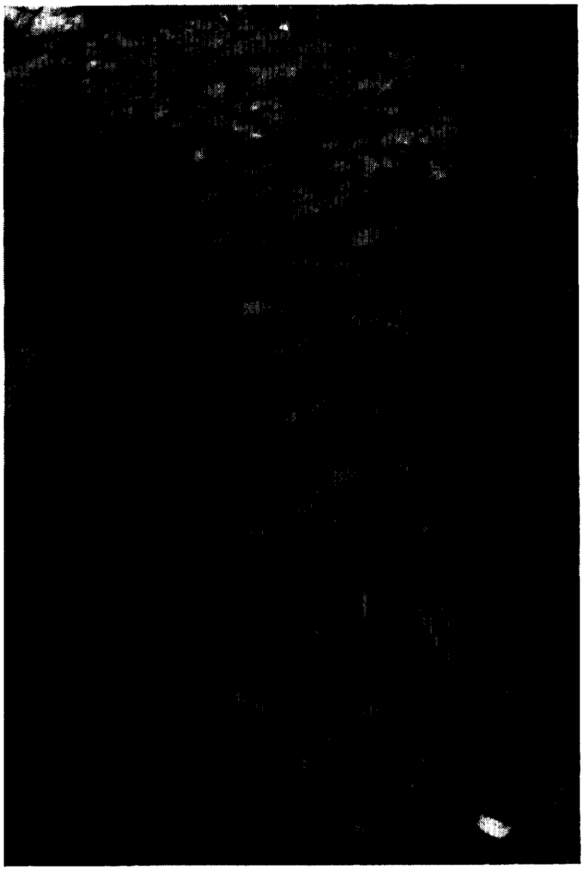

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Photo 3–Oligomictic conglomerate with hornblende trachyte clasts; Shebandowan Mine Road, 1 mile west of Green Bay.

mined because of lack of outcrop. In thin section, the arkose is composed of medium-grained microcline and quartz, in a fine-grained groundmass of quartz, potassium feldspar, chlorite, and carbonate.

Argillitic and cherty layers are interbedded with the arkose and conglomerate. The argillite is black, and fine-grained, with minor cubes of medium- to coarse-grained pyrite. In thin section, the argillite is composed of fine-grained quartz-feldspar-mica, with a few larger grains of quartz. The larger quartz grains are crushed at the edges, evidence of cataclastic deformation. The cherty layers are white on the weathered surface, and pale green on the fresh surface. Thin sections of chert are composed of fine-grained quartz and potassium feldspar, with minor amounts of plagioclase, sericite, and calcite.

FELSIC METAVOLCANICS

Felsic metavolcanics were observed north of Middle Shebandowan Lake, in the western part of the area. Their distribution is restricted to a relatively small area

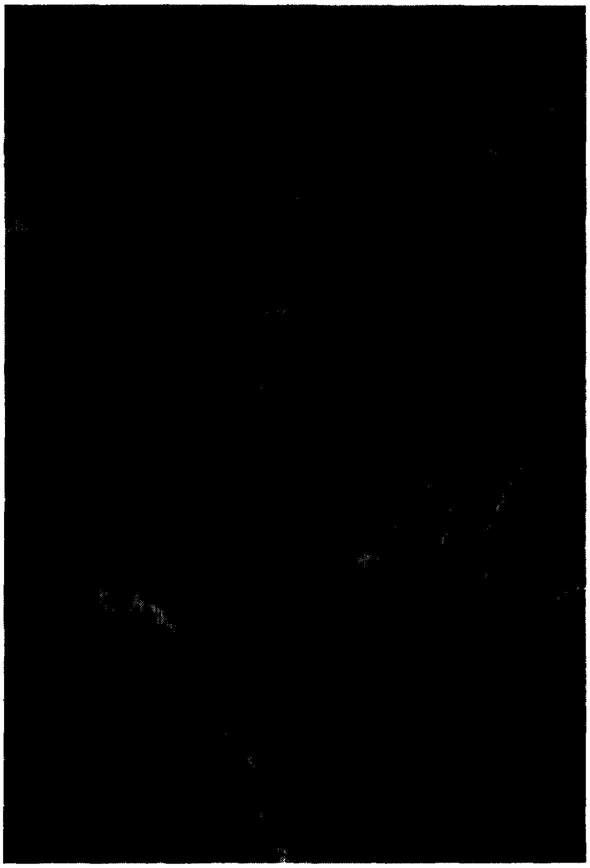

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Photo 4–Kashabowie Group paraschist with injected pegmatite veinlets. Primary layering visible in upper left corner. Drift Creek private road, 2,300 feet south of Drift Creek.

compared to the other metavolcanic rocks. Brecciated rhyolitic and dacitic flows are intercalated with mafic to intermediate flows. Individual thicknesses of the felsic flows were not determined. The main unit north of Middle Shebandowan Lake varies in thickness from 300 to 700 feet.

The felsic flows are sericitized, with relict quartz phenocrysts in the rhyolitic rocks. The presence of quartz phenocrysts, together with a more siliceous appearance, served to distinguish rhyolite from dacite.

A rhyolite breccia west of Young Bay contains pale green rhyolite fragments in a white fine-grained matrix, and displays some discontinuous thin flow banding. A white-weathering, pillowed, porphyritic dacite occurs on the north shore of Middle Shebandowan Lake, about 1 mile northwest of Rossmere Bay. The unit has a circular outcrop pattern, and may have been formed at the top of a volcanic conduit. A spontaneous polarization anomaly, found by J. F. West (1952) is centred on the unit (see Figure 4, this report).

KASHABOWIE GROUP OF METASEDIMENTS

The greywacke and its metamorphic derivatives in the northern part of the map-area are part of the Kashabowie Group, defined by Hodgkinson (1968). The Kashabowie Group underlies a topographic high, and the southern contact, with the metavolcanics and mafic intrusive rocks, is clearly delineated on air photographs as a northwest-trending ridge. The sequence consists of monotonously uniform massive, well-bedded greywacke, with minor thin interbedded layers of cherty sedimentary rocks. The greywacke has been increasingly metamorphosed to the north and near the granite contacts; near the northern edge of the map-area, the Kashabowie Group greywacke is represented by a biotite-quartz-feldspar schist.

Under the microscope, the greywacke is composed of fine-grained green hornblende, brown biotite, quartz, feldspar, sericite, and magnetite. Most of the quartz-feldspar groundmass has been recrystallized. The schist has a coarser grained texture, in which biotite, hornblende, garnet, quartz, and feldspar have all been recrystallized during metamorphism (Photo 4). At some localities, the biotite-quartz-feldspar schist contains knots of quartzo-feldspathic material.

In a study of progressive metamorphism of the greywacke along the road north from Highway 11 to Drift Creek, in the eastern part of the area, W. D. Birk (assistant) reported sillimanite, almandine garnet, and staurolite in some thin sections. The almandine garnets are characterized by normal zoning of CaO, MnO, MgO, and FeO along the southern part of the highway; and by reverse zoning of MnO, MgO, and FeO along the northern part of the road. The reverse zoning of the garnets led Birk to postulate retrograde metamorphism for the Kashabowie Group exposed along the northern part of the Drift Creek road (Birk 1971).

Approaching the northern granite, the number and size of granitic and pegmatitic veinlets increases. In the extreme northern part of the area, the rocks are migmatitic, and boudinage, contorted folding, and *lit-par-lit* phenomena are common (Photo 5). Because of this intermixture of schist with white granite and pegmatite, any contact drawn is extremely arbitrary.

Intrusive Rocks

MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

Mafic and ultramafic rocks in the map-area include gabbro, anorthositic gabbro, serpentinized peridotite, and lamprophyre. They commonly form sills within the metavolcanic sequence.

The gabbro is grey-white on the weathered surface and pale green to grey on the fresh surface. It is coarse-grained. In thin section, most of the gabbro samples are highly altered to chlorite, epidote, and hornblende. Anorthositic gabbro occurs as a feldspar-rich phase of some of these sills.

The gabbro body southeast of Far Lake is highly sheared in places. It appears to have been affected by alkali metasomatism from the northern granite, because sericite schist appears along shear zones in the gabbro.

South of Lower Shebandowan Lake, gabbro and peridotite bodies have been mapped using, in addition to the outcrop data, aerial and ground magnetometer

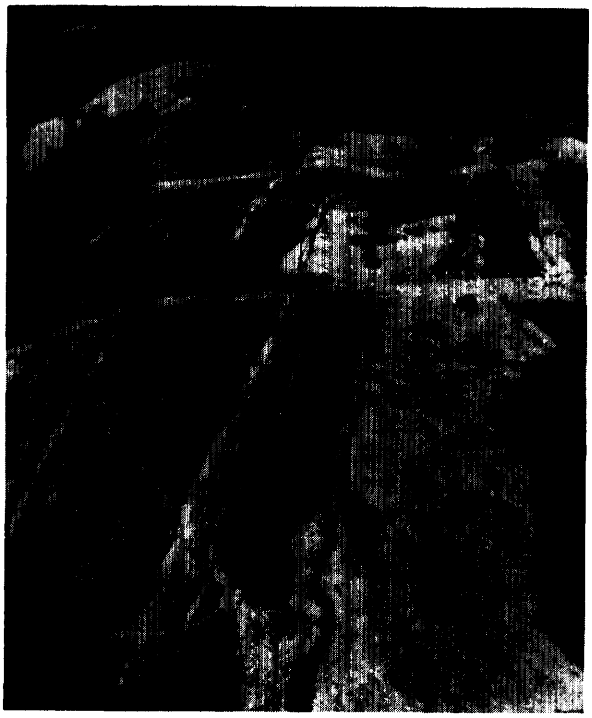

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Photo 5–*Lit-par-lit* migmatite near contact between Kashabowie Group and northern granite mass. Drift Creek private road, about 2 miles northeast of Far Lake.

survey results and diamond drill hole information filed for assessment work credit with the Resident Geologist, Ontario Ministry of Natural Resources, Thunder Bay.

Peridotite forms narrow pod-like sills within the metavolcanics south of the western part of Lower Shebandowan Lake. It is everywhere highly serpentinized, and weathers grey, it has a shiny black fresh surface. It is moderately magnetic. In thin section, the peridotite consists of serpentine with minor talc, magnetite, and carbonate. The serpentine has completely replaced the olivine, and forms pseudomorphs that retain the outlines of the original olivine grains. Hornblendite occurs as a minor phase of the peridotite, notably at the Shebandowan Mine Number 2 Shaft, and northwest of Hoestrom Lake, near the mine road.

Some lamprophyre occurs within the map area as dikes up to 20 feet thick. A vertical northwest-trending lamprophyre dike occurs northwest of Rossmere Bay along Highway 11. An east-trending dike occurs at the first outcrop south of the Shebandowan River, along the road to the Shebandowan Mine. In thin section, the lamprophyre consists of equidimensional grains of chlorite, magnetite, plagioclase, potassium feldspar, and calcite.

FELSIC INTRUSIVE ROCKS

Felsic intrusive rocks in the map-area include: a quartz diorite stock at Lower Shebandowan Lake (Shebandowan Lake Stock); auriferous quartz and quartz-

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Photo 6–Partly assimilated metavolcanic inclusion in quartz diorite. Junction of Highways 11 and 587, Hagey Township.

feldspar porphyries, and a pegmatite-rich granite batholith in the northern part of the area.

Shebandowan Lake Stock

The Shebandowan Lake Stock, referred to by Hodgkinson (1968) as the Loch McDougall granite, is composed of quartz diorite in the Hagey-Conacher area. The massive quartz diorite weathers light grey, with mottled patches of pink and green epidote alteration. It is coarse grained, and equigranular in texture. Thin sections contain coarse-grained euhedral plagioclase with epidote and chlorite alteration, and minor quartz, potassium feldspar, and magnetite.

The stock is wedge-shaped, and appears to have pushed aside the metavolcanic rocks to the north and south. Contacts between the stock and the surrounding metavolcanics are highly sheared and carbonatized. Xenoliths of andesite within the stock occur on Highway 11, north of the village of Shebandowan in Conacher Township. A partly assimilated inclusion of a metavolcanic rock occurs within the quartz diorite at the junction of Highways 11 and 587 (Photo 6).

A few feldspar porphyry dikes occur in the country rocks near the southern margin of the Shebandowan Lake Stock. They are similar in appearance to the quartz diorite of the stock proper. One shows intrusive relationships with peridotite on an island in Southwest Bay, at the Shebandowan Mine ventilation shaft. The contact between the 10-foot wide dike and the peridotite is sheared and carbonatized. The porphyry dike exhibits the effects of chilling in its aphanitic texture, and the absence of phenocrysts near the contacts. In thin section, the feldspar porphyry consists of plagioclase phenocrysts altered to an opaque brown material, with minor quartz and feldspar in the matrix.

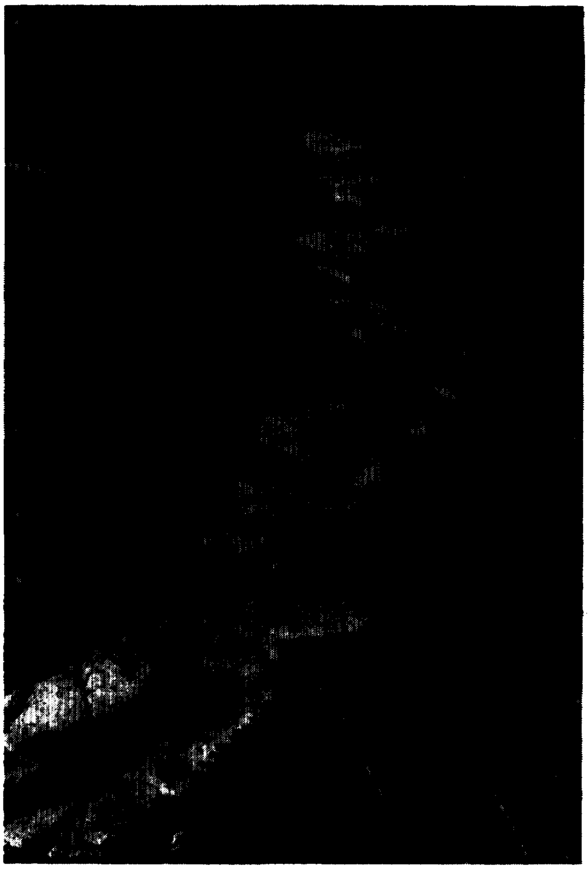

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Photo 7–Ptygmatically folded pegmatite in paraschist. Drift Creek road, 2,300 feet south of Drift Creek.

Quartz-Feldspar Porphyry

Gold-bearing quartz and quartz-feldspar porphyry bodies occur in the metavolcanics north of Lower Shebandowan Lake in Hagey Township. They are pink in colour, and contain abundant feldspar phenocrysts and minor quartz eyes. Narrow dikes of quartz-feldspar porphyry display well exposed intrusive contacts with the andesite southeast of Mathe Lake, along Highway 11. The porphyries may be near-surface intrusions related to the nearby felsic metavolcanics.

Granitic Rocks

A massive, homogeneous, white, muscovite-biotite granite occurs throughout much of the northern part of the map-area. In thin section, it consists of coarse-grained, inclusion-rich, microcline-perthite and quartz, with minor plagioclase, muscovite, biotite, and magnetite.

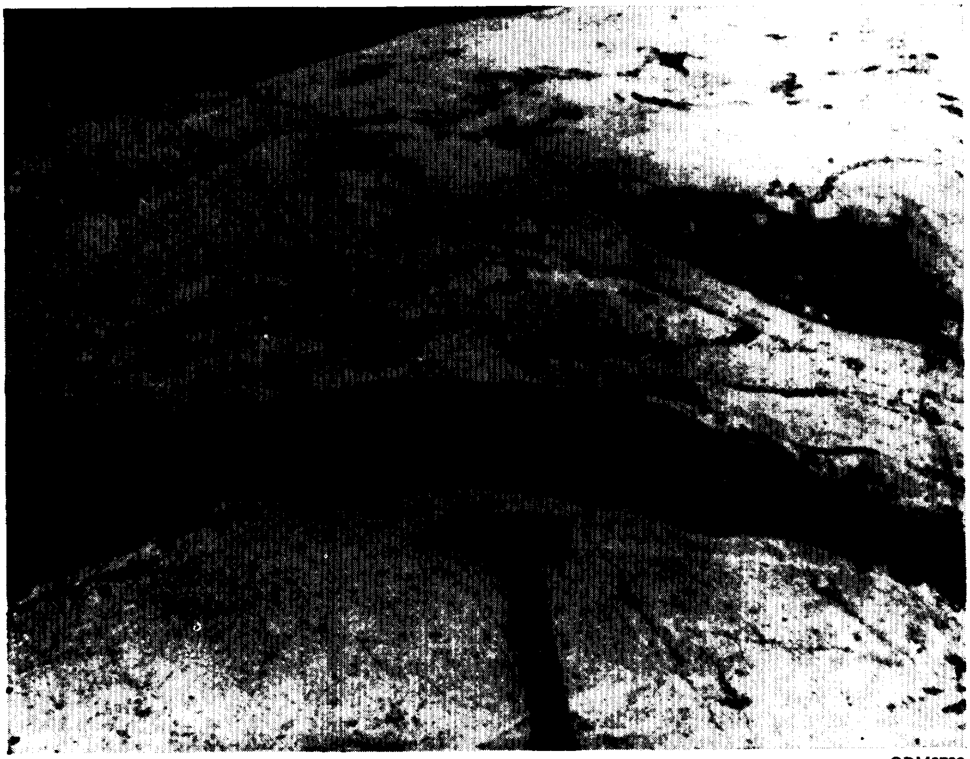

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Photo 8–Relict layers and clots of paraschist in granite; bush road 2½ miles northwest of south end of Drift Lake.

Contacts between the northern granite and the Kashabowie Group metasediments to the south are characterized by *lit-par-lit* structure and migmatite. Biotite-quartz-feldspar schist, or paraschist, forms *schlieren* and conformable beds within the white granite.

White pegmatite occurs as a coarse-grained phase of the white granite in many places. It locally forms ptygmatic folds within the paraschist (Photo 7). Minor amounts of tourmaline form thin (2-inch) discontinuous veins, 1 foot to 2 feet long, in the white pegmatite, along the northern part of the road north of Drift Lake. Pale red almandine garnets are present in some of the pegmatite. A minor phase of the northern granite is coarse-grained, porphyritic, and pink in colour. This porphyry is composed predominantly of alkali feldspar and minor amounts of quartz. The weathered surface of the rock is studded with phenocrysts.

Hodgkinson (1968) reported that the northern granite formed as a result of metasomatism of the Kashabowie Group. The author agrees with him, at least in part, but would also consider a possible origin as the result of partial anatexis of the Kashabowie Group greywackes. Evidence pointing to both modes of origin includes:

a) Foliation that persists from areas of paraschist into areas of granite.
b) Relict metasedimentary layers and mafic clasts of paraschist in granite (Photo 8).

c) *Schlieren* and contorted migmatites that occur locally in the granite.

Other felsic intrusions in the map-area include a small round stock of pink biotite granite in the extreme western part of Hagey Township, south of Highway 11. This granite is coarse-grained and massive, and has sharp contact relationships with the surrounding metavolcanics. A small stock of porphyritic hornblende syenite occurs northeast of Stewart Bay in Conacher Township.

Late Mafic Intrusive Rocks

Diabase

Diabase occurs in a few isolated outcrops in the northern granite batholith, especially north of Far Lake in Hagey Township. The diabase is dense, massive, and moderately magnetic. It is dark brown on the weathered surface, and black on the fresh surface. Grain size of the minerals ranges from 0.5 mm in some samples to 5 mm in others.

In thin section, the diabase consists of euhedral grains of altered pyroxene and unaltered plagioclase, with an ophitic texture. Magnetite comprises 10 to 15 percent of the rock, and is present as euhedral, blocky grains, and as fine-grained skeletal crystals. Very fine-grained needles of apatite are present.

Most diabase bodies have a maximum observed width of 150 feet. They trend from westerly to northerly. The diabase occurrence 1 mile northeast of the northern corner of Hagey and Conacher Townships contains inclusions of white granite, and may represent the base of a flat-lying diabase sheet (Photo 9). Grain size gradation, from the margin to the interior of the dike, is present in the dikes north of Far Lake.

CENOZOIC

QUATERNARY

Pleistocene and Recent Deposits

Pleistocene deposits of glacial origin are widespread throughout the report area. The dominant detritus is sandy gravel and boulder drift. Much of the area underlain by granitic rocks and the Kashabowie Group is covered by glacial drift. Most of Conacher Township north and east of Lower Shebandowan Lake is heavily drift covered. A few eskers are located in the vicinity of Swamp River in Conacher Township. They trend in a southwesterly direction.

Sand and gravel deposits that have been worked in the past are located off Highway 11 at the western end of Hagey Township; off the private road near Drift Creek in Conacher Township; and near the road to the Shebandowan Mine, 1 mile west of Steamer Channel.

ODM8792

Photo 9–Possible diabase sill with inclusions of white granite near base. One mile northeast of northern corner of Hagey and Conacher Townships.

STRUCTURAL GEOLOGY

FOLDS

The rocks south of the Postans Fault occupy the northern limb of a large isoclinal anticline whose hinge zone lies south of the map-area. The axial plane of the fold probably strikes about N70W to N80W, and dips vertically. Top determinations from pillowed lavas and graded bedding in the metavolcanics consistently indicate that the top of the section lies to the north.

Hodgkinson (1968, p. 19) found tops in the northern part of the metavolcanic rocks of the Kashabowie map-area face south. He consistently found south-facing tops in graded beds of the Kashabowie Group metasediments. In the present study, no top determinations were gathered from the Kashabowie Group, but excellent top determinations from pillowed lavas north of Lower Shebandowan Lake consistently indicate that the top of the metavolcanic sequence in this area faces north.

FAULTS

Two major faults have been recognized in the map-area: the Postans Fault, and the Crayfish Creek Fault. The Postans Fault forms the northern boundary of the metavolcanics. It has low topographic relief, and is almost entirely covered by swamp or overburden. This fault separates areas of differing lithology and structural trend, i.e. the northern granite area and the Kashabowie Group, with their northeasterly trend in foliation, is separated from the intermediate to mafic volcanic rocks that trend east-southeasterly. Aeromagnetic maps of the area (ODM 1953a, b) reflect the differences in structural trends north and south of the fault. The fault is not obvious in the field. Hodgkinson (1968) mapped the extension of the Postans Fault to the west, in Haines Township.

The Crayfish Creek Fault extends in a southeasterly direction through the southwestern corner of the map-area. It was traced by Hodgkinson in Haines Township, where it offsets the Postans Fault and has a horizontal displacement of about 1½ miles, with the north side moving east (Hodgkinson 1968). In Hagey Township the fault passes just south of the Number 1 Shaft at the Shebandowan Mine, where it is expressed underground by abundant fault gouge, highly sheared rock, and unstable ground. The eastern extension of the fault is covered by the lake, and is thought to extend to the area south of Castor Island.

In the northwestern corner of Hagey Township, Hodgkinson (1968) mapped a fault parallel to Highway 11. No evidence for this fault was found during the field mapping.

SCHISTOSITY

Many of the rocks are massive, with no megascopic penetrative fabric developed other than primary layering. However, some rocks have a well-developed schistosity, notably the Kashabowie Group metasediments and the tuffaceous members of the metavolcanic sequence. The dominant structural trend south of the Postans Fault is east-southeast. Schistosity in the Kashabowie Group has an east-northeasterly trend. Kink-bands, small-scale faulting, and boudinage occur locally within the rocks of the Kashabowie Group.

The Shebandowan Lake Stock appears to have pushed aside the rocks to the north and south during emplacement. Intense shearing and carbonatization is evident in the country rocks near the contact with the quartz diorite stock.

Schistosity in the northern granite consists of a parallel alignment of micaceous minerals.

ECONOMIC GEOLOGY

There are three types of metallic mineral deposits in the Hagey-Conacher area:

1) Massive, brecciated copper-nickel sulphides associated with peridotite.
2) Gold-bearing quartz veins and porphyries associated with the Shebandowan Lake Stock.
3) Bedded quartz-iron oxide iron formation.

Early exploration concentrated on gold and iron. Later work has involved the search for base metal sulphides associated with mafic to ultramafic rocks.

The only Cu-Ni sulphide deposit in the area that is currently being worked is located in the southwest corner of Hagey Township (The International Nickel Company of Canada Limited, Shebandowan Mine). Located north of the Crayfish Creek Fault, the mine is near the contact between the Shebandowan Lake Stock and an intercalated sequence of peridotites and metavolcanics. The orebody consists of a sulphide breccia, in which lithic fragments are cemented together by sulphides. Ore minerals include pyrite, chalcopyrite, pyrrhotite, and pentlandite. It is the only known deposit of this type in the area.

Peripheral to the Shebandowan Lake Stock are quartz-feldspar and feldspar porphyry dikes and extrusive flows. Some of the dikes contain quartz veins that sporadically bear gold, but these are not considered economic at the present time. The veins range from sliver-thin to a few feet wide, and some are over 100 feet long. In places, the quartz stringers intrude areas of previous carbonate alteration. They fill previously existing fractures and shear zones in the porphyries. Accompanying the gold is pyrite $\pm$ chalcopyrite $\pm$ sphalerite.

The iron formations are too thin and discontinuous for consideration as possible iron ore sources in this area. Most beds of iron formation are about 20 feet thick, dip vertically, and may be continuous along strike for as much as 3,000 feet. They are enclosed in the metavolcanics south of Shebandowan Lake. The iron formation is banded with quartz-rich layers alternating with iron oxide (usually magnetite) layers about ⅓ inch thick. The layers are deformed into small similar folds that are not fractured. Presumably folding of the layers occurred when the material was soft and ductile, soon after deposition (See Photo 1).

SUGGESTIONS FOR FUTURE MINERAL EXPLORATION

Within the map area, the most promising type of mineralization is the gold-bearing quartz veins in the porphyries marginal to the Shebandowan Lake Stock. These deposits are close to Highway 11 and the road to the Shebandowan Mine, and their ease of access, combined with a relatively high price for gold might make them profitable ores.

The contact between the metavolcanics and the Kashabowie Group is largely covered by swamp, but the structural situation is favourable for ore deposition, and is worth looking into.

The Cu-Ni mineralization at the Shebandowan Mine is intimately associated with an occurrence of peridotite in the metavolcanic pile. In exploration for similar peridotite-associated mineralization in this area, the mineral chromite, which is found as an accessory mineral in the Shebandowan orebody, may be a useful guide. According to Naldrett and Gasparrini (1970), the state of oxidation of iron in chromite is a direct index to the partial pressure of oxygen that prevailed during separation of an immiscible sulphide melt from an ultramafic silicate magma. If the oxidation ratio Fe_2O_3/Fe_2O_3+FeO of the chromite from other peridotites in this area is similar to the oxidation ratio of chromite from the Shebandowan Mine, similarities in associated sulphide mineralization may also exist.

SUGGESTIONS TO PROSPECTORS

Geophysical methods that have been employed in the search for metals in the Hagey-Conacher area include airborne and ground magnetometer surveys, electromagnetic surveys, and self-potential surveys. Magnetometer and electromagnetic surveys have been used in the search for Cu-Ni sulphides; self-potential methods have been employed in the search for gold mineralization.

An airborne magnetometer survey has been done in the area; the resulting maps were published by the Ontario Department of Mines (1953a, b). All the peridotites and most of the mafic intrusive bodies are discernible on the maps as anomalies. The peridotite anomalies have elongate, oval-shaped outlines, with steep edges and round-topped profiles. Anomalies due to mafic intrusives are similar in magnitude, but they differ from peridotite anomalies in that they are not elongate, and have more flattened 'upper surfaces'. The thin iron formations are not discernible on the aeromagnetic maps. Areas of intense alteration that has chemically released magnetite occur on the maps as irregularly-shaped anomalies (e.g. the highly epidotized metavolcanics near Mathe Lake in Hagey Township).

Ground magnetometer surveys are usually conducted along parallel cut lines a few hundred feet apart. The scale of the resulting map ranges from 1 inch to 100 feet to 1 inch to 400 feet, depending on the spacing of the lines and the instrument stations. Iron formations, and mafic and ultramafic intrusive bodies are indicated by conspicuous anomalies on ground magnetometer surveys. Iron formations tend to be linear in plan with narrow, steep profiles. Peridotite bodies are more elongated and oval in plan, with less steep profiles. Mafic intrusions generally are reflected by broad, less well-defined anomalies.

Electromagnetic surveys are usually conducted as a follow-up on promising ground magnetometer anomalies. An EM survey distinguishes iron formation, a non-conductor, from graphite and sulphide-bearing rocks, which are conductors. Diamond drilling is usually necessary to distinguish a graphite conductor from a sulphide conductor.

Self-potential methods have commonly been employed in the search for gold mineralization. The anomalies resulting from a self-potential survey are typically due either to graphite, or to sulphide-bearing rocks that may contain associated gold mineralization.

Surface prospecting would probably yield few returns in the map-area, because of the large amount of glacial drift and swamp cover, and because of previous thorough prospecting. However, geophysical work and diamond drilling of geophysical anomalies in the following areas might prove fruitful:

a) The area peripheral to the Shebandowan Lake Stock.

b) The silicified, epidotized, and carbonatized area near Mathe Lake.

c) The highly sheared Postans Fault, at the contact between the metavolcanics and the Kashabowie Group metasediments.

d) The felsic metavolcanic sequence north of the western part of the Shebandowan Lake Stock.

COPPER-NICKEL

The major, and only producing deposit of Cu-Ni mineralization in the Hagey-Conacher area is the Shebandowan Mine. The orebody is closely associated with a peridotite lense situated near the contact between the metavolcanic pile and the Shebandowan Lake quartz diorite stock. The Crayfish Creek Fault passes along the southern boundary of the orebody. Pyrrhotite, pentlandite, chalcopyrite, and pyrite are found in a sulphide breccia that contains lithic fragments.

Small amounts of chalcopyrite have been found in dacite about 100 feet north of the eastern end of Mathe Lake, and magnetic anomalies associated with peridotite bodies in the map-area have been drilled, but to date, little has been found to encourage further exploration for Cu-Ni bodies similar to the Shebandowan deposit.

Description of Properties

Abex Mines Limited [1954] (1)

In 1954, Abex Mines Limited held several groups of claims in the Hagey-Conacher area. In Hagey Township they held six claims south of Southwest Bay that are now included in the Canadian Nickel Company Limited's claim group. The area of these claims covered parts of the present claims numbered: TB116461, TB116462, TB115650, TB115653, TB115655, TB115657, and the northern half of TB115651, TB115652, and TB115654. In Conacher Township their holdings consisted of five claims at the central eastern edge of the township, and three claims south of the Shebandowan River, just east of Lower Shebandowan Lake. An electrical self-potential survey was done on the Hagey Township claims, and ground magnetometer surveys on the two claim groups in Conacher Township by Mining Geophysics Corporation in the summer of 1954.

Hagey Township Property

The surface geology of the Hagey Township claim group consists of mafic to intermediate metavolcanics with minor amounts of iron formation, peridotite, and gabbro. The electrical self-potential survey delineated three major anomalies:

a) On the northern part of TB116462, a broad anomaly was outlined and traced for 1,000 feet in an east-west direction.
b) North of Hoestrom Lake, on TB115655, a narrow anomaly, about 800 feet long, coincides with surface exposures of iron formation.
c) On TB115650, TB115652, TB115653, and the northern half of TB115651, anomalously high readings were noted near the peridotite body.

Along the southern boundary of the property, several small anomalies with limited strike lengths probably coincide with discontinuous bands of iron formation. The report submitted for assessment work recommended diamond drilling of the major anomalies to test for the presence of sulphides (Keevil 1954d).

Conacher Township Properties

The surface geology of the claim group on the Conacher-Blackwell township boundary includes metagreywacke, interbedded to a minor extent with cherty sediments. A northwest-trending magnetic high anomaly was attributed to a possible buried basic intrusion (Keevil 1954b). No further work was recommended on the property.

No outcrops occur on the second claim group in Conacher Township. The area overlies the metavolcanic-metasedimentary contact south of the Shebandowan River. A narrow linear magnetic anomaly was found by the ground magnetic survey, but its cause was not determined. Abex Mines also reported an old copper showing a bit north of this property (Keevil 1954c). A minimum amount of electrical work was recommended on this property. This area is now held by the Canadian Nickel Company Limited.

Avenue Syndicate [1960]

In 1960, Avenue Syndicate held 193 claims south of Southwest Bay, extending almost to Greenwater Lake in Haines, Begin, and Lamport Townships. The area covered by the claim group in Hagey Township is now held by the Canadian Nickel Company Limited, and includes part of the property formerly held by Abex Mines Limited.

On those claims in Hagey Township, the surface geology consists of mafic to intermediate metavolcanic flows and pyroclastics with minor amounts of conglomerate, arkose, argillite, iron formation, peridotite, and gabbro. A geological survey and electromagnetic survey were conducted over the entire property (Shepherd 1960a, b). In 1960, Chibougamau Jaculet Mines Limited held an option on the claims and conducted magnetometer and electromagnetic surveys over previously discovered electromagnetic anomalies. The three strongest electromagnetic conductors were tested by diamond drilling. All were found to contain graphitic slate, the apparent cause of the anomalies (Shepherd 1960b).

Canadian Nickel Company Limited (4)

The Canadian Nickel Company Limited, wholly owned subsidiary of The International Nickel Company of Canada Limited, holds claims which cover most of the area south of Lower Shebandowan Lake to the southern boundaries of Hagey and Conacher Townships, and farther south. The property includes the claims formerly held by Abex Mines Limited and the Avenue Syndicate.

Detailed geological mapping and ground magnetometer surveys of the area were carried out by Canadian Nickel Company Limited in 1967 and 1968 (Stewart 1968; Rodney 1969). An electromagnetic survey was conducted in 1967 and 1968 on most of the area south of Lower Shebandowan Lake in Hagey Township (Pritchard 1969). Geophysical and geological work was followed by extensive diamond drilling of geophysical anomalies. A good part of their geophysical and diamond drilling results are filed in the Ontario Ministry of Natural Resources assessment work files, Resident Geologist's office, Thunder Bay, and in the Toronto Assessment Files Research Office.

Dominion Gulf Limited [1954] (5)

Dominion Gulf Limited held 5 unsurveyed claims, north of the central part of Mathe Lake, in 1954. The surface geology consists of mafic to intermediate metavolcanics. A lapilli tuff is overlain to the north by altered basalt and coarse-grained basalt that is highly epidotized in places, and a small body of dacite. The latter two units are overlain by a tuff breccia unit.

In 1954, a ground magnetometer survey found a strong negative anomaly about 200 feet north of the north shore of Mathe Lake (Ratcliffe 1954). An outcrop of felsic metavolcanic rock with a few percent pyrite and chalcopyrite occurs near the anomaly, and may be responsible for part or all of the anomaly. A magnetic high occurs under Mathe Lake that might be indicative of a subjacent peridotite body; or more probably, is a reflection of the intense epidote alteration present in the surrounding rocks.

Freeport Sulphur Company [1945]

The Freeport Sulphur Company held 7 claims in the area south of Castor Island in 1945. The area was geologically mapped at a scale of 1 inch to ¼ mile (Freeport Sulphur Company 1945). This area is now part of The International Nickel Company of Canada Limited claim group.

Freeport Exploration Company, a wholly-owned subsidiary of the Freeport Sulphur Company, took an option on some claims in Conacher Township that now form part of Band-Ore Gold Mines' holdings. After drilling on the property, Freeport dropped the option in 1946.

Geo-Scientific Prospectors Limited [1954] (6)

The Rossmere Bay claim group of Geo-Scientific Prospectors Limited comprised 8 unsurveyed claims north and east of Rossmere Bay in Hagey Township. The claim group straddled the northern contact between the Shebandowan Lake Stock and the intermediate metavolcanics. A northwest-trending positive anomaly was located by magnetometer survey, in which the rise above background is about 2600 gamma units (Keevil 1954a). This anomaly may indicate a mafic intrusion, but it is located in an area of no outcrops.

The International Nickel Company of Canada Limited (8)
Shebandowan Mine

Development

The Shebandowan Mine is located at the southwest end of Lower Shebandowan Lake. The property was acquired in 1937 by The International Nickel Company of Canada Limited. Intermittent drilling was done until 1965, after which time in-

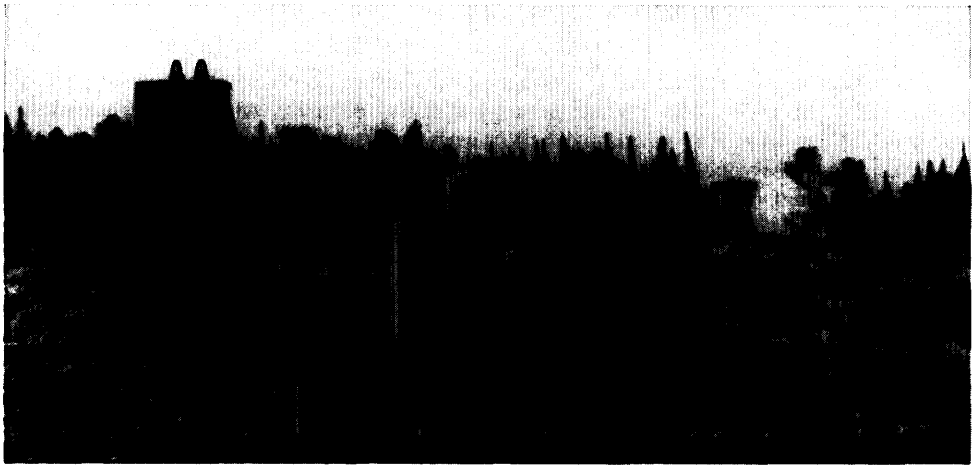

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Photo 10–Shebandowan Mine, Number 2 Shaft. Southwest Bay, Lower Shebandowan Lake.

tensive drilling was carried out. Ground magnetic and electromagnetic surveys were done in the area in 1967 and 1968.

The mine is presently undergoing development, with two shafts; Number 1 Shaft at Discovery Point, and Number 2 Shaft about 1 mile to the east, across Southwest Bay. Number 1 Shaft is 1,132 feet deep, and Number 2 Shaft is 2,400 feet deep (Photo 10). The shafts are connected at the 600-foot, 800-foot, and 1,000-foot levels.

The mill is about 3,000 feet directly south of Number 2 Shaft. All ore is to be moved from ore bins on the 400-foot level of the mine to the mill along an underground conveyor that is 3,300 feet long. The mill has one standard- and one short-head crusher, one 13½- by 22-foot ball mill, and 72 flotation cells. There are three ore bins in the mill: a 1,300-ton coarse (minus 8-inch) ore bin, a 1,300-ton fine (minus 1½-inch) ore bin, and a 1,800-ton fine (minus ⅜-inch) ore bin. The mill has a design capacity to treat 2,500 tons of ore per day, to produce a Ni-Cu concentrate. A 280-acre tailings pond was created to hold the mill wastes. The Ni-Cu concentrate will be shipped by rail to Copper Cliff for further processing (The International Nickel Company of Canada Limited 1971).

Surface Geology

The orebody at the Shebandowan Mine is associated with serpentinized peridotite near the contact between mafic metavolcanics and the Shebandowan Lake Stock. The orebody has an east-west trend, and is vertical.

A coarse-grained basalt underlies Discovery Point where Number 1 Shaft is located. The basalt is highly epidotized and sheared in places. It is intruded by granodiorite veins. One granodiorite vertical sill is 15 feet wide, and contains veins of epidote. This sill strikes N75W, parallel to local schistosity. Left-handed faults of small displacement are evident in outcrops, and displace both the granodiorite and epidote veins.

Coarse-grained clastic rocks occur south of Discovery Bay. Elongate, lenticular, pinkish-red clasts, up to 6 inches long, occur in a green chloritic matrix. These clasts are similar to the pink porphyritic hornblende trachyte clasts in the oligomictic conglomerate to the east. This unit is interpreted as a facies of the eastern conglomerate. The clastic unit is also exposed near the Number 2 Shaft, on the power line. Here the red clasts are up to 2 feet long, and have a length-width ratio of about 8:1. All the clasts are of a uniform felsic to intermediate composition. A volcanic tuff-breccia, with porphyritic intermediate volcanic clasts, occurs south of the trachyte conglomerate.

Near the west extremity of the road to Number 1 Shaft, an altered coarse-grained andesite occurs that is similar to the coarse-grained andesite north of Hoestrom Lake. North of the southwest arm of Southwest Bay, on the power line, a thin feldspar porphyry flow is exposed. The porphyry weathers white, and the surface is studded with medium-grained feldspar phenocrysts (80 percent). It is pale green on fresh surfaces. South of this unit, highly sheared dacite rocks outcrop that are pale yellow-green on the weathered surface. Porphyritic andesite, with coarse-grained white feldspar phenocrysts, outcrops along the north shore of the southwest arm of Southwest Bay.

Two islands occur in Southwest Bay, between Number 1 and Number 2 shafts. Serpentinized peridotite, with a 10-foot wide quartz-feldspar porphyry dike is exposed on the northern island. The dike strikes east-west, and near the contacts, a sheared aphanitic phase occurs. The dike is highly carbonatized, whereas the peridotite is not carbonatized. Minor amounts of disseminated pyrite occur in the porphyry. Pillowed andesite, which gives northerly top indications, forms the southern island.

Surface geology near Number 2 Shaft consists of serpentinized peridotite, basalt, and quartz diorite. The peridotite has a shiny black surface with yellow streaks of serpentine. The peridotite is highly sheared, and abundant slickensides occur in it. The basalt is dark green to black in colour and is highly altered.

Quartz diorite appears to intrude the peridotite and basalt. Everywhere on the shaft site, the quartz diorite is carbonatized and extensively altered. The contact between quartz diorite and peridotite or basalt is irregular in outline. At one locality, on the contact between quartz diorite and peridotite, a porphyritic granitic rock occurs. This granitic poryhyry has an aphanitic groundmass and a laminar structure that might be due to igneous flow. This is interpreted to be a chilled phase of the quartz diorite. At another locality on the site of Number 2 Shaft, altered quartz diorite is in contact with hornblendite. The hornblendite is probably derived from contact-metamorphosed peridotite or basalt. Dikes of feldspar porphyry, which are interpreted as phases of the quartz diorite, intrude the peridotite and basalt.

Underground Geology[1]

The orebody on the 600-foot level is a sulphide breccia, with inclusions of peridotite, volcanic rocks, and feldspar porphyry, in a sulphide matrix. The lithic inclusions range in size from less than one inch to several feet. The major sulphide

[1]Information about the underground geology was obtained from a tour on part of the 600-foot level near Number 1 Shaft.

minerals are pyrrhotite, pentlandite, chalcopyrite, and pyrite. Polydymite, platinum, paladium, bravoite, violarite, and millerite are present in minor amounts (Watson 1928; Tanton 1923).

The ore appears massive in areas where the lithic inclusions are small and a few in number, and stringer-like in areas where the inclusions are large and numerous. In places, the ore is banded, with streaky layers of pentlandite, and pentlandite "eyes" or augen; both of which may be due to shearing or primary flow. The sulphides are evenly distributed throughout the orebody. The orebody is continuous along strike, but it varies in thickness. No visible disseminated sulphides occur in the peridotite.

The Shebandowan orebody is located between a zone of mafic metavolcanics to the north, and a zone of intercalated peridotite and mafic metavolcanics to the south. Feldspar porphyry dikes are found in the wall-rocks to the north and south of the orebody (Figure 2). The northern metavolcanic zone is about 500 feet thick, and is in contact with the Shebandowan Lake Stock at its northern edge. Some of the mafic metavolcanics have been altered to hornblendite, especially where they are in contact with sulphide mineralization.

The southern zone consists of 50-foot thick units of peridotite, intercalated with mafic metavolcanics. Approaching the Crayfish Creek Fault, this sequence becomes increasingly sheared, with abundant fault gouge; here the ground is not stable enough to permit underground workings. The peridotite is completely serpentinized, and is not visibly mineralized. The entire mine sequence is shot through with white carbonate-quartz. veins.

Origin of the Orebody

The origin of the Shebandowan orebody is necessarily speculative, due to the lack of exposed outcrop and the lack of available underground mine and drilling data. Close association of the Cu-Ni mineralization and the peridotite lens is taken by the author as evidence that the orebody is magmatic in origin. Significant facts, with which any interpretation of the origin of the orebody should be consistent, include the following.

a) The orebody is spatially associated with a peridotite lens, a major fault zone, and the contact between the Shebandowan Lake Stock and neighbouring metavolcanic rocks.
b) Part of the orebody is a breccia with fragments of peridotite, metavolcanics, and quartz diorite in a sulphide matrix (Photo 11).
c) The orebody is separated from the Shebandowan Lake Stock by a zone of altered metavolcanics that probably have undergone contact metamorphism.
d) The mineralogy of the ore consists of pyrrhotite, pentlandite, chalcopyrite, pyrite, and magnetite; with minor millerite, bravoite, violarite, and polydymite.
e) One of the textures observed in the ore is nodular pyrite phenocrysts, partly surrounded by chalcopyrite in a foliated matrix of pyrrhotite-pendlandite (Photo 12).

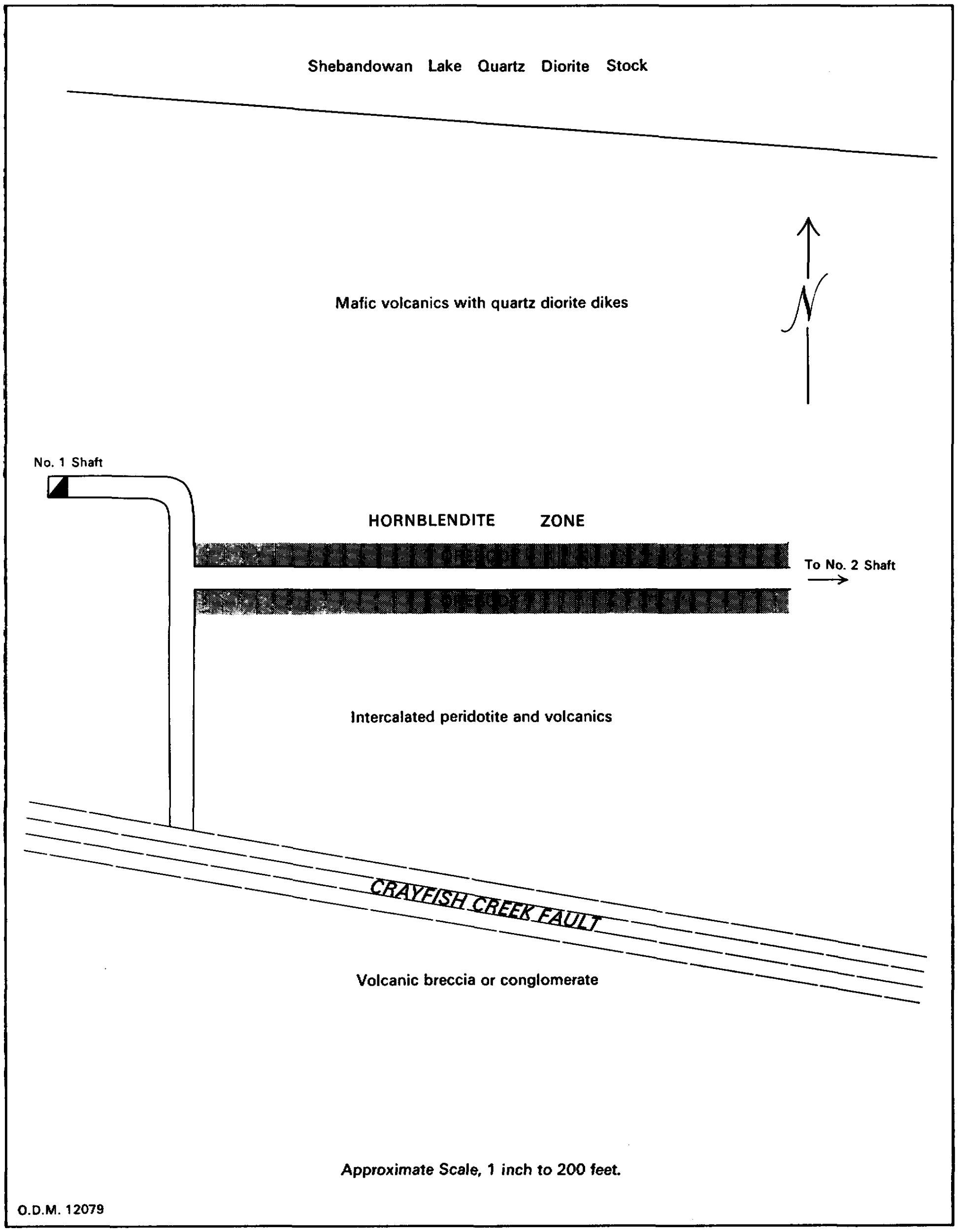

Figure 2–Sketch map of underground geology, 600-foot level, Shebandowan Mine.

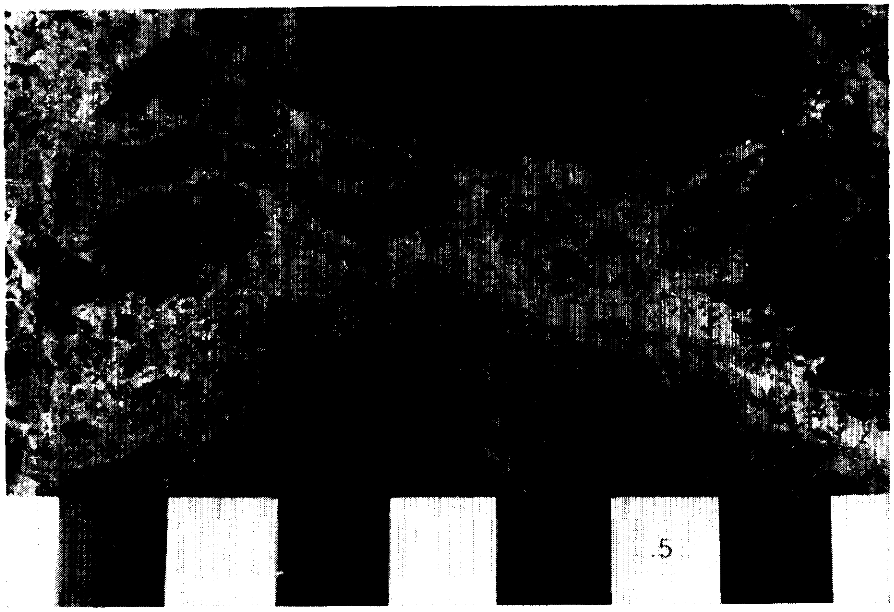

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Photo 11–Typical breccia ore, Shebandowan Mine. Brecciated serpentinized peridotite with irregular stringers of pyrrhotite-pentlandite-chalcopyrite.

f) One of the structures observed in the ore consists of a foliated matrix of pyrrhotite and pentlandite, in which streaky, discontinuous layers of pentlandite and of pyrite and chalcopyrite are included (Photo 13).
g) The high-temperature oxide, chromite, occurs in pods with euhedral cumulate textures.
h) Sulphur (S^{34}) isotope values from peridotite associated with the orebody have a value of −0.34 (Watkinson and Irvine 1964).
i) The massive sulphides consist of 9 percent Ni and 6 percent Cu, and have a Ni/Cu ratio of 2:1.
j) Peridotite at the Number 2 Shaft site contains about 0.35 percent Ni (Watkinson and Irvine 1964).

The above facts are consistent with the following interpretation of the origin of the orebody. The peridotite was either intruded into the volcanic pile, or extruded as a flow. Upon intrusion, or extrusion, the peridotite probably consisted of a mush of crystals, with minor amounts of pyroxenitic silicate magma that acted as a lubricant. Accompanying the peridotite was a sulphide melt, rich in Ni and Cu. Cooling of the sulphide melt *in situ* produced a pyrrhotite-monosulphide mix as a solid phase, and a co-existing sulphide-rich melt that crystallized as pyrite nodules with chalcopyrite partial rims (Naldrett and Gasparrini 1970). Fragments of peridotite and volcanic rocks were incorporated into the primary sulphide melt.

The next major event was intrusion of the Shebandowan Lake Stock. Heat from the stock metamorphosed adjacent volcanic rocks to hornblendites. Feldspar porphyry dikes associated with the stock intruded the peridotite and metavolcanics. The stock heated the orebody enough to remobilize the sulphides, and move them into the nearby feldspar porphyry dikes, peridotite, and metavolcanics. Heat and

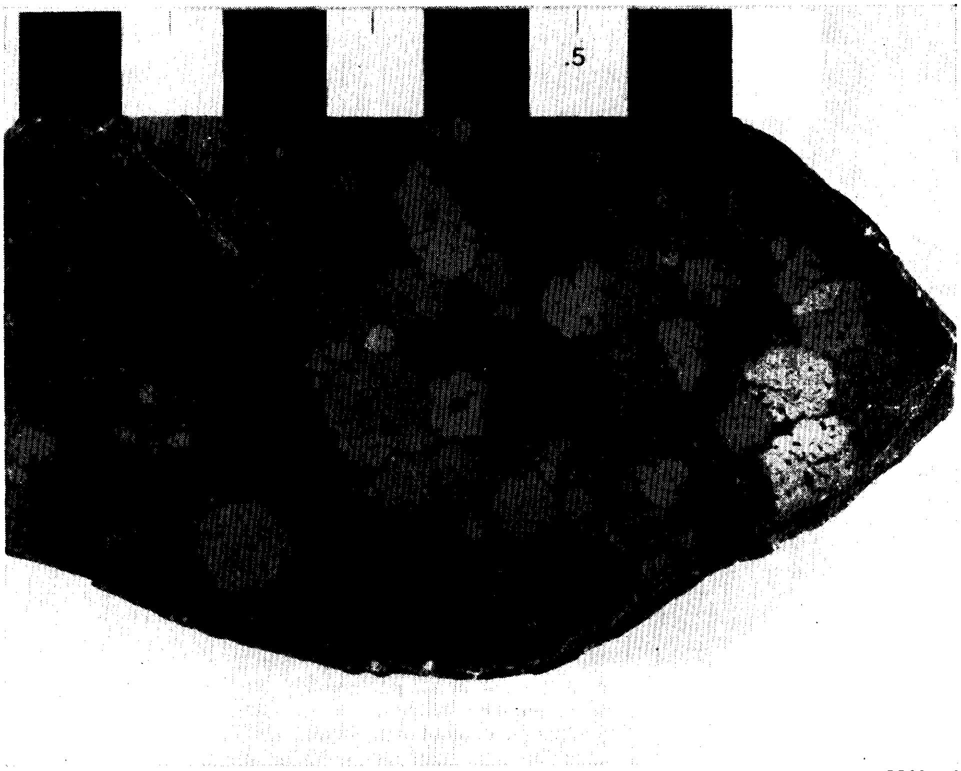

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Photo 12–Massive ore, Shebandowan Mine. Pyrrhotite-pentlandite matrix with nodular phenocrysts of pyrite partly surrounded by chalcopyrite. Fragmented inclusion of serpentinized peridotite visible in bottom centre of photo.

pressure from the stock resulted in recrystallization and the formation of foliation and breccia structure observed in parts of the orebody. Faulting along the Crayfish Creek Fault was the last major event in the mine area. The fault appears to be completely unrelated to the mineralization.

Mandarin Mines Limited (10)

Mandarin Mines Limited holds 9 surveyed claims south of Lower Shebandowan Lake, on the Hagey-Conacher township boundary. Their property includes part of the area formerly held by Ourgold Mining Company Limited, and drilled by Trans-Canada Explorations Limited. A small gold showing is located near the east end of the shear zone in Conacher Township, on claim TB25746 (old claim TB13696). This showing does not appear on the map. Geological and geophysical surveys of the property were carried out in 1969 (Kidd 1969).

The contact between the Shebandowan Lake Stock and the metasediments to the south passes through the claim group. Magnetometer surveys of the property indicate there are no peridotite bodies present in the metasedimentary-metavolcanic sequence south of the quartz diorite stock on the Mandarin property. Electromagnetic anomalies cut across geological units, and are attributed to shearing in the rocks (Kidd 1969).

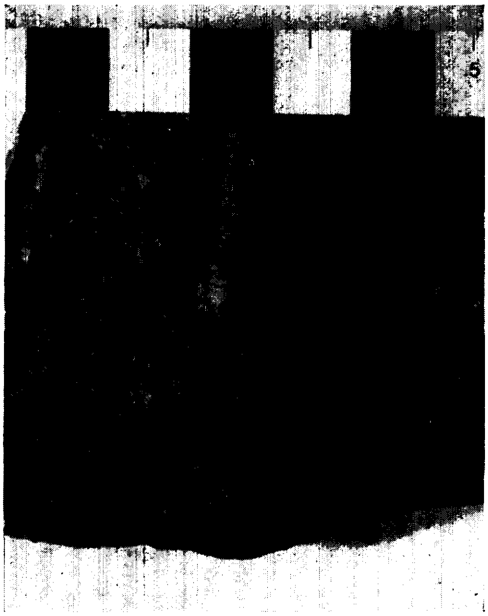

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Photo 13–Massive ore, Shebandowan Mine. Foliated pyrrhotite-pentlandite ore, with parallel stringers of pyrite-chalcopyrite, pentlandite-pyrite-chalcopyrite, and pentlandite 'eyes' or augen.

Trans-Canada Explorations Limited [1956]

In 1956, Trans-Canada Explorations Limited conducted an extensive diamond drilling program south of Lower Shebandowan Lake on the Hagey-Conacher township boundary, property now held by Mandarin Mines Limited and the Canadian Nickel Company Limited. The surface geology consists of the Shebandowan Lake Stock, in contact with metasediments and metavolcanics. Mafic to ultramafic sills occur within the metavolcanics (Benner 1956).

Most of Trans-Canada's drilling was concerned with delimiting the east-west-trending peridotite body about 1 mile southeast of Cranberry Island. One analysis of the peridotite contained Cu values from a trace to 0.01 percent, and Ni values 0.12 to 0.23 percent (drilling reports, on file with the Resident Geologist, Ontario Ministry of Natural Resources, Thunder Bay). Ten holes were drilled, totalling 3,897 feet.

GOLD

In the Hagey-Conacher area, gold occurs in narrow quartz veins and stringers The gold is generally accompanied by sulphide minerals; pyrite ± chalcopyrite ± sphalerite ± pyrrhotite. Gold mineralization is closely associated with quartz-feldspar or feldspar porphyry dikes that intrude the mafic and intermediate metavolcanics around the periphery of the Shebandowan Lake Stock.

The quartz veins and stringers vary in width from 1/10 inch to 24 inches. The largest of these has been traced more than 100 feet along strike. The gold-bearing quartz veins are commonly found filling fractures and shear zones in the porphyries and nearby metavolcanics. Sulphide distribution on the veins is erratic.

Gold mineralization, accompanied by pyrite and minor amounts of chalcopyrite, has also been reported from an area of porphyry affected by a dense, fine-grained carbonate alteration (West 1952).

Description of Properties

HAGEY TOWNSHIP

John Anderson (2)

John Anderson holds two properties in the map-area: one just north of Pistol Lake in Hagey Township, and the other southwest of Swamp Bay in Conacher Township. The property north of Pistol Lake is an unsurveyed claim, filed in 1970, immediately north of claim TB36785 on Map 2267 (back pocket). The surface geology consists of andesite and pillowed andesite.

Two diamond drill holes were drilled, totalling 812 feet. In one drill hole, 560 feet southwest of the northeast corner of the claim, a 65-foot interval of minor disseminated pyrite was encountered, A granitic rock, encountered from a depth of 320 feet to the bottom of the hole, can probably be correlated with the quartz-feldspar porphyry that occurs just east of the small unnamed lake north of Pistol Lake (drilling report, Assessment Files Research Office, Ontario Division of Mines, Toronto). During field mapping, minor disseminated pyrite was observed on the surface in amygdaloidal andesite, about 800 feet west of the drill hole collar.

W.A. Gray [1950] (7)

The W. A. Gray property is claim TB40058, located in the northwestern corner of Hagey Township, near the abandoned station house on the Canadian National Railway, at the intersection with the road to Upper Sabrina Lake. The geology of the area consists of intermediate metavolcanics, mainly andesite. Four diamond drill holes were collared about 400 feet northwest of the centre of the claim. Total length of the drill holes was 400 feet. Drilling encountered a 3-foot thick porphyry dike in the metavolcanics (drilling report, Assessment Files Research Office, Ontario Division of Mines, Toronto).

Lobanor Gold Mines Limited [1945] (9)

Lobanor Gold Mines Limited formerly held a property north of Lower Shebandowan Lake, on the Hagey-Conacher township boundary. Their property consisted of

Table 2 | DRILLING RESULTS, LOBANOR GOLD MINES LIMITED (9) LOWER SHEBANDOWAN LAKE AREA

HOLE	INTERSECTION (FEET)	MAXIMUM GRADE (OUNCES/TON)	INTERSECTION (FEET)	AVERAGE GRADE (OUNCES/TON)
2	0.9	0.43	13.9	0.10
6	0.3	1.27	3.4	0.148
7			1.1	0.08

Adapted from Lobanor Gold Mines Limited, 1945.

16 unsurveyed claims in the area between Highway 11 and the first power line to the north. The entire property is covered by 20 to 75 feet of overburden. Diamond drilling revealed that the northern part of the claim group is underlain by metavolcanics, whereas the southern part is underlain by a granitic feldspar porphyry that may be a northern extension of the main Shebandowan Lake Stock. Diamond drilling on the township boundary covered 1,100 feet across the metavolcanic-feldspar porphyry contact.

Lenticular shear zones in the porphyry are silicified and mineralized, with some pyrite, minor chalcopyrite, and very minor gold (Lobanor Gold Mines Limited 1945). Three of the drill hole intersections may represent a shear zone which has a minimum length of 200 feet. Drilling 200 feet east of this shear zone did not locate the zone. Lobanor suspended drilling in July 1945, by which time the company had completed 14 diamond drill holes, totalling about 12,000 feet. Lobanor Gold Mines Limited was dissolved in 1965.

J. F. West (12)

The West property is in the centre of Hagey Township, north and south of Highway 11. It consists of the following patented claims: TB36719, TB36778, TB36784-TB36787, TB36789-TB36791, TB36788, TB36793-TB36794.

The economic geology was reported by J. F. West in a geophysical report filed for assessment work with the Resident Geologist, Ontario Ministry of Natural Resources Thunder Bay, in 1952 (West 1952). Excerpts from this report read as follows:

> Previous work, starting in 1947 when the claims were staked, consists of stripping and trenching, a geological survey and report on 7 claims, and 7 diamond drill holes ranging from 100 to 141 feet in depth. The rocks exposed on the property are chiefly volcanics of basic to intermediate composition and a porphyry with various facies which range in composition from a quartz diorite porphyry to a rhyolite porphyry. The main porphyry body which lies at about the centre of the claim group has been exposed for a length of 3,000 feet in an easterly direction and varies in width from 300 to 800 feet. Knifeblade stringers of quartz and finely disseminated pyrite are widespread in the porphyry. Locally, stringers and veins of quartz from 1 to 24 inches wide occur and where pyrite cubes or coarse chalcopyrite are present, gold also is found. The most extensive such vein found was traced for 140 feet on the strike and varied from a few inches to 24 inches in width. Sulphide distribution is erratic in these veins and

stringers. A selected sample contained as much as 40% pyrite, and this sample assayed 3.65 ounces of gold per ton, but zones averaging as much as 5% of sulphides have been traced for lengths of only about 10 feet.

A second type of mineralization consists of dense, fine grained carbonate traversed by quartz stringers from 1/10 to 1/2 inch wide and impregnated with pyrite and minor chalcopyrite. In this type of material so far exposed the sulphides constitute about 1 to 4 percent of the rock, and gold assays vary from 0.01 to 0.11 ounces per ton. In claim T.B. 36719 the carbonates outcrop continuously between drill holes A-1 and A-2 for a strike length of 100 feet. In drill hole A-1, between depths of 5 feet 9 inches and 25 feet, four samples were taken which assayed from 0.015 to 0.05 ounces of gold per ton [Table 3, this report]. Such mineralization is interesting in that it shows small amounts of gold distributed over a width of 19 feet and suggests the possibility of similar bodies with higher contents of both sulphides and gold [Figure 3, this report].

The carbonate alteration mentioned in West's report is present mainly in the porphyry, and is present only to a minor extent in the lamprophyre dike. A spontaneous polarization survey was conducted on the property in 1950. Ten anomalies were indicated, and are shown in Figure 4. The anomalies were interpreted and evaluated by West in his geophysical report on the property (West 1952, p. 7). He summarized his geophysical results as follows:

The geophysical survey has indicated 10 areas of interesting mineralization, none of which were previously known to exist. These areas have been designated as anomalies and numbered on the plan map. The first eight anomalies have been classified into three types, according to the electrical data and their inferred relationships to geologic structure and mineral distribution.

Anomalies of type one are in broad zones within which the electric potential increases more or less gradually from nothing at the periphery to a maximum of something between —50 Mv. [millivolts] and —166 Mv. at one or more centers of concentration. These zones have irregular shapes, their widths being great in comparison with their strike lengths. Most self-potential profiles across these zones have several peaks suggesting the presence of several local concentrations of sulphides within widths of several hundred feet to a thousand feet. Anomalies 1, 4, and 5 are of this type [Figure 4, this report]. The maximum sulphide content of the material responsible for these anomalies is expected to be within the range of 4% to 20%. The structures suggested by the shapes of the anomalies are fracture zones with the possibility of replacements.

The geophysical profiles do not indicate any narrow continuous zone of high potentials such as might be expected from a mineralized fault or shear zone. However this is a broad zone of higher than average potential which is continuous from Profile 25 23 at the west end of anomaly 4 to Profile 45 25, beyond the east end of anomaly 5e [these profiles do not appear in this report]. This zone, about 2,000 feet long by 1,000 feet wide, contains 9 local areas where the potential exceeds —50 Mv.

Anomalies of type 2 are in narrow zones in which the potential rises very abruptly to a maximum of —150 Mv. or more. Anomalies 2, 7, and 8 [Figure 4, this report] are of this type. Anomaly 2 has a maximum potential of —229 Mv. and occurs in a narrow zone of higher than average potential which appears to be continuous for 1,500 feet or more. Pyrite, pyrrhotite, and chalcopyrite occur in outcrops within Anomaly 2 and the maximum potential suggests that material containing at least 20% sulphides may be present.

Anomaly 3 [Figure 4, this report] covers a zone in which the potential rises rapidly from zero to slightly in excess of —50 Mv. This zone is noteworthy for two reasons. First, the profiles across Anomaly 3 are very similar to, but of higher potential than, Profile 37 in the vicinity of drill holes A-1 and A-2 where quartz-pyrite stringers carrying gold occur. Second, the Anomaly 3 is located in the greenstone about 150 feet away from and parallel to the porphyry contact where

Table 3 | DIAMOND DRILLING RESULTS, J. F. WEST PROPERTY (12)*
LOWER SHEBANDOWAN LAKE AREA

HOLE	GRADE (OUNCES/TON AU)	INTERSECTION (INCHES)
A-1	0.005	14
	0.05	27
	0.025	28
	0.02	12
	0.015	34
	0.01	24
	0.025	24
	Trace	14
A-2	0.01	24
	Trace	18
	Nil	27
C-1**	0.045	13
D-1	Trace	23
	Nil	4
	0.10	12
	0.32	6
1	0.78	17
	0.06	5
	Trace	8
	0.13	31
	0.02	24
2	0.04	8
	0.01	25
	0.02	27
4a	1.02	19
5	0.20	20
13	0.24	10
	0.26	20
16	1.28	6

* Adapted from West, 1953.
** Note that Hole C-1 is about 400 feet west of Hole D-1, and does not appear on Figure 3.

gold-bearing quartz-pyrite stringers also occur. The potential suggests a sulphide content of 3 to 5% which is in the range that might be expected for pyritic gold-quartz ore. The strike length of the −50 Mv. contours is about 700 feet.

From 1949 to 1952, 25 diamond drill holes, totalling 2,765 feet, were collared on the West property.

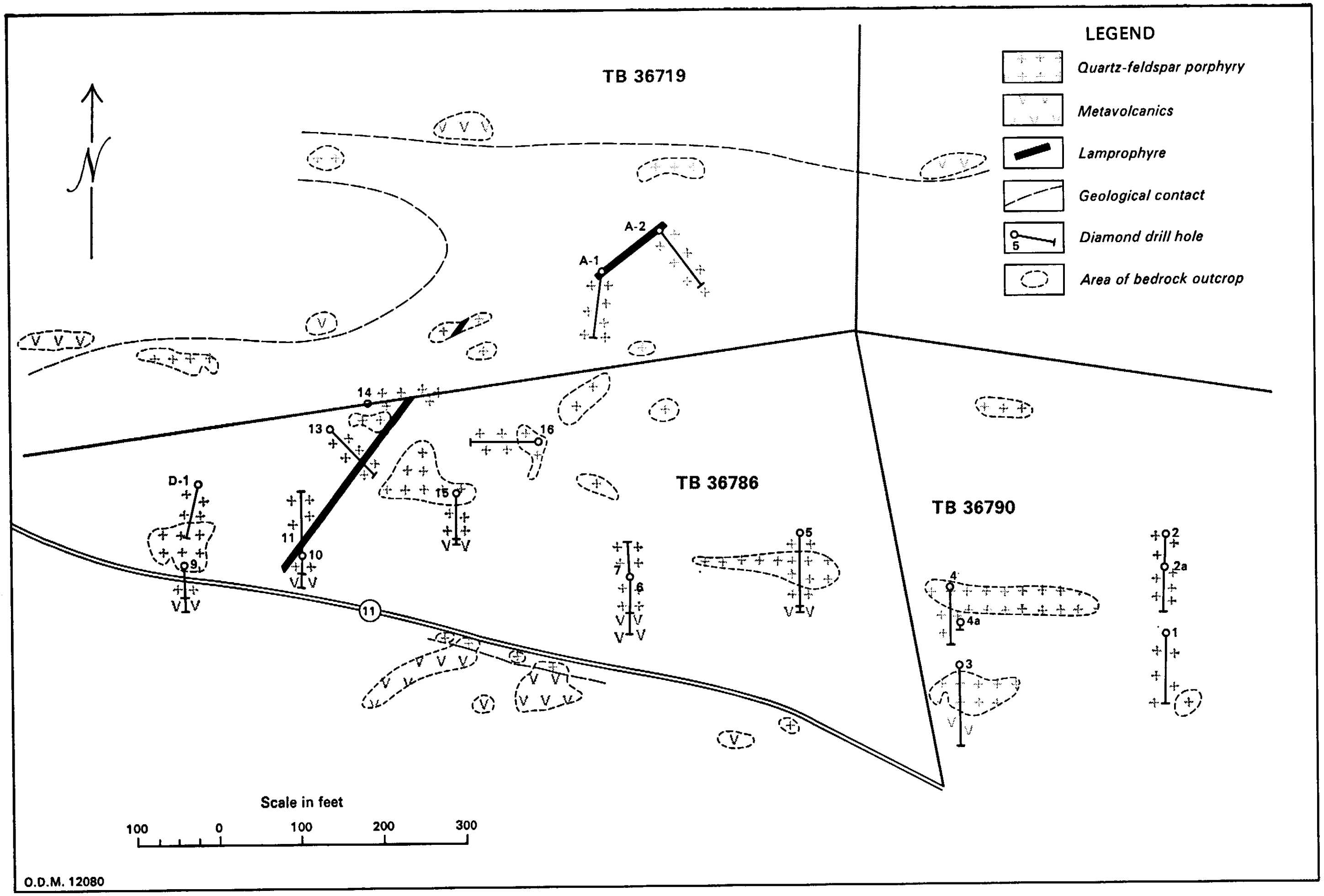

Figure 3–Map showing location of diamond drill holes, J. F. West property, Hagey Township.

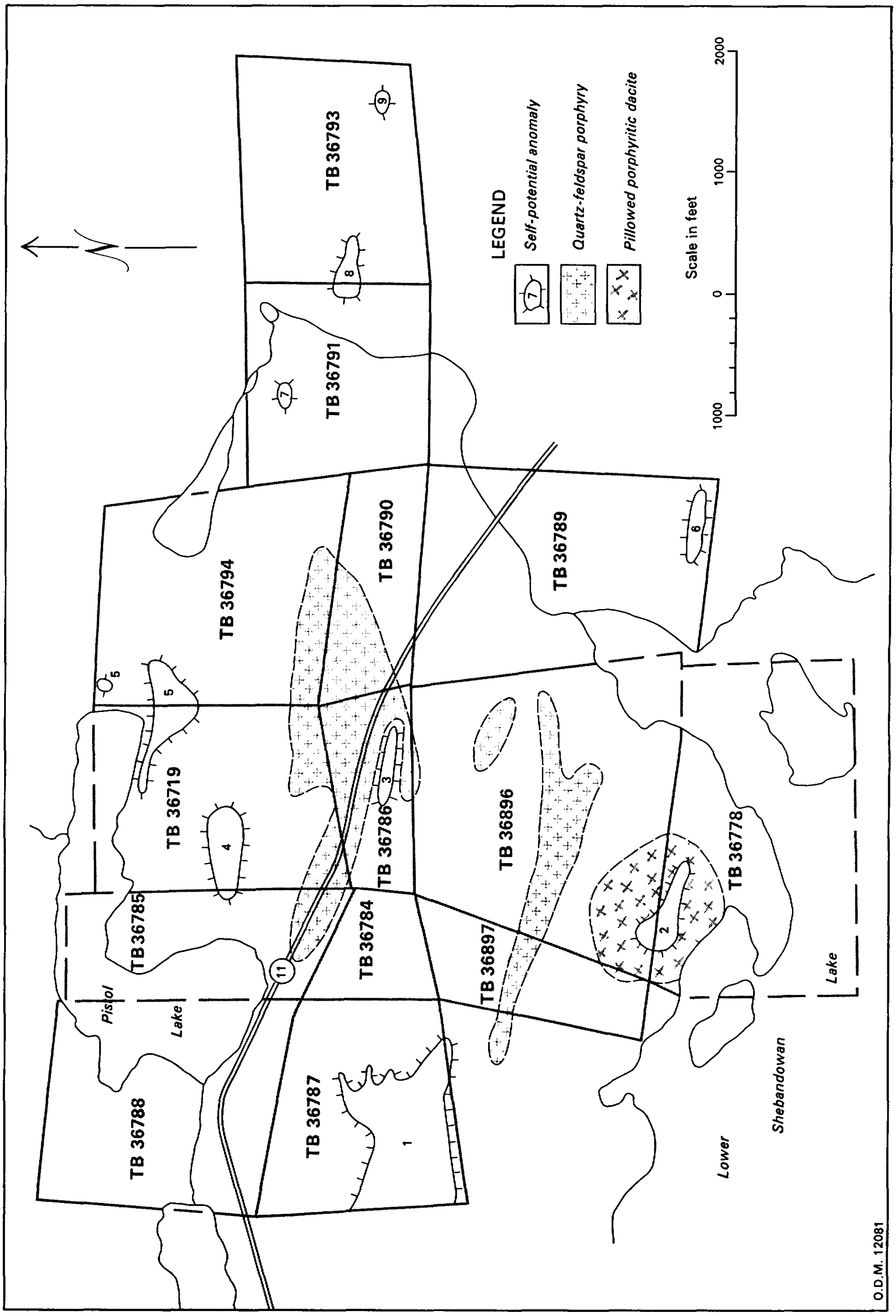

Figure 4–Map of J. F. West property, showing surface geology and spontaneous polarization anomalies.

John Anderson (2)

The John Anderson property in Conacher Township consists of one unsurveyed claim located on the north shore of Lower Shebandowan Lake, just west of Swamp Bay. The claim was filed in 1966. Surface geology consists of intensely sheared rock that has a composition consistent with either highly sheared quartz diorite or intermediate metavolcanics. Shearing is probably related to intrusion of the nearby Shebandowan Lake Stock. Three diamond drill holes, with footages of 237, 218, and 105 feet have been drilled. Unspecified mineralization over core lengths of 20 feet and 1 foot was encountered in a south-trending drill hole offshore, near cottage lot PP127 (drilling report, Ontario Ministry of Natural Resources, Resident Geologist's files, Thunder Bay).

Band-Ore Gold Mines Limited [1951] (3)

One property in Conacher Township has been directly associated with three companies. The property straddles the Swamp River, near Highway 11. Auband Gold Mines Limited held part of the property until the spring of 1945, when it was optioned to Freeport Exploration Company, a wholly-owned subsidiary of Freeport Sulphur Company. Freeport Exploration drilled the property, and dropped the option in 1946. Band-Ore Gold Mines Limited acquired the property from Auband in 1946, and Auband Gold Mines Limited was dissolved the same year. Band-Ore last worked on the property in 1951, and still holds 16 patented claims (TB28019, TB28089-TB28092, TB26953-TB26954, TB21966, TB22147, TB17221, TB26533-TB26535, TB26539, TB26547, TB27924).[1]

In 1944, Auband Gold Mines collared 17 diamond drill holes in the southern part of TB28019, northwest of Swamp Bay. The south-trending holes, all of which were inclined at 45 degrees, intersected gold-bearing shear zones in feldspar porphyry. In one hole, a shear zone contained quartz stringers with pyrite, chalcopyrite, a little sphalerite, and traces of gold. One core sample assayed 0.3 ounces Au per ton over a 3.5-foot interval, but a subsequent check assay yielded 0.18 ounces Au per ton. The intersected shear zones vary in width from 2.5 feet to 3.0 feet, with an average assay of 0.10 ounces Au per ton. The total diamond drilling footage reported for assessment work credit was 9,863 feet (Auband Gold Mines 1945).

Freeport Exploration Company collared 6 diamond drill holes in 1945-1946. The drilling results indicated that the shear zones are probably narrow, and contain little gold (Auband Gold Mines Limited 1945). Assay results from 4 drill holes appear in Table 4.

[1]According to the Northern Miner, August 3, 1972, Band-Ore plans to re-activate this property. The east section, extending to the Conacher township boundary, was dropped some years ago, and has recently been re-staked. Recent geophysical results have been encouraging, and re-sampling of old trenches, for gold and silver, is underway.

Table 4 DRILLING RESULTS, FREEPORT EXPLORATION COMPANY LOWER SHEBANDOWAN LAKE AREA

HOLE	GRADE (OUNCES/TON AU)	INTERSECTION (FEET)
1	0.18	3.8
2	0.24	3.4
3	0.06	1.0
4	0.23	4.7

Auband Gold Mines Limited, 1945

The surface geology consists of intermediate metavolcanics (mostly pyroclastics) and gabbro. Shearing is present in all rock types, but is especially well-developed in the feldspar porphyry[1]. Shear zones in the porphyry are silicified, and contain small quartz stringers with pyrite, chalcopyrite, minor sphalerite, and traces of gold. The gold appears to be associated with chalcopyrite.

Lobanor Gold Mines Limited [1945] (9)

See description of property under properties in Hagey Township.

Ourgold Mining Company Limited [1961] (11)

The Ourgold property lies north of Lower Shebandowan Lake, just east of the boundary between Hagey and Conacher Townships. The property formerly consisted of 10 claims. At the time of writing, Ourgold holds one patented claim, TB10962.

The surface geology on the former Ourgold claim group consists of intermediate metavolcanics. Few outcrops are exposed in the area. Eight trenches were dug in 1939 and 1961. Lenticular quartz veins were found in a shear zone in volcanic agglomerate. Pyrite and pyrrhotite accompany the quartz. The sheared agglomerate is reported to strike east-west (Oja 1962). In one trench, a thin (12-16 inch) porphyry dike intrudes the agglomerate. The proximity of the quartz veins and mineralization to the Shebandowan Lake Stock suggests that they are probably related to the stock.

Ourgold Mining Company formerly held 25 unsurveyed claims south of Lower Shebandowan Lake, near the Hagey-Conacher township boundary. This property is now divided between Mandarin Mines Limited and The International Nickel Company of Canada Limited. The surface geology consists of mafic to intermediate metavolcanics and metasediments. Ourgold Mining Company dug 29 trenches, and found quartz veins filling fault planes and tension fractures. Minor gold was reported (Oja 1962).

[1]Feldspar porphyry was not found to outcrop at surface.

IRON

Early prospectors in the area searched for iron as well as other metals. Iron formation uniits occur within the metavolcanic sequence south of Lower Shebandowan Lake. They are locally conformable, commonly about 20 feet thick, with a vertical dip. On ground magnetometer surveys, they are reflected by strong, narrow, linear anomalies, up to 3,000 feet in length along strike. Magnetic anomalies caused by iron formation tend to be narrower than anomalies caused by peridotite bodies. The discontinuous nature of the iron formations along strike makes them poor marker horizons. It is not possible to locate areas of iron formation from the aeromagnetic maps, except in cases where the maps are at scales larger than 1 inch to 1,000 feet.

The internal structure of the iron formation consists of alternating layers of iron oxide and quartzose material, each about ⅛ inch thick. The iron oxide is commonly magnetite, and the quartz-rich material is generally jasper. Small similar folds are commonly observed. The passive flow nature of the folding suggests that deformation occurred when the material was soft and ductile; presumably within the original basin of deposition.

The thin and discontinuous nature of the iron formation units makes them poor prospects for iron ore. More promising sources of iron ore lie in the area south of Hagey and Conacher Townships.

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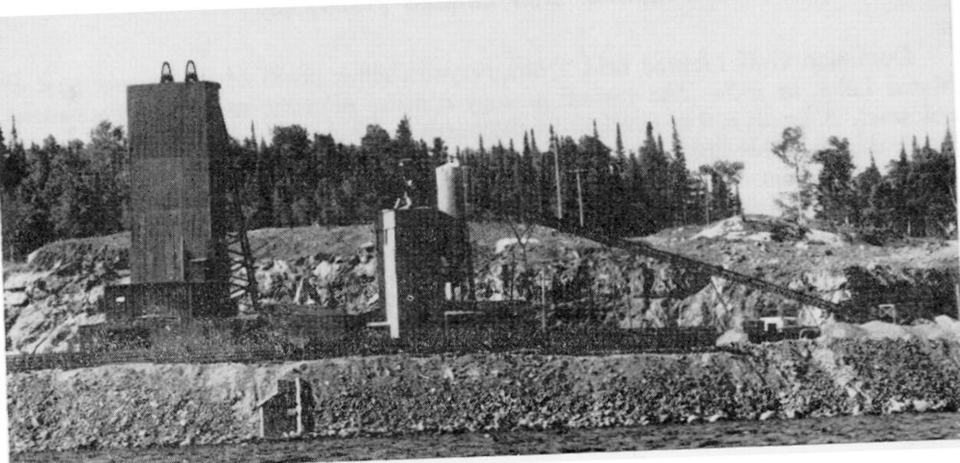

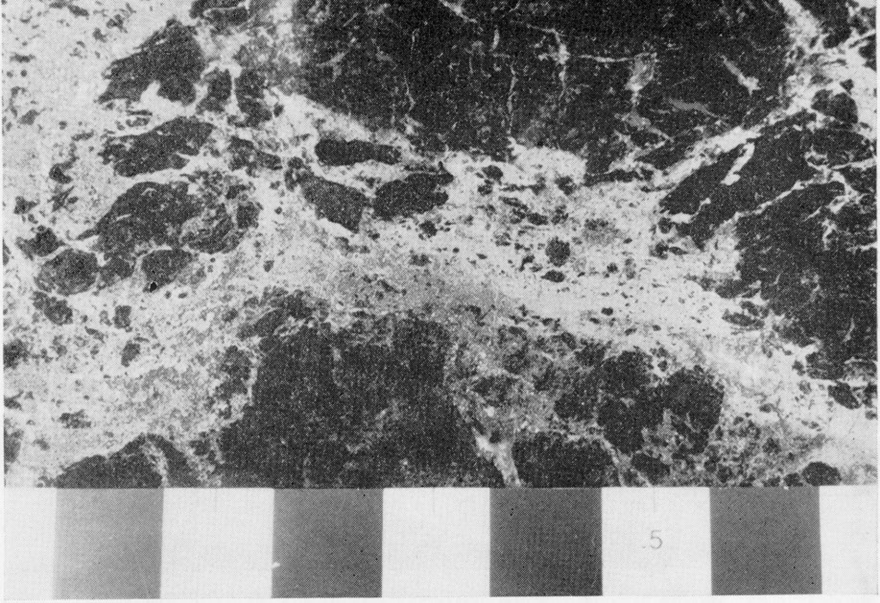
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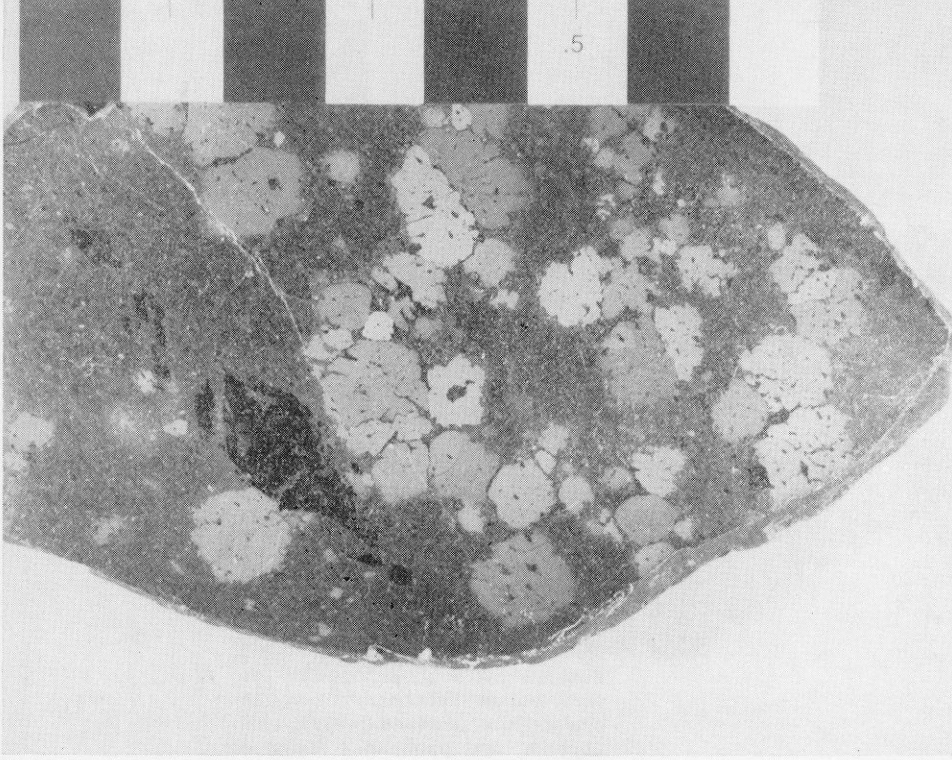
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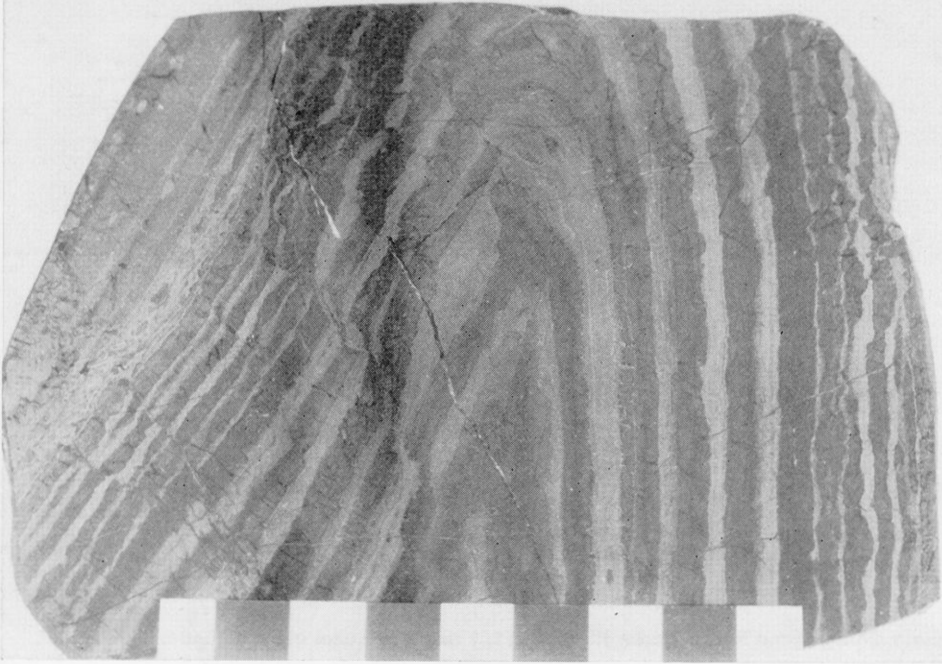
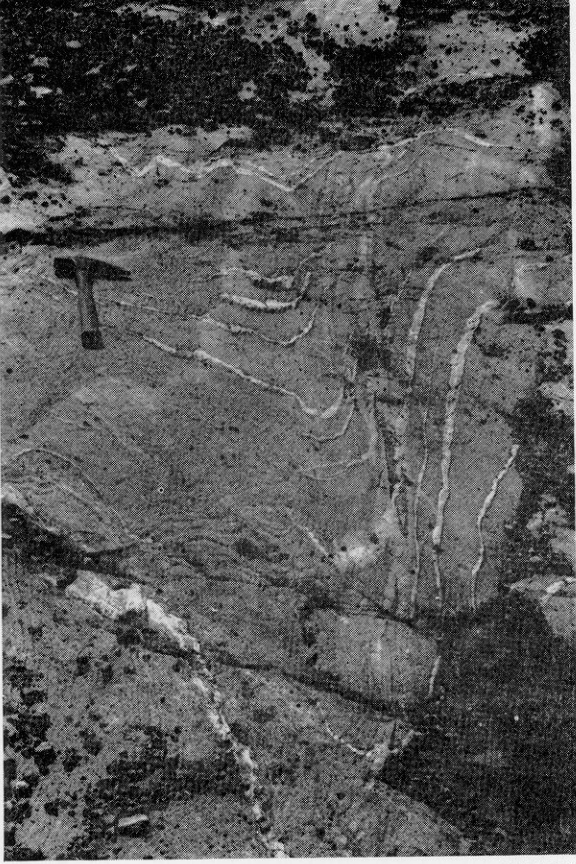




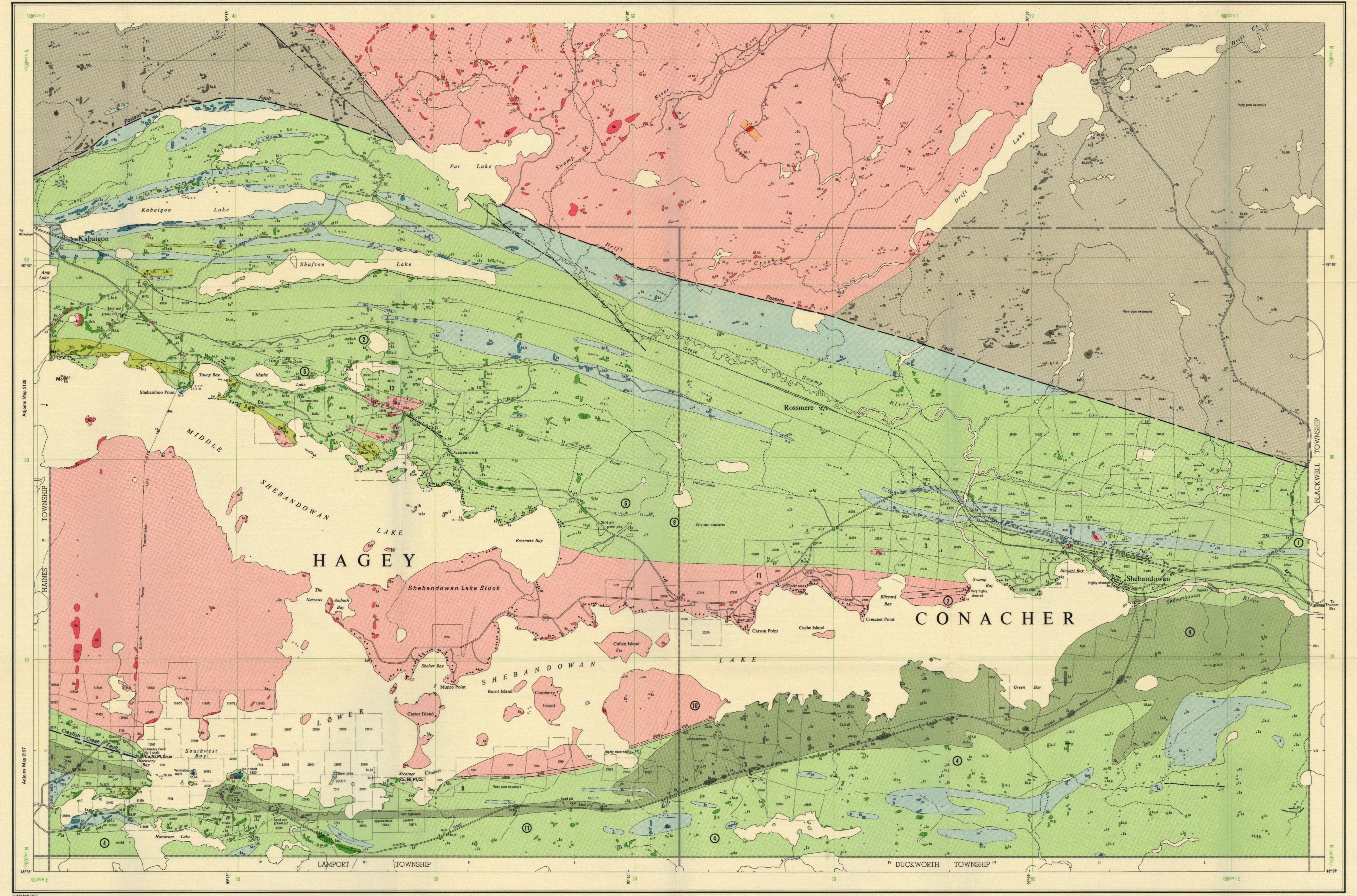
ONTARIO
DIVISION OF MINES
HONOURABLE LEO BERNIER, *Minister of Natural Resources*
W. Q. MACNEE, *Deputy Minister of Natural Resources*
G. A. Jewett, *Executive Director, Division of Mines* E. G. Pye, *Director, Geological Branch*

Map 2267
Lower Shebandowan Lake

Scale 1 inch to 50 miles
N.T.S. Reference 52 B/9

SYMBOLS

- *Esker.*
- *Small bedrock outcrop.*
- *Area of bedrock outcrop.*
- *Bedding, top unknown; (inclined, vertical).*
- *Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).*
- *Lava flow; top (arrow) from pillows shape and packing.*
- *Schistosity; (horizontal, inclined, vertical).*
- *Geological boundary, observed.*
- *Geological boundary, position interpreted.*
- *Geological boundary, deduced from geophysics.*
- 2700γ *Magnetic contour, value in gammas.*
- *Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.*
- *Lineament.*
- *Drill hole; (projected vertically, projected up dip).*
- 32′ *Shaft; depth in feet.*
- *Muskeg or swamp.*
- (11) *Motor road. Provincial highway number encircled where applicable.*
- *Other road.*
- *Trail, portage, winter road.*
- *Building.*
- *Township boundary, with mileposts, approximate position only.*
- *Township boundary, unsurveyed, approximate position only.*
- *Surveyed line, approximate position only.*
- 8 (5) *Mining property; (surveyed unsurveyed). See list of properties.*



LIST OF PROPERTIES

1. *Abex Mines Ltd.*
2. *Anderson, J.*
3. *Band-Ore Gold Mines Ltd.*
4. *Canadian Nickel Co. Ltd.*
5. *Dominion Gulf Ltd.*
6. *Geo-Scientific Prospectors Ltd. [1954]*
7. *Gray, W. A.*
8. *International Nickel Co. of Canada Ltd.— Shebandowan Mine.*
9. *Lobanor Gold Mines Ltd. [1945]*
10. *Mandarin Mines Ltd.*
11. *Ourgold Mining Co. Ltd.*
12. *West, J. F.*

Ownership of properties as of August, 1970. Date in square brackets indicates year of last major work.

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Ontario Department of Mines, Provincial Aeromagnetic and Radioactive Surveys, Thunder Bay 1953: No. 2—Hagey, No. 3—Conacher.

Preliminary maps, P. 708 Hagey Township and P. 709 Conacher Township, scale 1 inch to ¼ mile, issued 1971.

Cartography by M. J. Colman and assistants, Ministry of Natural Resources, 1972.

Basemap derived from maps of the Forest Resources Inventory, Ministry of Natural Resources, with additional information by J. Morin.

Magnetic declination in the area was approximately 2° East, 1970.

The designating letters "TB" have been omitted on this map from the numbers marking the mining claims recorded at the office of the Thunder Bay Mining Division.

LEGEND

CENOZOIC[a]

RECENT

Lake, stream, and swamp deposits.

PLEISTOCENE

Sand, gravel, clay.

UNCONFORMITY

PRECAMBRIAN[b]

LATE MAFIC INTRUSIVE ROCKS

7 *Diabase.*

INTRUSIVE CONTACT

ARCHEAN

FELSIC INTRUSIVE ROCKS

- 6a *Quartz diorite.*
- 6b *White muscovite-biotite granite.*
- 6c *White pegmatite.*
- 6d *Pink porphyritic granite, pink biotite granite.*
- 6e *Quartz porphyry, quartz-feldspar porphyry, feldspar porphyry.*
- 6f *Migmatite (mostly lit-par-lit type).*
- 6g *Porphyritic hornblende syenite.*

INTRUSIVE CONTACT

MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

- 5 *Unsubdivided.*
- 5a *Gabbro.*
- 5b *Anorthositic gabbro.*
- 5c *Peridotite and hornblendite.*
- 5d *Lamprophyre.*

INTRUSIVE CONTACT

METAVOLCANICS AND METASEDIMENTS

KASHABOWIE GROUP

- 4a *Greywacke.*
- 4b *Biotite-quartz-feldspar schist.*

FAULT CONTACT

FELSIC METAVOLCANICS

- 3a *Rhyolite.*
- 3b *Porphyritic rhyolite.*
- 3c *Dacite.*
- 3d *Porphyritic dacite.*

METASEDIMENTS

- 2a *Conglomerate.*
- 2b *Arkose.*
- 2c *Argillite with minor cherty sediments.*

MAFIC TO INTERMEDIATE METAVOLCANICS

- 1 *Unsubdivided.*
- 1a *Andesite.*
- 1b *Basalt.*
- 1c *Coarse-grained basalt.*
- 1d *Coarse-grained andesite.*
- 1e *Pillowed andesite, pillow breccia.*
- 1g *Porphyritic andesite.*
- 1h *Amygdaloidal andesite.*
- 1j *Intermediate tuff.*
- 1k *Lapilli tuff.*
- 1m *Breccia tuff.*

IF *Iron formation.*

Au	*Gold.*
Co	*Cobalt.*
cr	*Chromite.*
Cu	*Copper.*
Mo	*Molybdenum.*
Ni	*Nickel.*
Pt	*Platinum.*

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[a] *Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured parts of the map.*

[b] *Bedrock geology. Outcrops and inferred extensions of each rock map unit are shown respectively in deep and light tones of the same colour. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

Map 2267

LOWER SHEBANDOWAN LAKE

THUNDER BAY DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles

Metres 1000 0 1 2 3 Kilometres

Feet 1000 0 5,000 10,000 Feet