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# Field Trip Guidebook for the Nipigon–Marathon Area

By

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1991

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V.G. Milne, Director
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# INTRODUCTION

This field trip guidebook is designed to provide a geologically informative and scenic one or two day trip along the north shore of Lake Superior between Nipigon and Marathon, Ontario. Eighteen geological and scenic field stops are described, including two optional stops. The field trip can be considerably shortened if one visits only the stops on Highway 17 (see contents). Nipigon is located on Highway 11-17 approximately 110 km east of the City of Thunder Bay. Marathon, the end of the journey, is located approximately 310 km east of the city. The north shore of Lake Superior is famous for its spectacular scenery, including rugged cliffs and rock exposures, glimmering blue waters and cobble shorelines. The stops described along this 200 km route provide an introduction to the general geology and several types of economic mineralization, characteristic of the area. Travellers more interested in the scenery and geology should refer to Geological Guidebook No. 2: Geology and Scenery, North Shore of Lake Superior (Pye, 1969).

This field trip guidebook was initiated and funded by the Mines and Minerals Division, Ontario Ministry of Northern Development and Mines. Many of the field guide stops do not present safe parking facilities and caution must be taken when parking on the shoulder of Highway 17. Permission from the property owners may be required for several of the field guide stops.

## ACKNOWLEDGEMENTS

The authors wish to thank Patricia Perry for critical review of the manuscript and typists Annabelle Dowton, Agi Mansfield and Alvina White for their care in its preparation. Suggestions and assistance provided by John Scott is greatly appreciated. The authors also thank Myra Gerow for her input on building stone and stone quarrying. The authors also wish to thank the prospectors and exploration companies who assisted in various parts of this field trip guidebook.

## GEOLOGY

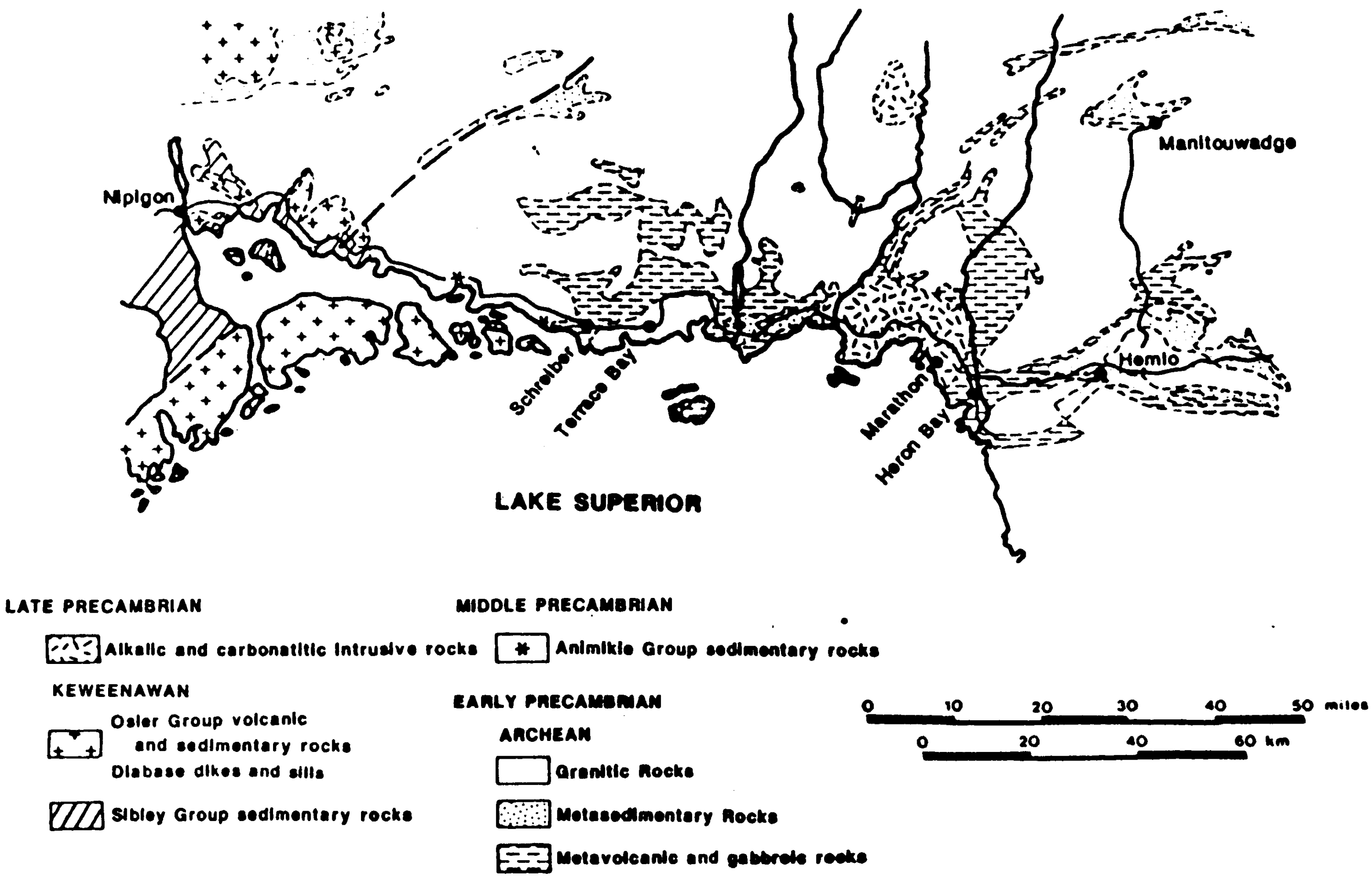
The Nipigon - Marathon area is underlain by Early to Late Precambrian rocks. The Early Precambrian (Archean) rocks represent a portion of the Abitibi-Wawa subprovince of the Superior structural province (**Figure 1**). These rocks are made up of a metavolcanic-metasedimentary sequence which has been intruded by granitic-syenitic plutons and metagabbroic dykes and sills. The metavolcanic rocks consist of iron-rich tholeiites including mafic to intermediate massive and pillowed flows, tuffs and pyroclastic rocks. The metasedimentary rocks consist predominantly of graded turbiditic sequences (wacke and argillite), minor conglomerate and iron formation. The Terrace Bay Batholith intrudes the metavolcanic and metasedimentary rocks. This 8 km wide and 25 km long batholith consists predominantly of medium-grained granodiorite, with minor diorite, tonalite, and biotite-hornblende granite. Mafic intrusive rocks include gabbro and diorite.

Middle Precambrian rocks unconformably overlie the Early Precambrian rocks. The Animikie Group of metasedimentary rocks are represented locally by the Gunflint and Rove Formations. The Gunflint Formation consists of minor basalt, tuff, conglomerate, algal chert, siliceous taconite, ferruginous and dolomitic chert-carbonates and shale. The Rove Formation consists of black pyritic shale, argillite and quartzitic greywacke.

Late Precambrian sedimentary rocks disconformably overlie Early and Middle Precambrian rocks. The Pass Lake, Rossport and

## Figure 1: General Geology of the Nipigon – Marathon Area

(after Map 2199, Ayres et al., 1970)



Kama Hill Formations comprise the Sibley Group. The Pass Lake Formation consists of quartz arenite and a basal conglomerate unit. The Rossport Formation is composed of dolomite, arenaceous dolomite, chert and stromatolites. The Kama Hill Formation consists of clay and K-feldspar - rich mudstone containing abundant reduction spheres, mud cracks, salt casts and ripple marks.

Keweenawan rocks are represented by diabase dykes and sills, and the Osler Group of volcanic rocks, comprising tholeiitic basalts, minor rhyolite and sedimentary rocks with a basal clastic unit.

Late Precambrian intrusive rocks include alkalic and carbonatitic rocks which comprise the Coldwell and Killala Lake alkalic complexes and the Prairie Lake carbonatite, as well as mafic to felsic dykes.

## EXPLORATION HISTORY

The Nipigon - Marathon area has been actively explored since the 1860's. Gold was first discovered in 1873 by Donald McKellar in the Jackfish and Victoria Cape areas. Early production came from the Empress Mine (1895 to 1900) and the North Shore Mine (1898 to 1900 and 1935 to 1937).

During the 1920's and 1930's, gold exploration was focused in the Schreiber area, resulting in minor production. Properties discovered and explored during this time include the Harkness-Hays, Gold Range, Otisse, Jeddar, Johnston-McKenna, McKenna-McCann and the Schreiber-Pyramid. To date, approximately 3000 ounces of gold has been produced in the area (Resident Geologist's Files, Ontario Ministry of Northern Development and Mines, Thunder Bay, Ontario).

Base metals, mainly zinc, copper and lead were also discovered in the late 1800's. The first production came from the Zenith Mine in 1898 to 1901 and again from 1966 to 1970 (Kite 1981). In 1982 Corporation Falconbridge Copper used an integrated geological exploration model in discovering the Winston Lake deposit, located 1 km west of the Zenith Mine. Minnova Inc. is presently mining the Winston Lake deposit and exploring on the Pick Lake horizon which is approximately 1.5 km SW of the Winston Lake deposit.

Building stone has been produced in the area since the early 1880's. Sandstone from the islands (Vert and Simpson Islands) in Nipigon Bay was quarried for architectural and construction uses.

Both sandstone and granite were quarried by the Canadian Pacific Railway as the railway pushed through the area. Commercial red and black granites (syenites of the Coldwell Alkalic Complex) were quarried near Marathon in the late 1920's and the early 1930's.

**STOP #1**

## Xenolithic and Pegmatitic Migmatite

An exposure of Archean migmatite and gneiss is found on both sides of Highway 17, approximately 23.9 km east of Nipigon. The term migmatite stems from a Greek word meaning "mixed", and commonly refers to a composite rock consisting of metamorphosed country rocks and igneous components. The migmatite contains sub-angular to sub-rounded xenoliths of metasedimentary rock. Quartz-feldspar pegmatite dykes up to 1 m in width intrude the migmatite. The banding observed in the exposure is due to highly contorted, alternating, biotite-rich layers and quartz-feldspar - rich layers (**Photograph 1**). Polished slabs of this rock make an attractive ornamental stone.

**PHOTO 1:** CONTORTED BANDING IN MIGMATITE. THE DARK AND LIGHT COLOURED LAYERS ARE BIOTITE AND QUARTZ-FELDSPAR-RICH, RESPECTIVELY. NOTE HAMMER FOR SCALE.

STOP #2

Kama Hill Occurrence: Lead-zinc-silver veins

This occurrence is located approximately 25 km east of Nipigon. It outcrops on both sides of the Little Bear Quarry (Camp 81) Road 4.2 km northeast off Highway 17.

The main showing is about 150 m (500 feet) west of the road and is representative of the lead-zinc-silver veins of the district. Old trenches and pits are present, but are difficult to observe during peak foliage seasons. A composite vein of barite, quartz and calcite occurs in a shear or fault zone. The vein pinches and swells considerably, varying in width from 7.5 cm to 60 cm, striking approximately 105° to 140° and dipping 60° to 70° south. The east end of the vein is hosted by red cherty dolomite of the Sibley Group. Further west, the vein is hosted by brecciated chert of the Rossport Formation in contact with granitic rocks. The calcite content of the vein is considerably less than the barite content. The barite occurs as large, platy, pinkish-beige crystals, and occurs in conjunction with fluorite. The vein is mineralized with sphalerite, chalcopyrite, galena, minor malachite and chalcocite.

Travel northeast up the Little Bear Quarry Road allows an excellent view of Kama Hill and the breathtaking cliffs. Care must be taken driving up the road with respect to logging trucks. Keep to the right at all times! An optional stop, approximately 30 km farther up the road, could be the Little Bear Amethyst Quarry.

STOP #3

## Sibley Group Sedimentary Rocks

An excellent exposure of the Sibley Group rocks is located 27 km east of Nipigon, at a scenic lookout on Highway 17.

The Sibley Group is a red bed sequence located in the elongate Nipigon Basin (**Figure 2**). The oldest unit, the Pass Lake Formation is up to 50 m thick and consists of quartz arenite and a conglomerate unit deposited primarily in a quiet, lacustrine environment (Franklin and McIlwaine 1982). It is overlain by the Rossport Formation, which is up to 135 m thick and consists of a lower arenaceous red dolomite member, a central chert-carbonate and stromatolite member, and an upper argillaceous red dolomite member (**Table 1**). The Rossport Formation was deposited in a shallow, highly saline environment, in a basin of fluctuating size (Franklin and McIlwaine 1982). The central chert-carbonate member makes an attractive ornamental stone.

The Kama Hill Formation, overlying the Rossport Formation, is up to 50 m thick and consists of a purple shale composed of smectite, authigenic microcline and quartz. It was deposited in a periodically dry mud flat and is characterized by dessication cracks, evaporite casts and mud chip microbreccias (Franklin and McIlwaine 1982). The Kama Hill Formation is named for the prominent bluff along the shore of Kama Bay, Lake Superior. The rocks at the highway level belong to the Rossport Formation. The base of the Kama Hill Formation is transitional over 1 to 2 m with the top of the Rossport Formation, and is marked in the

| PROTEROZOIC STRATIGRAPHY OF THE THUNDER BAY-NIPIGON AREA | | | |
|---|---|---|---|
| GROUP AND FORMATION | LITHOLOGIES | MINERAL COMMODITY | AGES |
| OSLER GROUP | Tholeiitic basalts, minor rhyolite and sedimentary rocks, basal clastic unit | Cu, Ag, agate | 955 - 1110 my (Van Schmus et al (1980)) |
| | LOCAL DISCONFORMITY | | |
| LOGAN DIABASE, GABBRO, PERIDOTITE | | Cu, Ni, Pt, Pd | 1150 - 1250 my (Van Schmus et al (1980)) |
| | INTRUSIVE CONTACT | | |
| SIBLEY GROUP<br>Kama Hill Formation | Clay and K-feldspar rich mudstone, abundant reduction spheres, mudcracks, saltcasts ripple marks | Pb, Zn, barite, amethyst, U | 1339 my (Franklin et al (1982)) |
| Rossport Formation | Dolomite, arenaceous dolomite, chert, stromatolites | | |
| Pass Lake Formation | Quartz arenite, basal conglomerate | | |
| | DISCONFORMITY | | |
| ANIMIKIE GROUP | Felsic igneous activity, Lake Nipigon area | | 1536 my (Sutcliffe, OGS, personal communication (1982)) |
| Rove Formation | Black pyritic shale, argillite, quartzitic greywacke | Ag, Zn, Pb, barite | 1700 my (Franklin (1978b)) |
| Gunflint Formation | Minor basalt, tuff, conglomerate, algal chert, siliceous taconite, ferruginous and dolomitic chert-carbonates, shale | Fe, Ag, U, amethyst | ~2000 my (Floran and Papike (1975)) |
| | GREAT UNCONFORMITY | | |
| ARCHEAN | Metavolcanics and associated metasedimentary rocks, iron formation, granitoids and migmatites | Au, Ag, Cu, Zn, Ni, Fe, etc | |

Table 1. Proterozoic Stratigraphy of Thunder Bay-Nipigon-Marathon Area (after Scott, 1987).

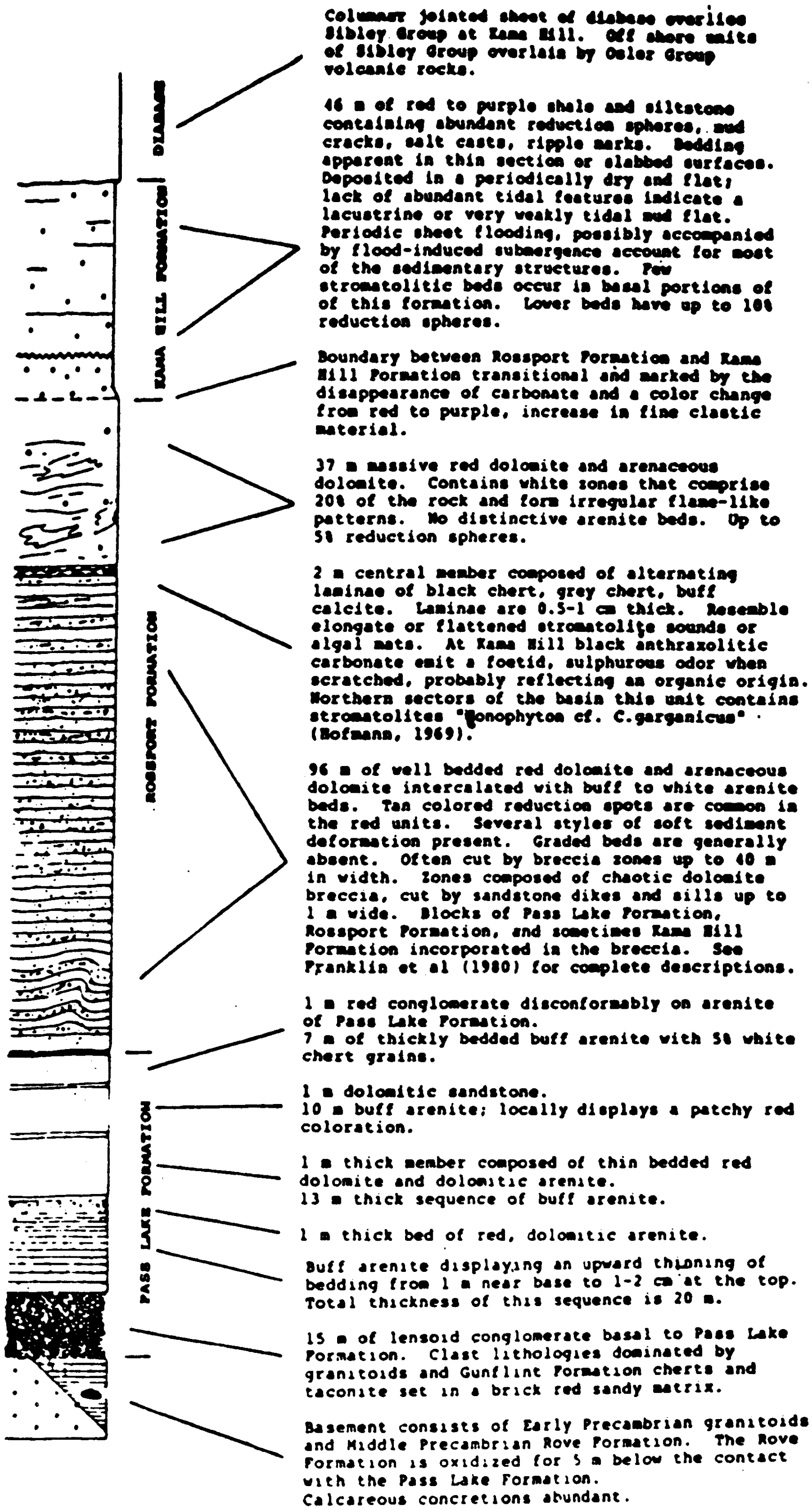



Figure 2: Composite Stratigraphic Column Sibley Group Sediments (after Franklin and MacIlwaine 1982 and Scott 1987)

rocks by the disappearance of carbonate minerals, an increase in fine clastic material and the appearance of fine lamination and fissility. The rocks are predominantly red to purple shale and siltstone which contain abundant reduction spheres on bedding surfaces. The rocks are intruded by Logan diabase sills up to a few metres thick (**Photograph 2**).

The red colouration of the Sibley Group sediments (locally termed "red rock") is due to hematite coatings principally on carbonate and clay grains (Franklin and McIlwaine 1982).

**PHOTO 2:** DARK, FINE-GRAINED LOGAN DIABASE SILLS IN FLAT-LYING SIBLEY GROUP (LOWER ROSSPORT FORMATION) SEDIMENTARY ROCKS.

STOP #4

<u>Scenic Lookout, Kama Hill area</u>

This stop is approximately 31.5 km east of Nipigon. An excellent view of Nipigon Bay in Lake Superior and the surrounding topography is presented at this site (Photograph 3).

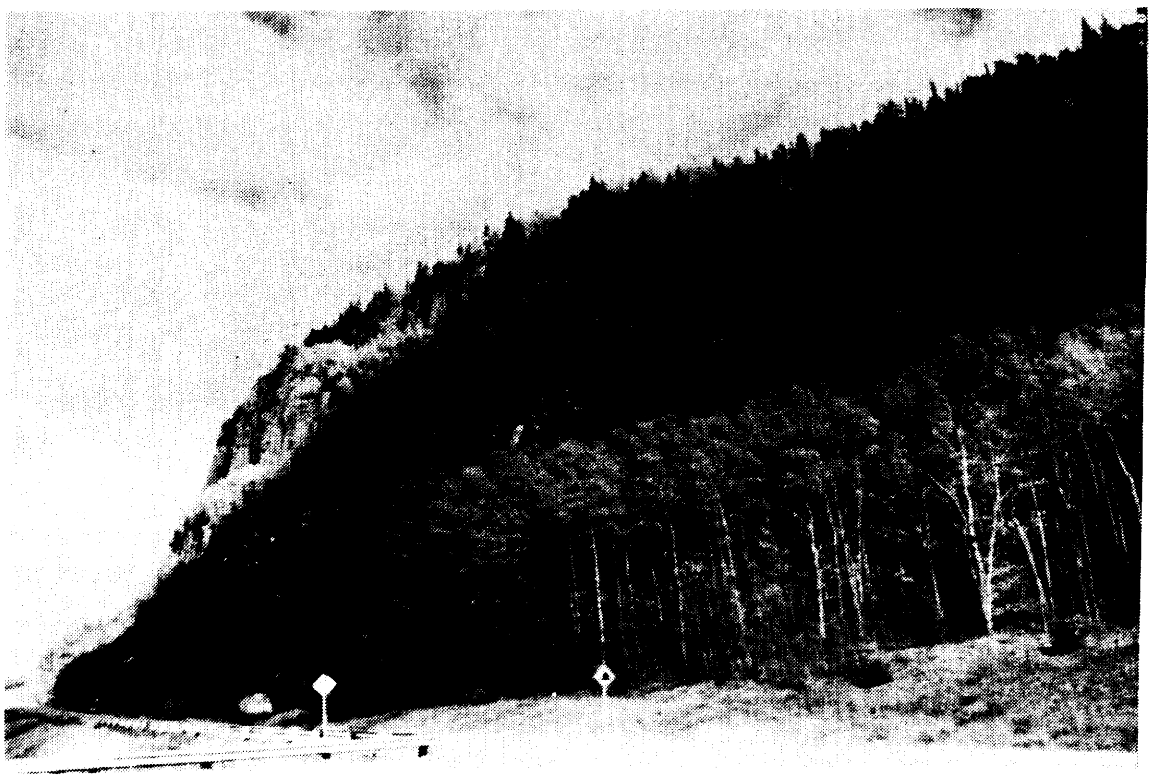


**PHOTO 3:** KAMA HILL LOOKOUT. THE HILL IS CAPPED BY A COLUMNAR-JOINTED DIABASE SILL THAT HAS INTRUDED SIBLEY GROUP SEDIMENTARY ROCKS.

The bedrock, exposed at the lookout and in the large highway rock cut immediately below it, is diabase, while Vert and La Grange islands in Nipigon Bay are predominantly Sibley Group sedimentary rocks which have been intruded by diabase sills and dykes. Because the diabase is more resistant to erosion than the Sibley Group sedimentary rocks, erosional remnants produce a cuesta-type and mesa-type topography. South-sloping cuestas are observed to the west, towards Nipigon and Red Rock (Photograph 4).

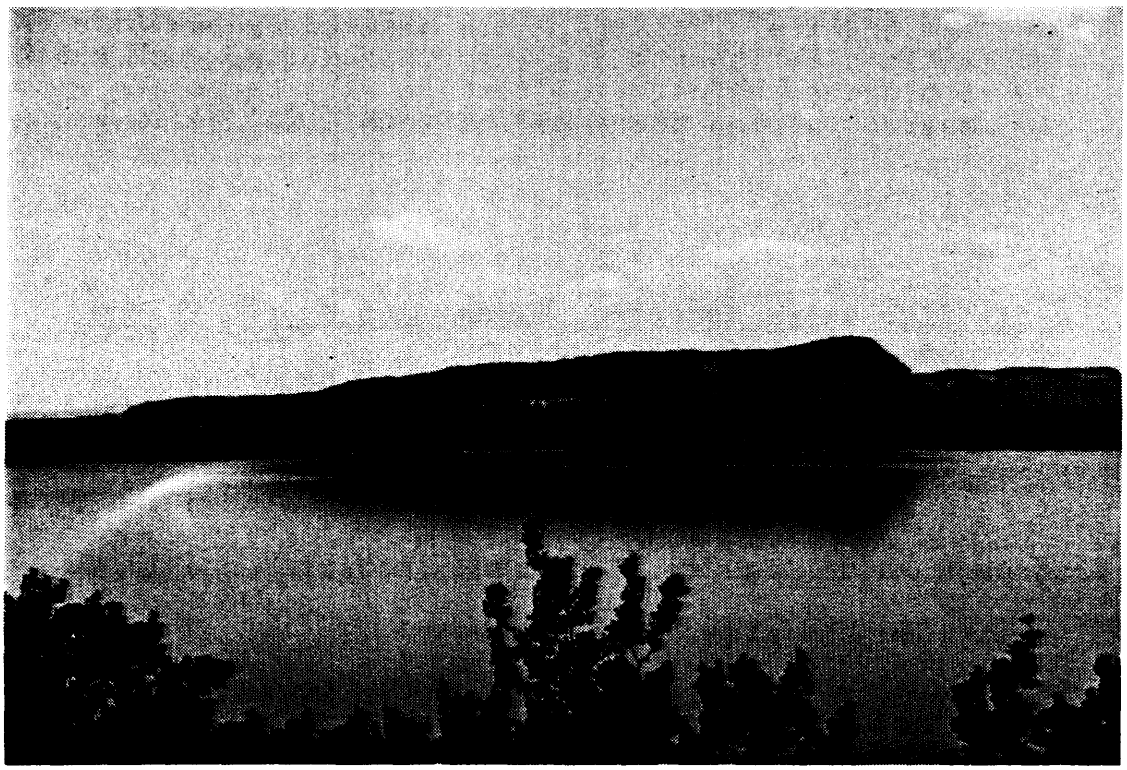


**PHOTO 4:** CUESTA TOPOGRAPHY, LOOKING WEST ACROSS KAMA BAY. THE CUESTAS ARE EROSIONAL REMNANTS OF GENTLY-DIPPING SIBLEY GROUP SEDIMENTARY ROCKS THAT HAVE BEEN PROTECTED BY A CAPPING OF EROSION - RESISTANT DIABASE.

STOP #5

Archean - Sibley Group Unconformity

This stop is approximately 46 km east of Nipigon and on the north side of Highway 17.

Sibley Group sedimentary rocks consisting of Lower Rossport Formation rocks lie unconformably on Archean quartz monzonite. The geology has been described by Scott (1987):

> "Here sandstone and mudstone of the Rossport Formation of the Sibley Group lie unconformably on altered Archean granitic rocks. The alteration is characterized by a green and red blotchy appearance of the granite. Feldspars are altered by hematite and the mafic constituents are chloritized. The rock exhibits a blotchy, exfoliation texture with carbonate and quartz veining developed between exfoliation blocks."

STOP #6

Barite-fluorite veins (Sunrise, Midday and Sunset veins)

Three composite barite-fluorite veins occur approximately 5 km west of Pays Plat and 63.1 km east of Nipigon. The veins are located on a long, steep hill (Cavers Hill), within the rocks cuts through which Highway 17 passes. Vehicles should be parked with caution on the side of the highway.

The immediate area is underlain by an igneous complex of two major rock types: granite and pegmatite. This complex is intruded by quartz-epidote veins and mafic dykes.

Three northeast-striking barite-fluorite veins (from east to west: Sunrise, Midday and Sunset) contain large granitic fragments cemented by quartz, barite and fluorite. The veins vary in width from 1 cm stringers up to 13.5 m. The quartz is coalesce, producing clots and layers. The term variole itself has been commonly used in defining a pea-sized spherule in basic volcanic rocks. Past workers have attributed the development of spherules, spherulites and varioles to the devitrification of glass around scattered nuclei or centres due to rapid crystallization of a viscous magma or melt (Williams et al. 1954) or in response to undercooling of the liquid during cooling (Fowler et al. 1987).


**PHOTO 6:** VARIOLITHIC PILLOWED LAVAS, STEEL RIVER. NOTE THE LIGHT-COLOURED PILLOW SELVAGES AND THE COALESCENCE OF THE VARIOLES.

commonly a milky white colour, although some cavities are lined with amethyst crystals. The breccia fragments contain epidote, giving the breccia zones a greenish-yellow colour on fresh surfaces.

The Sunrise and Midday veins contain barite and fluorite, but very little amethyst. Fluorite and barite occur as narrow veinlets along irregular fractures within these veins. Brecciation is evident in the Sunrise Vein.

**STOP #7 (Optional)**

**Winston Lake Deposit (Minnova Inc.)**

Arrangements for a surface or underground tour of the Winston Lake deposit should be made with personnel at Minnova Inc. prior to making the visit. The phone number is (807) 824-3368.

The Winston Lake deposit is a volcanogenic massive sulphide deposit with replacement characteristics (R. Sim, Winston Lake Division, personal communication, 1990) located 25 km north-northwest of Schreiber (**Figure 3**). A gravel road leads north from Highway 17 at a point 8 km west of Schreiber, approximately 21 km north to the mine site. Original mineable reserves (all categories including 20% dilution at zero grade) reported November 1, 1987 were 3,076,339 tonnes at 1.00 % copper, 15.60 % zinc, 30.87 g/t silver and 1.02 g/t gold (R. Sim, Winston Lake Division, personal communication, 1990) (**Figure 4**).

The Winston Lake Deposit was discovered by Corporation Falconbridge Copper in June of 1982, after applying a persistent and integrated model based on geology, geochemistry and geophysics.

The area has had an active exploration history which dates back to the discovery of the Zenith Deposit in 1879. The exploration history is described by Severin and Balint (1984):

> "Minor production is reported for the period 1899 to 1902 but no serious exploration was iniatiated until Zenmac Metal Mines Limited acquired the property during the early 1950's. Diamond drilling indicated a mineral inventory of 141,000 tons grading 23% Zn and 0.25% Cu but planned development was suspended due to low ($0.105/lb.) zinc price. By the autumn of 1963 the price of zinc had risen to $0.13/lb. and the long range forecasts were optimistic. A decision was made to proceed to production and a 13.5 mile gravel road was completed by July of 1964. Shaft sinking commmenced in September, 1964 and was completed to 425 feet by November. Three levels were established at depths of 150, 275 and 400 feet. During the period April 1, 1966 to April 29, 1970, 180,000 tons of 16.5% Zn were milled."

The Zenith deposit appears to represent a small slice of the Winston Lake deposit (Simmons 1983) which was rafted into place by a gabbroic intrusive (Kite 1981).

Severin and Balint (1984) have described the geology:

> "The Winston Lake massive sulphide deposit occurs at the southwest end of the Big Duck Lake volcanic belt and is located at the top of the Winston Lake calc-alkalic felsic volcanic package which is overlain by a series of Mg- to Fe-rich tholeiitic basalts. The contact between these two contrasting sequences is marked by a composite sill-like gabbro intrusion. The gabbroic intrusion(s) is thought to have dislocated a portion of the Winston Lake Deposit during its emplacement. This small (165,00 tonnes) segment of massive sulphides, known as the Zenith Deposit was mined by Zenmac Metal Mines Limited during 1966 to 1970."

and

> "The Winston Lake massive sulphide deposit occurs at the top of the Winston Lake felsic volcanic

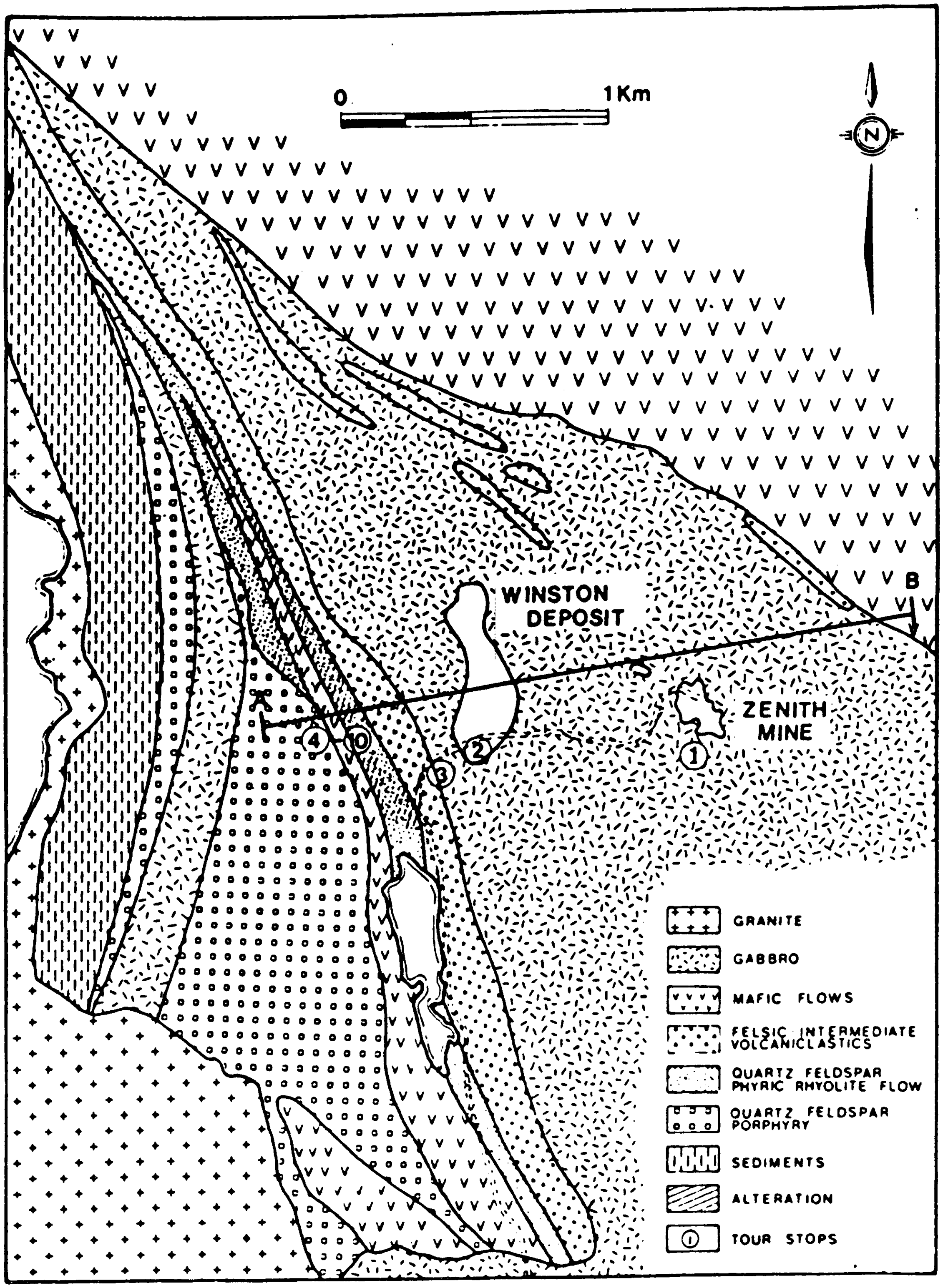



Figure 3: Geology of the Winston Lake Area (after Severin and Balint 1985)

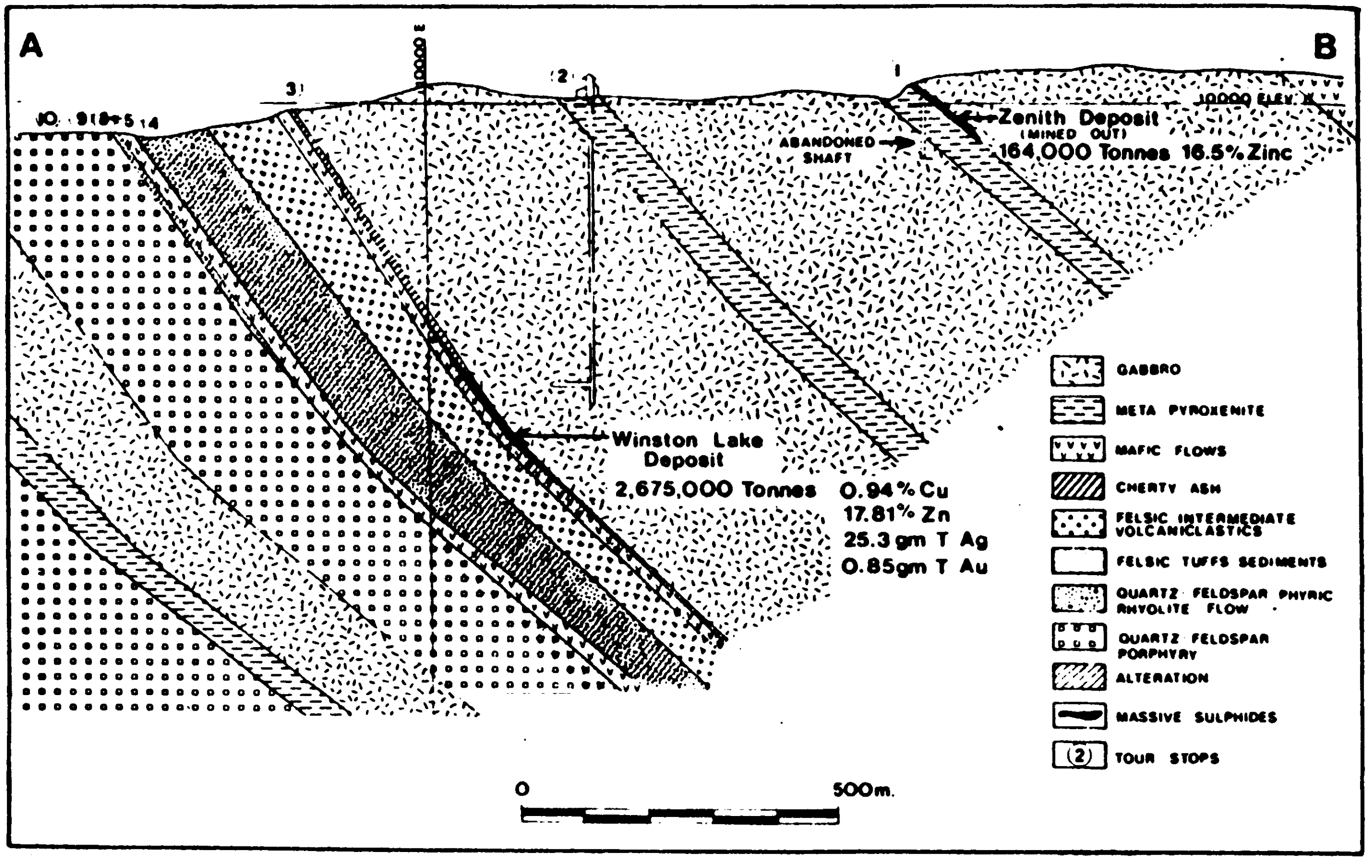



Figure 4: Composite Section of the Winston Lake Deposit Looking NNW (after Severin and Balint 1985)

> sequence and is intimately associated with a cherty ash that marks the top of a package of felsic to intermediate volcaniclastics. The sulphide deposit occurs as a relatively thin sheet with an 'average' true thickness of 4.3 m and a length and width of 700-800 m and 300-400 m, respectively."

Hydrothermal alteration of the associated wall rocks is characterized by complete replacement of the original minerals to an anthophyllite-biotite-cordierite assemblage.

The mineralogy has been described by Simmons (1983) as follows:

> "The massive sulphides themselves consist mainly of sphalerite, pyrrhotite, pyrite and chalcopyrite. Minor magnetite is present and traces of arsenopyrite, native silver and Ag- and Bi-tellurides have been identified microscopically.
>
> The sulphides are banded to very finely laminated. Despite amphibolite-facies metamorphism, beautifully slumps, flames and other soft sediment features are often apparent in the core."

Exploration continues on the property including drilling on the Pick lake Zone discovered in 1984. This continuous massive sulphide sheet or horizon has potential to provide further base metal tonnages.

**STOP #8**

**Harkness-Hays and Gold Range Properties**

The Harkness-Hays and Gold Range properties are located north of Highway 17, in Priske Township, approximately 4.7 km east of Schreiber. They are accessed via a gravel road which extends 0.5 km north from Highway 17 immediately west of the railway overpass to a gravel pit (**Figure 5**). The old workings include adits at the base of the ridge and a shaft and trenches located near the junction of two roads located 50 m east of the gravel pit. Recent overburden stripping has revealed the complex geological relationships between the quartz-carbonate veins, their host rocks and the granitic intrusion. Visible gold can be found in dump samples from both areas. Caution should be taken when investigating in the area around the old workings or the cliff faces.

These properties underwent development during a period from 1917 to 1941. Production was 194 ounces of gold from the Harkness-Hays property from 1935 to 1936, and 17 ounces of gold from the Gold Range property in 1941 (Marmont 1984). Gold is concentrated in a series of quartz ± carbonate veins which are generally en echelon and can occur subparallel to the contact of the Terrace Bay Batholith. The most important veins referred to by previous workers are the No.'s 1, 2, 3, and 7 veins (Resident Geologist's Files, Ontario Ministry of Northern Development and Mines, Thunder Bay).

On the Harkness-Hays property, the gold-bearing quartz ± carbonate veins are hosted predominantly by mafic metavolcanic rocks. However, mapping has indicated that in addition to the mafic metavolcanic rocks, quartz-feldspar porphyry and iron formation containing chert, massive pyritic sections and pyritic, carbonaceous slate, also occur locally.

The rocks locally have been intensely fractured and faulted. This is evident on top of the Gold Range ridge. Air photo interpretation and mapping indicate a conjugate set of lineaments striking northeast and northwest.

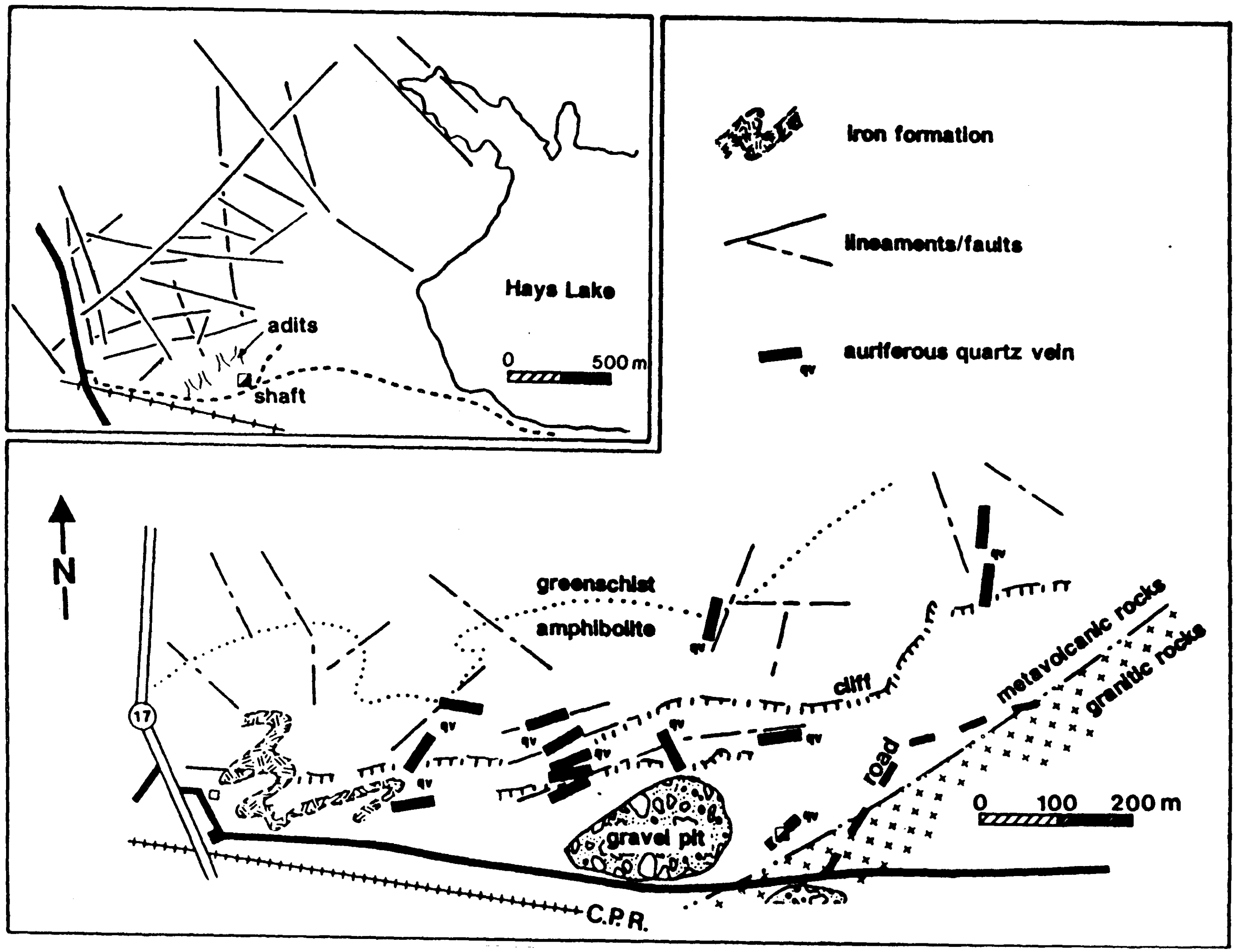



Figure 5: Geology of the Harkness-Hays - Gold Range Properties (Schnieders et al. in press)

A contact metamorphic halo is particularly well developed where the mafic metavolcanic rocks are in contact with the Terrace Bay Batholith. The contact metamorphic aureole is 200 m to 300m in width and often gradational, extending from the contact into the metavolcanic rocks. The metavolcanic rocks within the contact aureole are generally amphibole-rich and exhibit few relict primary textures. Near the granitic-metavolcanic contact, the metavolcanic rocks may resemble a mafic intrusion, such as a gabbro or diorite. This is believed to be the result of recrystallization during hornblende-hornfels (amphibolite) facies metamorphism. Outside the contact metamorphic aureole, the metavolcanic rocks are generally chlorite-rich and primary textures are preserved. Typical regional greenschist facies metamorphism predominates beyond the contact metamorphic halo.

First-order vein mineralization consists of visible gold, fine, euhedral pyrite, galena, molybdenite, and possibly tellurides. Second-order veins are commonly wider and crosscut the first-order veins. They contain pyrite, chalcopyrite, galena, molybdenite, sphalerite, tellurides, magnetite, graphite, silver and gold. Pyrite is present as large, euhedral crystals, up to 2.5 cm in size, and contains abundant gold as inclusions and along fractures. Geochemical evidence from unaltered and altered host rocks indicate that the altered rocks display carbonatization, sericitization ($K_2O$ enrichment), sodium depletion and pyritization (**Photograph** 5).

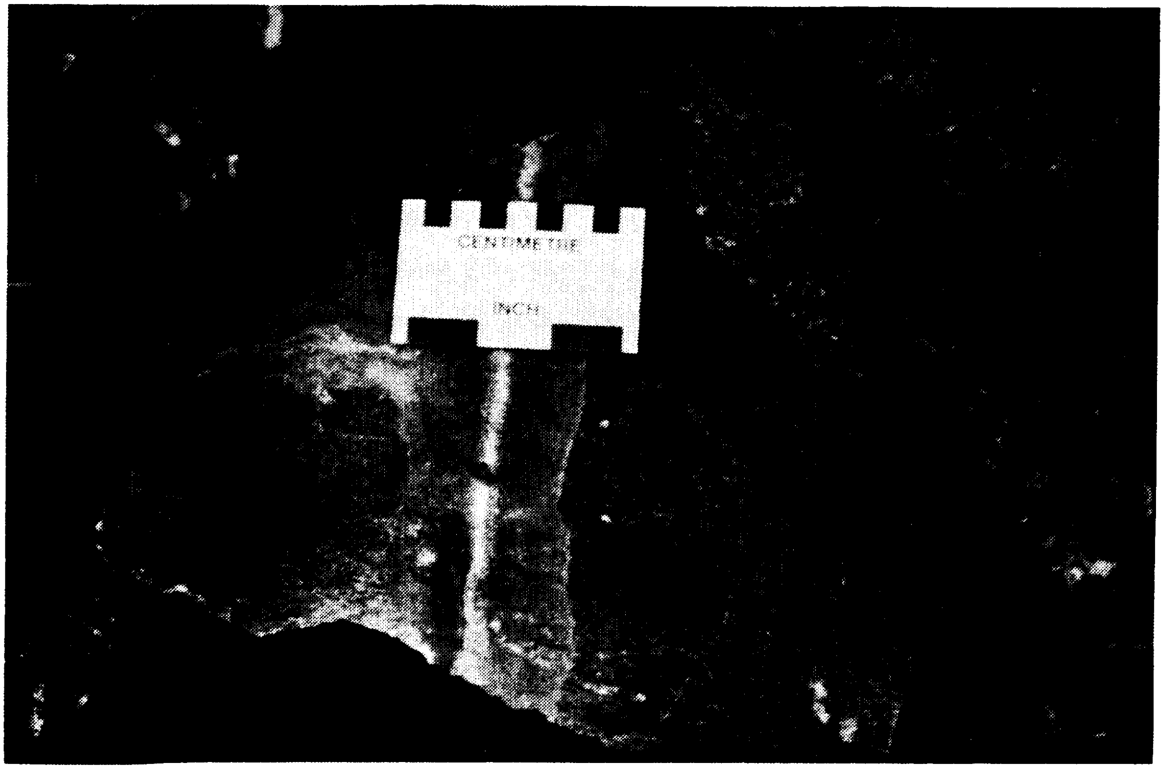



PHOTO 5: ALTERATION ENVELOPE AROUND NARROW GOLD-BEARING QUARTZ VEIN, GOLD RANGE PROPERTY. THE HOST ROCK IS A STRONGLY ALTERED MAFIC METAVOLCANIC ROCK.

STOP #9

Blanchford Occurrence

This occurrence is located on the north side of the Ontario Hydro powerline cut approximately 3.2 km southeast of Schreiber. Access may be gained via a bush road (Schreiber dump road) leading south from Highway 17 about 5.3 km east of Schreiber. Recently this road has been accessible only by four-wheel drive vehicles or by foot (see Road Log).

The showing consists of a narrow quartz vein up to 30 cm in width which strikes 120° and dips 45° south. The vein is hosted by pink hornblende-biotite granite or granodiorite, and is exposed in a long trench 30 m or more in length. Mineralization consists of pyrite, chalcopyrite and molybdenite. The vein contains irregular mineralization throughout. Molybdenite occurs along the fracture surfaces within the ribbon- or 'crack-seal'-textured vein.

STOP #10

Xenolithic Granite (Terrace Bay Batholith)

A granite to quartz diorite intrusion containing xenoliths occurs in the front lawn area of the Coach House Motel at Jackfish Lake, some 20.1 km east of Terrace Bay.

The granite is fine- to medium-grained and pink in colour, containing approximately 25% quartz, 40% potash feldspar, 25% to 30% oligoclase-andesine and 5% hornblende or biotite (Walker 1967). Minor constituents, in order of decreasing abundance, are sphene, apatite, fluorite, tourmaline, muscovite, epidote and magnetite.

The intrusive rocks are usually foliated near the contacts with the surrounding rocks, and in these areas the intrusion contains numerous, partially digested xenoliths of hornblende gneiss or amphibolite. These xenoliths are angular to subrounded and range from only a few centimetres up to 30 cm or more in length. The xenoliths repesent altered fragments of the nearby metavolcanic and metasedimentary rocks.

**STOP #11**

**Jackfish (Steel River) Pillow Lava**

A roadside exposure of Archean pillow lava occurs on the south side of the Trans-Canada Highway approximately 2 km west of the Steel River. This exposure affords an excellent three-dimensional view of this variolitic, pillowed unit, typical of a submarine environment. The pillows have well-preserved, fine-grained selvages with cusps, with some locally developed hyaloclastite in the interpillow spaces. Local flows young to the east-southeast. Lava tubes and quartz-filled,"drain-away" cavities occur locally.

Varioles are generally present within a 20 cm envelope adjacent to the selvages. The varioles commonly display a radiating or fibrous internal structure, although metamorphism and deformation have destroyed many of these primary features. Both the varioles and the pillow selvages are white to light green, while the pillow matrix varies from a medium to dark green. The varioles appear to have an affinity to

STOP #12

## Steel River Metasedimentary Rocks

This stop is located 28.3 km east of Terrace Bay. A gravel parking area is located just east of the Steel River bridge on the south side of Highway 17.

The metasedimentary rocks of the lower Steel River - Little Steel Lake area consist of well-bedded, predominantly graded wacke, siltstone and slate layers. Primary sedimentary textures include graded bedding, while sedimentary structures include parallel lamination, convolute lamination, cross-bedding, load casts, flames structures, ripples, loaded ripples, rip-up clasts, and scour structures (**Figure 6, Photograph 7**). The sedimentary rocks represent deposition from turbidity currents. Bouma (1962) defined the sequence for the classification of sediments of turbidite association. In this facies classification, Bouma described a classical turbidite by defining five divisions, A-E. Division A represents rapid deposition, with graded beds common. Division B represents traction in an upper flow regime and commonly displays parallel stratification, while Division C represents traction in a lower flow regime and displays cross-lamination. Division D represents deposition of fines (silt and clay, commonly parallel-laminated) from turbidity currents, while Division E represents turbiditic rainout followed by pelagic sedimentation, resulting in a fine-grained, pelitic portion. Classical turbidites (ABCDE) can vary in width from several centimetres up to several metres.

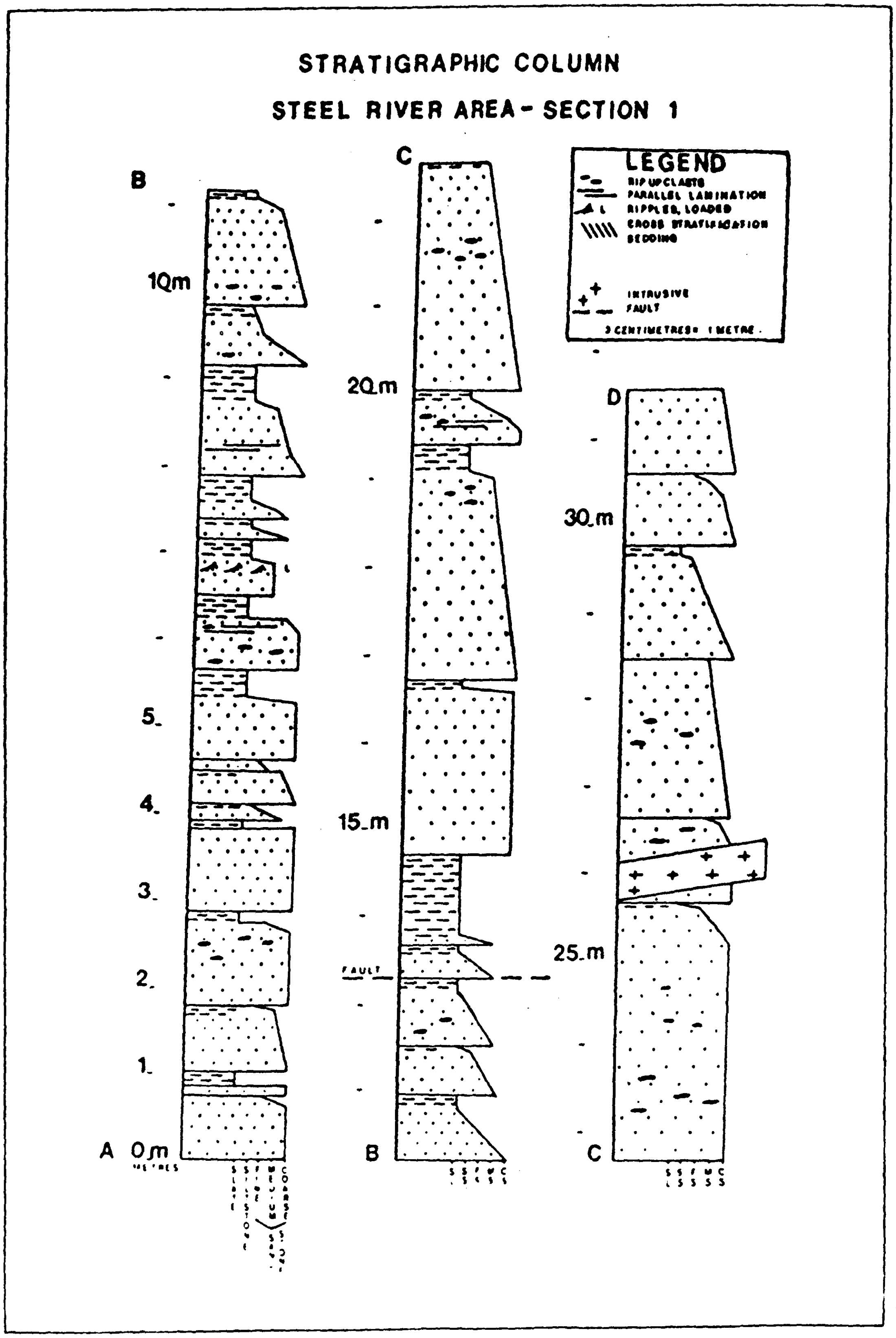



Figure 6: Stratigraphic Column Steel River Area - Section 1 (after Schnieders 1987)

Near classical turbidites varying from ABCBCD to ABCBCDE successions are present in the Steel River area.

**PHOTO 7:** FINE-GRAINED TURBIDITES, STEEL RIVER, DISPLAYING PARALLEL-LAMINATION, LOADED RIPPLES AND GRANDED BEDDING.

STOP #13

## Simard-Swetz Occurrence

The Simard-Swetz Occurrence is located south of the Canadian Pacific Railway tracks approximately 400 m east of the Steel River bridge, 28.3 km east of Terrace Bay. The occurrence was discovered by George Simard and Peter Swetz in 1951, likely during construction of Highway 17 nearby.

The Simard-Swetz Occurrence consists of a 3 m wide sulphide facies iron formation which includes a pyritic, carbonaceous slate (**Figure 7**). The iron formation strikes northeast and is situated between a chlorite schist, interpreted to represent a deformed, pillowed mafic volcanic ~~rock~~, or sheared mafic intrusive rocks, and a wacke-siltstone sedimentary assemblage. A felsic porphyry dyke intrudes along the contact between the iron formation and the turbidites.

The clastic sedimentary rocks consist of lithic wacke, argillite, siltstone and carbonaceous slate. Massive, laminated and nodular pyrite is interlaminated with the slate. The pyritic, carbonaceous slate unit is approximately 2 m wide. In contact with this clastic unit is a siliceous slate that is up to 2 m wide. Late quartz and carbonate veins in the siliceous slate contain sphalerite and galena. Secondary, euhedral pyrite occurs in association with the veins.

Analytical results from samples collected in 1951 indicated 0.10 ounce gold per ton, 0.28 ounce silver per ton, 0.53% lead and 0.21% zinc across 12 feet (3.7 m) (Resident

## SIMARD-SWETZ TYPE SECTION

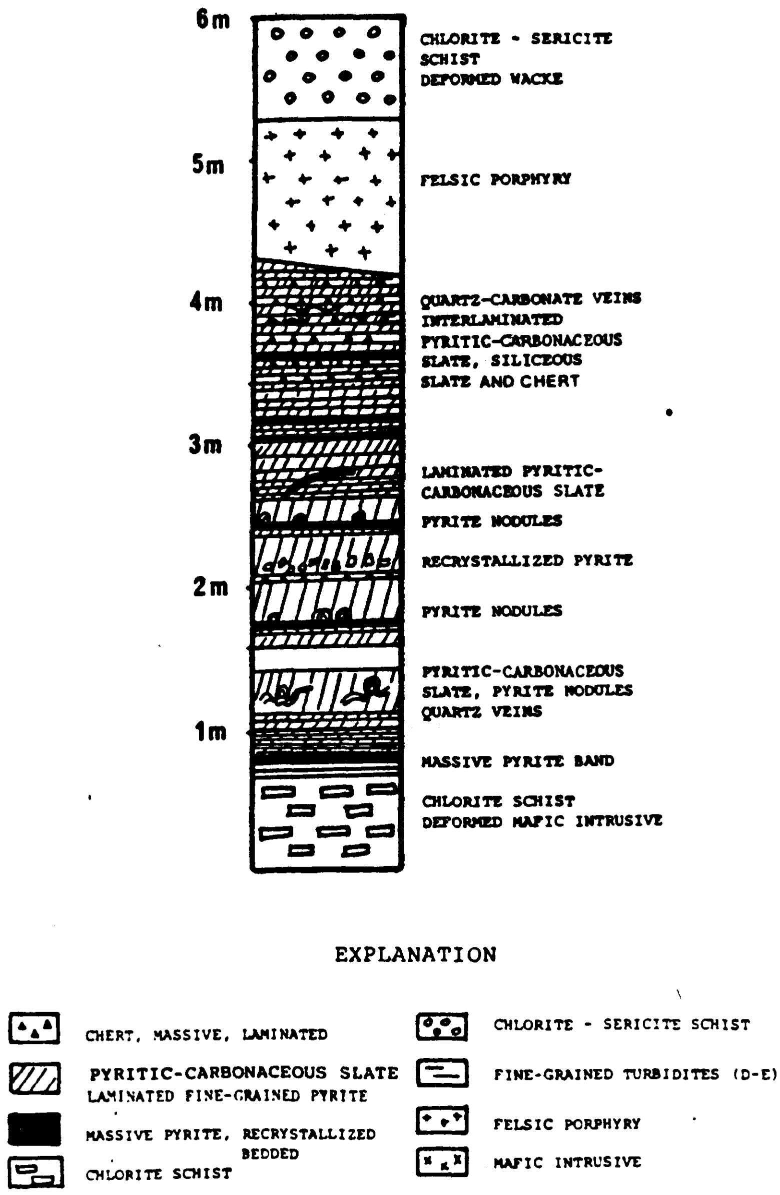



Figure 7: Type Section of the Simard-Swetz Occurrence (after Schnieders 1987)

Geologist's Files, Ontario Ministry of Northern Development and Mines, Thunder Bay, Ontario).

**STOP #14**

**McKellar Creek Diatreme**

The diatreme can be reached easily by a trail leading north from Highway 17, 42.8 km east of Terrace Bay, just west of McKellar Creek. The field stop is located appproximately 300 m north of the highway.

The McKellar Creek Diatreme is hosted by Early Precambrian (Archean), fine-grained metasedimentary rocks consisting of schistose argillite and siltstone. The diatreme breccia consists of rounded to angular clasts of pink and white quartzite, other metasedimentary rocks and altered trondhjemite. The clasts generally do not exceed 0.3 m in maximum dimension (Sage 1982).

Angular clasts of metasedimentary rocks predominate within the breccia. In outcrop, the reddish, altered clasts in association with quartzite clasts form a breccia which is clast-supported. The matrix is less resistant to erosion and weathers preferentially, producing raised fragments and clasts.

The quartzite clasts are considered to be derived from pre-existing Sibley Group sedimentary rocks which originally had overlain the area but have since been eroded. The quartzite clasts are more rounded than the clasts of Early Precambrian metasedimentary rocks. The rounding of the clasts is likely due to in-situ milling of the fragments during emplacement of the breccia. Clasts are variably hematitized and silicified.

**STOP #15**

**Deadhorse Creek (North) Prospect**

This prospect is located 44.6 km east of Terrace Bay and 0.9 km north along a gravel road just west of Deadhorse Creek which leads from Highway 17 to the showing.

This property is underlain by Archean mafic to felsic metavolcanic rocks interbedded with wacke and argillite, which in turn have been intruded by granite, quartz-feldspar porphyry and quartz-calcite veins. The general strike of the rocks is east and their dip varies from vertical to steeply south.

The property was examined American Yellowknife Exploration Company Limited in 1944 and 5022 feet (1522 m) of diamond drilling was carried out. Base metal sulphides occur in a brecciated calcite vein in trenches along a strike length of 220 m. The vein is hosted by carbonatized and chloritized mafic metavolcanic flows and strikes 90° to 100° and dips 80° to the north to vertically. It varies in width from several centimetres up to 2 m.

Sampling by American Yellowknife Exploration Company Limited returned 7.28% zinc, 1.45% lead and 8.27 ounces silver per ton over a length of 257 feet (78 m) and a width of 3.7 feet (1.1 m). Selected grab samples of the vein material have returned 27.0% zinc, 0.49% lead and 11.2 ounces silver per ton (Resident Geologist's Files, Ontario Ministry of Northern Development and Mines Thunder Bay, Ontario). Other grab samples of the vein material have assayed as high as 27.04% lead, 16.84% zinc, and 56.40 ounces per ton silver (Walker 1967). The banded calcite vein contains massive and brecciated sphalerite and galena with minor pyrite. Accessory minerals include quartz, ankerite, epidote, sericite and hematite.

**STOP #16**

**Deadhorse Creek Diatreme Complex**

This intrusive feature is located approximately 47 km east of Terrace Bay and about 3 km north of Highway 17 along the Great West Timber Road which joins the highway just east of Deadhorse Creek.

The Deadhorse Creek Complex (Sage 1982), which is 400 by 1600 m in size and elongated in a north-northest direction, is hosted by a northwest-trending package of Archean mafic to intermediate metavolcanic rocks and metasedimentary rocks. It comprises of a number of subcomplexes consisting mainly of diatreme breccias. The West Deadhorse and East Deadhorse subcomplexes are approximately 15 m by 60 m, and 60 m by 240 m in size, respectively. They are elongate in a northwesterly direction and may occupy faults which crosscut the Archean country rocks.

The breccias consist of angular to sub-rounded clasts of locally derived rocks in a fine-grained, variably altered, rock flour matrix. Clasts are generally less than 0.3 m in size. Hematitic alteration of the clasts ranges from incipient alteration of the clast margins to total clast alteration. This intense alteration imparts a brick red colour and renders the clasts difficult to break. The extensively altered breccias are generally radioactive and may be enriched in rare metals such as beryllium, zirconium and scandium, uranium, thorium, yttrium and rare earth elements (Sage 1982; Smyk et al. 1989).

Further descriptions of the McKellar Creek and Deadhorse Creek diatremes are presented by Mitchell and Platt, in Franklin and McIlwaine (1982):

> "Two small explosion diatremes (Deadhorse Creek and McKellar Creek) are located in the Archean greenstone belt just to the west of the Coldwell alkaline complex. A third subcircular diatreme (The Neys Diatreme) cuts rocks of the Coldwell complex. Located on the west side of the Coldwell Peninsula, this latter diatreme has been studied by Balint (1977). The diatremes in the greenstone belt have been studied by Sage (1978)."

and

> "The matrix of the diatreme, where unweathered, is dark green in colour and consists of carbonate and a greenish amphibole. Embedded in this are clasts of varying size and angularity. By far the most prominent are fragments from the greenstone belt. Of regional geological interest are occasional clasts of orthoquartzite. Similar clasts, together with red-purple shales, are found in greater abundance in the McKellar Creek diatreme. These clasts closely resemble rocks formed extensively in the Paleohelikian Sibley Group. Previously, the most easterly extension of this group of rocks was thought to be approximately 65 km to the west in the vicinity of Rossport.

Fragments similar in appearance to certain felsic porphyries of the Keweenawan Osler volcanic rocks are also present. This would indicate an easterly extension of Osler volcanism, although the seeming total lack of Osler basaltic rocks makes this assumption problematical."

**STOP #17**

**Little Pic Lookout**

The Little Pic Lookout is located approximately 51.4 km east of Terrace Bay and 1.2 km east of the highway bridge over the Little Pic River. This site offers an excellent view of the Little Pic River and Ashburton Bay of Lake Superior. The striking landscape of the Coldwell Peninsula and Pic Island to the southeast served as the subject of many of the sketches and paintings of Lawren Harris and other members of the renowned Group of Seven.

This locality within the Coldwell Alkaline Complex has been described by Mitchell and Platt (1982):

"**Parking Lot**

To the southwest can be seen cliffs of xenolith- free ferroaugite syenite along the west bank of the Little Pic River. The river probably occupies a fault zone with the east bank representing a down-faulted block of Centers -2 and -3 rocks. To the south lie the Coldwell Peninsula and Pic Island. Densely wooded shore are alkali gabbro and nepheline syenite. The distant barren shores are syenites and quartz syenites.

**Highway Cuts**

The highway cuts on the north side of Highway 17 provide excellent examples of the complex multiple igneous breccias so characteristic of the Little Pic - Redsucker Cove block. Center 2 breccias consist of alkali gabbro and nepheline syenites similar to those exposed on the west side of the Coldwell Peninsula. These breccias are found as large xenoliths in the later Center 3 quartz syenite breccias. Xenoliths in the quartz

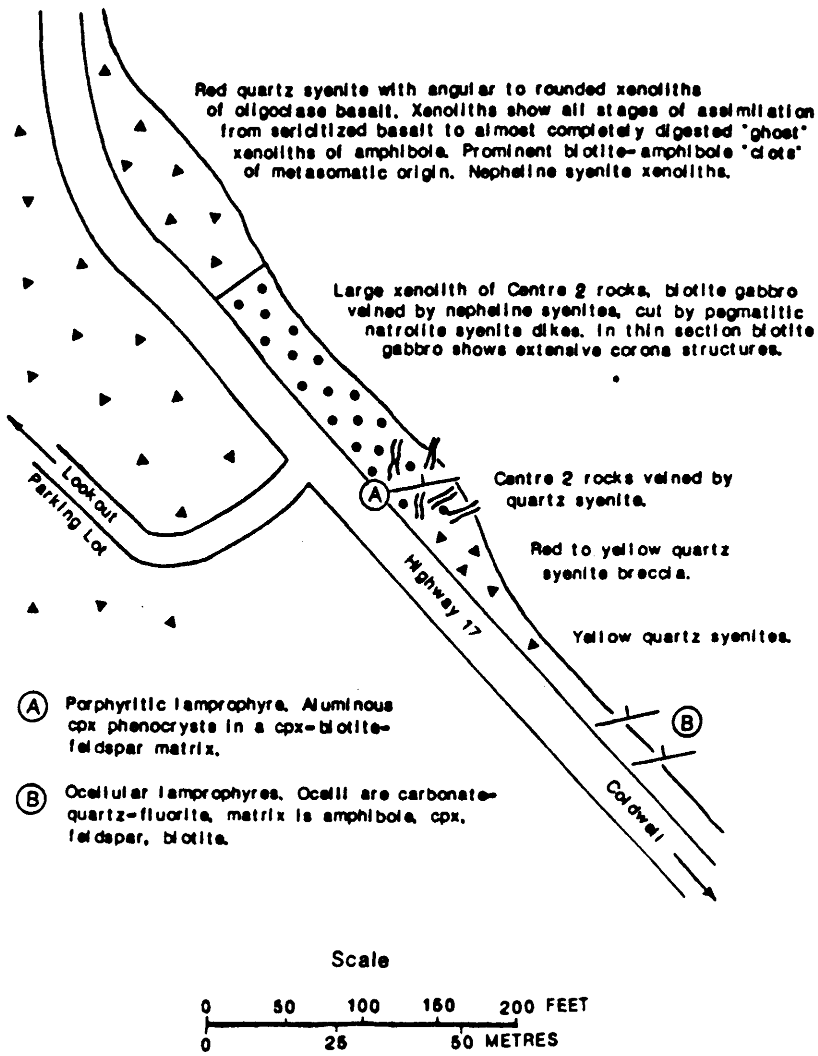



Figure 8: Geology of the Little Pic River Lookout Area
(after Mitchell and Platt, 1982)

syenite are oligoclase basalts. These show all stages of assimilation from relatively unaltered but sericitized basalt to almost completely digested xenoliths of amphibole-rich rocks.

Development of clots of biotite and amphibole is a characteristic metasomatic feature of xenoliths. The oligoclase basalts probably are remnants of Proterozoic extrusive rocks which originally capped the complex.

These outcrops demonstrate conclusively that Center 3 quartz syenites are younger than Center 2 undersaturated rocks.

Two types of lamprophyre can be found crosscutting the breccias:

(a) Porphyritic lamprophyre, characterized by greenish phenocrysts of Al-Cr-augite, possibly of high-pressure origin;

(b) Ocellar lamprophyre, characterized by ocelli of carbonate, quartz and fluorite."

**STOP #18**

## Layered Gabbro of the Coldwell Alkalic Complex

This stop is located approximately 1.8 km east of the Marathon turnoff on Highway 17. Parking is available on a large extended gravel shoulder / rest area on the south side of the highway. An excellent exposure of the well-layered Eastern or border gabbro of the Coldwell Alkalic Complex extends along the length of the gravel shoulder. This early gabbroic phase of the Complex and related syenites have been dated by Heaman and Michado (1987) at 1108$\pm$1 Ma. The gabbro at this stop is intruded by dykes of medium-grained to pegmatitic ferroaugite syenite, and has been described by Mitchell and Platt (1982):

"The arcuate mass of basic rocks which define the eastern and northern margin of the complex is commonly referred to as the border gabbro to distinguish it from the alkaline gabbro of Center 2. This border gabbro is considered to belong to Center 1 activity as it is intruded in many places by ferroaugite syenite. The petrological relationship between the two magmas is, however, unclear. Ferroaugite syenite is unlikely to be a direct differentiate of the gabbro because of the greater volume of the former and the lack of mineralogical gradations between the two rocks types. The zone of gabbro defines a prominent magnetic low ... This is considered by Lilley (1964) to be due to reversed magnetization of the gabbros. The gabbros are composed of ($Fo_{67-43}$) augite, plagioclase ($An_{60-35}$) and minor orthopyroxene ($En_{55-66}$) (Lum 1973). The orthopyroxene may be a product of assimilation of Archean metasedimentary rocks, a xenocryst derived from the pyroxene hornfels thermal aureole, or a relict high pressure phase.

The gabbro has been extensively prospected for its copper potential as accumulations of pyrrhotite and chalcopyrite, with minor pentlandite, cubanite, pyrite, bornite, arsenopyrite and mackinawite (Watkinson et al. 1973; Lum 1973) are common.

The excursion stop is close to the contact between the gabbro and the ferroaugite syenite. Many pegmatites of ferroaugite syenite cut the gabbro at this locality. The gabbro contains variable amounts of Archean xenoliths. Here the gabbro shows all transitions from massive homogeneous gabbro to rocks with well-developed igneous layering. The layers are not traceable over long distances and do not serve to outline the structure of the gabbro intrusion."

Copper and minor nickel and platinum group element mineralization is associated with the gabbroic rocks of the Coldwell Complex. On the eastern margin of the Complex, several textural and compositonal varieties of gabbro occur in a crescentic mass. The Marathon deposit, approximately 10 km north of this stop, is under current joint ownership of Fleck Resources Ltd. and Euralba Mining Ltd., and has drill-indicated reserves of 47 million tons of possible ore grading 0.42% Cu, 0.02 ounce per ton Pt, 0.054 ounce per ton Pd, and trace Ni, Co, Rh, Au and Ag. It is described by Dahl et al. (1986; 1987 a,b), and Watkinson et al. (1986).

**PHOTO 8:** MODAL PLANAR IGENOUS LAYERING, EASTERN BORDER GABBRO. THE DARK, RAISED BANDS ARE MAGNETITE-RICH AND ARE MORE RESISTANT TO EROSION THAN THE LIGHT COLOURED, PLAGIOCLASE FELDSPAR-RICH BANDS.

## ROAD LOG: NIPIGON-MARATHON AREA

## STOP LOCATIONS/DIRECTIONS

| | HIGHWAY 17 DISTANCE (km) | TOTAL DISTANCE (km) | DISTANCE BETWEEN (km) |
|---|---|---|---|
| **START** | | | |
| Proceed east on Highway 17 for 23.9 km to a series of outcrops on the north side of Highway 17 and STOP #1. | | | |
| <u>Reference Points</u> | | | |
| Husky Truck Stop, Nipigon, Ontario | 0.0 | 0.0 | |
| Nipigon River Bridge | 4.1 | | |
| Highway 11/17 Junction | 4.7 | | |
| **STOP #1** **<u>Xenolithic and Pegmatitic Migmatite</u>** | 23.9 | 23.9 | 23.9 |
| Return to vehicle and proceed east for 0.7 km to Little Bear Quarry (Camp 81) Road. | | | |
| Travel north on Little Bear Quarry Road for 4.2 km for STOP #2. | | | |
| <u>Reference Points</u> | | | |
| Highway 17/Little Bear Quarry Junction | 24.6 | 24.6 | |
| **STOP #2** **<u>Kama Hill Occurrence</u>** | 24.6 | 28.8 | 4.9 |
| Backtrack to Highway 17, continue east for 2.4 km to scenic lookout. | | | |
| Walk west along Highway for 400 m to STOP #3, on north side of Highway. | | | |

| | | | |
|---|---|---|---|
| **STOP #3**<br>**<u>Sibley Group Sedimentary Rocks</u>** | 27.0 | 35.4 | 6.6 |
| Return to vehicle and continue east for 4.5 km to junction of Highway 17 and small paved road. | | | |
| Travel south on small paved road to scenic lookout (approx. 1 km). | | | |
| **<u>Reference Points</u>**<br>Jackpine River Bridge | 29.7 | | |
| **STOP #4**<br>**<u>Scenic Lookout - Kama Hill Area (paved road junction)</u>** | 31.5 | 39.9 | 4.5 |
| Park in parking area and walk to fenced off viewing area. | | | |
| Proceed east for 14.5 km to STOP #5 located on the north side of Highway 17. | | | |
| **<u>Reference Points</u>**<br>Cypress River Bridge | 42.0 | | |
| **STOP #5**<br>**<u>Archean-Sibley Group Unconformity</u>** | 46.0 | 54.4 | 14.5 |
| From Stop #5 proceed east for 17.1 km to the top of Cavers Hill and the location of STOP #6 (Sunset Vein). | | | |
| **<u>Reference Points</u>**<br>Gravel River Bridge | 49.2 | | |
| **STOP #6**<br>**<u>Barite-Fluorite Veins</u>** | 63.1 | 71.5 | 17.1 |
| (Sunset Vein) | | 71.5 | |
| (Midday Vein) | | 71.7 | |
| (Sunrise Vein) | | 71.8 | |
| Proceed east for 23.3 km to the junction of Highway 17 and the Winston Lake Road (optional). | | | |

The Winston Lake Mine Site is an optional stop. Proceed up the Winston Lake Road approximately 22 km to the Mine Site and STOP #7.

| **Reference Points** | | | |
|---|---|---|---|
| Pays Plat River Bridge | 67.6 | | |
| Rossport Turnoff | 74.1 | | |
| Highway 17/Winston Lake Road Junction | 86.3 | 95.1 | |

**STOP #7**
**Winston Lake Deposit** 117.1 45.2
(optional)

Return to junction of Highway 17 and Winston Lake Road. Proceed east for 9.1 km to Imperial Esso in Schreiber.

**START**

Imperial Esso - Schreiber 0.0

From the Imperial Esso Service Station in Schreiber drive east for 4.7 km to the Hays Lake (north side of Highway 17) gravel road. Drive north for 0.5 km to a gravel pit parking area and STOP #8.

**STOP #8**
**Harkness-Hays Gold Range Properties** 5.2 36.3

Backtrack to Highway 17 and turn left (east) and proceed for 0.6 km to the old Schreiber Dump Road. Drive 1.1 km south on main road to junction of smaller side road. Turn left (south) and proceed for 0.3 km to a power (transmission) line. Note this road is not always in the best condition, and access by foot is recommended. Walk east along powerline for 500 m to the top of the hill and a large granite outcrop. STOP #9 is

| | | | |
|---|---|---|---|
| located along the north side of the powerline clearing. | | | |
| **Reference Points**<br>Highway 17/Old Schreiber Dump Road | 5.3 | 6.3 | |
| **STOP #9**<br>**Blanchford Occurrence** | | 7.7 | 2.5 |
| Backtrack to Highway 17 and turn east (right) and proceed for 9.4 km to the Red Dog Inn in Terrace Bay. | 14.7 | 9.1<br>18.5 | |
| **START** | | | |
| Red Dog Inn, Terrace Bay | 0.0 | | |
| Proceed east for 20.1 km to the Coach-House Motel (Eastern driveway) and STOP #10. The outcrop is located in the front yard of the motel. | | | |
| **Reference Points**<br>Jackfish Lake | 18.4 | | |
| **STOP #10**<br>**Xenolithic Granite** | 20.1 | 20.1 | 30.9 |
| From the Coach-House Motel proceed east for 5.5 km to outcrops on the south side of Highway 17 and STOP #11. Care must be taken when parking on shoulder of Highway 17. | | | |
| **STOP #11**<br>**Jackfish Pillow Lava (Steel River)** | 25.6 | 25.6 | 5.5 |
| Proceed east to a parking area just east of the Steel River Bridge, on the south side of Highway 17. This location allows access to STOPS #12 and #13. STOP #12 is located on the north side | | | |

of Highway 17 from the parking area to the Steel River Bridge.

| | | | |
|---|---|---|---|
| **Reference Points** | | | |
| Steel River Bridge | 28.0 | | |
| **STOP #12** **Steel River Metasedimentary Rocks** | 28.3 | 28.3 | 2.7 |

Stop #13 is located south of the parking site, and a trail leads from this site south to the CPR tracls. where a left (east) turn is made.

Follow the tracks for approximately 200 m to a small rock dump on the south side. If you reach the lake you have gone too far. Cross a small creek and follow a trail for 200 m until an old trench at the base of a cliff is reached and STOP #13.

| | | | |
|---|---|---|---|
| **STOP #13** **Simard-Swetz Occurrence** | 28.3 | 28.3 | 0.0 |

Return to vehicle and proceed east along Highway 17 for 14.5 km and park on roadside. An old bush road on the north side of the highway is followed north for approximately 300 m STOP #14.

| | | | |
|---|---|---|---|
| **Reference Points** | | | |
| Prairie River Bridge | 37.1 | | |
| Ripple Lake | 41.7 | | |
| **STOP #14** **McKellar Creek Diatreme (optional)** | 42.8 | 42.8 | 14.5 |

Proceed east for 1.8 km to a small gravel road located on the north side of the highway. Proceed north by vehicle or foot (depending on conditions) for 0.9 km to STOP #14.

| | | | |
|---|---|---|---|
| **STOP #15**<br>**Deadhorse Creek Prospect** | 44.6 | 45.5 | 2.7 |

Return to Highway 17. Turn left and proceed east for 0.4 km to junction of Highway 17 and the Deadhorse Creek Road on the north side of Highway 17. Travel north up the Deadhorse Creek Road for 3 km, and pull off in small gravel park. STOP #16 is exposed on the east side of the road, approximately 20 m up the hill.

**Reference Points**

| | |
|---|---|
| Deadhorse Creek Bridge | 44.6 |
| Deadhorse Creek Road | 44.8 |

| | | | |
|---|---|---|---|
| **STOP #16**<br>**Deadhorse Creek Diatreme** | 45.0 | 49.8 | 3.4 |

Return to Highway 17 and proceed east for 6.4 km to the Little Pic scenic lookout and STOP #17.

**Reference Points**

| | |
|---|---|
| Little Pic River Bridge | 50.2 |

| | | | |
|---|---|---|---|
| **STOP #17**<br>**Little Pic Lookout** | 51.4 | 59.2 | 6.4 |

Continue east for 29.2 km to STOP #18.

**Reference Points**

| | |
|---|---|
| Coldwell Road/Highway 17 Junction | 59.7 |
| Marathon Junction (Esso) Highway 17 | 78.8 |

**STOP #18**
**Layered Gabbro of the Coldwell Alkaline Complex**

## REFERENCES


Ayers, L.D., Lumbers, S.B., Milne, V.G. and Robeson, D.W. 1970: Ontario Geological Map, West Central Sheet, Ontario Department of Mines and Northern Affairs, Colour Map 2199, scale 1:1,013,760 or 1 inch to 16 miles.

Bouma, A.H. 1962: Sedimentology of some Flysch Deposits; Elsevier Pub Co., Amsterdam, P. 48-54, 168 p.

Currie, K.L. 1980: A Contribution to the Petrology of the Coldwell Alkaline Complex, Northern Ontario; Geological Survey of Canada, Bulletin 287, 43 p., 7 figures, 1 appendix.

Dahl, R., McGoran, J., and Watkinson, D.H., 1986. The Coldwell Complex Platinum-Group Element Deposit: 1. Geological Relationships of Layered Gabbroic Host Rocks; p.61 in G.A.C.- M.A.C.- C.G.U. Joint Annual Meeting, Ottawa, May, 1986, Program with Abstracts, vol. 11.

Dahl, R., Watkinson, D.H., and McGoran J.W. 1987a. Two Duck Lake Intrusion, Coldwell Alkaline Complex, Ontario: 1. Geology and Structure. Institute on Lake Superior Geology, 33rd Annual Meeting, Wawa, Ontario, May, 1987, Program with Abstracts.

Dahl, R., Watkinson, D.H., and McGoran, J.W., 1987b. Two Duck Lake Intrusion, Coldwell Alkaline Complex, Ontario 2. Petrology and Base-Metal/PGE Geochemistry. Institute on Lake Superior Geology, 33rd Annual Meeting, Wawa, Ontario, May, 1987, Program with Abstracts.

Fowler, A.D., Jensen, L.S., and Peloquin, S.A., 1987. Varioles in Archean Basalts: Products of Spherulitic Crystallization. Canadian Mineralogist, vol. 25, pp. 275-289.

Fralick, P.W., Barrett, T.J., Jarvis, K.E., Jarvis, I., Schnieders, B.R., and Vande Kemp, R., 1989. Sulfide-Facies Iron Formation at the Archean Morley Occurrence, Northwestern Ontario: Contrasts with Oceanic Hydrothermal Deposits. Canadian Mineralogist, vol. 27, pp. 601-616.

Franklin, J.M. and McIlwaine, W.H. 1982: The Sibley Group; p. 32-41 in Proterozoic Geology of the Northern Lake Superior Area, edited by J.M. Franklin, Geological Association of Canada/Mineralogical Association of Canada Joint Annual Meeting, Winnipeg, Manitoba, Field Trip Guidebook, 71p.

Franklin, J.M., McIlwaine, W.H., Poulsen, K.H., and Wanless, R.K. 1980: Stratigraphy and depositional setting of the Sibley Group, Thunder Bay District, Ontario, Canada; Canadian Journal of Earth Sciences, Vol. 17, No. 5, p. 633-651.

Franklin, J.M., Schnieders, B.R. and Koopman, E.R., 1990. Mineral Deposits in the Western Superior Province, Ontario. Geological Survey of Canada, Open File 2164. Field Trip 9, 8th IAGOD Symposium, 141p.

Harcourt, G.A., and Bartley, M.W., 1939. The Schreiber area. Ontario Department of Mines, Annual Report XLVII, Part IX. Accompanied by Map 47j, one inch to 1/2 mile, 40p.

Heaman, L.M., and Michado, N., 1987. Isotope Geochemistry of the Coldwell Alkaline Complex, I. U-Pb Studies on Accessory Minerals. p.54, in G.A.C. Annual Meeting, May, 1987, Saskatoon, Saskatchewan, Program with Abstracts, 12.

Kite, B.T. 1981: The Geology of the Zenith Zinc Deposit Near Schreiber, Ontario; Unpublished H.B.Sc. Thesis, Lakehead University, Thunder Bay, Ontario, 64p.

Lilley, F.E.M., 1964. An Analysis of the Magnetic Features of the Port Coldwell Intrusive. M.Sc. thesis, University of Western Ontario, London, 89p.

Lum, H.K., 1973. Petrology of the Eastern Gabbro and Associated Sulphide Mineralization of the Coldwell Alkalic Complex, Ontario. B.Sc. thesis, Carleton University, Ottawa, Ontario, 68p.

Marmont, S. 1984: The Terrace Bay Batholith and Associated Mineralization; Ontario Geological Survey, Open File Report 5514, 95p., 10 photos, 7 figures, 4 tables and 1 map in back pocket.

McKellar, P. 1874: Mining on the North Shore, Lake Superior; Library, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Thunder Bay, Ontario, 26p.

Mitchell, R.H., and Platt, R.G., 1982. The Coldwell Alkaline Complex. p. 42-61, in Proterozoic Geology of the Northern Lake Superior Area, G.A.C.-M.A.C. Joint Annual Meeting, Winnipeg, Manitoba, Field Trip Guidebook, edited by J.M. Franklin, 71 p.

Patterson, G.C. 1984: A Field Trip Guidebook to the Hemlo Area, Ontario Geological Survey, Miscellaneous Paper 118, 33p.

Patterson, G.C., Mason, J.K. and Schnieders, B.R. 1983: 1982 Report of the Thunder Bay Resident Geologist; p. 47-81 in Report of Activities, Regional and Resident Geologists, 1982, edited by C.R. Kustra, Ontario Geological Survey, Miscellaneous Paper 107, 211p.

Patterson, G.C., Mason, J.K. and Schnieders, B.R. 1985: Thunder Bay Resident Geologist Area, North Central Region; p. 56-133 in Report of Activities 1984, Regional and Resident Geologists, edited by C.R. Kustra, Ontario Geological Survey, Miscellaneous Paper 122, 297p.

Patterson, G.C., Mason, J.K., and Schnieders, B.R. 1986: Thunder Bay Resident Geologist Area, Northwestern Region; p. 71-135 in Report of Activities 1985, Regional and Resident Geologists, edited by C.R. Kustra, Ontario Geological Survey, Miscellaneous Paper 128, 340p.

Patterson, G.C., Scott, J.F., Mason, J.K., Schnieders, B.R., MacTavish, A.D., Dutka, R.J.A., Kennedy, M.C., White, G.D., and Hinz, P. 1987: Report of the Thunder Bay Resident Geologist; p. 72-127 in Report of Activities 1986, Regional and Resident Geologists, edited by C.R. Kustra, Ontario Geological Survey, Miscellaneous Paper 134, 322p.

Pye, E.G. 1969: Geology and Scenery, North Shore of Lake Superior; Ontario Depart. Mines, Geol. Guide Book 2, 144p. (reprinted 1975).

Sage, R.P. 1982: Mineralization in Diatreme Structures North of Lake Superior; Ontario Geological Survey, Study 27, 79p.

Schnieders, B.R. 1987: Geology and Depositional Environments of Sulphide-Facies Iron-Formation in the Lower Steel River-Little Steel Lake Area, M.Sc. Thesis, Lakehead University, Ontario, 196p.

Schnieders, B.R. and Speed, A.A. (in press): Property Visits and Report of the Schreiber-Marathon Economic Geologist Program 1983-1987; Ontario Ministry of Northern Development and Mines.

Scott, J.F. 1987: Uranium Occurrences of the Thunder Bay-Nipigon-Marathon Ara; Ontario Geological Survey, Open File Report 5634, 158p., 11 figures, 12 tables, 13 photos, 11 maps in text and 1 map in back pocket.

Severin, P.W.A., and Balint, F. 1984: Geological Setting of the Winston Lake Massive Sulphide Deposit; pB1-B18 in Hemlo-Manitouwadge-Winston Lake, Metallogenesis of High Metamorphosed Archean Gold-Base Metal Terrain, Canadian Institute of Mining and Metallurgy (CIM) Geology Division Guidebook, CIM Geology Division - District 4, Field Trip Oct. 1-4, 1984 edited by R.J. McMillan and D.J. Robinson, Westmin Resources.

Severin, P.W.A. and Balint, F. 1985: Geological Setting of the Winston Lake Massive Sulphide Deposit p. 6-15 in Gold and Copper-Zinc Metallogeny Hemlo-Manitouwadge-Winston Lake, Ontario, Canada edited by R.H. McMillan and D.J. Robinson Geological, Association of Canada and The Canadian Institute of Mining and Metallurgy, 91p.

Simmons, B.D. 1983: Winston Lake Discovery (a paper presented to the Prospectors and Developers Convention, March 9, 1983), Resident Geologist's Files, Ontario Ministry of Northern Development and Mines, Thunder Bay.

Smyk, M.C., Kingston, D.L., and Taylor, R.P. 1989. Geology of the West Deadhorse Creek diatreme-hosted rare metal occurrences, Schreiber-Hemlo District, Ontario; Geological Association of Canada - Mineralogical Association of Canada Annual Meeting, Program with Abstracts, Montreal, May 15-17, 1989.

Walker, J.W.R. 1967: Geology of the Jackfish-Middleton Area; Ontario Department of Mines, Geological Report 50, 41p. accompanied by Maps 2107 and 2112, scale 1 inch to 1/2 mile.

Watkinson, D.H., Mainwaring, P.R., and Lum, H.K., 1973. Petrology and Copper Mineralization of the Coldwell Complex, Ontario. p. 856, in G.S.A. Annual Meeting 5, Program with Abstracts.

Watkinson, D.H., Dahl, R., and McGoran, J.W., 1986. The Coldwell Complex Platinum-Group Element Deposit: 2. Relationships of Platinum-Group Elements to Pegmatitic, Biotite-Bearing Gabbro and the Role of a Fluid Phase. p. 142, in G.A.C.-M.A.C.-C.G.U. Joint Annual Meeting, Ottawa, Ontario, May 1986, Program with Abstracts, vol. 11.

Williams, H., Turner, F.J., and Gilbert, C.M. 1954. Petrography. W.H. Freeman and Co., Publishers, San Francisco, 406p.

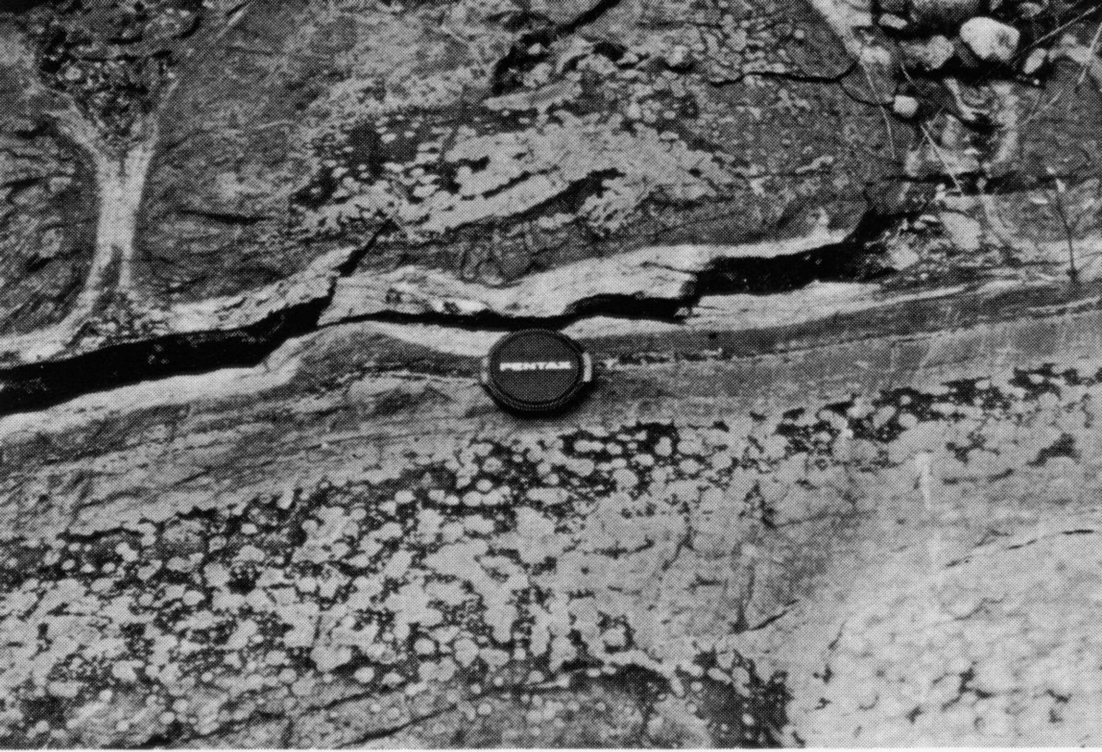
## CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

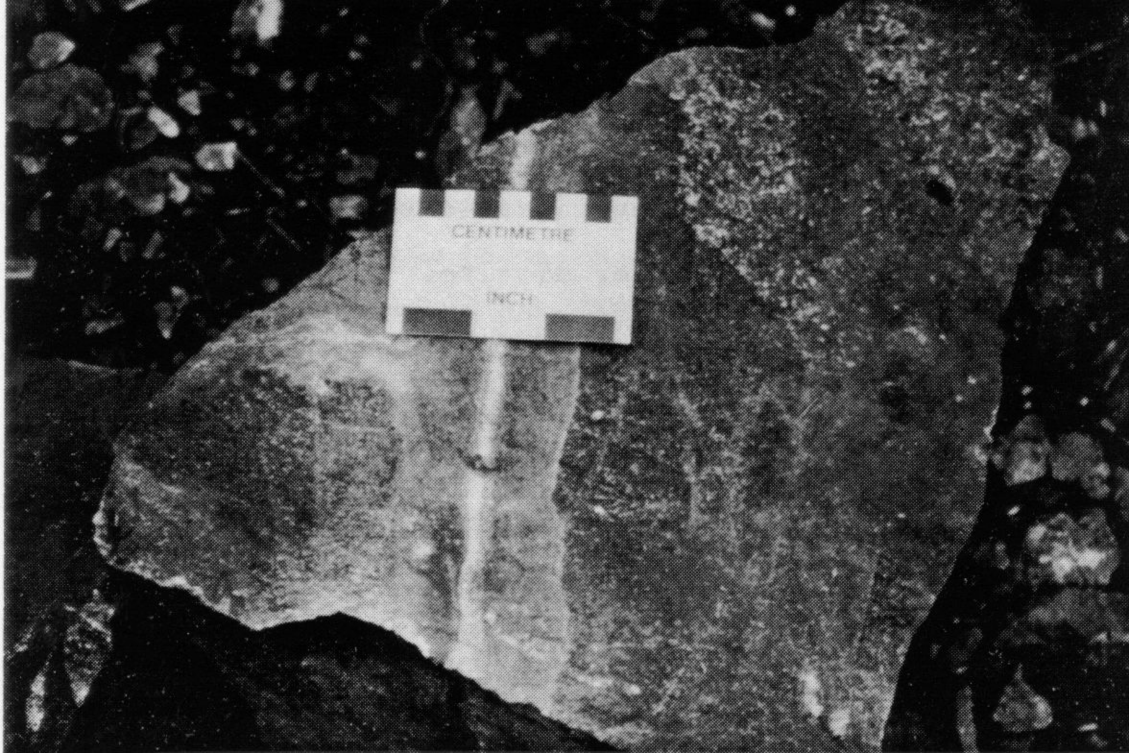
| Conversion from SI to Imperial | | | Conversion from Imperial to SI | | |
|---|---|---|---|---|---|
| *SI Unit* | *Multiplied by* | *Gives* | *Imperial Unit* | *Multiplied by* | *Gives* |
| | | | **LENGTH** | | |
| 1 mm | 0.039 37 | inches | 1 inch | **25.4** | mm |
| 1 cm | 0.393 70 | inches | 1 inch | **2.54** | cm |
| 1 m | 3.280 84 | feet | 1 foot | **0.304 8** | m |
| 1 m | 0.049 709 7 | chains | 1 chain | 20.116 8 | m |
| 1 km | 0.621 371 | miles (statute) | 1 mile (statute) | **1.609 344** | km |
| | | | **AREA** | | |
| 1 cm² | 0.155 0 | square inches | 1 square inch | **6.451 6** | cm² |
| 1 m² | 10.763 9 | square feet | 1 square foot | **0.092 903 04** | m² |
| 1 km² | 0.386 10 | square miles | 1 square mile | 2.589 988 | km² |
| 1 ha | 2.471 054 | acres | 1 acre | 0.404 685 6 | ha |
| | | | **VOLUME** | | |
| 1 cm³ | 0.061 02 | cubic inches | 1 cubic inch | **16.387 064** | cm³ |
| 1 m³ | 35.314 7 | cubic feet | 1 cubic foot | 0.028 316 85 | m³ |
| 1 m³ | 1.308 0 | cubic yards | 1 cubic yard | 0.764 555 | m³ |
| | | | **CAPACITY** | | |
| 1 L | 1.759 755 | pints | 1 pint | 0.568 261 | L |
| 1 L | 0.879 877 | quarts | 1 quart | 1.136 522 | L |
| 1 L | 0.219 969 | gallons | 1 gallon | **4.546 090** | L |
| | | | **MASS** | | |
| 1 g | 0.035 273 96 | ounces (avdp) | 1 ounce (avdp) | 28.349 523 | g |
| 1 g | 0.032 150 75 | ounces (troy) | 1 ounce (troy) | **31.103 476 8** | g |
| 1 kg | 2.204 62 | pounds (avdp) | 1 pound (avdp) | **0.453 592 37** | kg |
| 1 kg | 0.001 102 3 | tons (short) | 1 ton (short) | **907.184 74** | kg |
| 1 t | 1.102 311 | tons (short) | 1 ton (short) | **0.907 184 74** | t |
| 1 kg | 0.000 984 21 | tons (long) | 1 ton (long) | **1016.046 908 8** | kg |
| 1 t | 0.984 206 5 | tons (long) | 1 ton (long) | **1.016 046 908 8** | t |
| | | | **CONCENTRATION** | | |
| 1 g/t | 0.029 166 6 | ounce (troy)/ ton (short) | 1 ounce (troy)/ ton (short) | 34.285 714 2 | g/t |
| 1 g/t | 0.583 333 33 | pennyweights/ ton (short) | 1 pennyweight/ ton (short) | 1.714 285 7 | g/t |

### OTHER USEFUL CONVERSION FACTORS

| | *Multiplied by* | |
|---|---|---|
| 1 ounce (troy) per ton (short) | 20.0 | pennyweights per ton (short) |
| 1 pennyweight per ton (short) | 0.05 | ounces (troy) per ton (short) |

*Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.*


PENTAX


CENTIMETRE
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