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Geology of Lebel Township

District of Timiskaming

by

H.L. Lovell

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Abstract

Lebel Township covers an area of 93 km^2 (36 square miles) and is centred about Latitude 43°09'N and Longitude 79°57'W. The township is east of Kirkland Lake in the district of Timiskaming, Ontario. Southern portions of the township, most of which were unmapped, were mapped. The geology of the entire township is described in this report.

Bedrock in the map-area is of Early Precambrian (Archean) age, and forms part of the Superior Structural Province of the Canadian precambrian Shield. Surficial deposits consist of Pleistocene glacial, glaciofluvial, and glaciolacustrine deposits. Subdivisions of the Early Precambrian (Archean) rocks include Keewatin-type, Timiskaming-type, and related "Algoman" rocks. These rocks consist of basic and acid metavolcanics, metasediments, and iron formation that are intruded by ultrabasic to acid igneous rocks. Other parts of the Kirkland Lake area, as well as Lebel Township, are unique because Timiskaming-type potassium-rich trachytes are exposed there.

These alkalic metavolcanics and related intrusive rocks, as well as Timiskaming-type metasediments, are representative of the Timiskaming-Belt of deformed rocks that extends east from

Matachewan and Kenogami to the Ontario-Quebec Interprovincial Boundary near Larder Lake. Rocks of the Timiskaming deformed belt apparently formed in an island-arc environment. Fluviatile deposits are widespread. In Lebel Township the Timiskaming-type rocks have been subdivided into six possible stages of volcanic activity consisting of five tuff bands and interbedded lavas, and metasediments.

Gold, silver, and copper have been obtained from the quartz veins and stockworks which occur in the Timiskaming-type rocks and related "Algoman" rocks. Only industrial minerals from Lebel Township are currently used such as sand, and gravel. Groundwater is extracted from the Pleistocene eskers. Gull Lake is the reservoir for the municipality of Kirkland Lake. Production of iron ore is planned in the future. A sustained high price for gold might stimulate further production from known deposits which are not economic to mine at $42 U.S. per ounce.

Geology of Lebel Township

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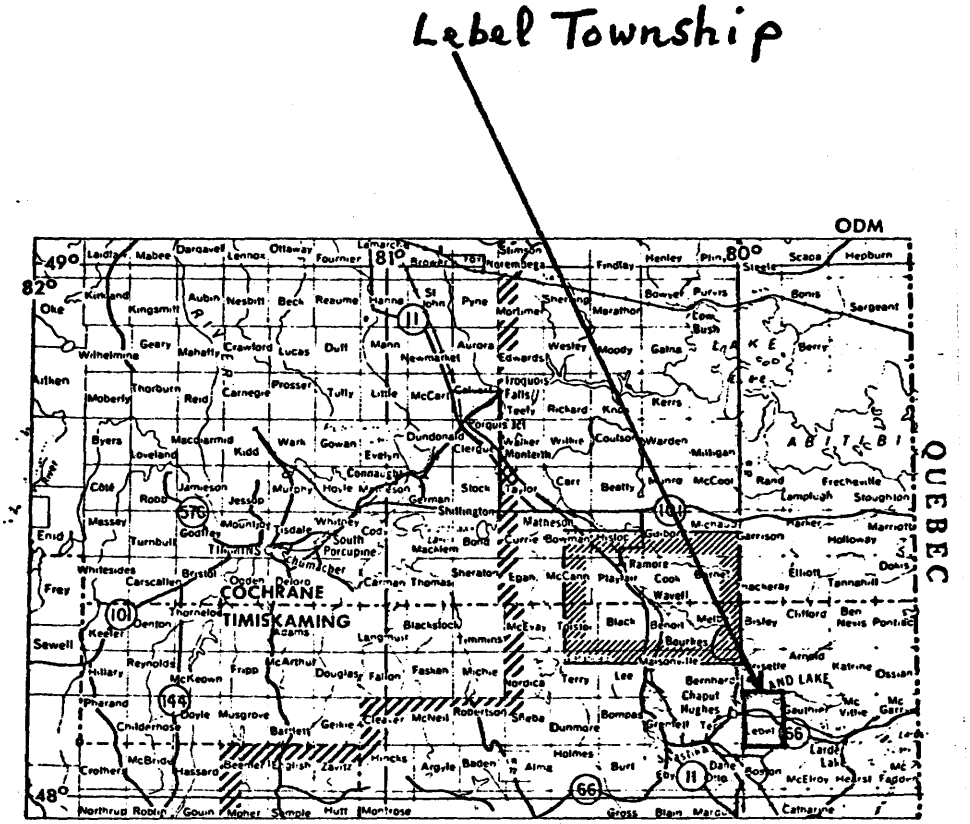

Figure 1 – Key map showing location of Lebel Township. Scale 1 inch to 25 miles (1:1,584,000).

[1]Resident Geologist, Ontario Ministry of Natural Resources, Kirkland Lake.
Manuscript accepted for publication by Chief Geologist March 3, 1975.

Introduction

Lebel Township is located east of Teck Township. The mining communities of Kirkland Lake (see Photo 1) and Swastika are situated in Teck Township. Kirkland Lake (population about 15,000, and the largest community in the District of Timiskaming) extends into the west central part of Lebel Township, and the small community of King Kirkland is in the central part of that township (see Photo 1). Highway 66 and a branchline of the Ontario Northland Railway that connects Swastika, Ontario with Noranda, Quebec, extend generally eastward across Lebel Township from Kirkland Lake. Access routes within the township are good; they consist of mining roads, logging roads, trails, and lakes; most of the lakes can be reached by road.

Electric power transmission lines from the substation in Kirkland Lake go east and south across Lebel Township. The natural gas distribution system that serves Kirkland Lake reaches the western boundary of Lebel Township, and the branch pipeline to the Adams Iron Mine extends to within one mile (1.6 km) of the southeastern part of Lebel Township.

The mineral production of Lebel Township is modest compared to that from Teck Township to the west, and Gauthier Township to the east. However, gold, silver, and copper have been produced, and iron ore in the southwestern part of Lebel Township is planned to be mined by the Adams mine operation of Dominion Foundaries and Steel Limited.

Field Work

Field work was done in 1969 to complete the detailed mapping of Lebel Township, and thereby contribute to the new province-wide program of regional development, as the program pertains to the proposed planning area to be centred on Teck Township. The field work from 1936 until 1940, inclusive, was done as part of the mapping of the Kirkland Lake-Larder Lake gold belt. The 1936-1940 mapping was done on the scale 1 inch to 100 feet (1:1 200), using plane tables and alidades, with the final map at the scale 1 inch to 1000 feet (1:12,000). The mapping done during 1969 covered that part of Lebel Township not previously mapped during the period 1936 to 1940. The 1969 mapping was done using air photographs at the scale 1 inch to 1,320 feet (1:15,840) to identify outcrops (see Map P.992) in back pocket). All of them were investigated in the field.

Acknowledgments

The earlier field work was done by Alexander MacLean assisted in

1936 by O.F. Carter, A.T. Griffis, and F. Slater; in 1937 by A.T. Griffis, Nelson Hogg, G.R.Casselman, R.G. Rhodes, and W. Norfolk; in 1938 by Nelson Hogg, G.R. Casselman, J.O. Gorman, D.P. Robertson, G.E. Parsons, and F.L. MacDonald; in 1939 by Nelson Hogg, G.R. Casselman, G.E. Parsons, and J.K. McFarlane; in 1940 by Nelson Hogg, and R.G. Rhodes.

The field work in 1969 was done by Thos. W. Caine, D.W. Rutherford, and Howard Lovell. This report makes extensive use of material from MacLean (1956), Cooke (1966), and Ridler (1969).

Previous Geological Work

Lebel and other townships were mapped in connection with the report "The Kirkland Lake and Swastika gold areas" by A.G. Burrows and Percy E. Hopkins, 1924. A strip, about 1/2 mile (0.8 km) wide on the west side of Lebel Township, is included in a map which has a scale of 1 inch to 600 feet (1:7,200) accompanying the report on the "Kirkland Lake gold area" by Burrows and Hopkins; 1920. A map on a scale of 1 inch to 2,640 feet (1:31,680) accompanies the report on "Lebel and Gauthier Townships" by Hopkins, 1923. Small areas of Lebel Township are included on maps accompanying the report on the "Kirkland Lake gold area" by E.W. Todd 1928.

Topography

The northern boundary of Lebel Township is about 2 miles (3.2 km) south of the height-of-land separating the James Bay watershed from St. Lawrence River watershed. Although outcrops constitute about 30 percent of Lebel Township, in most areas the topographic relief is not great. The lowest elevation is in the creek bed near the southwestern corner of the township (less than 300 m (1000 feet) above sea level) and the highest point is at the fire tower south of Crystal Lake (more than 400 m (1,300 feet) above sea level). The drainage is consequent because it is controlled mainly by bedrock structures such as the Long Lake Fault Zone (see Map 53A in MacLean 1956).

Natural Resources

The original forest cover has been cut for sawlogs and firewood, and some areas have been burned, particularly in the eastern part of the township. most of the tree growth now is second-growth poplar, spruce, jackpine, and birch. Lebel Township is near the northern limit of growth of white and red pines, and a few majestic specimens of these trees exist in the southwestern part of the township.

Victoria, McTavish, and Gull Lakes form the reservoirs supplying water to the community of Kirkland Lake. Summer cottages are built on the shores of Crystal and Jordan Lakes.

Wildlife includes moose, fox, muskrat, partridge, and duck. Beaver is plentiful in the map-area.

General Geology

Lebel Township is in a mobile belt (Ridler 1969, p.107) forming part of the Archean "Abitibi" belt composed of metavolcanics, metasediments, and intrusive rocks that extend from southwest of Timmins, Ontario, to Chibougamau, Quebec (Goodwin 1966). The main rock types are summarized in Table 1.

Precambrian

Early Precambrian (Archean)

Keewatin-Type Metavolcanics and Metasediments

Keewatin-type lavas and sedimentary rocks were first identified in the map-area by Burrows and Hopkins (1914, p.4). The Keewatin-type lavas are not abundant. The largest areas form a belt 1.6 km (1 mile) wide in the northern part of Lebel Township, and about 2.6 km2 (1 square mile) in the southwestern part of Lebel Township. The Keewatin-type lavas are basalt and andesite, and flow tops contain pillows that are on an average 0.6 m (2 feet) long (Maximum length 2.4 m; 8 feet). Weathered surfaces are pale greenish-grey and fresh surfaces are greenish-grey (chloritized) in the northern belt, and

greenish-black (amphibolitized) in the southwestern part of Lebel Township near the Lebel Syenitic Stock.

The Keewatin-type sedimentary rocks include volcanic breccia, agglomerate, tuff, and iron formation. These rocks occur north of McTavish Lake, east of mile-post IV on the Lebel-Morissette township line, and near the contact of the Lebel Syenitic Stock. Many of the Keewatin-type sedimentary rocks have distinct laminae of fairly consistent strike. According to MacLean (1956, p.10) most of the fine detritus was washed down from bedrock surfaces, with little transportation; some of the fine and much of the coarse material was dropped directly into the water.

The weathered surfaces of the tuff, agglomerate, and volcanic breccia are greenish grey, and are pitted or bumpy, depending on the nature of the fragments. Fresh surfaces are pale green, with, in many places, indistinct pale pink fragments or angular black fragments. In the agglomerate are angular fragments of pink volcanic material that are an average of 0.15 m (1/2 foot) long (maximum 0.9 m; 3 feet). Based mainly on the following whole-rock chemical analyses; MacLean (1956, p.9) concluded that Keewatin-type lavas and clastic sedimentary rocks are derived from the same igneous source and possible from the same eruption.

Oxide, sulphide, and carbonate facies of Algoma-type iron formation (Gross 1965, p.84; Plate IIC) have been identified in the southern

part of Lebel Township. Most of the iron formation is low grade. Some of the ore at the Adams Mine, for example, contains less than the minimum amount of iron (15 percent) required to constitute iron formation, according to some definitions (AGI Glossary 1972, p.372). The petrology and composition of the oxide facies of the Boston Township iron formation, which extends into Lebel Township, have been described by Dubuc (1965). The oxide facies consists mainly of interbedded lenses of magnetite and cherty quartzite or rhyolite tuff. Minor amounts of hematite, garnet, amphibole (probably grunerite), chlorite, pyrite, and carbonate minerals are also present. The average thickness of individual magnetite-rich or quartz-rich lenses is about 13 mm (1/2 inch), (maximum about 7.6 cm, 3 inches). In most places the bedding is contorted, dragfolded along minor faults, and thickened in the axial areas of minor folds. Dubuc (1965, p.72) found evidence of considerable dislocation of beds during sedimentation. Contortion and brecciation occur locally within several beds, and yet the layers above and below are relatively undisturbed, indicating slumping occurred before induration. Dubuc (1965) explained this as the result of volcanic activity; the invasion of the basin by volcanic flows. In some places, however, the bedding is regular and fairly uniform in thickness. The magnetite-rich and quartz-rich lenses grade into one another, and both are interbedded with Early Precambrian (archean) metavolcanics (mainly felsic tuffs), with graphitic metasediments, and with the sulphide facies of iron formation.

The sulphide facies of the iron formation in Lebel Township consists mainly of lenses of ferruginous black chert, slate; and rhyolite tuff; and is composed of quartz, chlorite, amphibole; graphite, pyrite, pyrrhotite; and minor amounts of chalcopyrite. Much of the pyrite occurs in the form of nodules, the remainder is disseminated and forms stringers. Sphalerite and galena are present, mainly in carbonate veins.

Interbedded with coarse-grained greywacke, black chert, rhyolite tuff, and slate of the sulphide facies and with magnetite-chert of the oxide facies of iron formation. The carbonate facies of iron formation was first recognized by Brock (1907, p.207) whose conclusion regarding the carbonate rock is:

"...its occurrence with slates and phyllites and with cherts - undoubted sedimentary rocks - as a conformable band with them, over a wide stretch of country, and its apparent composition, render it much more probable that it is an altered, stratified, ferriferous dolomite, probably forming a member of the Iron Ore formation".

Although the iron content is typically low (6.5 to 8 percent iron oxide, according to Ridler 1969, p.96) the carbonate rock is recognized readily by its rusty-brown weathered surfaces with numerous stringers of white quartz. In the field, the carbonate rock is sometimes subdivided into "brown carbonate rock" and "green

carbonate rock". Brown carbonate rock has greyish brown fresh surfaces speckled with grains of pyrite and arsenopyrite and rusty spots. Some of the green carbonate rocks have bright green fresh surfaces, coloured by chromium-bearing mica (fuchsite or mariposite). Most of the green carbonate rocks, however, contain chlorite that imparts a darker green colour to the schistose areas of the rock. The predominant carbonate mineral is ferruginous dolomite, with lesser amounts of ankerite and calcite. Thin section studies indicate that the carbonate rocks are composed mainly of a very fine grained mosaic of carbonate minerals and quartz, with chlorite and white mica causing the schistosity typical of many of the carbonate rocks. As elsewhere in the Matachewan-Kirkland Lake-Larder Lake area, for instance at the gold producer of Kerr Addison Mines Limited in McGarry Township, the carbonate rocks in Lebel Township contain anomalous amounts of gold. Most of the gold is in quartz stringers and stockworks in the carbonate rocks. Ridler (1969, p.96) suggested that during metamorphism, deformation, and relaxation the original carbonate sedimentary rocks were recrystallized and some of their original content of silica and gold was segregated into dilational vein stockworks. Possibly the silica and gold were concentrated by a process similar to the "lateral secretion" suggested by Boyle (1961, p.141 and 175) to explain the origin of the gold deposits at Yellowknife in the Northwest Territories.

Structural relationships in the iron formation are complex, partly

as a result of their position in a deformed mobile belt (Ridler 1969, p.48). Although the carbonate rocks may intrude adjacent formations, and are themselves cut by numerous quartz-carbonate stringers and veins, they are generally conformable with adjacent stratified formations. The following excerpt from Ridler (1969, p.46) offers a possible explanation for local intrusive-like contact relationships with adjacent formations:

"The carbonate facies has been subjected to a long history of intricate and repeated folding, shearing, faulting, and metamorphism out of proportion to much of the rest of the rocks of the area. It is not surprising, therefore, that locally intrusive or intrusive-like contact relations with its host rock have developed or that veins of carbonate are found cutting the country rock".

The most likely mode of origin of the iron formation in Lebel Township is described by Gross (1966, p.116-119) for Algoma-type iron formations.

Iron formation in Lebel Township is interbedded with Timiskaming-type metasediments (Hopkins 1923, p.59), which are interbedded with Timiskaming-type metavolcanics. Jasper pebbles, presumably derived from slightly older beds of oxide facies of iron formation, are ubiquitous constitutents of Timiskaming conglomerate (Thomson 1948, p.8). The carbonate facies of iron formation is

represented by pebbles of green carbonate rock in Timiskaming conglomerate No.10 of the accompanying map (Chart A, back pocket), on the Glenora property (Lovell 1967, p.75, Stop No.5). The age of Timiskaming-type metavolcanics in the Kirkland Lake area has been determined as 2,368 48 million years; and is within the range of age of the Keewatin-type metavolcanics, namely 2,343 50 million years (Fairborn et al. 1966, p.142, 143). In a few places, one of them is in Lebel Township, the contact is unconformable (Thomson 1948, p.11). Elsewhere no evidence of a structural unconformity was found along the Keewatin-Timiskaming boundary (Thomson 1941, p.20). In the author's opinion, Keewatin and Timiskaming-type rocks are products of a single orogenic cycle, and are to come extend interbedded, with minor disconformities.

The correlation of high potassium content in the iron formation with high potassium content in the Timiskaming-type rocks, and a structural analysis showing a symmetrical dome centred on the Lebel Stock, indicate that the age of the iron formation is Upper Timiskaming (Ridler 1969, p.36-43). The Timiskaming-type rocks, in turn, are thought to be the equivalent of the Cadillac belt of metasediments, that extends westward just south of Noranda (Ridler 1969, p.48).

The "Timiskaming" rocks were identified in the map-area first by Burrows and Hopkins (1914, p.9). However, the presence of lavas among Timiskaming-type sedimentary rocks was first recognized in

the general area by Cooke (1922, p.18). The Timiskaming-type rocks of Lebel Township form an east-trending part of the Kirkland Lake-Larder Lake belt, which was described in detail by Hewitt (1949, a and b; 1963), MacLean (1956), and Cooke (1966). In the map-area, the Timiskaming-type rocks consist of interbedded detrital metasediments, lava, volcanic breccia, and tuff; the clastic metasediments predominate; conglomerate composes the greater part of the sequence, followed by greywacke and argillite. The metavolcanics consist of andesite and mafic, felsic, and leucitic trachyte flows and pyroclastic rocks. Also present are contemporaneous intrusions of syenite and basic syenite. The major lithological changes occur from north to south, but facies variations also occur along strike. Furthermore, the conglomerate and greywacke are coarser grained in the western part of Lebel Township than in the eastern part and pyroclastic rocks form a higher percentage of the Timiskaming-type metavolcanics.

The following descriptions of Timiskaming-type lithologic facies are taken from MacLean (1956, p.11-13 and 23-45) with his references to a glacial origin for the Timiskaming-type metasediments deleted, and his term "tillite" changed to "conglomerate". On the revised map, because of repetitious folding (based on bedding attitudes), the numbers 1 to 13 that MacLean used to indicate a stratigraphic succession of "Timiskaming deposits" are thought; on the contrary, to represent merely lithologic facies.

Timiskaming-Type Metasediments and Metavolcanics

"The metasediments consist mainly of boulder and pebble conglomerate, arkosic greywacke, coarse-grained greywacke or grit, fine-grained greywacke, siltstone or argillite, and tuff. Most of the coarse fragments in the basal conglomerate are greenstone and quartz porphyry, with much lesser amounts of jasper, chert, banded iron formation, scoriaceous felsic volcanic rocks, feldspar porphyry, syenite, and mudstone. The largest boulders are 3 feet (0.9 m) in diameter, but most are less than 1/2 foot (0.15 m). The majority of large boulders are near the base of conglomerate beds. The matrix is fine-grained material of similar composition to that of the boulders. Beds in the greywacke range from 1/2 foot to 50 feet (0.15 to 15 m) thick. Much of the thinner bedded greywacke has scour channels and cross-bedding, indicating they were deposited by strong currents, possibly in a fluvial environment. The siltstone or argillite (or very fine grained greywacke) have beds which are mainly 1/8 inch to 6 inches (3.3 mm to 15 cm) thick, for the most part, and these beds consist of alternating light and dark layers made up of several fine laminae. Attitude in adjacent beds varies widely in places, possibly as a result of crumpling during soft-rock deformation".

Basal Conglomerate

(No.1 in Chart A, back pocket)

"MacLean (1956, p.2329) stated that Timiskaming-type basal conglomerate was found only on the north side of the belt of metasediments, where five or six widely separated exposures occur south of the Keewatin-type rocks. All these exposures of basal conglomerate are similar in texture and fragmental content. The matrix consists of mud and grit composed mainly of particles of greenstone and quartz porphyry. The greenstone and quartz porphyry pebbles and boulders are subangular, angular, and rounded; the large cobbles and boulders are well rounded".

Thin-Bedded Greywacke

(No.2 in Chart A, back pocket)

"This stratum lies discontinuously along the contact between the Keewtain-type and the overlying Timiskaming-type rocks. Where present, the Timiskaming-type basal conglomerate is below the thin-bedded greywacke, but elsewhere the greywacke lied directly upon or is interbedded with the Keewatin-type rock. In many places the greywacke beds are contorted; having strikes and dips varying considerably within short distances".

Arkosic or Tuffaceous Greywacke

(No.3 in Chart A, back pocket)

"Adjacent to, stratigraphically above, and grading along strike. into the thin-bedded greywacke (as on claim 2009 on Map P.992 in back pocket) is a stratum of arkosic or tuffaceous greywacke composed largely of clastic fragments of feldspar and, to a lesser extent, of quartz and indistinguishable comminuted rocks. This greywacke is well bedded, although not as finely laminated as the thin-bedded greywacke. Cross-bedding is common in the greywacke. The weathered surface is a soft rusty crust having a maximum thickness of 2.5 cm (1 inch)".

Second Conglomerate

(No.4 in Chart A, back pocket)

"The arkosic greywacke is succeeded by conglomerate (120 to 150 m) (400 to 500 feet) thick. This conglomerate has not been worked as much by water as the later conglomerates, but nevertheless the attitudes of beds can be determined from the minor bands of greywacke contained within the conglomerate".

Tuff No.1

"After the deposition of the second boulder conglomerate, the vulcanism that played an important part in producing the tuffaceous

greywacke of Teck Township apparently resumed with increased violence in Lebel Township, so that the greywacke content is minor and the rock can be called tuff. The tuff is about 600 feet (180 m) thick in the western part of Lebel Township, and slightly less farther east. Weathered surfaces are reddish brown material about 1/2 inch (13 mm) thick. Fresh surfaces are brownish-red to dark grey in colour, with reddish spots. Where altered by intrusives, the rock is red and may be related to syenite or "porphyry".

"About 1,500 feet (460 m) north of O'Connell Lake, a band of dense tuffaceous agglomerate or vesicular lava with large amygdaloidal bombs, is the only exposure of lava in the western part of Lebel Township which possibly corresponds to lavas of this eruption that extend from the eastern part of Lebel Township into Gauthier Township, in which the band is mapped as a lava flow with interbedded tuff (Thomson and Griffis 1941, Map 50c)".

Conglomerate

(No.6 in Chart A, back pocket)

"This conglomerate contains pebbles and cobbles most of which are less than six inches (15 cm) in diameter, with a few about one foot (0.3 m) in diameter. Near the base, however, the sorting is poor; boulders two feet (0.6 m) in diameter are present, and the proportion of pebbles to matrix is high.

The pebbles, cobbles, and boulders are of numerous rock types, including greenstone, jasper, chert, iron formation, vein quartz, porphyry, grey "granite" syenite, and red-spotted trachyte".

Tuff No.2

(No.7 in Chart A, back pocket)

"This tuff bed is only 60 feet (18 m) wide at the surface, but is 160 feet (49 m) wide on the 800-foot (240 m) level of the Continental Kirkland Mine No.1 shaft. This would mean that in its original position its thickness increased 100 feet (30 m) over a distance of 800 feet (240 m) towards the south, which might indicate the source of the tuff was to the south".

Conglomerate No.3, Intermediate Phase

(No.8 in Chart A, back pocket)

"Conglomerate No.3 is a wide band of interbedded pebble conglomerate and greywacke with a few masses of coarse conglomerate. The pebbles are smaller and better sorted than those of Conglomerate No.2, of which Conglomerate No.3 may be a later phase".

Tuff No.3

(No.9 in Chart A, back pocket)

"In claim L.2378 about 2,000 feet (600 m) east of the western boundary of Lebel Township this bed may be 500 feet (150 m) thick, and farther east in claims L.2677 and L.2807 north of Gull Lake the bed is about 1,000 feet (300 m) thick. In its least altered parts this tuff is mostly light grey and fine-grained, with a few lenses containing coarse fragments. Fresh surfaces are mottled, because of the development of reddish secondary feldspar and carbonate alteration".

Conglomerate No.3, Upper Beds

(No.10 in Chart A, back pocket)

"At the base, the beds are conglomerate, as in claims L.2452 and L.2430 north of Highway 56. Stratigraphically above this the beds are predominantly greywacke; with many variations to coarser phases along strike. Boulders larger than 10 inches (25 cm) in diameter are rare. Clasts are mostly greenstone, quartz (10 to 30 percent of the rock; generally 25 percent in greywacke) and where present, jasper".

White Fragmental Tuff

(No.11 in chart A, back pocket)

"This bed is folded on three sides of Gull Lake. Its constituents are tuffaceous and greywacke-like in character. Dispersed throughout the bed are rectilinear fragments (maximum length one inch (25 mm)) of dense, fine-grained, white argillite possibly derived from Conglomerate No.3 (No.10 in Chart A, back pocket), and for which the white fragmental tuff is named. The weathered surface is a rusty crust as much as one-half inch (13 mm) in thickness, but where altered by intrusives, pale grey. The fresh surface of the matrix is semi-translucent and yellow to pale green in colour".

Tuffaceous Conglomerate

(No.12 in Chart A, back pocket)

"The tuffaceous conglomerate is a hard, tough rock. It differs from earlier conglomerates because the proportion of pebbles and boulders formed of red volcanic material (probably derived from earlier Timiskaming-type rocks) in the rock is greater than the amount of pebbles and boulders derived from Keewatin-type rocks. About 80 percent of the coarse clasts and matrix are volcanic in origin".

"The colour of the matrix is darker than that of earlier conglomerates, in places being black. Textures range from that of a

fine-grained slate to a sandy grit. Much of the matrix contains small pink fragments similar to the larger volcanic pebbles. These pink fragments are characteristically present in all the tuffs previously mentioned".

Tuffaceous Conglomerate-Conglomerate No.4, Greywacke Phase

(No.13? in Chart A, back pocket)

"The tuffaceous conglomerate described above grades upwards into paler coloured conglomerate having a greywacke base. The tuffaceous conglomerate-Conglomerate No.4 greywacke phase is similar to Conglomerate Nos.2 and 3. Near the intersection of the South Harvey and Long Lake faults it is 3,500 feet (1070 m) thick. The original thickness was still greater, because the southern contact is intruded by the syenite mass, and the north boundary is a fault contact".

"Where this band is exposed in claims L.1872 and L.1873 near the Harvey Kirkland shaft, the lowest beds are dark, highly altered and contorted schist. Above the dark schist is fine-grained, thinly bedded greywacke with interbanded creamy yellow and brownish to purplish laminae. Above the thin-bedded greywacke is a bed of coarse conglomerate with closely packed pebbles and boulders. Some of the boulders have been drawn out so their long axes are as much as six times the length of their short axes. The jasper, quartz,

and granitic pebbles and cobbles, however, generally are rounded, being only slightly elongated".

Tuff No.5

"In the western part of Lebel Township this tuff is dark, only moderately well-bedded, and contains many pebbles; in the eastern part of Lebel Township it is more distinctly bedded and contains fewer pebbles".

Timiskaming-Type Igneous Rocks

"At times volcanic dust settled into the sea in such quantities that the rocks formed are definitely tuffs, having little or no admixture of other sedimentary rocks. As volcanic activity waned, the proportion of normal sedimentary rocks resulting from erosion increased, so that the rocks formed were tuffaceous greywacke or tuffaceous conglomerate. After the last remnants of each volcanic outburst had been washed into the water, normal sedimentation prevailed.

"Most of the lava flows are porphyritic at the base and amygdaloidal or brecciated near the top. All the Timiskaming-type lavas were classed as trachytes, although the original minerals in many of these rocks are altered. Minerals present in the trachytes are feldspar, kaolin, sericite, chlorite; carbonate, apatite,

pyrite, magnetite, ilmenite, and leucoxene".

Instead of the six stages of volcanic activity used by MacLean (1956, p.40-44), Cooke (1966, p.26-35) proposed four units to correlate Timiskaming-type metavolcanics of adjacent townships with those of Lebel Township. Cooke's four units are based on stratigraphic positions and mineralogical compositions of rock-types. A generalized stratigraphic section is given in the following table (Table 3), with the oldest formations (those farthest north) at the bottom of Table 3.

Cooke's first unit of metavolcanics forms a narrow band within a few hundred feet of the contact with Keewatin-type metavolcanics. The lower part of the first unit consists of grey or brown fine-grained or slightly porphyritic basic trachyte containing biotite or hornblende. The flows at the eastern boundary of Lebel Township are quartz leucotrachyte. A band of trachytic tuff and tuffaceous greywacke separates the lower basic trachyte flows from a narrow upper zone of leucitic tuffs. Most of these leucitic tuffs, containing aphanitic green to black rock fragments, are massive with rounded reddish brown spots about one millimetre in diameter. The overall colour varies from brown to mauve. Near the western boundary of Lebel Township, lavas are missing from this unit, and the tuffs consist of trachyte and andesite pyroclastic rocks. The pyroclastic rocks are grey, reddish brown, or green, and contain abundant fragments of fine-grained and porhyritic

metavolcanics, together with fragments of feldspar and ferromagnesian minerals. Quartz and jasper fragments are rare, a feature that distinguishes tuff from greywacke.

In the eastern part of Lebel Township, the tuff of Cooke's second unit of metavolcanic flows increases in amount and thickness. In the central part of Lebel Township normal trachyte and a few thin basic trachyte flows occur at the base of the unit. Trachyte is a greenish brown, fine-grained to porphyritic rock. Abundant amgydaloidal zones aid in distinguishing individual flows. In the field, leucite trachyte cannot be distinguished from phonolite. These rocks contain numerous green or red phenocrysts of leucite that are a maximum of about 2.5 cm (1 inch) in diameter set in a reddish brown aphanitic matrix. The flow breccias have a fragmental appearance but both the fragments and the matrix contain leucite phenocrysts of fairly uniform size. The tuff is spotted reddish brown to mauve. The tuff is distinguished from a flow by its bedded, fragmental nature. Irregular zones and thick lenses of volcanic breccia with fragments a maximum of 15 cm (6 inches) in diameter are present mainly within the leucitic tuffs overlying the main lavas. The breccia zones contain dark shard-like aphanitic fragments, as well as large porphyritic blocks of leucite trachyte. According to Cooke (1969, p.37) the second unit of metavolcanics may have erupted from centres in the central and southeastern parts of Lebel Township, in three distinct episodes, separated by long periods of erosion and sedimentation.

Cooke's third unit of metavolcanics consists of a sequence of flows and pyroclastic rocks thicker than (but lithologically similar to) those of Cooke's second metavolcanic unit. Leucite tephrite resembles basic trachyte in most respects. Small feldspar and ferromagnesian crystals are numerous, but tephrite contains large reddish coloured feldspar crystals as much as 2.5 cm (1 inch) long. Tuff increases in amount compared to lava flows towards the west; however, the thickness of the entire unit decreases, finally being faulted out east of Gull Lake. Compared with the first unit of metavolcanics, these tuffs are distinctly bedded. The leucite lava flows and breccias which are thickest in the central part of Lebel Township, lens out in the east and west. However, trachyte thickens towards the east. Tuff ranges in colour from grey to black, and in many places contains abundant pyrite and magnetite. As a result of deformation, slaty cleavage and secondary crenulations are strongly developed. Tuff is fine-grained and well bedded, sorted, and graded, indicating that deposition occurred in an aqueous environment.

Cooke's fourth unit of metavolcanics constitutes the final volcanic episode and consists of discontinuous and slightly irregular flows of trachyte and basic trachyte. These metavolcanics are separated from the third unit of metavolcanics by a narrow band of conglomerate, volcanic breccia, and tuff previously described as intrusive trachyte (MacLean 1956, p.44). Similar lavas overlie the

tuffaceous greywacke on the north shore of Gull Lake, and in Teck Township they have been called augite porphyrite (Thomson 1948, p.17). Common features of these rocks are the dark brownish green colour and rough pitted surfaces that result from weathering of ferromagnesian minerals. The zone of lithic and crystal tuff along the margin of Gull Lake is tentatively correlated with the basic trachyte and associated tuff in Teck Township. Tuffaceous greywacke, conglomerate, and a small amount of lava associated with the tuff are dark and probably trachytic to andesitic in composition. The zone of lithic and crystal tuff includes a thick lens of massive and bedded buff-coloured feldspathic tuff. Abundant fragments of angular feldspar and subsidiary amounts of fine-grained green metavolcanics give the rock a distinctive appearance. An elongate mass of feldspar porphyry south of Gull Lake has fine-grained borders, but grain size increases towards its centre. MacLean (1956, p.44) concluded that this mass is probably intrusive. Other basic masses that extend across the southern part of Lebel Township consist of greenish brown augite, hornblende, and biotite trachyte. Similar, but locally restricted basic trachyte with minor amounts of acidic trachyte occur throughout the sequence. Most types of trachyte are associated with the main units of metavolcanics, but are neither entirely confined to them nor confined to definite positions in the stratigraphic sequence. Cooke (1966, p.35) considered that basic trachyte came from a common source; the fourth volcanic episode was the most productive in volume.

Basic trachyte overlaps other lavas during eruptions and was extruded along fissures rather than from a centre of eruption. On the basis of their distribution, Cooke (1966, p.37) speculated that the centre of eruption of leucitic rocks was destroyed by the intrusion of the Lebel Syenite Stock. According to Ridler (1969, p.34):

"The development of the Timiskaming-type rocks may be assigned to three simplified stages: an opening phase of coarse sedimentation along the hinge line of the mobile belt; an intermediate phase of alkaline volcanics, hyabyssal intrusion and volcanogenic sedimentation representing the salic phase of the volcanic..., and a closing phase of quiescent volcanogenic sedimentation culminating in iron formation".

Sandstone and Mud Dikes

The following is an excerpt from MacLean (1956, p.51):

"In one of the crosscuts on the Harvey Kirkland property there was exposed, in the process of development work, a peculiar dike of cream-coloured rock that has a variable dip and, apparently, a wandering strike. In general the dip was flat, but the dike showed considerable roll in the exposed part. The rock of the dike was very similar to that of the fine-grained sedimentary rocks exposed

on the surface and in the shaft. The dike itself occurs in the darker, much schisted rock that stratigraphically underlies the cream-coloured rock. A similar dike, cream-coloured and flat-lying; was observed in the workings of the old Queen-Lebel Mine. The only explanation at present suggested is that, in the original position of the beds and while the cream-coloured mud was still soft, a fault occurred in the dark beds below the soft, whitish mud. Into the opening of the fault the mud was injected, to harden as a fairly hard dike. When the folding of the region brought the beds to a position nearly vertical, the enclosed dike was rotated through the same angle as the beds and now appears within them as a fairly flat-lying dike. The dike in the Harvey Mine, when exposed, is not as flat as that in the old Queen-Lebel Mine, which was exposed near the end of a drift and was almost horizontal in the back of the drift".

"A small sandstone dike was reported by Hogg in claim L.2796 (see ODM Map 53a and Chart A, back pocket) in the northwestern part of the township, in the Keewatin. This dike is nearly vertical, and the strike is east-west".

"Algoman" Igneous Rocks

Stocks, dikes, sills, and irregular masses of syenite, basic syenite, and feldspar porphyry intrude the rocks of Lebel Township; usually in that order. The largest of these intrusions is the Label

Syenite Stock (Lawton 1957, p.17), a dome-like structure occupying most of the south half of Lebel Township. The Lebel Stock extends more than 1.6 km (1 mile) into Boston Township, and to within 1.6 km (1 mile) of the Otto Township Syenitic Stock. The total area of the Lebel Stock is about 45 km2 (17 square miles).

The Lebel Stock consists of massive medium-grained grey to pink porphyritic hornblende syenite. Large tabular phenocrysts of feldspar (Maximum 2.5 cm; 1 inch; average 1.3 cm; 1/2 inch) are abundant (maximum 75 percent of the rock) in some areas, particularly near the contacts of the stock. Carlsbad twins are commonly visible on (001) cleavage facies of the phenocrysts. The matrix is composed of feldspars and dark green hornblende.

Microscopic studies show that feldspars to be relatively fresh microperthite. Much of the microperthite is of the "string" and "patch" variety, with its constituent feldspars so finely intergrown in some crystals as to suggest origin by exsolution. The plagioclase ranges from oligoclase to calcic albite in composition. Hornblende, biotite, and augite comprise about 15 percent of the syenite. The augite occurs as fresh, colourless to pale green grains, and has a maximum extinction Z^C = 51°. Some of the augite is altered to pale green, weakly pleochroic hornblende, which occurs also as independent grains. intergrown with the augite and accessory minerals is fresh, dark brown biotite. The accessory minerals consist of magnetite, apatite, and dark brown sphene.

A chemical analysis of samples collected from the Lebel Syenite along the south boundary of Lebel Township is given by Lawton (1954, p.171). Normative minerals calculated from the analysis, together with the average Rosiwal analyses, are shown in Table 4.

The Lebel Stock is somewhat similar to the Otto Stock (Lovell 1969, p.24) in chemical composition, texture, and mineralogy. However, the Lebel Stock has a lower percentage of silica (and no quartz syenite) and higher percentages of the oxides of lime, iron, and magnesium, resulting in a higher percentage of normative mafic minerals in the Lebel Stock (9.22 percent) than in the Otto Stock (4.65 percent). Modal analyses reveals augite in the Lebel Stock, and aegirine-augite in the Otto Stock. The Lebel Stock contains augite and biotite, whereas the Otto Stock contains aegirine-augite and no biotite except near the contact metamorphosed inclusions of country rock. Both stocks contain more soda than potash, but the total percentage of alkalies in the Lebel Stock (10.73 percent) is less than that in the Otto Stock (12.10 percent).

Marginal phases of the Lebel Stock are more basic than are interior phases. The basic syenite forms dark grey to brown, medium to coarse-grained phases within the stock, particularly near contacts with country rocks, and as dikes intruding the country rocks. Some of the basic syenite grades into inclusions of country rocks, indicating origin by assimilation of country rocks by syenitic

magma. Basic syenite is homogeneous in composition. Some basic syenite dikes intrude country rocks near the Lebel Stock. This latter type of basic syenite might be an early differentiate of the original syenitic magma. Basic syenite dikes and small stocks are spatially associated with basic trachytes, which were extruded at more frequent intervals than other lavas, and with much less pyroclastic equivalents. Cooke (1936, p.37) concluded that the basic syenite intrusions fill conduits and fissures separate from the central, more explosive volcanic vents.

The term lamprophyre has been used to describe dark red to black rocks that have gradational contacts with the normal Lebel syenite; as well as being used for distinct lamprophyre dikes. The lamprophyre ranges in composition from red-coloured varieties containing potassic feldspar to rocks composed almost entirely of biotite, hornblende, and pyroxene. The weathered surfaces of biotite lamprophyre consist of soft, greenish grey earthy material. Biotite lamprophyre is mainly in tuffaceous and arkosic greywacke in the northwestern part of the township, and in the tuff in the western part of the Continental Kirkland property.

Two "conglomerate dikes" were found (MacLean 1956, p.50). The "conglomerate dike" on Continental Kirkland claim L.2447 (see ODM Map 53a, and Chart A, back pocket) appears to be altered biotite lamprophyre containing cobbles and boulders of coarse-grained porphyry, tuff, and quartz. A proposed origin described by Lovell

(1969, p.27) related genetically the "pebble-bearing dikes" in Otto and Marquis Townships, which are similar to the "conglomerate dikes" in Lebel Township, to nearby lamprophyres and syenites.

Feldspar porphyry, syenite porphyry, porphyrite, quartz-feldspar porphyry, and quartz porphyry are widespread in the map-area. They contain pink feldspar phenocrysts 2 to 5 mm long in a reddish brown fine-grained matrix. According to Cooke (1966, p.94) quartz, hypersthene, and diopside are the diagnostic normative minerals. SiO_2 ranges from 55 percent in the quartz syenite porphyries to 66 percent in the quartz porphyries, and the concentration of Na_2O is greater than that of K_2O. Alumina, magnesia, and lime are present in moderate amounts, and are higher in the quartz syenite porphyries.

The Lebel Stock forms a sub-concordant dome flanked by compositionally similar alkaline, potassium-rich metavolcanics. According to Cooke (1966; p.134), intrusions of syenite and basic syenite were contemporaneous with the "Timiskaming" period of volcanism. Cooke (1966) stated that the mineralogical and chemical similarity of the syenites to the leucitic lavas, and of the basic syenites to the basic trachytes, indicate a common origin for these rocks. Cooke and Moorhouse (1968, p.119) considered that the distribution of leucitic flows, tuffs, and breccias indicates a major volcanic centre in the southern part of Lebel Township. Ridler (1969, p.52) believes the Lebel Stock to be the direct

descendant of the original feeder of the surrounding volcanic rocks.

Basic syenite, diorite, quartz gabbro, and serpentinite were found in localities near the Lebel Syenitic Stock. Probably some of the basic syenite owes its origin to contamination of peripheral parts of the Lebel Syenitic Stock by the basic igneous rocks. The peridotite is in the southwestern part of Lebel Township, close to the iron formation. The spatial association of peridotite and iron formation has been noted elsewhere in the Timmins-Kirkland Lake area (Pyke and Middleton 1970, p.17).

Phanerozoic

Cenozoic

Quaternary

Pleistocene and Recent

Surficial deposits in most parts of Lebel Township consists of glacial drift and clay in basin-like bedrock depressions. Most of the numerous bedrock highs are exposed as outcrop or are covered by thin soil. In the southeastern part of Lebel Township, however, surficial deposits predominate. The surficial deposits consist of sand (some of it windblown) and gravel from the western flank of the Munro Esker (Lee 1965), and attain a maximum thickness of more than 60 m (200 feet), (Hobson and Lee 1967). The gravel is part of the

western flank of the Munro Esker; the windblown sand was blown from an esker which is tributary to the Munro Esker from Lebel Township.

The community of King Kirkland is situated on sand and gravel of a generally southeast-trending branch of the Munro Esker. The branch extends from Kirkland Lake airport, which is built on a broad delta-like part of the tributary in Morrissette Township, north of Lebel Township.

The Munro Esker and its branch in Lebel Township provide sand and gravel for road and railroad beds, sand beaches and building sites, and are sources of water supply for Kirkland Lake and King Kirkland. The eskers are esker-delta complexes, and are located in channels (many of them fault-controlled) in the bedrock surface. Large volumes of water flow in the eskers, and appear on surface forming lakes such as Victoria Lake in the northeastern part of Lebel Township. Much of the water must have originated north of the height of land and flowed south in the fault zones followed by the eskers. In any case, the eskers and their associated lakes, the latter being "outcrops" of the water table, constitute rapidly self-replenishing supplies of large volumes of water. Thus, Kirkland Lake (population 15,000) has a water supply adequate for 50,000 people that comes mostly from a lake lying about 3.2 km (2 miles) from the height of land.

Structural Geology

Folds and Depositional Environments

Lebel Township forms part of the "Timiskaming mobile belt" described by Ridler (1969, p.12), who determined that one period of folding preceded the deposition of the Timiskaming metasediments, at least two periods of folding followed that, and several periods of crustal fracturing also occurred (Ridler 1969, p.107). The presence of cyclic graded bedding, simple and complex crossbedding, and ripple marks throughout the Timiskaming-type metasediments indicates deposition in shallow water marginal to mountainous areas (Cooke 1922; Thomson 1941). Hewitt (1949a, p.181) suggested that the Timiskaming-type metasediments were deposited in a eugeosynclinal environment and Bass (1961, p.696) postulated a volcanic island-arc system arising from the geosyncline. Hewitt and Bass interpret the great thicknesses of metasediments as indicating subsidence of the area of deposition during sedimentation. Hewitt (1949a, p.171) demonstrated that the provenance of the clastic debris is restricted to Keewatin-type and Timiskaming-type rocks within short distances of the areas of deposition.

Ridler (1969, p.12) suggested that syenite stocks, probably related to Timiskaming volcanism, formed vertical butresses about which subconcordant domical structures and crossfolds developed. The Lebel Township Syenitic Stock constitutes one such buttress.

Dubuc (1965, p.70) described part of the iron formation southeast of the Lebel Syenitic Stock as a syncline about 0.8 km (1/2 mile) wide, with its axis striking N35°E and plunging about 60°SW. Also, Dubuc noted a fold of similar attitude about 1.6 km (1 mile) farther south, in Boston Township. Isoclinal folding including these synclines seems to extend fairly continuously around the Lebel Stock. The folding is most obvious along Gull Lake, as indicated by the synclinal symbols on the accompanying map (see ODM Map 53a and Chart A, back pocket).

Faults

MacLean (1956, p.53) thought faulting was initiated during folding of the Timiskaming-type rocks, and the earliest faults may have been strike faults. General movements were to the southwest by the southeast sides of faults.

The Murdock Creek Fault Zone strikes generally N60°E and dips 65°NE at the Continental Kirkland No.2 shaft, and 75° to 80°NE on the Glenora and Black Gold properties. This fault zone is cross faulted at its intersections with the Lake Shore and Long Lake Faults, and may have undergone pre-ore as well as post-ore movements. Fault gouge is as much as 46 cm (18 inches) wide, and farther away from the main slip fracture is a crushed zone, including mylonite in some places.

The ore-bearing south vein of Kirkland Lake may terminate against the Murdock Creek Fault on the Glenora claims.

The ore-bearing north vein on Kirkland Lake extends east to the workings south of the Continental Kirkland No.1 shaft. The strike of the ore fractures corresponds to that of the Murdock Creek Fault, indicating possible contemporaneity of movement of the ore fractures and the Murdock Creek Fault.

The North Harvey Fault caused apparent horizontal movement of the dislocated strata south of Gull Lake. Where the fault crosses the boundary of Teck and Lebel Townships the southern end of beds striking north is cut off, and brought into contact with east-striking strata.

The Middle Harvey Fault extends east into Lebel Township through claims L.8080 and L. 8861 (see ODM map 53a, and Chart A, back pocket). It manifests itself on the Harvey Kirkland 122m level (400 feet) in a crosscut towards the north, and as a mud seam 0.3 m (one foot) wide. The rock north of the fault moved west and up relative to the south side, the latter may have moved west and up also, but to a lesser extent.

The South Harvey Fault extends east in a sinuous course, indicating that perhaps its dominant movement was vertical, although also the south side may have moved west relative to the north side.

Cross Faults

The cross faults or transverse faults are the youngest major movements. The apparent horizontal movement of beds east of the Long Lake and Heart Lake Faults northward relative to beds west of the faults may be the result of downward movement to the east.

Economic Geology

Compared to the Townships of Teck and Gauthier, mineral production from Lebel Township has been modest, and is now limited to sand and gravel. Gold and silver have been produced by the Bidgood, Gordon Lebel, Moffat Hall, Toburn, and Morris Kirkland mining companies. A small amount of copper concentrate was produced by Dane Mining Company Limited. Production of iron ore might be done by the Adams Mine from the magnetite-cherty tuff facies of iron formation in the southeastern part of Lebel Township.

Recommendations to Prospectors

As elsewhere in the Kirkland Lake-Larder Lake area, three facies of iron formation are present: oxide (magnetite-cherty tuff); sulphide (graphite-pyrite-pyrrhotite-tuff); and carbonate ("green" and "brown" carbonate rocks containing dolomite, ankerite, mica, quartz, and disseminated pyrite and arsenopyrite). In Lebel

Township, iron formation forms a ring around the Lebel Syenitic Stock. Where the oxide facies is sufficiently high grade and extensive to constitute iron ore, it causes a prominent high anomaly on total-intensity magnetic maps, and can be distinguished on aeromagnetic maps. The sulphide facies also causes electromagnetic anomalies except where the sulphide minerals are disseminated. The sulphide facies has potential for base metal exploration, including nickel where peridotite possibly cuts the iron formation, as described by Pyke (1970, p.17) for the Timmins area. The best exploration methods might be: sampling rusty zones; stripping overburden; geochemical sampling of the soils; geophysical exploration, and diamond drilling based on the above techniques. The carbonate facies should be investigated for gold deposits, but might require expensive exploration methods such as bulk sampling.

Additional exploration targets for gold mineralization are the syenitic and trachytic rocks, where they contain quartz veins or fine-grained disseminated pyrite. Most of the syenitic and trachytic rocks have been explored fairly extensively for high grade gold lode deposits in quartz veins. Large low-grade gold deposits, for which the Kirkland Lake-Larder Lake area seems to have potential, may occur in syenitic volcanic necks, trachytic flows and the carbonate facies of iron formation.

As indicated by discoveries on the Crystal Kirkland and other

properties, uranium is associated with syenitic and trachytic rocks as well as with Timiskaming-type greywacke and conglomerate. Such rocks are widespread in Lebel Township and exploration for uranium to date in them has been minor.

Description of Properties

Introduction:

The date of incorporation, mergers and present status of the companies mentioned in this section have been obtained from the following sources:

a) Canadian Mines Register of Dormant and Defunct Companies, 1960; published by Northern Miner Press Limited.

b) Canadian Mines Register of Dormant and Defunct Companies, 1966; First Supplement; published by Northern Miner Press Limited.

c) Canadian Mines Register of Dormant and Defunct Companies, 1971, Second Supplement; published by Northern Miner Press Limited.

d) Canadian Mines Handbook, 1935, 1937, 1939 to 1973-74.

Belrosa-Rocamsa Mines Limited

Belrosa Prospect (1)

(Formerly Boyd Kirkland and Brant Properties) on

(ODM Map 53a, Chart A, back pocket))

Geology:

The property is on the north edge of the Lebel Township Syenitic Stock and also contains fine to coarse-grained Timiskaming-type metagreywacke with east-trending carbonate zones exposed north of the syenite contact. Keewatin andesite is exposed within the syenite and metagreywacke zones.

Economic Features:

Stripping, trenching, and magnetometer surveys of carbonate zones (Frohberg 1946) and 743 m (2,438 feet) of diamond drilling (14 holes) in 1945 did not intersect gold mineralization in excess of 0.03 ounce of gold per ton over a width of 1.2 m (4 feet). Deeper diamond drilling (in 1945) consisted of ten drill holes, total length 1,222 m (4,006 feet) that tested several carbonate zones without locating gold mineralization (Winston, R.W. 1945; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake). The diamond drilling was concentrated on claims L.980 and L.40174.

History:

The Brant property was prospected in 1918 with an unspecified amount of diamond drilling done prior to 1922 (Hopkins 1923, p.75). Work on the Boyd Kirkland claims consisted of 275 m (900 feet) of surface trenching and digging two pits after the property was incorporated in 1936 as Boyd Kirkland Gold Mines Limited (Sinclair et al. 1937, p.106). Diamond drilling in 1937 was the last activity of the company.

The Belrosa claims consist of the former Brant and Boyd Kirkland properties with twelve additional claims northwest of Long Lake (Division of Lands, Mining Recorder's Office, Ontario Ministry of Natural Resources, Kirkland Lake). The 30-claim group was incorporated in 1944 as part of Belrosa-Rocamsa Mines Limited and was financed jointly by Macassa Mines Limited and Sylvanite Gold Mines Limited. All work was discontinued in 1945 and the company surrendered its charter in 1961.

Rocamsa Prospect (2)

Geology:

The Rocamsa Prospect is on the northeast edge of the Lebel Township Syenitic Stock and also includes fine to coarse-grained

Timiskaming-type metagreywacke, tuff, and trachyte flows. Keewatin andesite outcrops within the syenite near its north contact. An east-trending carbonate zone is exposed south of Turtle Lake.

Economic Features:

Surface prospecting and magnetometer surveys were conducted in 1944. (Frohberg 1945; Low and Keevil circa 1944). Seven diamond drill holes (2,738 feet; 834 m total length) confirmed magnetite bearing greenstone in 1945. A maximum gold assay of 0.02 ounce of gold per ton was intersected in a 2.7 m (9-foot) section of one drill-hole (Winston, R.W. 1945; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

History:

The Bouzan claims were prospected in 1913, with unspecified work before patenting in 1922 (Gibson 1913, p.54, and Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake). The Wright-Carroll ground was similarly developed between 1918 and 1922. The Stelmack and Wilson claims were established in 1934. These properties, with additional claims, were incorporated in 1944 as a 24 claim group of Belrosa-Rocamsa Mines Limited under the financial control of Macassa Mines Limited. Exploration on the Rocamsa group was terminated in 1945 and the company surrendered its charter in 1961.

Bidgood Kirkland Mine (3)

Geology:

The claims are in the Kirkland Lake-Larder Lake belt of Timiskaming-type interbedded metasediments and metavolcanics. The rocks here consist of conglomerate, greywacke, tuff, and trachyte, intruded by syenite, feldspar porphyry, lamprophyre, quartz diorite porphyry and diorite. The description of the geology is taken from Parsons (1946 and 1948).

Diorite

The diorite stock consists of several phases that grade into one another (Parsons 1946). The dioritic rocks are dull green and contain albite ($Ab_{98}An_2$) and epidotized, carbonatized, chloritized, and silicified zones. Epidote constitutes a maximum of 40 percent of parts of the diorite and forms patches, lenses, and stringers. Silicification, saussuritization, and pyritization are common forms of alteration replacing the epidote and the matrix.

In and near the northern section of the stock, the diorite contains fragments of porphyritic diorite and possible banded greywacke a maximum of 0.3 m (1 foot) in diameter. Near the main break, as well as near the property of Gordon Lebel Mines Limited,

ilmenite-containing diorite is abundant. Near faults and veins the ilmenite is altered to a pale lavender-coloured leucoxene. The ilmenitic diorite grades into fine-grained epidotized diorite. The rock types of the diorite stock have not been mapped in sufficient detail to remark on their significance or mutual relationships. According to Parsons (1946) there is no reason to suppose that the individual types of diorite have any bearing on the ore picture.

Mine terminology for a number of related intrusives are diorite porphyry or "porphyrite", and quartz porphyrite. They are green to pale green rocks with small white to pale green tabular feldspar crystals, and quartz eyes in the pale green rocks near the diorite contact and near metasediments.

Syenite

Several syenitic stocks have been found. The largest, which has granitic texture, intrudes the diorite stock in the No.2 winze area below the 465 m (1,525 foot) level. This stock broadens with depth (Parsons 1946).

The youngest intrusives are feldspar porphyry and hornblende lamprophyre dikes. They are genetically related to each other, and strike northeast and dip N70oW (approximately parallel to the gold-bearing veins). Furthermore, the dikes have sharp contacts and regular atitudes, so they provide the best fault displacement

markers to an ore search.

The feldspar porphyry, which is reddish brown, contains large equidimensional potassic feldspar phenocrysts and small elongated potassic feldspar phenocrysts, the latter being much more numerous. Minor amounts of hornblende are present. Lamprophyre is a dark fine-grained rock with small elongated grains of potassic feldspar and, in the matrix, a few grains of black hornblende. The feldspar porphyry and lamprophyre dikes seem to constitute the felsic and mafic phases of a single magma. In places the feldspar porphyry occupies the centre of lamprophyre dikes, with gradational contacts between the two types.

Most of the ore came from seven veins in the diorite stock that occupies much of claim L.9382 (see ODM Map 53a and Chart A, back pocket) and extends south into the Moffat-Hall ground. The gold-bearing quartz veins, which contain calcite, pyrite, molybdenite, chalcopyrite, and tellurides as well, occupy reverse fault fractures striking northeast and dipping northwest, approximately parallel to the feldspar porphyry dikes (Parsons 1948, p.655; Figure 2).

The strongest fault in the mine workings is known as the "Bidgood Main Break", a large, clean-cut, mud-filled fault along which the relative movement of the northwest (hanging wall) side is upward and east. The "Bidgood Main Break" and other faults having

approximately the same strike are cut by later faults striking north. Within the mine such post-ore faults, which are numerous, have caused a great deal of difficulty for mining operations by offsetting the ore. In addition, many ore lenses were small; so vertical as well as horizontal movements had to be taken into consideration in searching for their extensions (Parsons 1948, p.654, Figure 1).

The spatial relationship between syenitic rocks and the gold ore is exemplified by the No.9 vein. This vein is at or near the contact between feldspar porphyry and medium-grained hornblende syenite, underground near the No.1 shaft on claim L.6796 (see ODM Map 53a and Chart A, back pocket). A genetic relationship, a damming or a filtering effect on the gold-bearing solutions by the syenitic rocks is indicated by Figure 3 (Parsons 1948, p.656). The fracture or minor fault occupied by the vein in Figure 3 (Parsons 1948, p.656) passes through the lamprophyre dike, and its hanging wall is displaced upward a few feet (metres). Although no sulphide minerals or gold occurs within the dike, gold-bearing quartz is present in the part of the fracture between the lamprophrye dike and feldspar porphyry dike mentioned above.

A somewhat similar relationship between gold ore and diorite is exemplified by the No.10 vein. In this vein, the gold is concentrated adjacent to a diorite dike, and the concentration decreases with increasing distance from the dike.

Economic Features:

During the years 1934-39, and 1951, Bidgood Kirkland Gold Mines Limited produced gold and silver from 586,367 tons of ore (Arnoldi 1955, p.14).

In recent years, low-grade radioactive occurrences have been discovered in trachyte and syenite. Across a 70-foot (21 m) width of outcrop on claim L.7407 (see ODM Map 53a and Chart A, back pocket), the radioactivity is three to four times background, and representative samples contained 0.032 to 0.05 percent U_3O_8. In 1968, McIntyre Porcupine Mines Limited and Probex Limited dropped their option on the property, after limited exploration for uranium that included a scintillometer survey from a helicopter (Robertson 1948, p.92, and Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

History:

Bidgood Gold Mines Limited was incorporated in 1919 to prospect and develop eight claims, which were the nucleus of a group that increased to 22 claims. A number of northeast-striking, northwest-dipping veins were found and No.1 shaft was sunk near the north shore of Mud Lake on claim L.6796 (see ODM Map 53a, and Chart A, back pocket) on No.9 vein. By 1923, No.1 shaft had been sunk to a

depth of 180 m (600 feet) and levels opened up at the 90 , 120-, 180-m (300-, 400-, and 600-feet) levels (Hopkins 1923, p.4, p.74). In 1923, the mine closed and was reorganized as Bidgood Consolidated Mines Limited. In 1927 the mine was dewatered, and diamond drilling and lateral work underground were carried on for two years (Todd 1928, pt.2, p.155-156). In 1928, No.1 shaft was deepened to 221 m (725 feet) and No.2 shaft was started 3/4 mile (1.2 km) farther northeast, on claim L.9882. In 1929 the western claims of the present group were acquired from Cambro Kirkland Mines Limited. When operations were suspended in 1931; No.2 shaft (which later became the production shaft) had been sunk to a depth of 150 m (500 feet).

In 1933 Bidgood Kirkland Gold Mines Limited was incorporated to take over the property, and mining was resumed at No.2 shaft. The mine produced from 1934 until 1949, the ore coming from many levels between surface and a depth of 632 m (2,075 feet)(Savage 1964, p.15-16).

In 1956, Bidgood Kirkland Gold Mines Limited was reorganized to form Bidcop Mines Limited (Savage 1964, p.15-16). C.W. Tully drilled a 244 m (801 feet) long diamond drill hole on claim L.7407 in 1958.

Bryce 1917 (4)

Geology:

The single claim (L.2504) (see ODM Map 53a, and Chart A, back pocket) is adjacent to the Toburn property at the west end of Gull Lake. East-striking Timiskaming-type tuff and boulder conglomerate are intruded by Algoman-type feldspar porphyry.

Economic Features:

No economic mineralization is reported.

History:

The property was staked and patented in 1917 by W. Stillar (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Continental Kirkland Mine (5)

Geology:

Timiskaming-type metasediments, tuff, and trachyte flows, intruded by Algoman-type basic syenite, syenite, and syenite porphyry outcrop on the west claims. Glacial deposits cover most of the east claims. The north branch of the Murdock Creek fault trends northeast across the centre of the property.

Mining activity has been concentrated in the intrusive zones. Two shafts explored the Murdock Creek Fault and two parallel faults. Block faulted sedimentary rocks north of the intrusive zone produced complex underground structures, preventing the development of gold-bearing quartz veins and associated sulphides into commercial ore deposits.

Economic Features:

Gold assays in 1922 of grab samples obtained during the sinking of the No.1 shaft, on the former post claim (L.2257) (see ODM Map 53a and Chart A, back pocket) ranged from $8.00 to $39.00 per ton (source unknown). Best mineralization reported from underground drilling was 0.24 ounce gold per ton across 0.73 m (2.4 feet) in a wide quartz zone on the 244 m (800 feet) level in 1938 (Northern Miner 1939). No production was reported during the life of the property.

History:

Organized in 1922 as Continental Mines Limited, the company acquired a 27 claim group from 18 different owners (Savage 1964, p.22). Surface exploration was followed by sinking a two-compartment shaft (No.1 shaft). Underground exploration on several levels to a depth of 251 m (825 feet) continued until the

mine closed in 1925. Continental Kirkland Mines Limited incorporated in 1927 and sank the No. 2 shaft to below 150 m (500 feet) on the former Croteau claim (L. 2807) (see ODM Map 53a). All operations were suspended in 1929 after lateral work was done on the 150 m level (500 feet) and over 1200 m (4,000 feet) of diamond drilling as done from surface. Company control was transferred jointly to Toburn Gold Mines Limited, Premier Gold Mining Company Limited, and American Smelting and Refining Company in 1936. The No.1 shaft operations resumed under Toburn Gold Mines' direction with 737 m (2,418 feet) of underground diamond drilling done in 1938 (Northern Miner 1939). The mine was allowed to fill with water the following year (Tower et al. 1940, p.209).

Diamond drilling on the Toburn property in 1947 and on the surface of the Continental Kirkland property in 1962 were the last reported activities on the deposit (Savage 1964, p.23).

Cyrstal Kirkland Occurrence (6)

Geology:

About 40 percent of the ground is outcrop or shallow overburden. The northern and southern parts of the property are underlain by Timiskaming-type sedimentary and volcanic rocks that consist of conglomerate, greywacke, slate, and trachyte. Outcrops in the central part of the property are feldspar porphyry, syenite

porphyry, mafic syenite, and lamprophyre.

Economic Features:

One showing on claim L.9935 (see ODM Map 53a and Chart A; back pocket) consists of pyrite-containing quartz stringers in a fracture zone cutting feldspar porphyry. The fracture zone strikes N60oE and dips 75oN, has been traced for a length of 17 m (56 feet), and is 0.6 to 1.2 m (2 to 4 feet) wide. A diamond drill hole intersected the zone at a vertical depth of 60 feet (18 m) and yielded $4.00 worth of gold per ton (0.11 ounce gold per ton, gold at $36.20 per ounce) for 0.9 m (3 feet) and $3.20 worth of gold per ton (0.088 ounce of gold per ton) for 0.9 m (3 feet) (Holbrooke 1939).

Another showing near the centre of claim L.9933 consists of quartz stringers in a fracture zone in fine-grained mafic syenite a short distance south of its contact with feldspar porphyry. The fracture zone strikes N65oE, dips steeply northwest, has been traced by cross trenches for a length of (140 feet) [43 m], is 0.6 to 1.5 m (2 to 5 feet) wide, and contains fine-grained pyrite and some galena. The owners reported $10.00 to $30.00 worth of gold per ton (0.27 to 0.83 ounce of gold per ton) across 0.3 m (1 foot) in the centre of the zone, and 0.4 to 0.6 m (1-1/2 to 2 feet) on either wall containing about $1.80 in gold per ton (0.049 ounce of gold per ton) (Holbrooke 1939).

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A radioactive boulder was discovered in 1957. In 1966, assays (including 2.16 lb. U_3O_8 per ton, and 0.22 percent U_3O_8) were obtained from the boulder, the soil was removed by bulldozer and rock trenching was done by Rio Algom Mines Limited, in order to examine fresh surfaces of bedrock near the boulder.

From north to south, the rock types are: Timiskaming-type trachyte, conglomerate, tuffaceous greywacke with areas of quartzite (the darkest tuffaceous greywacke is the radioactive stratum), sericite schist, and trachyte. Diamond drilling indicates that the trachyte flows grade into syenite intrusive rocks. To the west, the radioactive stratum branches into two separate strata, for a total length of about 490 m (1,600 feet) and widths from 0.9 to 2.4 m (3 to 8 feet). A 1.5 m (5 feet) chip sample across the greenish-black, most highly radioactive part of the tuffaceous greywacke of the eastern showing contained almost 2 lbs. U_3O_8 per ton (Robertson 1968, p.92). Drilling of seven diamond-drill holes (about 600 m; 2000 feet) by Rio Algom, designed to core the radioactive strata (dip averaging 80°N) at about 37 m (120 feet) depth, obtained only one ore-grade section (1 m; 3-1/2 feet) containing 1-1/2 lb. U_3O_8 per ton (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

No thorium was obtained from the samples assayed, and the intensity of radioactivity is low compared to Elliott Lake U_3O_8 ore of

similar grade. The uranium-bearing mineral was never identified, being too fine-grained for concentration by panning methods.

History:

Crystal Kirkland Mines Limited acquired the four claim group in 1928. Sylvanite Mines Exploration Department conducted a geological study and sampling program in 1939. Discovery of radioactivity on the property in 1957 was followed by uranium exploration by Rio Algom Mines Limited in 1966.

Dane Mine (7)

(Nucleonic Mines Limited)

Geology:

Keewatin-type bedded mafic and felsic tuff, including magnetite-cherty tuff; "iron formation", are wedged between the Lebel and southeast Teck Township Syenitic stocks. Some of the Keewatin-type rocks are altered to hornblende schist, hornblendite, and diorite. Shafts were sunk at the two main showings, which are in iron formation.

The east shaft is in a north-striking, steeply east-dipping, thinly bedded low-grade magnetite-chert iron formation containing

chloritic zones heavily mineralized with lenses and stringers of chalcopyrite and some pyrite and pyrrhotite. The west shaft is a vertical east-striking quartz vein containing blebs of chalcopyrite and cuts a north-striking layer of iron formation.

Economic Features:

During 1911-12, and 1914, 137 tons (124 metric tons) of copper ore were shipped at a value of $2,692 (Gerrie 1950). In 1913, 698 metric tons (770 tons) of 15 percent to 20 percent copper ore were shipped (copy of letter, Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake). Additional shipments were made in 1921 and during World War II (one ton grading 11 percent copper ore) (Shklanka 1969, p.363). Consular Harker's diamond drilling intersected up to 2.15 percent copper over a core length of 6 m (20 feet). From the showing at the east shaft, a chip sample across 0.9 m (3 feet) true width contained 9.72 percent copper and no gold values (Gerrie 1953). Assays of the Nucleonic Mines' drill core yielded no gold values and 0.05 percent copper in one sample (Pain 1970).

History:

The property was known as the Ogilvie-McKinnon Copper Mine in 1911. In 1912 the Dane Mining Company sank two shafts, 30 m and 34 m (100 and 113 feet) on former claim L.31725 and a third shaft on L.24218

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(See ODM Map 53a and Chart A, back pocket). The eastern shaft (34 m) was later deepened to 60 m (200 feet), followed by 60 m (200 feet) of lateral development (Savage 1964, p.83). A geological study was conducted in 1950. In 1951 the Harrison Mining and Development Company dewatered the eastern shaft to the 30 m (100 feet) Level. ~~(100 feet)~~ Consular Harker Mines Limited did X-ray diamond drilling from the surface near the eastern shaft. In the following year a self-potential survey covered the two remaining claims in Lebel Township. A magnetometer survey was conducted by Consular Harker in 1955 (Shklanka 1964, p.363). Iso Uranium Mines Limited optioned the property in 1956 and dewatered the eastern shaft, followed by eight diamond-drill holes from the surface, totalling over 481 m (1,578 feet) (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake). J.J. Gray sponsored a 215 m (707 foot) diamond-drill hole on former claim L.31725 in 1969. M.J. Labine conducted geological and magnetometer surveys on the adjacent claim (formerly L.1112) in the same year. Nucleonic Mines Limited acquired the property and drilled five holes totalling (1,307 feet) 398 m on former claim L.31725 in 1969-1970 (Pain 1970).

Darmac Prospect (8)

(Formerly Jalore Mining Company Limited)

Geology:

Extensive swamp and sand overburden are the main features of the surficial geology. Diamond drilling and scattered outcrops revealed dark, finely bedded Keewatin-type tuff and layered iron formation intruded by numerous dikes of coarse-grained syenite, and a wide north striking diabase dike. An open, northeast trending synform is indicated by bedding attitudes across the Jalore Mining Company Limited claims.

Economic Features:

Three diamond-drill holes which total 600 m (2000 feet) in length in 1946 on claim L.41885 yielded gold assays of 0.10 ounce to 0.36 ounce of gold per ton in 1.8 m (6 feet) core sections (Whitman 1949). Four diamond-drill holes in 1949 and 1950 with a total length of 185 m (606 feet) intersected $0.17 per ton (0.004 ounce per ton) of gold, 0.06 percent copper, nil silver and nil nickel. Relogging of all the core in 1951 disputed the previously reported gold mineralization (Anon. 1951A). Minor amounts of pyrite were found but no mineralization of economic value was indicated (Drury 1960).

History:

Surface prospecting and trenching of iron sulphides occurred circa 1914. Sporadic diamond drilling was reported from 1914 to 1946 but

no record of the core exists (Whitman 1949). The company was organized in 1945 with a group of 9 claims previously held by the Orezone Prospecting Syndicate. An additional 17 claims were acquired by purchase and staking to form a single block in the southeast corner of the Township. The charter of Darmac Gold Mines Limited was cancelled in 1958. Five of its claims were patented by Peter J. Roche and optioned to Jalore Mining Company Limited in 1956. During 1960 a geological survey was done and one hole was drilled for a length of 195 m (639 feet) (Drury 1960).

Donnell and Myles (1916) (9)

Geology:

Timiskaming-type greywacke strikes east to S55°E and dips southwest in scattered outcrops at the east end of Gull Lake. Boulder conglomerate of similar attitude underlies the greywacke in the eastern part of the four claim block. Both units are intruded by Algoman-type quartz porphyry and basic syenite.

Economic Features:

No economic mineralization has been reported.

History:

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Claim L.1605 was staked and patented by J.W. Myles in 1915, L.1604 by J.A. Donnell in 1916, and L.1602 and L.1603 by J.J Rankin in 1916. The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Ed. Hargreaves-Kirkland Mine (10)

Geology:

A gabbro mass near a Keewatin-Timiskaming contact and an adjacent red feldspar porphyry intrusive mass are the main bedrock features. The contact zone trends southeast. Grab samples from the mine dump yielded gold assays from 0.005 ounce per ton to 743.0 ounces per ton in 1959 (Anon. 1959). McLeod (1959) concluded that the variety of mineralization present in the dump specimens indicates an abandoned rock or mineral collection. The shaft was sunk on a carbonate zone, at the contact between Timiskaming-type sedimentary rocks and Keewatin-type volcanic rocks and a gabbroic intrusion.

Economic Features:

No economic mineralization has been reported, except for the assays of samples of uncertain origin (Savage 1964, p.32).

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History:

A vertical shaft was sunk on claim L.8084 in 1928 to 49 m (162 feet) and deepened to 90 m (300 feet) in 1936. Some lateral work was done on the 49 m (160 feet) level. The shaft reportedly intersected a south dipping quartz vein 2.4 m (8 feet) wide. Ed Hargreaves Kirkland Gold Mine Limited was incorporated in 1934. Operations were halted in 1936 (Savage 1964, p.31). the property was acquired by T. Tammlnen in 1959, including six claims of the former Kirgood Gold Mines property, who did detailed mapping of the shaft area and assayed the dump samples in 1959 (Amos 1959).

Two diamond-drill holes (300 m; 1000 feet) collared near the shaft by Grasset Lake Mines Limited in 1961 intersected minor pyrite, pyrrhotite, and chalcopyrite in gabbro and feldspar porphyry (Gauvreau 1961).

In 1972 Toronado Mines Limited did horizontal loop electromagnetic and magnetic surveys but no anomalies were picked up (Cunningham-Dunlop 1972).

Erin Kirkland Prospect (11)

Geology

Most of the property is covered by swamp, sand and gravel. The Munro esker covers the eastern portion of the claims, with dune

sand in the southeast corner. Overburden thicknesses of 8 m (27 feet) to 69 m (226 feet) are indicated by drilling (Parsons and McLeod 1948, Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake). Keewatin-type metavolcanic breccia, agglomerate, and tuff are the dominant underlying rocks. The Lebel Township Syenite Stock intrudes the northwest claim. A southwest-trending carbonate zone, cut by diabase dikes striking N20oE, is inferred to cross the southwest corner of the property. A narrower carbonate zone of parallel trend is also inferred across the northeast corner. Feldspar porphyry outcrops on the eastern claims (in Gauthier Township).

Economic Features:

Traces of galena and native silver are recorded for a diamond drill hole near the Lebel-Gauthier township boundary. Gold assays yielded 0.005 to 0.08 ounce of gold per ton over core lengths of 0.3 to 1.5 m (1 to 5 feet) in three diamond-drill holes. Two gold intersections occurred in brecciated quartz veins at 34 m and 328 m (110 and 1,075 feet) in two drill holes assayed 0.01 ounce of gold per ton (Parsons and McLeod 1948, Resident Geologist's Office, Ontario Ministry of Natural Resources, Kirkland Lake).

History:

The company was incorporated in 1937 on 21 claims in southeastern

Lebel Township with an adjoining claim in Gauthier Township. One diamond-drill hole of 460 m (150 feet) length on claim L.28263 was completee in 1940. Ten holes totalling over 2,753 m (9,032 feet) in length were drilled in 1944 on claims L.29980 and L.28263. An incomplete record of this work exists.

Dominion Gulf relogged the core in 1948 (Savage 1950). No further activity has been reported. The charter of Erin Kirkland Mines Limited was cancelled in 1967.

Evenlode Prospect (12)

Geology:

Algoman-type syenite and Timiskaming-type carbonatized greywacke outcrop in the southeast corner of claim L.9985 (see ODM Map 53a and Chart A, back pocket). Timiskaming-type tuff was intersected in one diamond-drill hole in the northeast corner of the same claim. The remainder of the property is covered by sand and swamp. A northwest striking carbonate zone is inferred across the southern part of the claims.

Economic Features:

No economic mineralization was recorded by surface exploration of three diamond-drill holes, 1,376 m (4,516 feet) in total length in

1944 on claims L.9689 and L. 9985 by Biroco Kirkland Mines Limited (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

History:

The property was staked in 1921-1922 and patented in 1927 and 1928 by P.J. Roche and R.S.J. Roche. The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Federal Kirkland Mining Company Limited (1927) (13)

Geology:

Timiskaming-type metasediments are intruded by lamprophyre, syenite porphyry, and northtrending diabase dikes.

Economic Features:

No economic features are reported from the Lebel Township claims. One vein in the northeast corner of claim L.2502 occurs in Timiskaming-type conglomerate (Savage 1964, p.24).

History:

The company was formed in 1927 by taking over claims of Kirkland Combined Mines Limited and Kirkland Federal Mines Limited (Savage 1964, p.24).

H. Flynn (1936) (14)

Geology:

The McTavish Lake property is almost entirely water covered. A small portion of an island of carbonatized Keewatin-type volcanic breccia, agglomerate, and tuff with a schistosity striking east to southeast is the only exposed bedrock. The eastern boundary of the claim is swamp covered. The Crystal Lake claim is water covered except for a small part of its northeast corner, underlain by Timiskaming-type greywacke.

Economic Features:

No economic mineralization has been reported from either property (no report of any kind).

History:

The McTavish Lake claims (L.16132 and L.16133) (see ODM Map 53a, and Chart A, back pocket) were staked in 1926 by G.A. Edwards and the Crystal Lake claim (L.14284) in 1924 by D.J. Pinel. Both

properties were patented in 1936 by H. Flynn. The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Glendora Prospect (15)

Geology:

The main rock types on the property are east-trending Timiskaming-type boulder conglomerate, tuffaceous conglomerate, and coarse greywacke. These rocks are intruded by Algoman-type basic syenite in the northeast corner of the claim group. The claim group is cut by the northeast-trending Murdock Creek Fault.

Economic Features:

A vein located on claim L.2412 (see ODM Map 53a and Chart A, back pocket) in a narrow band of syenitized tuff is in contact with a conglomerate on surface which assayed 0.259 ounce of gold per ton over 45.7 cm) (18 inches) for a length of 81 m (265 feet). On the 46 m (150 feet) level the vein assayed 0.2 ounce of gold over 107 cm (42 inches). The 1945 diamond drilling failed to locate the mineralized veins in the tuff (Hogg 1939, revised 1951).

History:

The information in this section is derived mainly form Savage (1964). The northwest claim of the group, L.2412 (north of Gull Lake), was staked in 1912 by T.H. Tough. Subsequently, most work was done on this claim. In 1914 Gull Lake Mining Company acquired claim L.2412 and adjacent claims. This company was superseded by London Gull Lake Mines Limited who sunk a 14 m (45 foot) shaft in 1924.

Glenora Gold Mines Limited took over the property in 1933, and carried out a development program. Extensive trenching was followed by sinking a shaft to a depth of 142 m (465 feet) with levels at 46, 91, and 111 m (150, 300, and 365 feet) and 35 diamond drill holes (footage unknown). The mine was closed in 1937. In 1945 four diamond drill holes (1454 m; 4770 feet) long were drilled to explore the Murdock Creek Fault. Glenora Gold Mines Limited was reorganized in 1955 and became Glenn Uranium Mines Limited.

Gordon Lebel Deposit (16)

(extension of Bidgood Mine)

Geology:

The contact between Keewatin-type and Timiskaming-type rocks trends S65°E across the centre of the property. North of the contact, the outcrops along the south shore of McTavish Lake are Keewatin-type

volcanic rocks (including pyroclastic rocks) intruded by diorite. South of the contact are Timiskaming-type interbedded sedimentary rocks, pyroclastic rocks, and trachytic flows striking parallel to the contact, that are cut by Algoman-type feldspar and quartz porphyry and a diabase dike.

Several faults cross the property, the most important being the "Bidgood Fault".

Economic Features:

A small tonnage of gold ore from the stope above the north drift from the Bidgood 617 m (2025 feet) level was included in the production figures of Bidgood Kirkland Gold Mines Limited (Savage 1964, p.31).

During the recent exploration for uranium on the neighbouring Crystal Kirkland and Bidgood properties, some uranium was found on Claims L.14682 and L.14678 of the Gordon Lebel property. The highest assay obtained was 0.09 percent U308 in a chip sample taken from a 3.6 m (12 feet) width of dark tuffaceous greywacke on claim L.14862 (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

History:

Gordon Lebel Mines Limited was incorporated in 1927 and took over the 7 claims previously held by Pinelle Kirkland Mines Limited. Two diamond-drill holes (totalling more than 203 m; 665 feet) were drilled to test the Bidgood Fault.

Following a geological map (1 inch to 50 feet; 1:600) and report by A.C. Lee in 1936 (Butterfield 1937), 21 holes (3,620 m; 11,880 feet) were diamond drilled in 1936 and 1937. Most of the diamond drilling was done near the extension of the Bidgood Fault, in search for the orebodies similar to those at the Bidgood mine. The diamond drilling results indicated little possibility of finding ore at shallow depths on the extension of the Bidgood Fault. A subsequent development programme, including plans to sink a shaft to 300 m (1000 feet), was deferred following the outbreak of war in 1939 (Savage 1964, p.31).

By the end of the Second World War, the company had acquired 7 additional claims, and in 1946 arrangements were made with Bidgood Kirkland Gold Mines Limited to have part of the Gordon Lebel property explored at depth from the Bidgood underground workings. Two drifts on the Bidgood 617 m (2025 feet) level were extended across the boundary, the north drift for 40 m (130 feet) and the south drift to 20 m (70 feet). A small stope was started above the north drift, but was abandoned when the grade became too low. The Bidgood Mine itself was closed in 1949 (Savage 1964; p.31).

Gull Kirkland Prospect (17)

Geology:

Timiskaming-type tuffaceous conglomerate, fragmental tuff and greywacke strike N60°W and dip southwest. The tuff and conglomerate are intruded by two small stocks of Algoman-type basic syenite.

Economic Features:

Surface exploration and 1967 m (6455 feet) of diamond drilling reported in 1938 did not yield economic mineralization (Canadian Mines Handbook 1939, p.111).

History:

The claims were staked and patented in 1917 (L.2923), 1921-1926 (L.9619), and 1919-1926 (L.S. 202) by E. Croteau, J.B. Neahon, and T.W. Toner. Gull-Kirkland Gold Mines Limited acquired the property from the Kirkland Gull Lake Gold Lake Syndicate and was incorporated in 1925 (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Harrison Occurrence (18)

Geology:

The single claim property (L.2772), between the claim groups of Donnell and Myles and Lebel Oro Mines Limited, contains numerous outcrops of Timiskaming-type tuff and tuff breccia intruded by Algoman-type basic syenite, lamprophrye, and feldspar porphyry.

Economic Features:

Pyrite bearing quartz veins 13 mm to 5 cm (1/2 inch to 2 inches) with pyrite having thin rims of chalcopyrite, were exposed by a pit in the southwest corner of the claim. A surface grab sample was reported by G.E. Harrison to yield a gold assay of $7.00 per ton (0.17 ounce per ton at 1950 values). Drill core assays were of "low gold values" (Savage 1952)

History:

Surface trenching and a 40 m (113 feet) diamond-drill hole in 1952 are the only reported activities (Savage 1953).

Reference:

Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Harvey Kirkland Mine (19)

Geology:

East-striking Timiskaming-type boulder conglomerate and coarse and fine-grained greywacke are intruded by Timiskaming-type trachyte sills. The south half of the property has been displaced to the east. It is bounded on the north by the Moffat-Hall Fault Zone with three splay faults trending northeast on claim L.7875. The South Harvey Fault follows the south boundary of the property.

Economic Features:

No economic data were recorded (Savage 1964, p.33).

History:

The property was incorporated in 1922. A 127 m (417 feet) deep shaft was sunk in quartz pyrite veinlets on claim L.1872 by 1924, with levels developed at 60 m and 120 m (200 and 400 feet). This was followed by 700 m (2300 feet) of surface diamond drilling in 1925. Subsurface development continued for a year in 1929. Elroy Gold Mines Limited incorporated the Harvey Kirkland Mines Limited property and became Belteco-Kirkland Mines Limited in the same year (Savage 1964, p.32).

Kenakott Kirkland Mine (20)

Geology:

Keewatin-type volcanic rocks which are intruded by diorite are exposed on the property.

Economic Features:

There is no record of economic mineralization (Savage 1951).

History:

Kenakott Kirkland Gold Mines Limited was incorporated in 1936 on 8 claims in the northeast corner of the township, acquiring the former property of Seneca-Lebel Gold Mines Limited. Surface exploration, 900 m (3000 feet) of diamond drilling, and a 7.6 m (25 feet) deep shaft were completed in 1936 (Savage 1951). The Kenakott Kirkland Mines Limited charter was cancelled in 1955 and that of Seneca-Lebel Gold Mines Limited in 1956.

King Kirkland Mine (21)

Geology:

The north claims are drift covered. Most of the property north of King Kirkland station is in Algoman-type quartz porphyry.

Timiskaming-type greywacke, trachyte flows and sills, and tuffaceous conglomerate and agglomerate strike east and dip vertically or steeply to the south.

Economic Features:

One vein is exposed on surface for over 60 m (200 feet). Sampling yielded gold assays from $1.00 to $48.00 per ton (0.04 ounce to 2 ounces gold per ton; 1921 values), with several samples ranging from $4.00 to $22.00 per ton (0.18 to 0.97 ounce of gold per ton). A 2.4 m (8 feet) deep pit on vein No.25 yielded a bottom sample of $10.00 per ton (0.44 ounce gold per ton) over 0.6 m (2 feet). Other veins yielded samples ranging from $7.00 per ton (0.31 ounce gold per ton) over 12 m (40 feet) of surface exposure to $7.50 per ton (0.33 ounce gold per ton) from grab samples. Sampling of the No.5 vein in the shaft yielded a 1921 gold value of $34.00 per ton (1.5 ounces of gold per ton) across 36 cm (14 inches) at a depth of 18 m (60 feet). At the 27 m (90 feet) level the vein assayed $28.00 per ton of gold (1.2 ounces of gold per ton) across 0.6 m (2 feet) (Craig 1921).

History:

King Kirkland Gold Mines Limited was incorporated on a ten claim group in 1920; following a gold discovery on claim L.4118 (see ODM Map 53a and Chart A, back pocket) by R. Montgomery in 1918. An

inclined shaft was sunk during the next three years on a series of veins exposed on claim L.8002 and levels were opened at depths of 27 m and 120 m (90 and 400 feet). Tonopah Mining Company Limited optioned the property in 1923 and did additional lateral work on the 120 m (400 feet) level, consisting of 716 m (2350 feet) of crosscutting and drifting. Activity ceased when the option was dropped at the end of the year (Hopkins 1923, p.72).

Reorganization in 1936 was accompanied by a name change to Kirkking Gold Mines Limited. The mine was dewatered and re-sampled with some additional diamond drilling on claims L.8001 and L.8002. Kirking Gold Mines Limited surrendered its charter in 1938 and the property again became that of the King Kirkland Gold Mines Limited. No further activity has been reported (Savage 1964, p.36-37).

Kirana Kirkland Mine (22)

Geology:

Most outcrops are pillowed Keewatin andesite that dip generally to the north. Timiskaming-type conglomerate overlies andesite in the southeast corner of claim L.1749 (see ODM Map 53a and Chart A, back pocket). Algoman-type quartz porphyry intrudes the andesite in the northwest corner of the property.

Economic Features:

The narrow high grade streaks or bands are reported to carry from $20.00 to $15.00 per ton (0.9 ounce to 7 ounces gold per ton) of gold, and a probable value of $15.00 to $18.00 per ton (0.73 to 0.87 ounce of gold per ton) is given for a width of 2 m (7 feet) to 3 m (10 feet), for some of the ore (Burrows and Hopkins 1915, p.263). Later figures give gold values of $23.08 (0.65 ounce per ton) for B width of 0.5 m (1.8 feet) and a length of 50 m (170 feet) (Nelson 1947).

History

The claims of Kirana Kirkland Gold Mines straddle the Teck-Lebel Township boundary. La Belle Kirkland Mines during 1916 sunk an inclined shaft to a depth of 90 m (300 feet) (Burrows and Hopkins 1916, p.262). It was subsequently deepened to 110 m (360 feet) and 350 m (1150 feet) of lateral work was done on the 30 and 76 m levels (100 and 250 feet).

Kirana Kirkland Gold Mines Limited was incorporated in 1936 succeeding La Belle Kirkland Mines Limited. The mine was dewatered in 1936 and the shaft was reconditioned, and a further 250 m (820 feet) of crosscutting done mainly on the 776 m (250 feet) level. The company's charter was cancelled in 1954 (Savage 1964, p.37-38).

Kirduke Gold Mining Syndicate Limited [1944] (23)

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Geology:

Bedrock is exposed in small scattered outcrops above a thin cover of pleistocene sand and gravel. Keewatin-type andesite outcrops on the western two-thirds of the property. Pillowed andesite, on claims L.6803 strikes N50°E and dips N80°W. A narrow zone of Algoman type feldspar porphyry trends east near the north boundary of claim L.6802 and Algoman-type mafic intrusives are exposed in the southwest corner of the property. Quartz veins in andesite and feldspar porphyry have been explored by surface pits.

Economic Features:

No economic mineralization has been reported.

History:

The property (claims L.6802 and L.6803) was staked in 1916 and patented in 1924 by H.B. Duke (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake). The Kirduke Gold Mining Syndicate Limited was incorporated in 1938 and allowed its charter to lapse in 1944.

Kirgood Mine (24)

Geology:

Keewatin-type volcanic rocks trend northeast across the southern claims of the property. Sheared Algoman-type feldspar porphyry, Timiskaming-type greywacke, conglomerate, and tuff outcrop north of the volcanic rocks. A quartz vein and mineralized shear zone strike N70E across claim L.9250 and has been exposed for a length of 76 m (250 feet). A shaft was sunk to a depth of 12 m (40 feet) on a branch of the Murdock Creek Fault.

Economic Features:

The highest gold value obtained in diamond-drill core was 0.01 ounce per ton from quartz veins and stringers (Sutton 1937). Sampling of the surface pits and shaft yielded traces to $0.35 of gold per ton (Harding 1939).

History:

Kirgood Gold Mines Limited was incorporated in 1936 on the former D.A. McPherson or Thackerey claim group in the north-central part of Lebel Township. Early surface exploration was concentrated on claim L.9250 and a 12 m (40 feet) shaft was sun, on claim L.8680. Four diamond drill holes of 726 m (2381 feet) in total length were drilled on claims L.8680 and L.9250 in 1937. Dewatering and sampling of the surface pits and shaft were done in 1939. The

company's charter was cancelled in 1960 (Savage 1964, p.38).

In 1972 Toronado Mines Limited did horizontal loop electromagnetic and magnetic surveys and detected some small magnetic anomalies (Cunningham-Dunlop 1972).

Kirkland Central Occurrence (25)

Geology:

Keewatin-type andesite is exposed in numerous outcrops on the property. Timiskaming-type conglomerate overlies the andesite in the southwest corner of the property. A small intrusion of Algoman-type quartz porphyry outcrops in the northwest corner of the property.

Economic Features:

Surface exploration in pits dug before 1937 did not yield economic mineralization.

History:

The property was staked in 1915 and patented in 1923 by T. Oke. Kirkland Central Mining Company Limited was incorporated as a gold prospect on two claims in the northwest of Lebel Township and an

adjacent claim in Morrissette Township (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Kirkland Combined Occurrence (26)

Geology:

Four claims are in the northwest quarter of Lebel Township. Algoman-type acid syenite and syenite intrude Timiskaming-type boulder conglomerate and coarse greywacke in the south half of the property. The Algoman-type syenites are in fault contact with Timiskaming-type metasediments in the west quarter of the property.

Economic Features:

No economic mineralization is reported.

History:

The property was staked in 1917 and patented in 1919 by P. Woodward. Kirkland Combined was incorporated in 1917 as a four claim gold prospect (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Kirkland Commodore Prospect (27)

Geology:

Timiskaming-type greywacke, tuff-breccia, and agglomerate outcrop north of a central trachyte flow zone which trends approximately S70°E across the property. A trachyte sill intrudes part of the southern contact of the trachyte flow zone. Both trachyte units are intruded by north to northeast striking diabase dikes. Scattered outcrops of Timiskaming-type tuff and tuffaceous conglomerate occur south of the trachyte zone.

Economic Features:

Diamond drill core gold assays yielded a trace to 0.17 ounce of gold per ton in 0.5 to 0.9 m (1.5 to 3 feet) sections. No other mineralization was reported from the diamond-drill core of 25 holes totalling 4,281m (14,047 feet) (Anon. 1951).

History:

Kirkland Commodore Mines Limited was incorporated in 1950. The property was optioned to Mining Corporation of Canada Limited in the same year. Mining Corporation of Canada Limited did geological mapping and conducted the 1950-1951 diamond drilling program (Savage 1951a). Since 1951 the company has been idle.

Kirkland Eastern Gold Mines Limited (1922) (28)

Geology:

Timiskaming-type conglomerate and white fragmental tuff outcrop on the north and south shorelines of the central part of Gull Lake. The property includes one island of tuffaceous conglomerate and exposures of fragmental tuff northwest of the constriction of land dividing the north and south parts of Gull Lake.

Economic Features:

No economic mineralization has been reported.

History:

The property was incorporated in 1922 as Kirkland Eastern Gold Mines Limited. In 1937 the company was succeeded by the New Kirkland Eastern Gold Mines Limited. Its charter was cancelled in 1958.

Kirkland-Hudson Bay Gold Mines Limited (1919?) (29)

Geology:

Northwest-striking Timiskaming-type conglomerate, greywacke, and

tuff dip steeply to the south on the south shore of Gull Lake, the company's only claim in the Lebel Township.

Economic Features:

No economic mineralization has been reported.

History:

Kirkland-Hudson Bay Gold Mines Limited was incorporated in 1919 under the control of Hudson Bay Mines Limited. No record exists of activity on the company's former single claim in Lebel Township (L. 2954). The company became Kirk-Hudson Mines Limited in 1956 and changed its name to Northgate Exploration in 1958 (Savage 1964, p.41)

Kirk Royale Mine (30)

Geology:

The north claims of the property are almost entirely sand covered. Small and widely scattered outcrops of Algoman-type greywacke, quartz porphyry occur on the property. Timiskaming-type conglomerate, and tuff strike east and dip south. These units are interbedded with a trachyte flow in the centre of the property and a conformable trachyte sill across the southwest claim. The shaft was sunk on Timiskaming-type greywacke and the underground

operations explored a quartz vein that follows the north contact of the trachyte flow and conglomerate (Savage 1964, p.45).

Economic Features:

Sampling results are not available. No economic mineralization has been reported (Savage 1964, p.45).

History:

In 1924 Kirk Gold Mines Limited, incorporated in 1916, sank a shaft to 58 m (190 feet) (Hopkins 1923, p.72). In 1926 the company was reorganized and became Conroyal Mines Limited, sinking a shaft to 140 m (550 feet). By 1928 a winze had extended the mine to a depth of 340 m (1115 feet) with lateral work concentrated on the 90 and 150 m (300 and 500 feet) levels (Todd 1928, p.157). The mine closed in the same year and remained inactive until 1937.

Conroyal Mines Limited became Conroyal Gold Mines Limited in 1934 and Kirk Royale Gold Mines Limited in 1937. Kirk Royale dewatered the mine and reconditioned the equipment. A sampling and diamond drilling program followed until all activity ceased at the end of 1937 (Sinclair et al. 1938, p.147).

In 1950 a single diamond drill hole of 161 m (528 feet) length was drilled from the surface (Savage undated). In 1958 the Kirk Royale

property was acquired by G.E. Harrison who maintained a diamond drilling program from 1959 to 1963. Ten holes were recorded with a total length of 445 m (1461 feet) (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake). During the year 1971-1972, T. Martin diamond drilled three holes (221 m; 726 feet) ~~Lakeside-Kirkland Mine (31)~~ and did some trenching on it.

Lakeside - Kirkland Mine (31)

Geology:

Outcrops of Timiskaming-type conglomerate, greywacke, and pyroclastic rocks dominate the western half of the property. The eastern claims are intruded by Algoman-type basic syenite and porphyry. The North-Harvey Fault and its subsidiary faults trend approximately N60°E across the west half of the property. Its northern branch trends northeast and intersects the No.1 shaft area as a zone of seritized greywacke.

Economic Features:

Only trace assays of gold were obtained from diamond-drill core samples. The quartz-carbonate vein in which the No.1 shaft is situated contains minor amounts of molybdenite, pyrite, galena, sphalerite, chalcopyrite and low gold values (Savage 1964, p.50).

History:

Lakeside-Kirkland Gold Mines Limited was incorporated in 1934 with a seven claim group previously held by Queen Lebel Gold Mining Company, who succeeded the original owners, Queen Lebel Gold Mines Limited.

The Queen Lebel Gold Mines Limited was formed in 1921 and sank a 18 m deep (60 feet) shaft on a quartz carbonate vein on claim L.2924. The No.1 shaft was deepened from 18 to 98 m (60 to 321 feet) in 1923 when the property was under option to the Anglo-Canadian Syndicate (Hopkins 1923, p.68-69). This was followed by 180 m (600 feet) of lateral work on the 90 m (300 feet) level and underground drilling. Work resumed in 1936 with the sinking of shaft No.2 to 24 m (78 feet) on claim L.2924. Activity was discontinued until 1938 when No.2 shaft was deepened to 175 m (575 feet) and over 70 m (240 feet) of lateral work was done on the 91 and 168 m (300 and 550 feet) levels before the mine closed again (Sinclair et al. 1939, p.141).

In 1941 the No.1 shaft was dewatered under the direction of the Mining Research Corporation and some sampling was done on the 90 m (300 feet) level. Surface work consisted of a 150 m (500 feet) long trench (Tower et al. 1942, p.136). Two diamond-drill holes were drilled a total of 183 m (600 feet) in 1950 (Nelson 1950). The company's charter was cancelled in 1956.

On the former claim L.2924 C.L. Boland diamond drilled two holes

(75 m; 245 feet) in 1955 and 19622 (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

Lebel Lode Mine (32)

Geology:

Timiskaming-type sedimentary rocks and pyroclasitc rocks are in contact with Keewatin-type volcanic rocks across the northern part of the property. Algoman-type feldspar porphyry intrudes the eastern claims.

Economic Features:

Numerous veins in trachyte occur in a zone 180 m (600 feet) wide trending east across claim L.2900 and L.2262. The main vein has a surface exposure of 120 m (400 feet) on claim L.2900 and may have been cut in drill hole No.1. It consists of Calcite and quartz with 5 percent to 40 percent fine-grained pyrite with traces of chalcopyrite and a few irregular quartz veinlets. A 43 m (140 feet) long section in this vein, sampled in 1933, yielded gold assays of $36.00 per ton (1.24 ounces of gold per ton) over 61 cm (24 inches), $5.20 per ton (0.2 ounce of gold per ton) over 86 cm (34 inches), and others from $2.40 to $0.40 per ton (0.08 to 0.001 ounce of gpld per ton) (Hopkins 1933). Gold assays of surface samples from the shaft area in 1939 ranged from $2.40 to $63.00 per

ton (0.06 ounce to 1.8 ounces of gold per ton). Unlerground assays results were nil until the 15 m (50 feet) level yielded a gold assay of $1.97 per ton (0.05 ounce per ton of gold). Four diamond drill holes totalled 1063 m (3,487 feet), three on claim L.2909 and one on claim L.2262. Diamond-drill core assays yielded $17.50 per ton (0.48 ounce of gold per ton) in gold over a 12 m (40 feet) length and $8.00 per ton (0.20 ounce of gold per ton) over a 3 m (10 feet) length (McNab 1939).

History:

Lebel Lode Limited was incorporated in 1921 on a group of five claims held bY W.J. Post since 1912. Surface exploration exposed several veins and four holed were drilled in 1923. A three-compartment shaft was sunk 9 m (30 feet) on claim L.2262 prior to the suspension of operations in 1929. The property was re-examined in 1933 and a two-compartment shaft was sunk in 1934 on claim L.2909 (McNab 1939).

Lebel Oro Mine (33)

Geology:

The five claims of the property are divided into outcrop areas northeast and southwest of a glacial drift covered zone. Algoman-type quartz porphyry near the southwest corner of the

property and southeast striking Timiskaming-type boulder conglomerate and tuff in the north claims are the main outcrop areas. A few small exposures of Algoman-type basic syenite and Timiskaming-type conglomerate occur near the west boundary of the property.

The quartz veins are exposed on the surface in the quartz porphyry near the shaft. The veins strike N30E and dip N65W to N70W. Only one of them is gold bearing and it is 46 cm (18 inches) wide. Gold is present in associated stringers of dark quartz and mineralized schist. Pyrite is a common accessory mineral, but it contains only traces of gold. Chalcopyrite and galena are present in small amounts.

Economic Features:

Subsurface channel samples by E.W. Todd (1928A) yielded gold assays of $1.00 per ton, 0.05 ounce of gold per ton, based on 19 assays, $5.00 per ton, 0.24 ounce of gold per ton on 5 assays, and $30.60 per ton (1.48 ounces of gold per ton; one assay) over a width of 23 cm (9 inches) on the main vein.

History:

The property was incorporated in 1920. A 18 m (60 feet) vertical shaft on claim L.3191 was sunk in 1921. Shaft sinking was halted by

flooding until 1923 when it progressed ot 62 m (203 feet) with levels at 30 m and 60 m (100 and 200 feet). Nine hundred feet (274 m) of drifting and 137 m (450 feet) of crosscutting were completed by 1928.

Nipissing Mining Company Limited optioned the claims and drilled six holes 1,570 m (5,149 feet) in 1928 (Todd 1928). In 1936 the mine was dewatered and 549 m (1,800 feet) of underground diamond drilling and 277 m (900 feet) of surface diamond drilling were done. Magnetometer, resistivity, and geological mapping surveys and six diamond drill holes totalling 919 m (3015 feet) were drilled from the surface near the shaft in 1948 and did not intersect economic mineralization (Burr 1948).

Lebel Oro Mines Limited became Consolidated Lebel Oro Mines Limited in 1949 and Copper-Man Mines Limited in 1952 (Savage 1964, p.51).

McKinnon Occurrence (34)

Geology:

The claim straddles the west arm of Gull Lake. Timiskaming-type boulder conglomerate is exposed south of Gull Lake and along the north boundary of the calim. A small outcrop of Algoman-type feldspar porphyry is also present north of the lake. The axial zone of an east-trending syncline is outlined by the attitude of the

Timiskaming-type boulder conglomerate. The Murdock Creek Fault zone and a sub-parallel fault trend northeast across the claim.

Economic Features:

Quartz stringers containing scattered chalcopyrite were intersected in three diamond-drill holes a total of 97 m (320 feet) in the conglomerate (Newman 1961). A 55m (183 feet) long drill hole in the feldspar porphyry intersected minor pyrite mineralization (McKinnon 1962).

History:

The property and five adjacent claims in Teck Township were controlled by Black Gold Mines Limited until 1958. No activity was recorded on the Lebel Township claim by Black Gold Mines Limited (Savage 1964, p.17). D. L. McKinnon re-staked the claims in 1961 and drilled three diamond-drill holes a total of 97 m (320 feet). A fourth hole was diamond drilled in 1962 (56m; 183 feet).

Mid-Kirk Deposit (35)

Geology:

Timiskaming-type sedimentary rocks (conglomerate and greywacke) intruded by "feldspar porphyry" dikes are the main outcrop

features. Several claims are covered by water and muskeg.

Economic Features:

A quartz vein striking N70oE with molybdenite and oxidized sulphides follows a shear zone and trachyte-conglomerate contact. Grab samples assayed $2.45, $0.70, and $0.17 per ton of gold in 1936. Two parallel shear zones of quartz and feldspar porphyry were stripped for 60 m (200 feet). One and one-half, 2, and 7.6 m (5, 7, and 20 feet) deep pits yielded a maximum gold assay of $0.35 per ton in 1937. In the same year a 7.6 m (25 feet) deep pit on an island produced a maximum gold assay of $2.50 per ton (0.7 ounce of gold per ton) over a 0.3 m (1 foot) vertical sample (Campbell 1937).

History:

Three claims and a leasehold fraction at the southwest end of Gull Lake were acquired from Chippewa Kirkland Gold Mines Limited and incorporated as Mid-Kirk Gold Mines Limited in 1936. The company has been idle since 1937 and its charter was cancelled in 1965.

Moffat-Hall Mine (36)

Geology:

A large mass of Algoman-type quartz porphyry intrudes Timiskaming type greywacke in the central claims. Massive and porphyritic Timiskaming-type trachyte flows and sills outcrop north of Crystal Lake and northeast of Mud Lake. Three branches of the Bidgood Fault trend northeast and converge to the northeast on the northwest claims. Small outcrops of Algoman-type feldspar porphyry are near the perimeter of the Algoman-type quartz porphyry intrusion. Massive Algoman-type quartz diorite was intersected in the mine near the north boundary of the property.

The mine was developed on quartz veins in a sheared contact between a feldspar porphyry dike and diorite. An ore zone was within "Fractured and altered wallrock heavily mineralized with fine pyrite and cut by dark quartz stringers" (Savage 1964, p.55). The vein was terminated 15 m (50 feet) southwest of the shaft by a cross fault striking N45°W.

Economic Features:

Gold production from the first 46 m (150 feet) level was 2,287 tons of ore at 0.75 ounce of gold per ton. The lower levels produced 8,467 tons of ore in 1934, averaging 0.3 ounce of gold per ton and 7,912 tons of ore in 1935 averaging 0.28 ounce of gold per ton. A small amount of ore was mined from the 130 m (425 feet) level where 15 m (50 feet) of cross cutting yielded 0.45 ounce of gold per ton over 1.8 m (5.9 feet) and 22.6 m (74 feet) averaged 0.08 ounce of

gold over 1.4 m (4.7 feet). Development of the 168 m (550 feet) level was poor and no ore was extracted (Hogg 1950).

Surface diamond drilling in six holes collared within 137 m (450 feet) south of the shaft yielded gold in quartz stringers in three sections: 0.04 ounce of gold per ton for a length of 0.7 m (2.3 feet), 0.12 ounce of gold per ton over 0.3 m (1 foot); and 0.38 ounce of gold per ton over 0.3 m (1 foot) (Armstrong 1966).

History:

F. C. Bidgood discovered gold in a surface quartz vein on claim L.S.270 (see ODM Map 53a and chart A, back pocket) in 1917. Moffat-Hall Gold Mines Limited was incorporated on a 14 claim group in 1921. Tonapah Mining Company optioned the property in 1923 (Hopkins 1923, p.75) and the McIntyre Porcupine Gold Mines Limited optioned the property in 1928. During 1927 diamond drilling was done in order to intersect a break in the rocks (Todd 1928, p.157). A 174 m (570 feet) shaft was sunk on claim L.S. 4 between 1930 and 1935 and levels were developed at 46, 91, 130, and 168 m (150, 300, 425, and 550 feet). Between February and September 1934, 3,178 tons of ore were shipped to Noranda (Sinclair 1935, p.128 and Savage 1964, p.55).

The Bidgood and Moffat-Hall Mines were connected by a 17 m (55 feet) raise from the Bidgood 152 m (500 feet) level to the

Moffat-Hall 130 m (425 feet) level and operations resumed under the control of Bidgood-Kirkland Gold Mines Limited. Until the end of production in July 1935 the ore was processed at the Bidgood Mill. In 1936 the property was reorganized as the Moffat-Hall Mining Company Limited and operations continued until October 1936 (Savage 1964, p.55).

Total underground development consisted of 882 m (2,630 feet) of drifting, 529 m (1,735 feet) of crosscutting, and 1,056 m (3,464 feet) of diamond drilling in 21 holes (Hogg 1950). The total or ore mined and milled was 16,388 tons yielding $166,569 (Arnoldi 1949, Table II in pocket). Diamond drilling from the surface consisted of six drill holes in 1938 and six diamond-drill holes in 1941.

In 1964 Consolidated Virginia Mining Company carried out geological mapping in the east claims at a scale of 1 inch to 200 feet (1:2,400) and did some surface trenching for the current owners; Ernest Deloye and Edgar Peterson (Lee 1964). Edgar Peterson drilled six diamond-drill holes, totalling 210 m (690 feet) in 1965 and 1966 (Armstrong 1966).

Morris Kirkland Mine (37).

Geology:

Timiskaming-type greywacke, tuff breccia, agglomerate, and massive

and porphyritic trachyte porphyry are the main bedrock features. Part of a wide east-trending trachyte flow outcrops on the south half of the property. The mine workings are confined to part of the trachyte flow within a fault zone, referred to as the "Main Break", which strikes N30°E and dips almost vertically. On surface and on the upper levels, a narrow Algoman-type quartz porphyry dike follows the fault zone and the ore. The dike was not found below the 267 m (875 feet) level. To the northeast, the Main Break and the ore associated with the dike end abruptly against the almost vertical fault contact of the trachyte and Timiskaming-type greywacke. The Main Break was traced southwest for 230 m (750 feet). Mineralization in the gold bearing zones consisted chiefly of pyrite, chalcopyrite, and galena, in order of decreasing abundance. Quartz is relatively rare.

Economic Features:

During the years of production (1936-1938, and 1940-1942), 127,253 tons of ore were mined containing about 16,699 ounces of gold and 29,910 ounces of silver (Hogg 1950a) for a value of $621,544 (Arnoldi 1948, Table II in pocket). The average grade from the upper levels was $5.70 per ton (0.16 ounce of gold per ton), (gold at U.S. $35.00 per ounce) and $4.15 per ton (0.11 ounce of gold per ton) from the lower levels. The ore at Morris Kirkland contained a ratio of gold to silver of 0.56:1.00, as contrasted with 6.00:1.00 in the Kirkland Lake Mines and 2.00:1.00 in the Bidgood Kirkland

Mine (Hogg 1950a).

History:

Wood-Kirkland Gold Mines Limited was incorporated in 1920 on a five claim group originally staked by E.B. Wood. An option on the property was held by the Tonopah Mining Company in 1923. The No.1 shaft was sunk by Wood-Kirkland to 30 m (100 feet) on claim L.7479 (see ODM Map 53a and Chart A, back pocket) with 9 m (30 feet) of lateral work (Hopkins 1923, p.75, and Todd 1928, p.158). Wood-Kirkland was reorganized in 1928 as Kirkland Gold Belt Mines Limited. Between 1929 and the closing of the mine in 1934 the No.2 shaft was sunk to 234 m (768 feet) with 1,328 m (8,356 feet) of lateral work (Sinclair 1935, p.108).

Activity resumed in 1935 when the company became Morris Kirkland Gold Mines Limited. Development continued until operations ceased because of bankruptcy in 1941. The No.2 shaft was sunk to 503 m (1651 feet) with 13 levels at 38 m (125 feet) intervals and more than 200 underground diamond drill holes. Lateral development consisted of 5.527 m (18,133 feet) of drifts, crosscuts and raises concentrated on the 38, 228, 381 m levels (125, 750, and 1,250 feet) (Tower et al. 1942, p.163 and Hogg 1950). A 100-ton mill constructed in 1936 processed 61,398 tons of ore between 1936 and 1938. The mill was leased to Upper Canada Gold Mines Limited while underground development continued. In February 1940 milling was

resumed but closed down again in 1941. Custom milling of ore from small mines of the Kirkland Lake camp was attempted without success (Hogg 1950).

Pawnee-Kirkland Mine (38)

Geology:

Outcrops of Timiskaming-type trachyte, conglomerate, and greywacke striking S70°E are the main bedrock features of the property. A narrow zone of tuffaceous conglomerate in the centre is bounded by a red spotted porphyritic trachyte to the north and a layered trachyte flow to the south. Carbonate rock is exposed and contains a large amount of pyrite, and a coarse greywacke. The shaft was sunk on an east-striking vein in the layered trachyte. Wall rock for a few inches on each side of the vein contains pyrite, quartz, and calcite. A 15 m (50 feet) length of the vein yielded encouraging gold assays across widths ranging from 7.6 to 38 cm (3 to 15 inches), (Hopkins 1923, p.75). Hopkins (1923, p.75) made the following additional remarks:

"About 150 feet (46 m) to the north of the shaft is a quartz vein carrying iron pyrites, copper pyrites, and tetrahedrite. Near the south-central part of (claim) L.S. 466 is a rusty conglomerate outcrop with two pronounced fractures striking nearly east and west and dipping 85°S. The sedimentary rocks adjoining the fractures are

replaced by considerable iron pyrite and some quartz which yield low values in gold".

Todd (1928, p.158) gave the following description:

"The vein dips to the south somewhat more steeply in the lower levels than in the upper; between the 500-foot (150 m) and the 750-foot (230 m) levels it is practically vertical. The rocks seen along the vein walls consist of altered trachyte and sedimentary rocks in which occur stringers of quartz. The narrow crushed zone is impregnated with fine pyrite. Molybdenite occurring along slip planes is common, and occasional visible gold is encountered. Short lengths of commercial ore have been developed, but the distribution of the values has so far proved to be erratic".

Economic Features:

The highest gold assays were $5.60 per ton, 0.27 ounce of gold per ton (1928 value) across 0.8 m (2.5 feet) of core intersected in two diamond drill holes (Langford 1928). During the recent work by Labrador Mining and Exploration (Ontario) Limited, three lenses of gold ore were discovered; one section which consists of blue (molybdenite-bearing) chert or quartz lenses is high grade. Elsewhere, the ore is in sheared, layered pink trachyte containing much fine-grained pyrite and is cut by many quartz stringers.

History:

Pawnee-Kirkland Gold Mines Limited was formed on a four claim group in 1922 in central Lebel Township (Hopkins 1923, p.75). A 238 m (780 feet) vertical shaft was sunk on claim L.S.466 in 1927 with levels established at 38 m (125 feet) intervals to the 228 m (750 feet) level (Todd 1928, p.158). Lucky Tiger Combination Gold Mining Company Limited drilled four diamond-drill holes from the surface with 396 m (1300 feet) of drifting done by Pawnee-Kirkland Gold Mines Limited before the mine closed at the end of 1928. In 1931 part of the property was sold to Kirkland Basin Gold Mines Limited (Salkeld 1933).

Regal Kirkland Gold Mines Limited was incorporated in 1933 on the Pawnee Kirkland property. Under the new company the mine was dewatered in 1936, accompanied by sampling 300 m (1000 feet) of underground diamond drilling, crosscutting, and drifting. The work stopped in the same year and Pawnee-Kirkland Gold Mines Limited re-acquired control of the property. The company has been inactive since 1936 and its charter was cancelled in 1963 (Savage 1964, p.59-61).

In 1963 Upper Canada Mines Limited acquired the property and in 1964 Labrador Mining and Exploration (Ontario) Limited optioned the property and carried out an induced polarization survey and a surface diamond drilling programme amounting to a total of 611 m

(2004 feet; 5 holes). In 1966 the mine was dewatered, a small headframe raised, and more than 900 m (3000 feet) of drifting as well as diamond drilling were done on the 150 m (500 feet) level and the 230 m (750 feet) level. All levels (38; 76, 114, 152, 190, 229 m, 125, 250, 375, 500; 625, and 750 feet) were geologically mapped. Mineable ore sections were not indicated and operations were suspended in 1967 (Riddell 1969, p.37).

M. Pollack [1936] (39)

Geology:

The property is mostly swampy ground west of McTavish Lake. Several small outcrops of Keewatin-type volcanic breccia, agglomerate, and tuff strike N60E on claims L.16162 and L.16163 (see ODM Map 53a and Chart A, back pocket) at the western end of the property.

Economic Features:

No economic mineralization has been reported (not on file).

History:

Claims L.16161-16164 (see ODM Map 53a and Chart A, back pocket) were staked in 1926 by W. O'Grady, acquired by R. Pollack in 1928 and patented in 1936. In 1927 Margaret Pollack staked L.20343 and

L.20344 (see ODM Map 53a and chart A, back pocket) and patented them in 1936. The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Pritchard Kirkland Gold Mines Limited [1936] (40)

Geology:

Timiskaming-type coarse greywacke with an east to northeast strike, in places interbedded with boulder and pebble conglomerate, composes most of the claim group. A Timiskaming-type trachyte sill is exposed on the west end of the property and Algoman-type feldspar porphyry forms a small stock in the centre. Algoman-type basic syenite is exposed on claim L.7418 (see ODM Map 53a and Chart A, back pocket). Subsidiary faults of the Middle-Harvey Fault Zone strike northeast through the northwest corner of the property and one east-striking fault is mapped across the southern part of the property.

Economic Features:

Several quartz (?) veins were exposed on claims L.7419 (see ODM Map 53a and Chart A, back pocket) and L.2400. No economic mineralization has been reported (not in files).

History:

Pritchard Kirkland Gold Mines Limited was incorporated in 1928 as a six claim gold prospect south of Gull Lake. After initial surface exploration; no activity has been reported except an announcement of diamond drilling plans in 1936 (Canadian Mines Handbook 1937, p.359).

Ritchie-Moore Deposit (41).

Geology:

The Middle and South Harvey Fault zones strike eastward across the property. A Timiskaming-type trachyte sill zone outcrops between them, and is fault bounded to the south. Scattered outcrops of tuffaceous conglomerate and Algoman-type basic syenite occur within the trachyte zone. Coarse Timiskaming-type greywacke is exposed south of the trachyte.

Economic Features:

No economic mineralization has been reported (Bragg 1962).

History:

The Six claim group composing the Ritchie Moore property were

originally staked between 1912 and 1928. Various amounts of unspecified assessment work have been recorded (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

In 1962 Upper Canada Mines Limited did 673 m (2208 feet) of diamond drilling in four holes at the southeast corner of Ritchie-Moore claim L.6820 (See ODM Map 53a, and Chart A, back pocket). An additional 1059 m (3474 feet) were drilled in six holes under the southwest corner of the adjacent claim to the east (Bragg 1962).

M.J. Roche [1939] (42)

Geology:

The single claim (L.27306) (see ODM Map 53a, and Chart A, back pocket) property contains most of Jordan Lake in its northeast corner. The bedrock is covered by sand and gravel in the eastern half of the claim, the western half is swamp covered. Diamond-drill core data from the west and southwest of the claim has resulted in the bedrock in claim L.27306 being inferred as Keewatin-type fragmental volcanic rocks, breccia, agglomerate, and tuff.

Economic Features:

No economic mineralization has been reported.

History:

The claim was staked in 1934 and patented in 1939 by M.J. Rocke. The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

"Rose et al." [1931] (43)

Geology:

The two claims (L.15456 and L.15457) (see ODM Map 53a and Chart A, back pocket) composing this property are almost entirely covered by Crystal Lake. A small portion of Crystal Beach occupies the southeast corner of claim L.15457. The south boundary of both claims is also sand covered.

Economic Features:

No economic mineralization has been reported.

History:

The claims were staked in 1925 and patented in 1931 by H.S. Rose. The work recorded for patenting is unspecified (Mining Recorder's

Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

1These claims are marked "Rose et al." on ODM Map 53a even though the Mining Recording Office files indicate H.S. Rose was the only person involved with the property until the claims were patented.

H.S. Rose [1926] (44)

Geology:

The irregularly shaped claim (L.8536) (see ODM Map 53a and chart A back pocket) southwest of Crystal Lake contains more than fifty percent outcrop. Most of the outcrop is composed of Timiskaming-type massive and porphyritic trachyte. Scattered, small outcrops of Timiskaming-type greywacke and tuff breccia occupy the northeast part of the claim and strike east, with dips north to the vertical. A small mass of Algoman-type feldspar porphyry intrudes trachyte near the south boundary of the claim.

Economic Features:

No economic mineralization has been reported.

History:

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The claim was staked in 1920 and patented in 1926 by Henry S. Rose (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Ross-Powell [1922] (45)

Geology:

Claims L.3692 and L.3693 (see ODM Map 53a, and Chart A, back pocket are covered by Gull Lake. Timiskaming-type tuffaceous greywacke and massive to porphyritic trachyte flows are intruded by Algoman-type syenite porphyry along the exposed north boundary of claim L.3087. A small island of basic syenite outcrops near the south boundary of claim L.3087.

Economic Features:

No economic mineralization has been reported.

History:

The claims were staked in 1913 and patented in 1922 by H.R. Powell The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

St. Joseph Kirkland Occurrence [1920] (46)

Geology:

Numerous outcrops of Timiskaming-type tuff and tuffaceous greywacke strike east to southeast and dip steeply to the south and southwest and are separated by a zone of boulder conglomerate. A large area of the two claim property is covered by tailings from the Sylvanite Mine in Teck Township.

Economic Features:

No economic mineralization has been reported.

History:

The claims (L.2008 and L.2009) (See ODM Map 53a and Chart A, back pocket) were staked by W. Stillar and patented in 1920. The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Simpson Gold Mines [1940] Limited (47)

Geology:

Timiskaming-type coarse-grained greywacke forms an east-trending antiform and is intruded in the northern part of the claims by Algoman-type quartz-feldspar porphyry. A trachyte sill intrudes the southern part of claim L.S. 269 (see ODM Map 53a and Chart A, back pocket).

In 1940 the linearity of Crystal Creek through claim L.2327 was tested by diamond drilling for the presence of faulting and mineralization. Two diamond drill holes totalling 269 m (883 feet) were drilled and one intersected 1.5 m (5 feet) of a quartz and calcite vein and several narrow feldspathic dikes. No evidence of faulting was observed (Hogg 1950b).

Economic Features:

"Low" gold assays were reported from two diamond drill holes (Hogg 1950b).

History:

Simpson Gold Mines Limited was incorporated in 1928 on three claims acquired from Great Kirkland Gold Mines Limited at the west end of Crystal Lake. The property has been inactive since 1940.

Skinner [1917] (48)

Geology:

Mud Lake covers the north half of the single claim property. The Long Lake Fault Zone strikes N30E, bisecting the claim. The southwest quarter of the claim is mostly gravel covered with small outcrops of Algoman-type quartz porphyry. A Timiskaming-type trachyte sill outcrops along the southeast boundary with larger outcrops of Algoman quartz porphyry to the north.

Economic Features:

No economic mineralization has been reported.

History:

Claim L.3250 (see ODM Map 53a and Chart A, back pocket) was patented by W. Woodney in 1917. The work recorded for patenting is unspecified (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake).

Toburn Mine (49)

Geology:

The east end of the gold-bearing syenite porphyry of the Kirkland Lake camp intrudes Timiskaming-type coarse greywacke and tuff.

Algoman type feldspar porphyry is also present. The Lebel Township claims are bisected by the north-trending O'Connell Lake fault zone. The Murdock Creek Fault Zone trends northeast across the south claim.

Economic Features:

Five gold-bearing veins that were extensively deveopled in Teck Township have been mined into the Lebel Township claims. Gold production exclusively from the Lebel Township workings is not identifiable (Savage 1964, p.69)

History:

Toburn Gold Mines Limited incorporated in 1931 did more than a total of 180 m (600 feet) of drifting and crosscutting on the 35, 122, 165, 203, 272, 310, 671, 754 m (116, 400, 542,;667, 893, 1013, 2200, and 2475 foot) levels from shafts in Teck Township that penetrated Lebel Township. The Lebel Township claims were acquired by Associated Arcadia Nickel Corporation Limited in 1959 (Savage 1964, p.69).

Toronado Mines Limited [1970] (50)

Toronado Mines Limited, incorporated 1970, did horizontal loop electromagnetic and magnetic surveys on a block of claims in the

northwest part of Lebel Township. No anomalies were found (Cunningham-Dunlop 1972). The eastern portion of the property is mostly covered by sand and gravel. Outcrops consist of Keewatin volcanic rocks with small plugs of "Algoman" diorite.

J. Wedderburn, Estate, [1947] (51)

Geology:

The property is mostly sand covered east of Long Lake with occasional outcrops of Algoman-type syenite of the Lebel Township Syenite Stock.

Economic Features:

A copper showing is reported to have yielded "good values" from grab samples of a mineralized zone 0.3 to 0.6 m (2 to 3 feet) side on surface widening in a 3m (10 feet) deep pit. A 43 m (142 feet) long diamond drill hole on claim L.34746 did not intersect economic mineralization (Savage 1947).

History:

The five-claim group was staked and explored by J. Wedderburn. Diamond drilling in 1947 is the only reported activity on the property (Mining Recorder's Office, Division of Lands, Ontario

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Ministry of Natural Resources, Kirkland Lake).

Welland-Kirkland Syndicate (1937) (52)

Geology:

Keewatin-type andesite strikes east to N65E with dips from vertical to N85W in intermittant exposures. The dip direction was recorded from pillow-top determinations on claim L.8089. Timiskaming-type conglomerate outcrops in a small zone in the centre of claim L.8088 (see ODM Map 53a; and Chart A, back pocket). Algoman type mafic intrusive rocks and Timiskaming-type greywacke occupy the southeast part of claim L.8090 (see ODM Map 53a and Chart A, Back pocket).

Economic Features:

An adit was opened in a fault zone in andesite in the centre of claim L.8090 (see ODM Map 53a, and Chart A, back pocket). No economic mineralization has been recorded.

History:

The three claims were staked in 1919 and patented in 1925 by H.B. Duke (Mining Recorder's Office, Division of Lands, Ontario Ministry of Natural Resources, Kirkland Lake). No activity has been reported since the property was incorporated in 1937 as the Welland-Kirk

Mining Syndicate Limited.

Selected References

Amos, A.C.

1959: Unpublished Report on Tamminen Gold (old Ed. Hargreaves Property); Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Anon.

1951: Unpublished Progress Report for Kirgood Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Anon.

1951a: Unpublished Report on Darmac Gold Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Armstrong, C.M.

1966: Unpublished Diamond Drill Logs Peterson-Deloye; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland

Lake.

Arnoldi, M.G.

1949: Statistical Review of the Mineral Industry of Ontario for 1948; Ontario Dept. Mines, Vol.58, pt.1, p.1-51, 7 tables in pocket (published 1950).

1955: Statistical Review of the Mineral Industry for 1954; Ontario Dept. Mines, Vol.64, pt.1, p.1-66 (published 1956).

Bass, M.N.

1961: Regional Tectonics of Part of the Southern Canadian Shield; J. Geol. Vol.69, No.6, p.668-702.

Boyle, R.W.

1961: The Geology, Geochemistry, and Origin of the Gold Deposits of the Yellowknife District; Geol. Surv. Canada, Mem.310, 193p. Accompanied by 9 figures.

Bragg, J.G.

1962: Unpublished Diamond Drill Logs for Upper Canada Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural

Resources, Kirkland Lake.

Brock, R.W.

1907: The Larder Lake District; Ontario Bur. Mines, Vol.16, pt.1, 1907, p.202-218. Accompanied by 1 map, scale 1 inch to 1 mile.

Burr, S.V.

1948: Unpublished Reports on Geology and Diamond Drilling for Lebel Oro Property; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Burrows, A.G., and Hopkins, P.E.

1914: The Kirkland Lake and Swastika Gold Areas, and Maisonville, Grenfell, and Eby Townships; Ontario Bur. Mines, vol.23, pt.2, p.1-39. Accompanied by Map Nos. 23a and 23b, scale 1 inch to 3/4 mile.

1916:Goodfish Lake Gold Area; Ontario Bur. Mines, Vol.25, pt. 1, p.260-263.

1920:Kirkland Lake Gold Area (Second Report); Ontario Dept. Mines, vol.29, pt.4, p.1-53. Accompanied by Maps 29g and 29h, scale 1 inch to 600 feet.

Butterfield, A.M.

1937: Unpublished Interim Report on Operations on the Property of Gordon Lebel Mines Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Campbell, C.A.

1937: Unpublished Report on Mid-Kirk Gold Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources; Kirkland Lake.

Cooke, D.L.

1966: The Timiskaming volcanics and Associated Sediments of the Kirkland Lake Area; Unpublished Ph.D. Thesis, University of Toronto, Toronto, Ontario, 148p.

Cooke, D.L., and Moorhouse, W.W.

1969: Timiskaming Volcanism in the Kirkland Lake Area; Ontario, Canada; Canadian J. Earth Sci., Vol.6, No.1, p.117-132.

Cooke, H.C.

1922: Kenogami, Round, and Larder Lake Areas, Timiskaming District; Ontario; Geol. Surv. Canada, Mem.131, 64p. Accompanied by Maps 1926 and 1927, scale 1 inch to 1 mile, and Map 1932, scale 1 inch to 1/2 mile.

Craig, E.

1921: Unpublished Report on King Kirkland Gold Mines Ltd., Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Cunningham-Dunlop, G.R.

1972: Unpublished Report on Electromagnetic and Magnetic Surveys by Pioneer Consultants Ltd. for Toronado Mines Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Drury, J.J.

1960: Unpublished Report, Jones and Laughlin Steel Corporation Report on Geology of Fox Lake Claim Group Claims L.70424 to L.70441, Boston and Lebel Townships; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Dubuc, F.

1966: Geology of the Adams Mine; Trans. CIM, Vol.69, p.67-72.

Dyer, W.S.

1935: Notes on Some Properties in Lebel Township; Ontario Dept. Mines, Vol.44, pt.2, p.59-61 (published 1936).

Fairbairn, H.W., Pinson W.H.,Jr., and Hurley, P.M.

1966: Age Relations of Volcanics at Kirkland Lake, Ontario with the Round Lake Pluton; p.141-143 in Variations in Isotopic Abundances of Strontium, Calcium, and Argon and Related Topics; M.I.T. 1381-14, Fourteenth Annual Progress Report, Dept. of Geology and Geophysics, Massachusetts Inst. Technology, 194p.

Frohberg, M.H.

1945: Unpublished Report on Rokamsa Mines, Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1946: Unublished Report on Delrosa Mines, Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Gauvreau, E.J.

1961: Unpublished Diamond Drill Logs for Grasset Lake Mines Ltd.; Resident Geologist.s Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Gerrie, W.

1950: Unpublished Report on the Geology and Mineral Showings of Mining Claims 16709, 51700, 52929-30, 54022-24, Townships of Teck and Lebel, District of Temiskaming; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1953: Unpublished Report on Properties of Consular Harker Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Gibson, T.W.

1913: Report of the Bureau of Mines 1913; Ontario Bur. Mines, Vol.22, pt.1, p.5-61.

Goodwin, A.M.

1966: Archean Procontinental Growth and Mineralization; Canadian Mining J., May 1966, Vol.87, No.5, p.57-60.

Gross, G.A.

1965: Geology of Iron Deposits in Canada, Vol.1, General Geology and Evaluation of Iron Deposits; Geol. Surv. Canada, Econ. Geol. Rept. No.22, 181p. Accompanied by Map 1187A, scale 1 inch to 120 miles.

Harding, A.D.

1939: Unpublished Report on Property of Kirgood Gold Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Hewitt, D.F.

1949a: A Study of the Timiskaming Series of the Kirkland Lake-Larder Lake Belt; Unpublished Ph.D. Thesis, University of Wisconsin, Madison, Wisconsin.

1949b: Geology of Skead Township, Larder Lake Area: Ontario Dept. Mines, vol.58, pt.6, p.1-43 (published 1951). Accompanied by Map 1949-3, scale 1 inch to 1000 feet.

1963: The Timiskaming Series of the Kirkland Lake Area; Canadian Mineralogist, Vol.7, pt.3, p.497-523.

Hobson, G.D., and Lee, H.A.

1967: Thickness of Drift, Lebel, Gauthier, Boston and McElroy Townships; Ontario, Geol. Surv Canada, Prelim. Geol. Map 11-1967, scale 1 inch to 1/2 mile.

Hogg, N.

1939: Unpublished Report on Glenora Gold Mines Ltd., Lebel Township (Revised 1951): Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1950: Unpublished Report on the Moffat-Hall Gold Mines, Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1950a: Unpublished Report on Morris Kirkland Gold Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1950b: Unpublished Report on Simpson Gold Mines Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Holbrooke, G.L.

1939: Unpublished Short Report on Crystal-Kirkland Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Hopkins, P.E.

1923: Lebel and Gauthier Townships (area between Kirkland and Larder Lakes); Ontario Dept. Mines, Vol.32, pt.4, p.53-88 (published 1925).

1933: Unpublished Report on Lebel Lode Limited Gold Mines; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Kindle, E.D.

1936: Kirkland Lake Area; p.44-55 in Gold Occurrences of Ontario East of Lake Superior, Geol. Surv. Canada, Mem.192, 167p.

Langford, G.B.

1928: Unpublished Report on Pawnee-Kirkland Gold Mines Ltd.; East Kirkland Lake Area; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Lawton, K.D.

1954: The Round Lake Batholith and its Satellitic Intrusions in the Kirkland Lake Area; unpublished Ph.D. Thesis, University of Toronto, Toronto, 182p.

1957: Geology of Boston Township and Part of Pacaud Township; Ontario Dept. Mines, vol.66, pt.5, 55p. (published 1959). Accompanied by Map 1957-4, scale 1 inch to 1000 feet.

Lee, A.C.

1964: Unpublished Report on Consolidated Virginia Mining Corporation, Peterson-Deloye Option; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Lee, A.C.

1965: Investigation of Eskers for Mineral Exploration, 2. Buried Valleys near Kirkland Lake, Ontario, Geol. Surv. Canada, Paper 65-14, 20p.

Lovell, H.L.

1969: Geology of Eby, Otto Townships; and the Northern Part of Marquis Township, District of Timiskaming; Ontario Dept. Mines,

OFR5041, 62p. Accompanied by Maps P.448 and P.501, scale 1 inch to 1/4 mile.

Low, J.H., and Keevil, N.B.

circa 1944: Unpublished Report on Geomagnetic Survey of part of Rocamsa Mines, Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

MacLean, A.

1962: Geology of Lebel Township; Ontario Dept. Mines Bull. 150, 63p.

McKinnon, D.L.

1962: Unpublished Diamond Drill Logs for McKinnon Occurrence; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

McLeod, H.D.

1959: Unpublished Report on Tamminen Gold; Resident Geologists' Files, Ontario Ministry of Natural Resources, Kirkland Lake.

McNab, J.J.

1939: Unpublished Report on Lebel Lode Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Nelson, N.E.

1947: Memorandum on Kirana Gold Property, Teck Township, Ontario; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Newman, R.

1961: Unpublished Diamond Drill Logs on McKinnon Occurrence; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Northern Miner

1939: Continental Kirk to have Survey (article); The Northern Miner, March 9, 1939.

Pain, S.A.

1970: Unpbulished Report on 2,000 Feet of Diamond Drilling on Claims 52929 and 102213 Lebel Township; Resident Geologist's Files,

Ontario Ministry of Natural Resources, Kirkland Lake.

Parsons, G.E.

1946: Unpublished Report on Geology of Bidgood Kirkland Gold Mine; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1948: Bidgood Kirkland Mine; p.653-658 in Structural Geology of Canadian Ore Deposits, CIM, Jubilee Vol., 948p.

Parson, G.E., and McLeod, H.D.

1948: Unpublished Report on the Geology of the Erin Kirkland Deposit; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Pyke, D.R., and Middleton, R.S.

1970: Distribution and Characteristics of the Sulphide Ores of the Timmins Area; Ontario Dept. Mines, MP41, 24p. Accompanied by 1 map, scale 1 inch to 2 miles.

Riddell, G.S.

1969: Statistics of the Mineral Industry and Mining Operations in

Ontario for 1967; Ontario Dept Mines, Vol.77, 192p.

Ridler, R.H.

1969: The Relationships of Mineralization to Volcanic Stratigraphy in the Kirkland Lake Area, Ontario; Unpublished Ph.D. Thesis, University of Wisconsin, Madison, Wisconsin.

Robertson, J.A.

1968: Uranium and Thorium Deposits of Northern Ontario; Ontario Dept. Mines MRC9, 106p.

Salkeld, L.F.

1933: Unpublished Report on Pawnee-Kirkland Gold Mines Ltd. in the Kirkland Lake District; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Savage, W.S.

Undated: Unpublished Report on Kirk Royale Gold Mines Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1947:Unpublished Diamond Drill Log Claim No. L.34736; Resident

Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1950: Unpublished Report on Erin Kirkland Mines Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1951: Unpublished Report on Kenakott-Kirkland Mines Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1951a: Unpublished Report on Kirkland Commodore Mines Ltd.; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1953: Unpublished Report on Harrison Claim 2772; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

1964: Mineral Resources and Mining Properties in the Kirkland Lake-Larder Lake Area; Ontario Dept. Mines, MRC3, 108p. Accompanied by 1 chart scale 1 inch to 2 miles.

Shklanka, R.

1969: Copper, Nickel, Lead, and Zinc Deposits of Ontario; Ontario

Dept. Mines, MRC12, 394p.

Sinclair, D.G.; Keeley, E.C., Cooper, D.F., Weir, E.B., and Webster, A.R.

1935: Mines of Ontario in 1934; Ontario Dept of Mines, Vol.44, pt.1, p.67-167, (published 1936).

Sinclair, D.G., Tower, W.O., Bayne, A.S., Cooper, D.F., Weir, E. B., and Webster, A.R.

1937: Mines of Ontario in 1936; Ontario Dept. Mines, Vol. 46, pt.1, p.90-238 (published 1938).

Sinclair, D.G., Tower, W.O., Taylor, J.B., Douglass, D.P., Bayne, A.S., Cave, A.E., Cooper, D.F., Weir, E.B., and Webster, A.R.

1938: Mines of Ontario in 1937; Ontario Dept. Mines, Vol. 47, pt.1, p.80-249. (published 1939).

Sinclair, D.G., Cave, A.E., Tower, W.O. Taylor, J.B., Douglass, D.P., Bayne, A.S., Cooper, D.F.; Weir, E.B., and Webster, A.R.

1939: Mines of Ontario in 1938; Ontario Dept. Mines, Vol.48, pt.1, p.72-239 (published 1940).

Sutton, W.R.

1937: Unpublished Progress Report for Kirgood Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Thomson, J.E.

1941: Geology of McGarry and McVittie Townships, Larder Lake Area, Ontario Dept. Mines, Vol. 50, pt.7, 99. (published 1943). Accompanied by Map Nos.50a and 50b, scale 1 inch to 1000 feet, and Map No.50d, scale 1 inch to 400 feet.

1946: The Keewatin-Timiskaming Unconformity in the Kirkland Lake District (Abstract), p.171 in Abstracts of Papers, Trans. Roy. Soc, Canada, Third Series, Vol.40, p.135-185.

1948: Geology of Teck Township and the Kenogami Lake Area, Kirkland Lake Gold Belt; Ontario Dept. Mines, Vol.57, pt.5, p.1-53 (published 1950). Accompanied by Map Nos. 1945-1 and 1946-1, scale 1 inch to 1000 feet.

Thomson, J.E., And Griffis, A.T.

1941: Geology of Gauthier Township, East Kirkland Lake Area; Ontario Dept. Mines Vol.50, pt.8, 29p. (published 1944).

Accompanied by Map No.50c, scale 1 inch to 1000 feet.

Todd, E.W.

1928: Kirkland Lake Gold Area (A Detailed Study of the Central Zone and Vicinity); Ontario Dept. Mines, Vol.37, pt.2, p.1-159. Accompanied by maps and sections.

1928a: Unpublished Report on Lebel Oro Mines Ltd; Resident Geologist's Files, Ontario Department of Natural Resources, Kirkland Lake.

Tower, W.O., Cave, A.E., Taylor, J.B., Douglass, D.P., Hargrave, W.G., Bayne, A.S. Cooper, D.F., Weir, E.B., and Webster, A.R.

1940: Mines of Ontario in 1939; Ontario Dept. Mines, Vol. 49, pt.1, p.72-242, (published 1941).

Tower; W.O., Smith, R.L., Cave, A.E., Cooper, D.F., Taylor, J.B., Bawden, W.E., Little, E.S., Weir, E.B., and Douglass, D.P.

1942: Mines of Ontario in 1941; Ontario Dept. Mines, Vol.51, pt.1, p.64-236 (published 1946).

Winson, R.W.

1945: Unpublished Report on Belrosa-Rocamsa Mines Limited; Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Whitman, L.

1949: Unpublished Report on Darmac Gold Mines Ltd., Lebel Township; Ontario Ministry of Natural Resources, Kirkland Lake.

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8001D IS IT EOF
REPLY Y

TOWNSHIP OF MORRISETTE

Adjoins Tp. of Morrisette Map No. P.447

TOWNSHIP OF TEOK

Adjoins Tp. of Teck Map No. 1945-1

TOWNSHIP OF GAUTHIER

Adjoins Tp. of Gauthier Map No. 806

TOWNSHIP OF BOSTON

Adjoins Tp. of Boston Map No. 1957-4

Ontario
Division of Mines

HONOURABLE LEO BERNIER, *Minister of Natural Resources*
Dr. J. K. REYNOLDS, *Deputy Minister of Natural Resources*
G. A. Jewett, Executive Director, Division of Mines E. G. Pye, Director, Geological Branch

CHART A[1]
GEOLOGICAL INTERPRETATION OF
LEBEL TOWNSHIP

DISTRICT OF TIMISKAMING

Scale: 1:12,000 or 1 inch to 1,000 feet

2000 1000 0 1000 2000 Feet
200 100 0 200 400 Metres

NTS Reference: 32 D/4W, 42 A/1E
ODM-GSC Aeromagnetic Map: 47G, 289G (Rev.)
ODM Geological Compilation Map: 2205

[1]Revision of Ontario Dept. of Mines Map 53a.

LEGEND**

QUATERNARY
PLEISTOCENE AND RECENT
Sand and gravel; swamp deposits

GREAT UNCONFORMITY

PRECAMBRIAN
EARLY PRECAMBRIAN (ARCHEAN)
POST-"ALGOMAN"
L. Mica lamprophyre: narrow dikes
D. Diabase

"ALGOMAN"
A9 Feldspar porphyry
A8 Quartz porphyry
A7 Porphyrite
A5 Mafic syenite and lamprophyre intrusive as dike-like masses into metasediments
A4 Diorite, serpentinite, and mafic syenite: border phase of A1
A3 Hornblendite
A6 Felsic syenite: intrusive as dike-like masses into metasediments
A2 Syenite large intrusive masses
A1 Gabbro, diorite, quartz gabbro, quartz diorite, serpentinite

INTRUSIVE CONTACT

TIMISKAMING-TYPE METAVOLCANICS AND METASEDIMENTS
Tuffs and greywackes. Extreme alteration results in porphyritic, A7 above.
T9 Trachyte sills
T8 Trachyte flows, green and red spotted and amygdaloidal
T7 Trachyte flows, massive and porphyritic
T11 Tuffaceous conglomerate, includes some greywacke
T12 White fragmental tuff
T6 Tuff-breccia and agglomerate
T5 Tuff
T3 Tuffaceous greywacke
T10 Coarse-grained greywacke
T2 Fine-banded greywacke
T13 Pebble conglomerate
T4 Boulder conglomerate
T1 Basal conglomerate

UNCONFORMITY

KEEWATIN-TYPE METAVOLCANICS AND METASEDIMENTS
K3 Iron formation
K2 Volcanic breccia, agglomerate and tuff
K1 Andesites, light and dark in colour
Cb Carbonate rock or "dolomite"
Carbonatized rocks

**This legend is a revision of the legend on Ontario Dept. of Mines Map No.53a accompanying Ontario Dept. of Mines Bull. 150.

SYMBOLS

- Swamp.
- Railway.
- Electric power transmission line.
- 945' Elevation in feet above sea level.
- King's Highway.
- Motor road.
- Trail.
- Glacial striae.
- Geological boundary defined.
- Geological boundary, approximate.
- Geological boundary, assumed.
- Boundary of outcrop.
- 75 Strike and dip of beds.
- Strike and vertical dip of beds.
- 80° Strike and dip of schistosity.
- Strike and vertical dip of schistosity.
- Direction in which beds face (together with strike and dip).
- Direction in which beds face, dip vertical.
- Strike and dip of overturned beds as indicated by shape of pillows (beds face in direction of loop).
- Direction of top of lava flows as indicated by shape of pillows.
- Drag fold.
- Shaft.
- Test pit.
- Adit.
- Diamond drill hole.
- Building.
- Dam.
- Water pipe line.
- Slimes pipe line.
- Fault, defined.
- Fault, indicated, assumed.
- Sheared zone.
- Mining claim boundary.
- Property boundary.
- Vein.
- Vein projected to the surface.
- 2 Lithologic facies.
- ra Radioactivity.
- Syncline, Anticline.

OWNERSHIP OF PATENTED MINING CLAIMS: 26 AUGUST 1969

1 Associated Arcadia Nickel Corp.Ltd.
2* Baker, Jessie
3* Beatty, W.A.
4 Belteco Kirkland Mines Ltd.
5 Bidcoo Mines Ltd.
6 Biroco Kirkland Mines Ltd.
7 Boland, Muriel P.
8* Botsford, J.H.
9 Caldwell, Edward (Estate)
10 Carmindex Mines Ltd.
11 Canadian Auxiliary Syndicate Ltd.
12* Clemens, R.M.
13 Consular-Harker Mines Ltd.
14 Continental Kirkland Mines Ltd.
15 Copper-Man Mines Ltd.
16* Crossman, Daniel G.
17 Davidson, J.H.
18 Day, Thomas
19 Day, Wilson, Campbell & Martin
20 Duke, Barbara
21 Federal Trading & Agency Co.Ltd.
22* Franish, Lottie
23 Gordon Lebel Mines Ltd.
24 Harrison, G.E.
25 Hudson Bay Mines Ltd., The
26* Johnston, Leroy
27 Kaplan, Max (Estate)
28 King Kirkland Gold Mines Ltd.
29 Kirkland Combined Mines Ltd.
30 Kirkland Commodore Mines Ltd.
31 Laberada Mines Ltd.
32* Lake Shore Mines Ltd.
33 Lang-Michener & Cranston
34 Lebel Lode Ltd.
35 Letourneau, Guy & Patricia
36 McCabe, Harold
37 McEnaney, Bernard
38* McGee, Louis L. & Landry, Paul
39 Magavern, W.J.
40* Michener, D.R.
41 Mining Futurer & Holdings Ltd.
42 Pollock, Margaret (Estate)
43* Riddell, (J.E.), Transport Ltd.
44 Roche, Peter J.
45 Rose, Henry S. (Estate)
46 Ross, Margaret K.
47 St. Joseph-Kirkland Gold Mines Ltd.
48 School Section One Lebel
49 Simpson Gold Mines Ltd.
50 Stalmack, Alexander
51 Terrex Mining Co.Ltd.
52* Webb, Howard
53 Wedderburn, J. (Estate)
54* White, Jane G.
55* Wright-Hargreaves Mines Ltd.

*Owners of properties not described in the text.

METAL AND MINERAL REFERENCES

Ag ..... Silver
Au ..... Gold
bn ..... Bornite
Cu ..... Copper
gf ..... Graphite
Ni ..... Nickel
po ..... Pyrrhotite
py ..... Pyrite

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SOURCES OF INFORMATION

Base-maps from township outlines and mining claim plans of the Surveys and Mapping Branch, Ontario Division of Lands.

Geological maps of Mining Companies.

Ontario Dept. of Mines Map No.32e, Kirkland Lake Area by A.G. Burrows and P.E. Hopkins, 1923.

Geology by field parties under the direction of A. MacLean, 1936-39. Additional geology by N. Hogg, 1940 and by H.L. Lovell, D.W. Rutherford and T.W. Caine, 1969. Additional information by Jan de Grijs and F. Ploeger.

Magnetic declination approximately 10°W, 1968.