# CROWN CONTROLLED MINERAL PROPERTIES SURVEYS

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## GENERAL INTRODUCTION

An evaluation of Crown controlled mineral properties was begun during the 1976 field season and was continued and expanded during the 1977 and 1978 field seasons. The purpose of this project is to review and evaluate the mineral potential of approximately seventy-five mineral properties under the control of the Government of Newfoundland and Labrador. These properties consist of Fee Simple Mining Grants that have been declared undeveloped under the Undeveloped Mineral Areas Act, Fee Simple Mining Grants that have reverted to Crown control because of forfeited mortgages and dissolution of companies, and properties that were formerly held under development licences or mining leases before they were relinquished to the Crown. Some areas that have been exempted from the Mineral Act, 1976, are also included. Final reports containing detailed results of new field work and recommendations for further activity on these properties will be prepared for open file release.

It is anticipated that by identifying properties that have potential for exploration and/or development, the government will be in a position to either promote private development or to carry out detailed exploration on its own.

Work carrried out by the Mineral Development Division since the project began in May, 1976, includes detailed geological mapping, ground magnetic and electromagnetic surveys, and geochemical soil and silt sampling.

The following is a report of the work carried out during the 1977 and 1978 field seasons on the Barry and Cunningham (Ming's Bight) and Cleary (Sunday Cove Island) properties.

## BARRY AND CUNNINGHAM PROPERTY

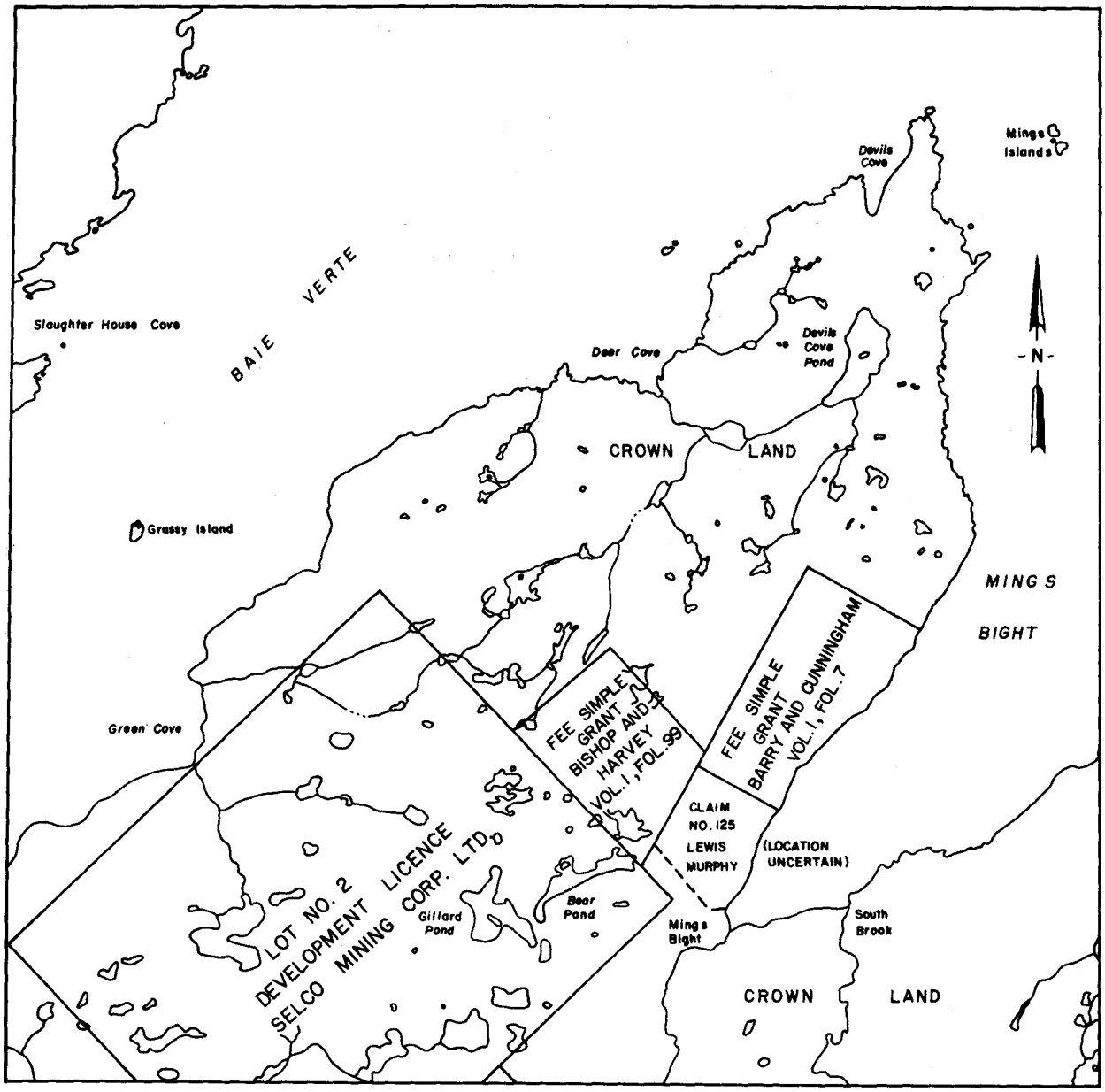
### Introduction

The Barry and Cunningham property (Fee Simple Grant Volume 1, Folio 7, Newfoundland Registry of Crown Grants) lies approximately 2.5 km northeast of the community of Ming's Bight on the Baie Verte Peninsula (Figure 1). In 1961 the Fee Simple Grant was declared undeveloped by Order in Council 510'61 under authority of the Undeveloped Mineral Areas Act.

The property was examined briefly by the Mineral Evaluation Section during the 1977 field season. Additional follow-up work was carried out during the 1978 field season.

The property lies within a disrupted ophiolite assemblage, one of several which collectively comprise the Point Rousse Complex northwest of Ming's Bight. It is underlain mainly by basic pillowed flows and intercalated pyroclastic rocks and volcanogenic sediments. The northern tip of the property is underlain by gabbro. Pyrite with minor chalcopyrite and gold occurs in several areas of the property, predominantly in chlorite schist zones within the pillow lava. Several ferruginous chert horizons also occur on the property.

The best exposed mineral showing is located on the coast near the northeast corner of the property. Old workings such as a timbered water-filled shaft and a short adit driven into the coastal cliff, are evidence of early attempts to explore the prospect. Pyrite and chalcopyrite occur as stringers along planes of schistosity in chlorite schist. Malachite, bornite, and sphalerite are also present in minor amounts. A diamond drill hole, drilled by Consolidated Rambler Mines Ltd. in 1970 to test the down dip extension of the zone, intersected very




From Land Tenure Maps 12I/1 And 12H/16

Nfld. Department of Mines And Energy.

LAND TENURE - MING'S BIGHT AREA

Figure 1

low grade copper, gold and silver. A very narrow quartz vein containing visible free gold is reported to occur approximately 6 m south of the adit (Tuach and Collins, 1974). Extensive surface blasting and sampling have now obscured the surface expression of the vein.

Several piles of rubble are located near some water-filled pits and trenches about 300 m inland along strike (southwest) from the coastal showing. The rubble consists of blocks of strongly sheared and chloritized basalt and chlorite schist. The chlorite schist contains stringers and disseminations of pyrite and minor associated chalcopyrite along schistosity planes, but discordant fracture planes are also thinly coated with chalcopyrite. M.J. Boylen Engineering Ltd. tested this showing, in 1962, with two diamond drill holes. Both intersected mineralized zones which assayed very low grade copper and gold.

## Geological setting

The Ming's Bight area is located near the western margin of Newfoundland's Central Mobile Belt (Williams, 1964) and lies within the Fluer de Lys Zone of tectonostratigraphic zones of the Newfoundland Appalachians (Williams *et al.*, 1974). Miller and Deutsch (1975), on the basis of a gravity survey, proposed that the zonation of the Baie Verte Peninsula be reconsidered. They concluded from gravity differences across the Baie Verte Lineament that oceanic crustal material similar to that found on Notre Dame Bay (Notre Dame Zone) may extend underneath the Fleur de Lys Zone as far west as the Baie Verte lineament. They suggested that the eastern boundary of the Fleur de Lys Zone be moved westward as far as the Baie Verte lineament and that the area between the lineament and the Notre Dame Zone (which includes the Ming's Bight area) be reclassified as a separate zone.

Vestiges of ophiolite assemblages occur as structural blocks within the peninsula northwest of Ming's Bight (Figure 2). These blocks, separated from each other by fault zones, have been collectively termed the Point Rousse Complex (Williams *et al.*, 1977). The Barry and Cunningham property is underlain mainly by pillow lava, volcanic agglomerate and crystal tuff. Gabbro and sheeted dikes occur along the northern margin of the property.

## Previous work

The property was acquired in 1886 by F.T.Barry and A.B. Cunningham as a Fee Simple Mining Grant. The operators of the Betts Cove Copper Mine carried out work on the prospect sometime prior to 1892 (Murray, 1918). The Newfoundland Government carried out a cursory examination of the property in 1935 (Snelgrove, 1935) and again in 1947 (Watson, 1947).

In 1961 the Barry and Cunningham Fee Simple Mining Grant was declared undeveloped by Order in Council 510'61 under authority of The Undeveloped Mineral Areas Act. The Newfoundland Government then entered into an exploration agreement with M.J. Boylen Engineering Ltd. This agreement involved the adjoining Goldenville property as well as the Barry and Cunningham Property. Work carried out under the agreement in 1961 consisted of line cutting, geological mapping, a magnetic and self-potential survey, and 414 m of diamond drilling (de Geoffrey, 1962).

In 1974 the Government of Newfoundland entered into an exploration agreement with Dr. D.F. Strong with respect to the area covered by the Barry and Cunningham Fee Simple Grant. Dr. Stong subsequently optioned his exploration rights to Consolidated Rambler Mines Ltd., which carried out a property evaluation involving chip sampling (for gold), geochemical soil sampling (for copper and zinc) and some 510 m of diamond drilling (Tuach and Collins, 1974).

The work carried out by Consolidated Rambler Mines Ltd. was designed mainly to evaluate the property as a potential gold producer. Emphasis was placed on bulk and chip sampling for gold assay. A comprehensive chip sampling program was conducted along the shoreline, and chip and bulk samples were also taken from old workings, ferruginous chert horizons, and trenched quartz veins. Except for two samples of the gold bearing quartz vein on the coast, none returned significant gold values. The two exceptions recorded 284 g/Au/tonne and 4.2 g/Au/tonne. Four other samples from the vein recorded between 0.06-0.08 g/Au/tonne.

Consolidated Rambler Mines Ltd. also drilled three widely separated diamond drill holes on the property. One hole, designed to test the mineralized chlorite schist zone on the coast, intersected a mineralized zone of quartz-chlorite schist which appears to be the downdip extension of the zone. A 4.6 m section within this zone assayed 0.21 percent Cu, 0.40 g/Au/tonne and 26.5 g/Ag/tonne. The objectives for the other two holes are not clear although composite samples of narrow sections of quartz carbonate, ferruginous chert, and jasper were selected from the core and assayed for gold. None of the samples returned significant gold values.

Consolidated Rambler concluded from their program that the Barry and Cunningham property has very little potential as a gold or copper producer.

## New field work

During the 1977 and 1978 field seasons the Barry and Cunningham property was examined by the Mineral

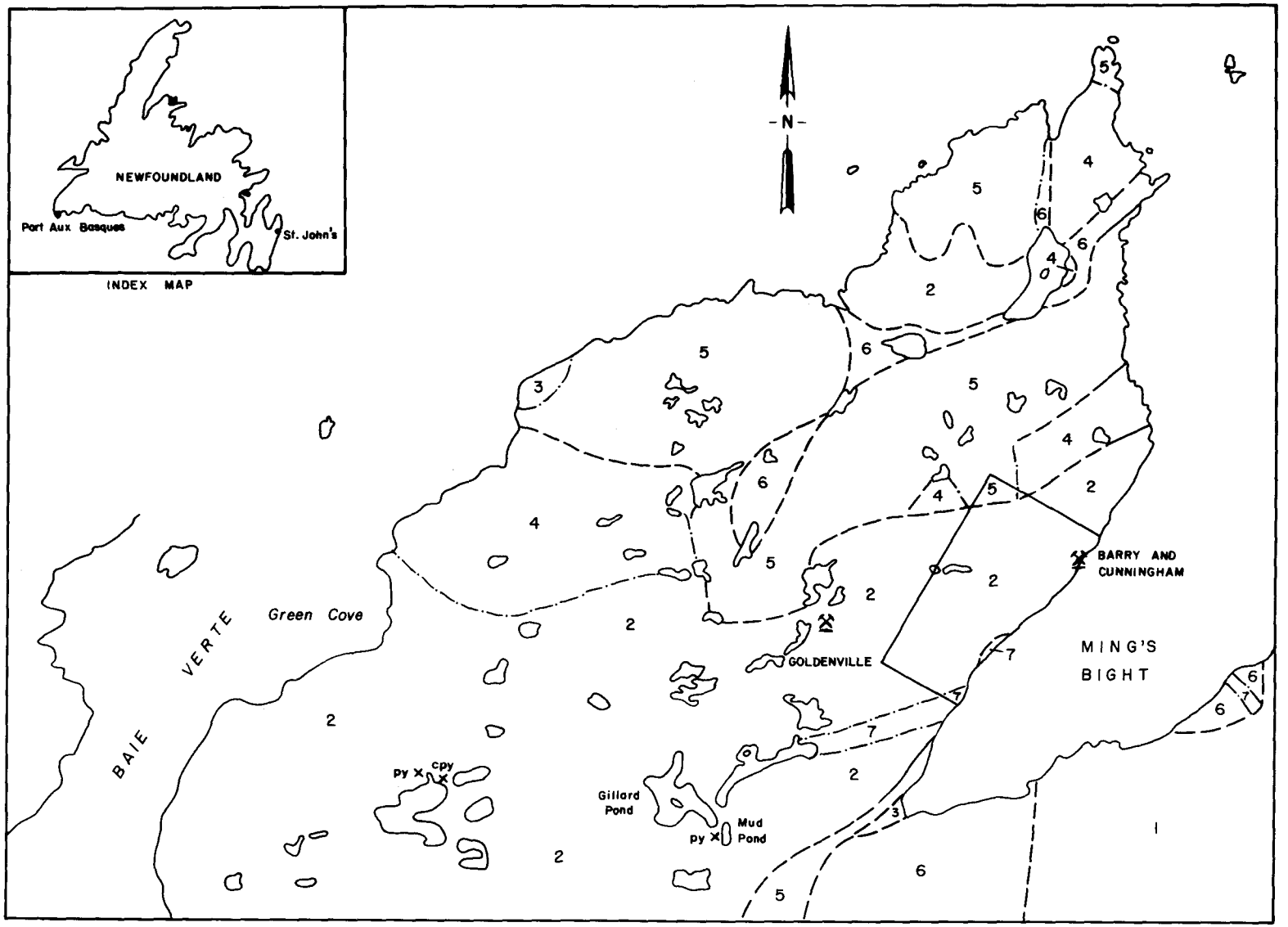



Figure 2 GEOLOGICAL SKETCH MAP OF THE MING'S BIGHT AREA, NEWFOUNDLAND. (Simplified from Hibbard, 1977)

## LEGEND

**SILURIAN-DEVONIAN**

7 *Gray-green hornblende gabbro.*

**LOWER ORDOVICIAN OR OLDER**

**Point Rousse Complex (2-6)**

6 *Talc and talc-carbonate alteration zones.*

5 *Cumulate ultramafic rocks, gabbro, and diorite.*

4 *Sheeted diabase dikes.*

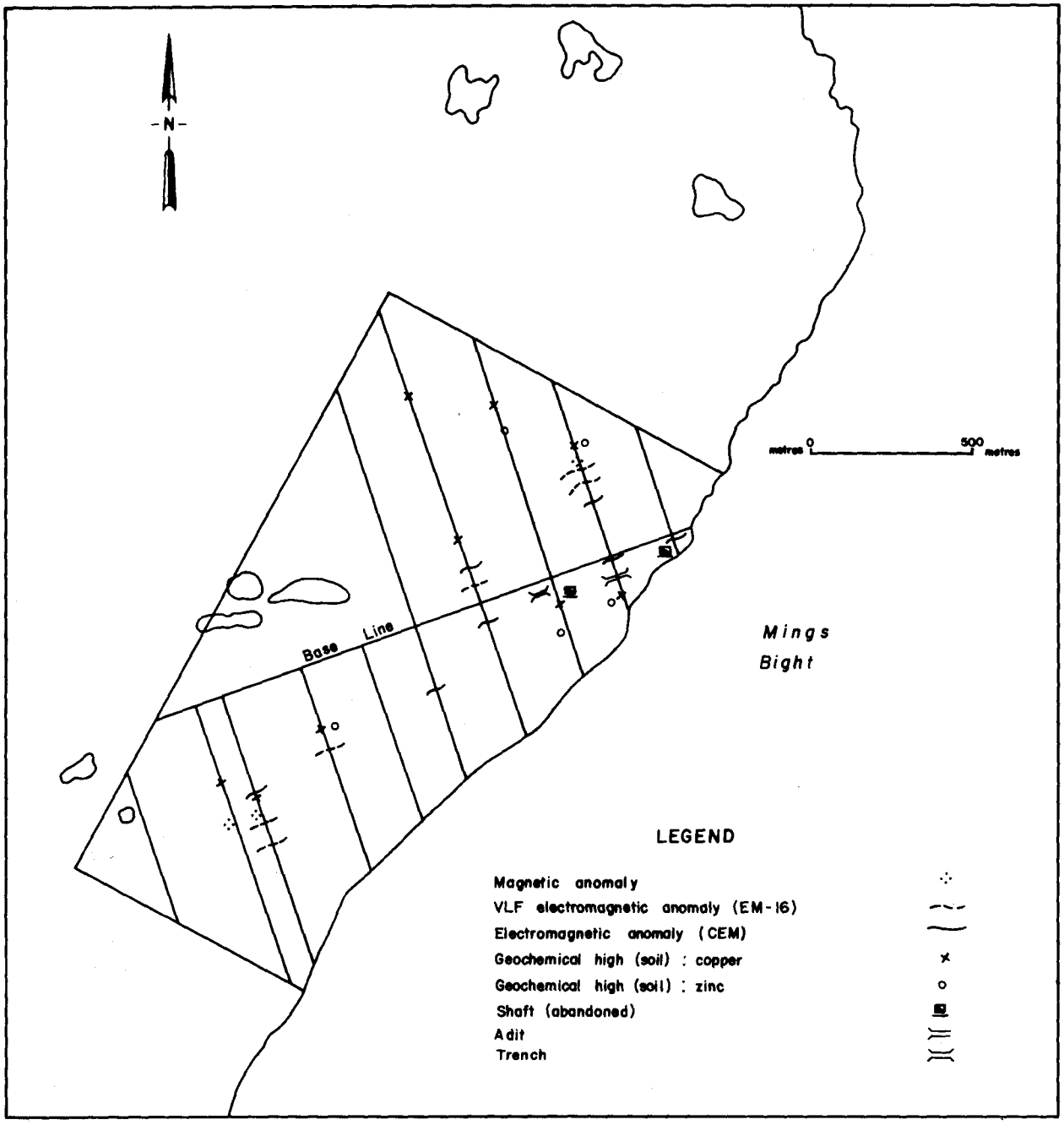
3 *Intensely deformed greenschists, in part, or totally, deformed diabase dikes and gabbro.*

2 *Pillow lava, mafic pyroclastic rocks, volcanogenic sedimentary rocks, diabase dikes, minor chert and marble pods.*

**EOCAMBRIAN (?)**

**Ming's Bight Group**

1 *Psammitic and semipelitic schist.*




Sketch map showing a summary of results of the geophysical (CEM and EM-16) and geochemical surveys - Barry and Cunningham Fee Simple Mining Grant, Ming's Bight, Newfoundland.

Figure 3

Evaluation Section. A grid was laid out for control purposes using the chain and compass method. Wherever possible, maximum use was made of existing cut lines. The grid consists of a baseline 2 km in length bearing 250°, with crosslines at intervals of 200 m. The examination consisted of a geochemical soil survey as well as ground electromagnetic and magnetic surveys. Geological data were recorded in conjunction with these surveys. Known mineral showings were reexamined as were old workings such as adits, shafts, pits and trenches.

### Geochemical soil survey

A soil survey of the grid area was carried out with samples of the B horizon taken at 40 m intervals. These samples were analyzed for copper, lead, and zinc by atomic absorption spectrophotometry. Results were plotted on grid maps (scale 1:4000). Each element was contoured to indicate areas of high concentrations, the contours being chosen on the basis of histograms and cumulative frequency plots.

### Ground magnetometer survey

The grid was surveyed with a Scintrex MFD Digital Fluxgate magnetometer using 20 m station intervals. Corrections were made for diurnal magnetic variation and the data plotted as a contour map of isoanamalies.

### Ground electromagnetic survey

An EM survey was also conducted using a Geonics EM-16. Readings were taken at 20 m station intervals using station NAA-Cutler, Maine (Frequency 17.8 kHz). The in-phase and quadrature components of the vertical magnetic field were plotted as curves directly on a line survey map (scale 1:2000). The readings were also mathematically filtered, using the method described by Fraser (1969), and the results plotted and contoured.

A horizontal shootback survey was conducted over the property using a Crone CEM unit. Readings were taken at 20 m intervals using coil spacings of 80 m.

## Results

### Geochemical

One area anomalous in copper and zinc was outlined by the geochemical soil survey (Figure 3). This is an area of known mineralization and corresponds to the chlorite schist zone which hosts the coastal copper showing. Several "probable" copper and zinc anomalies were outlined. One of these, located south of the baseline at the western end of the grid, is probably caused by a ferruginous chert horizon which was traced along a 25° strike for 230 m and is mineralized with minor disseminated chalcopyrite.

### Geophysical

The magnetic survey shows a rough magnetic topography with a definite northeasterly trend reflecting the regional strike. Most of the highs occur south of the baseline and are generally confined to basic volcanic rocks. Isolated magnetic peaks are possibly caused by magnetite bearing diabase dikes or sills. A magnetic anomaly south of the baseline at the western end of the grid is caused by a ferruginous chert horizon. Several magnetic depressions occur on the property. Two of these, located near the northeast corner of the property, are near an area probably anomalous in copper and zinc.

The VLF electomagnetic survey detected several weak conductors possibly caused by shear zones. A fairly stong crossover that registered near the northeast boundary of the property roughly corresponds to the geochemical highs and magnetic lows mentioned previously. However, the CEM horizontal shootback survey did not detect a conductor in that area.

The CEM horizontal shootback survey detected three anomalous areas. One coincides with a geochemical (copper) anomaly and lies along the strike of the nearby copper and gold showing on the coast. The others closely coincide with magnetic and VLF anomalies. One, located in the southwest part of the property, is apparently caused by a ferruginous chert horizon which contains disseminated chalcopyrite. The other is located immediately north of the baseline, near the centre of the property, and may also be caused by ferruginous chert bands.

## Conclusion

The surveys show that the coastal copper and gold prospect, which appears to be part of a mineralized horizon extending inland for at least 300 m, has not been adequately tested at depth. Very old workings, such as water filled shafts, trenches, and adits, are located along the strike of this zone, but whatever information they provided pertaining to subsurface geology and mineralization has been lost. The zone has been tested at its southwest end by two diamond drill holes, both of which intersected low grade copper and gold. The northeast end of the zone, which is best exposed on the coast, has been tested by two diamond drill holes, one of which intersected low grade copper and traces of gold. The surveys suggest that further testing of the zone along its strike is warranted.

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## SUNDAY COVE ISLAND PROPERTY

### Introduction

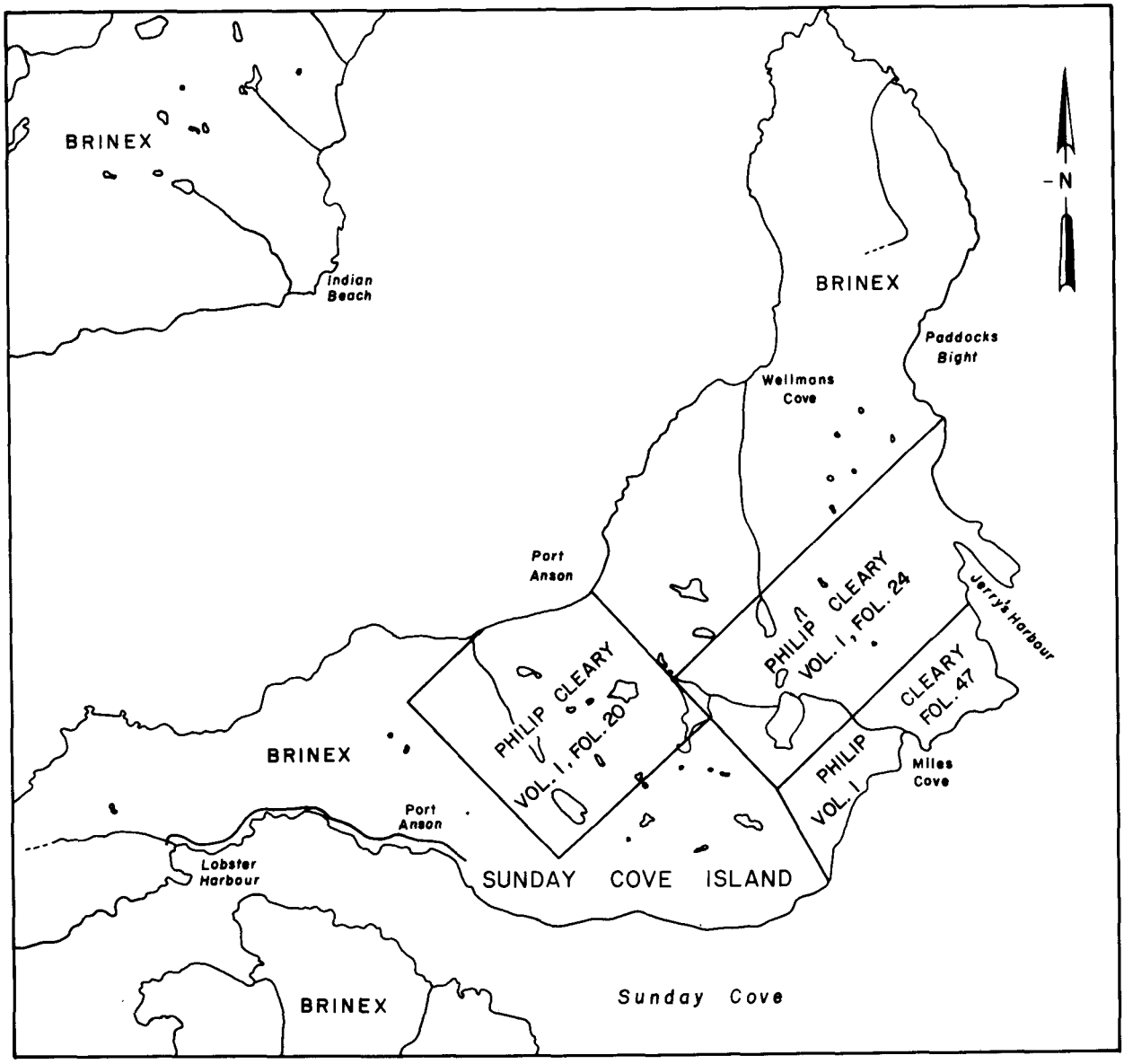
Sunday Cove Island occupies the mouth of Halls Bay on the western side of Notre Dame Bay, Newfoundland. The property consists of three Fee Simple Mining Grants (Volume 1, Folios 20, 23, and 47) originally granted to Philip Cleary in 1894 (Figure 4). These grants have been declared undeveloped by Order in Council 888-66 under authority of The Undeveloped Mineral Areas Act.

The Sunday Cove Island property is underlain by mafic pillow lavas and associated mafic agglomerates and tuffs of the Lush's Bight Group of Early Ordovician age or older (Figure 5). Chlorite schist zones within the pillow lava are frequently the host for pyrite and chalcopyrite mineralization. The most promising prospect on the property, near Miles Cove, occurs in such an environment. A chlorite schist zone in pillow lava and tuff hosts pyrite and chalcopyrite with minor but consistent gold and silver. The mineralization occurs as blebs and stringers of pyrite with minor chalcopyrite associated with quartz veinlets which follow the schistosity (strike 140°, dip 85° W). A study of diamond drill hole sections indicates that the mineralized zone has a strike length of 100 m and an average width of approximately 8 m. The deposit has been estimated to contain 129,000 t of 1.55 percent Cu on the basis of thirteen drill holes (Ten Cate, 1957).

Three other less known and less explored copper prospects occur at Jerry's Harbour, Paddock's Pond, and Mud Pond. In each case the geology and mineralization are similar to that of the Miles Cove deposit, *i.e.* restricted to chlorite schist zones in pillow lava and tuff. These prospects were examined in detail during the 1977 and 1978 field seasons.

### Geological setting

The Sunday Cove Island area lies at the northernmost end of the Newfoundland Central Mobile Belt. Williams *et al.* (1974) divided insular Newfoundland into seven tectonostratigraphic zones, the boundaries of which are defined by faults, mélange zones, and structural discontinuities. Sunday Cove Island, except for the southwest tip, lies within the Notre Dame Zone, which consists of mafic pillow lava and associated mafic agglomerates and tuffs. Sunday Cove Island, itself, is underlain by mafic volcanic rocks of the Lush's Bight Group. The Lukes Arm-Lobster Cove Fault, a major east-west lineament, separates the Notre Dame Zone from the Exploits Zone, which consists of flows, tuffs, and sedimentary rocks. It has also been suggested




From Land Tenure Map 2E/12.

Nfld. Dept. of Mines And Energy

MILES 0 1 2 MILES

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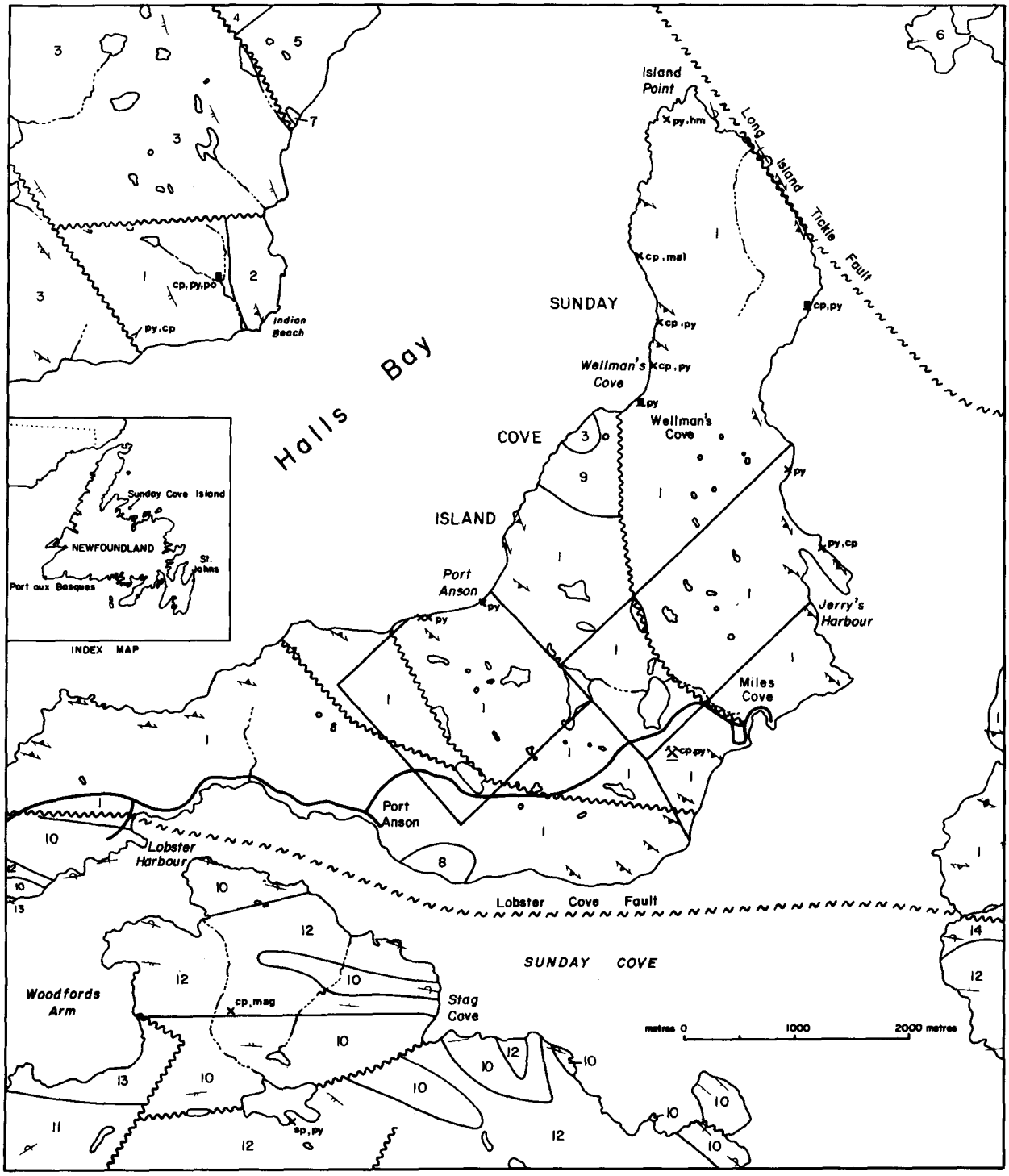
LAND TENURE - SUNDAY COVE ISLAND AREA.

Figure 4




Geological Map – Sunday Cove Island Area, Newfoundland. Taken From Dean And Strong, 1976.

Figure 5

## LEGEND

### SILURIAN OR DEVONIAN

**Springdale Group**

14 — *Brownish-gray to reddish-brown fine sandstone, siltstone and mudstone; medium to coarse sandstone and conglomerate.*

13 — **Woodfords Arm Pluton:** *Pink to brownish-red medium to fine grained granite and granodiorite (Intrudes Roberts Arm Group).*

### UPPER ORDOVICIAN OR SILURIAN

**Roberts Arm Group**

12 — *Red to brown and gray to grayish-green rhyolite and dacite flows, agglomerate, tuff and sills.*

11 — *Green to light greenish-gray, intermediate to basic coarse volcanic breccia and agglomerate.*

10 — *Dark, greenish-gray to reddish brown and black pillowed basalt, pillow breccia and massive flows, thin lenses and beds of chert, tuff and graywacke.*

### ORDOVICIAN (?) (Intrusive rocks)

9 — **Wellman's Cove Pluton:** *Light gray to dark gray, medium grained diorite and quartz diorite with minor gabbro.*

8 — *Pink to gray-white, medium grained granodiorite stocks (Intrudes Cutwell and Lush's Bight Groups).*

7 — *Fine to coarse grained, porphyritic to nonporphyritic gabbro and diabase sills (Intrudes Western Arm Group).*

### LOWER AND MIDDLE ORDOVICIAN

**Cutwell Group**

6 — **Long Tickle Formation:** *Fine to coarse, bedded and reworked tuff, coarse agglomerate, massive to pillowed andesite and fine grained recrystallized, silicified limestone.*

**Burnt Head Formation**

5 — *Green, vesicular, porphyritic andesitic pillow lava, pillow breccia, massive andesite flows, minor tuff and agglomerate.*

4 — *Basic to intermediate reworked tuff, black shale, chert, coarse agglomerate, and minor felsic pyroclastics and slump breccia.*

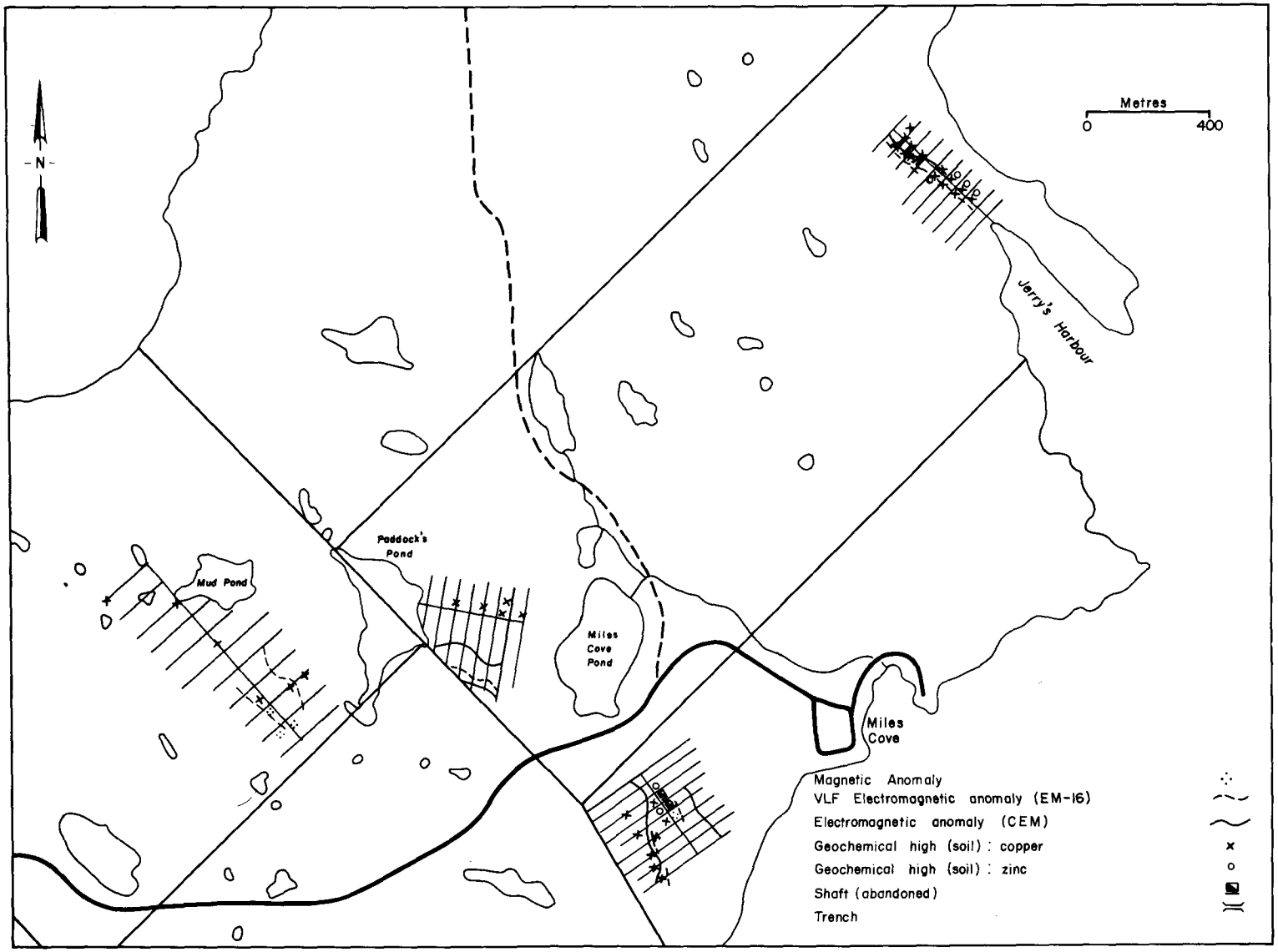
### CAMBRIAN AND/OR LOWER ORDOVICIAN

**Lush's Bight Group**

3 — *Dark to light green, massive to pillow basalt, pillow breccia, aquagene tuff and chert, dark gray pillow basalt, sheeted diabase and gabbro.*

2 — *Red to green chert and cherty siltstone, tuffaceous sedimentary rocks and minor volcanic conglomerate.*

1 — *Dark to light green pillow basalt, pillow breccia, massive basaltic flow and flow breccia, and chlorite schist.*




Sketch map showing a summary of results of the geochemical (soil) and geophysical (CEM and EM-16) surveys.- Cleary Fee Simple Mining Grants, Sunday Cove Island, Notre Dame Bay, Newfoundland.

Figure 6

(Strong and Peters, 1972) that this fault separates base metal deposits of the region into Kuroko (island arc) type in the south from Cyprus (ocean crust) type in the north.

## Previous work

The three adjoining Fee Simple Mining Grants on Sunday Cove Island were granted to Philip Cleary on November 24, 1894. The Tharsis Company took option on the claims from Philip Cleary in 1898, and by the end of 1899 had mined and shipped approximately 190 t of 10 percent Cu ore from the Miles Cove deposit (Murray and Howley, 1918). The Reid Newfoundland Company examined and described the Miles Cove mine workings early in this century. The investigators explored the existing workings and attempted to trace the ore zone along strike (Howard, date unknown). In 1935, Hans Lundberg carried out a geophysical (electrical) survey over the entire Sunday Cove Island property. Lundberg produced a 1:6000 scale map depicting the geology and geophysical results (Lundberg, 1936).

M.J. Boylen interests (Anacon Lead Mines) optioned the Cleary Fee Simple Grants in 1956 and carried out an evaluation of the Miles Cove deposit involving a self-potential survey, a magnetic survey, and diamond drilling. Thirteen diamond drill holes were completed, totalling 1645 m. On the basis of the drilling program the deposit was estimated to contain 128,910 t grading 1.55 percent Cu. Further geophysical work and diamond drilling were recommended (Ten Cate, 1957).

In 1963 Brinex began exploration activities on Sunday Cove Island. Work included geochemical silt sampling of major streams and geological investigations and prospecting of selected areas of the island (Bradley and Lilly, 1964). The silt survey indicated several anomalous streams, the most interesting of which are in the Miles Cove area. Brinex did follow-up work on the geochemical anomalies in 1964; the Miles Cove area was mapped on a 1:4800 scale and a self-potential survey was conducted. In 1965 Brinex did further geophysical work on Sunday Cove Island. Magnetic, self-potential and electromagnetic (vertical loop) surveys were carried out. These were mainly reconnaissance surveys which touched on all three Fee Simple Grants. In addition to the geophysical work, the 1:4800 scale mapping of Bradley and Lilly, which covered a north-south strip through the centre of the island, was extended east and west. Brinex carried out diamond drilling on the Miles Cove prospect in 1967. The program involved the drilling of eight holes totalling 1233 m. The objective of the program was to try and determine the lateral extent of the deposit which had been outlined by the Boylen (1956) drilling. Concurrently, trenching and sampling and a geophysical survey (self-potential) were done on the Jerry's Harbour prospect (Strong, 1968). The report recommends that furture drilling of the Miles Cove prospect should be aimed at determining the vertical limits of the deposit (Strong, 1968). In 1968 Brinex tested the Jerry's Harbour and Paddock's Bight showings with diamond drilling. The program involved the drilling of six holes totalling 666 m (Murthy, 1969).

## New field work

During the 1977 field season the Mineral Evaluation Section initiated its work on the Cleary Fee Simple Grants with an examination of the Miles Cove copper prospect. The examination consisted of a geochemical soil survey, a VLF electromagnetic survey, and a ground magnetic survey. Geological data were recorded in conjunction with these surveys. Old workings such as adits, shafts, pits and trenches were also examined.

During the 1978 field season additional and follow-up work was carried out on the properties. In addition to work on the Miles Cove prospect, three other areas were subjected to detailed examinations. These areas were selected after a study was made of all available geological, geochemical and geophysical data relating to the properties, and after brief preliminary geological investigations were made in the field. These areas are informally referrred to as: grid 2 (Miles Cove), grid 3 (Paddock's Pond), grid 4 (Mud Pond) and grid 5 (Jerry's Harbour) (Figure 6). Grids 2, 3 and 5 consist of cut baselines with flagged crosslines at 40 m intervals laid out by chain and compass method. Line stations are indicated by labelled fluorescent flagging tape. Grid 4 (Mud Pond) is uncut and crosslines are at 80 m intervals.

### Geochemical soil survey

A soil survey of all four grids was carried out with samples taken mainly of the B-horizon at 20 m spacings. These were analyzed for copper, lead, and zinc by atomic absorption spectrophotometry. Results have been plotted on grid maps at a scale of 1:1000. Each element has been contoured to emphasize the areas of high concentrations, the contours being chosen on the basis of histograms and cumulative frequency plots.

### Ground magnetometer survey

Each grid was surveyed with a Scintrex MFD Digital fluxgate magnetometer using 20 m station intervals. Corrections were made for diurnal magnetic variation and the data plotted as a contour map of isoanomalies.

### Ground electromagnetic surveys (EM-16, CEM)

Each grid was subjected to an EM survey using a Geonics EM-16. Readings were taken at 20 m intervals

on the crosslines, using station NAA - Cutler, Maine (Frequency 17.8 $kH_2$). The in-phase and quadrature components of the vertical magnetic field were plotted as curves directly on a line survey map (scale 1:1000). The readings were also mathematically filtered, using the method described by Fraser (1969), and the results plotted and contoured.

A horizontal shootback survey was conducted on three of the grids (Miles Cove, Jerry's Harbour and Paddock's Pond) using a CEM unit. The vertical loop method was used to trace the attitude of conductors. The results have been plotted on grid maps (scale 1:1000).

## Grid 2 (Miles Cove) - Results

### Geology

Most of the grid area is underlain by pillowed basalt. The basalt is frequently chloritized and epidotized and this alteration increases as the main chlorite schist zone is approached. Narrow lenses of tuffaceous material were also widely noted. These rocks all show a penetrative foliation which takes the form of slaty cleavage in the more brittle rocks (tuff), and defines the schistosity in the chlorite schist zones. Foliation has a varying strike which averages approximately 140° and dips approximately 85° westwards. Minor kinks and folds in the main foliation are also present.

Two types of intrusive rocks were recognized in the grid area and they were given the field names diabase and quartz-feldspar porphyry. The diabase outcrops in several areas, usually as small isolated exposures. The weathered surface is various shades of brown and has a massive blocky appearance. The fresh surface is dark green and has a fine grained homogeneous texture.

The quartz-feldspar porphyry occurs mainly as talus along the hanging wall of the chlorite schist zone. It has also been observed in one or two bedrock exposures elsewhere on the grid. On the weathered surface the rock has a massive, slightly mottled appearance, and is orange-brown in color. The fresh surface shows quartz and feldspar phenocrysts in a fine grained groundmass of muscovite (sericite), quartz and feldspar.

The main point of economic interest is a zone of chlorite schist which hosts pyrite, chalcopyrite, gold, and silver mineralization. This schist zone is expressed as a north-south trending topographic depression that has a width of approximately 25 m. Outcrop is scarce and, near the surface projection of the mineralized zone, the ground is covered with extensive rubble resulting from early mining activity. The mineralization, as observed on surface, consists of blebs and stringers of pyrite with minor chalcopyrite associated with quartz veinlets which occur along schistosity planes. Subsurface mineralization as logged by Ten Cate (1957) ranges from stringers and veinlets of pyrite and chalcopyrite to fairly massive veins several centimetres in thickness in sheared and drag folded chlorite schist. Wide quartz-filled shear zones occur above and below the mineralized zone.

A narrow sill-like body of quartz-feldspar porphyry parallels but does not form the hanging wall of the chlorite schist zone.

### Geochemical soil survey

Anomalous coppper and zinc values occur over the main chlorite schist zone which hosts the Miles Cove prospect. High copper values also trend in a southerly direction away from the main zone for approximately 250 m. This trend closely follows a CEM conductor outlined by the vertical loop survey. Outcrop in this area is scarce but small exposures of mineralized (pyrite and minor chalcopyrite) crenulated chlorite schist have been noted.

### Geophysical surveys

The main chlorite schist zone is clearly indicated by the magnetic survey. A magnetic high occurs near the south end of the mineralized zone. This area, which is obscured by a thin layer of bog, also returned the highest copper value (2920 ppm) in the geochemical soil survey.

A CEM conductor was traced by vertical loop along an approximate southerly direction for about 400 m. This conductor closely parallels the trend of the copper (soil) anomaly mentioned above.

The copper prospect was detected in the VLF electromagnetic survey as slight inflections in the in-phase curve and as definite crossovers near the south end of the zone, on the footwall side. The strongest crossovers are spatially related to a magnetic and a geochemical anomaly.

## Grid 3 (Paddock's Pond) - Results

### Geology

The grid is underlain predominantly by basalt which is strongly chloritized and epidotized. Narrow lenses of tuff and agglomerate also occur. Two prominent, roughly parallel, shear zones characterized by chlorite schist occur in the grid area. The surface expressions of these shear zones are approximately 200 m apart. All of these rocks have a penetrative foliation which strikes approximately 100° and dips 60° southwards.

Diabase and rhyolite porphyry are two types of intrusive rocks seen on the property. The former occurs fairly frequently as narrow dikes or sills. The latter was observed in only one outcrop on the shore of Paddock's

Pond where it occurs close to the hanging wall of the chlorite schist zone.

Pyrite and associated minor chalcopyrite occur along the chlorite schist zone immediately north of the baseline as stringers and disseminations along schistosity planes. The mineralization is not consistent either along the strike of the zone, which was mapped for 300 m, or along the dip (approximately 15 m true width). Minor malachite staining was also observed. Float consisting of small angular blocks of strongly crinkled chlorite schist containing pyrite and chalcopyrite was observed in Paddock's Pond Brook, which parallels and sometimes coincides with the chlorite schist zone.

Pyrite, with very minor amounts of chalcopyrite, occurs along a shear in the southern area of the grid. Gossan zones are also present caused by pyrite, which occurs as narrow stringers and disseminations in what appears to be brecciated and silicified zones within the basalt. A linear structure, seen on airphotos and expressed topographically as a cliff face, suggests a fault through this area.

### Geochemical surveys

The geochemical soil survey shows an area anomalous in copper trending in an approximate east-west direction immediately north of the baseline. This closely coincides with the chlorite schist zone which hosts pyrite and minor chalcopyrite mineralization. Other isolated copper highs in the southern area of the grid coincide with narrow similarly mineralized shear zones.

### Geophysical surveys

The northern mineralized chlorite schist zone, near the baseline, did not produce a significant response from the VLF (EM-16) and (CEM) vertical loop surveys. South of the baseline two roughly parallel conductors were indicated by the CEM survey. One of these corresponds to a VLF-EM conductor which lies along a photo linear that is expressed topographically as a cliff face and geologically as highly sheared, and in some places brecciated, basalt and pyroclastic rocks. The two southern conductors apparently curve towards each other and merge westwards near Paddock's Pond.

## Grid 4 (Mud Pond) - Results

### Geology

The grid area is underlain by pillow basalt with intercalated pyroclastic rocks and volcanogenic sediments. Remnants of stretched and flattened pillows occurs in some of the exposures of basalt. Long narrow bands of chlorite schist also occur, the longest of which extends through the centre of the grid for approximately 500 m and has an average width of 40 m. All of these rocks have a penetrative foliation which strikes approximately 140° and dips 60°-70° westwards. Quartz feldspar porphyry occurs as several small exposures and appears to intrude the above sequence of rocks.

Minor amounts of pyrite, chalcopyrite and magnetite are present in several exposures of chlorite schist. The sulphides occur as stringers and disseminations along schistosity planes, and are not consistent either along the strike or dip of the schistosity. The most extensive mineralization occurs in a lens of chlorite schist at the southeast end of the grid where bands of magnetite up to 3 cm in width, with associated minor pyrite and chalcopyrite, lie parallel to the schistosity. Minor chalcopyrite hosted by sheared and chloritized basalt was observed in a small exposure in the northwest part of the grid area.

### Geochemical soil survey

Two areas anomalous in copper and zinc were outlined by the soil survey in the southeast half of the grid. One area, located about 200 m north of the baseline, is underlain by chlorite schist which is notably barren of sulphide mineralization in its surface exposures. A weak VLF-EM conductor parallels the trend (average 140°) of this anomaly. The other copper and zinc anomaly is located on and immediately south of the baseline and corresponds to an area underlain by chlorite schist which hosts narrow bands of magnetite and minor pyrite and chalcopyrite. Other isolated copper highs occur elsewhere on the grid. One of these, at the extreme northwest corner, is located near an outcrop of strongly sheared and silicified basalt which contains minor disseminated chalcopyrite.

### Geophysical survey

Magnetic and VLF-EM anomalies occur in the southeast area of the grid. The magnetic highs are located over areas that are underlain by chlorite schist and are obviously caused by the narrow (up to 3 cm thick) bands of magnetite that occur in the schist.

The VLF-EM survey detected two weak conductors in the southwest part of the grid area. One is located approximately 150 m east of the baseline and corresponds roughly to a band of strongly sheared basalt which is apparently barren of significant sulphide mineralization in the surface outcrops. The conductors are probably caused by water-filled shears zones. The other conductor is near the baseline and is spatially related to a geochemical high (copper) and a magnetic high. The area is underlain by chlorite schist which hosts minor magnetite, pyrite and chalcopyrite.

## Grid 5 (Jerry's Harbour) - Results

### Geology

Most of the grid area is underlain by basalt which is frequently chloritized and epidotized. Stretched and deformed pillows occur in some outcrops. Narrow lenses of tuff and agglomerate are evident along the narrow mineralized shear zone at the northwest end of the grid. All of these rocks have a penetrative foliation which strikes 130° and dips 50° - 70° westeards. Rhyolite porphyry and diorite intrude the above sequence particularly in the southeast part of the grid area.

Mineralization exposed by a series of trenches occurs along a narrow shear zone which parallels the baseline in the northwest part of the grid area. It consists mainly of pyrite and associated minor chalcopyrite, malachite and azurite. The host rock consists of sheared, brecciated agglomerate, chloritic tuff and chlorite schist. The mineralization usually occurs as narrow blebs and stringers along foliation planes, but a 1 m wide band of massive sulphide was observed in one trench. The strike length of the shear zone as exposed by the trenches, is approximately 120 m. The VLF-EM survey traced the shear zone for approximately 300 m.

### Geochemical soil survey

The soil survey shows an area anomalous in copper and zinc which trends along the full length of the baseline. This trend roughly parallels the strike of the shear zone, and also coincides with the trend of magnetic and electromagnetic anomalies.

### Geophysical survey

The electromagnetic surveys registered the strongest response in the northwest part of the grid area, where part of the mineralized chlorite schist and tuff is exposed by a series of trenches. This zone was traced along strike for about 200 m by a CEM survey, using the vertical loop method. The VLF survey detected the shear zone over 300 m.

## Conclusion

Work carried out by the Mineral Evaluation Section on Sunday Cove Island has focused on four prospects. Two of these (Miles Cove and Jerry's Harbour prospects) have been tested by past diamond drilling programs. Detailed work on the other prospects (Paddock's Pond and Mud Pond) has been minimal in the past, consisting mainly of a few surface pits and trenches which probably date back to the last century.

The results of our work indicate that the Miles Cove prospect is the most attractive. Geological, geochemical, and geophysical surveys suggest that an anomalous area south of the known copper deposit, and trending toward it, has not been adequately tested by past drilling programs.

The work at Jerry's Harbour indicates geophysical and geochemical anomalies over a gossan zone that was presumably tested in the past by three diamond drill holes. Information on the drilling is incomplete. The exact locations of the holes are unknown and core assays are missing, although the logs report widespread minor chalcopyrite mineralization.

The surveys conducted over the Paddock's Pond prospect indicate two potential zones for sulphide mineralization which warrant further investigation since both are open along strike. The grid at Mud Pond was not subjected to a CEM survey because of time shortage. However, the geophysical and geochemical results suggest such a survey is warranted, particularly in the southwest part of the grid area.

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