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MINING DIVISION

ASSESSMENT WORK REPORT

ON GEOLOGY OF A

FOSTER TOWNSHIP PROPERTY

By

M.L. HALLADAY, P.ENG.

Toronto, Ontario

December 12, 1978



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GEOLOGICAL REPORT
FOSTER TOWNSHIP PROPERTY
ONTARIO

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CERTIFICATE - M. HALLADAY

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LIST OF PERSONNEL

Geological Report
FOSTER TOWNSHIP PROPERTY
Ontario

PROPERTY

The property consists of 28 claims in two parts:- (a) an optioned group of 5 claims numbered and held as follows:

Claims 471438 & 471439 held by William Alanen

Claims 471202 - 471204 inclusive held by Taisto Tamminen

These are located in lots 8 and 9, Concession III, Foster Township and (b) an additional 23 claims staked peripherally as follows:

Claims 398141 - 398153 inclusive staked by Joe Allard and transferred to Union Carbide

Claims 398131 - 398140 inclusive staked by M. Halladay and transferred to Union Carbide

Anniversary dates of all claims are June and July.

LOCATION AND ACCESS

Foster Township is located some 40 miles to the west of the city of Sudbury, Ontario.

The property is about 7 road miles east of the Town of Espanola over excellent gravel road. The claim group straddles this east-west road and is bounded by Elizabeth Lake on the north, and St. Leonard Lake on the south. A branch road to Hannah and Stratton Lakes departs the main gravel road near the west end of the property and proceeds south. It, too, is an excellent gravel road.

The potential of a mineral occurrence at this location is enhanced by the local infrastructure. The Town of Espanola is a source of competent labour and a supply centre. A hydro transmission line passes a mile and a

half south of the property and the Canadian Pacific Railway branch line to Manitoulin Island passes within the 2 miles of the claim group. The Great Lakes shipping port of Little Current is about 30 miles south of Espanola on paved highway No. 68.

Numerous mining and milling facilities in the centres of Elliott Lake, Agnew Lake, and Sudbury are within trucking distance.

HISTORY

The existence of chalcopyrite - molybdenite with pyrite and pyrrhotite was known at this location for some years prior to 1966. At that time claims held by Messrs. Piispanen and Tamminen were optioned by Texas Gulf after R.M. Ginn examined the property, recognized the occurrence as skarn and discovered the presence of scheelite.

Texas Gulf then did a geological survey, partial magnetometer survey and 3073 feet of drilling in 6 holes. Results were encouraging but no ore intersections were obtained and the option was dropped.

In 1970 Cerro Corporation optioned the property and did trenching and surface sampling, together with further analyses on cores of the T.G.S. drilling. They dropped their option when Cerro suspended Canadian exploration.

In 1971 Vangulf, managed by R.M. Ginn, optioned the property and conducted surface surveys. Vangulf's option was taken over by St. Joseph Exploration and an additional 6 drill holes (4,629 feet) were completed without ore intersections.

TABLE OF FORMATIONS

CENOZOIC

Recent and Pleistocene

Glacial drift; gravel, sand,
silt, clay.

----- Unconformity -----

PRECAMBRIAN

PROTEROZOIC

Keweenaw

Olivine diabase dykes

----- Intrusive Contact -----

Nipissing

Metadiorite, metadiabase silt

----- Intrusive Contact -----

Huronian Supergroup:

Quirke Lake Group:

Serpent Formation

- subgreywacke, fine-grained
quartzite, non-calcareous.

Espanola Formation

- calcareous siltstone, greywacke,
limestone. Discrete limestone
bed at base of formation.

Bruce Formation

- polymictic conglomerate
argillaceous greywacke matrix,
non-calcareous

Hough Lake Group:

Mississagi Formation

- medium-grained quartzite, non-
calcareous.

The Grenville Front lies 20 miles to the southeast.

On the property, the sedimentary formations are the northern limb of a southwest plunging anticline. This structure is cut by two important faults.

The regional grade of metamorphism within Foster Township is greenschist with the exception of the present Union Carbide property which contains rocks altered to almandine amphibolite facies.

Previous official maps (O.D.M.) ascribed rocks south of the base line on the Union Carbide property to the Mississagi formation but recent studies (including some 30,000 feet of section measuring) have led to the conclusion that the area is in fact part of the Serpent Formation - indicating changes must be made to the previous interpretation of the structure.

GEOLOGICAL SURVEY

A geological map was prepared for the area of the option by M. Halladay, and forms part of this report. Formations mapped are shown in the Table of Formations included herewith, and are briefly described below.

Mississagi Formation

This earliest formation is similar to the Serpent Formation but is generally a sandstone with grains seen to be more fused than the rounded grains of the Serpent. It is immature to submature, medium to coarse grained quartz - feldspar sandstone with minor argillite and minor lenses of conglomerate.

On the property it is seen only as large basal blocks within Bruce conglomerate on the base line at 4E.

The area south of the base line, previously ascribed to Mississagi Formation, is now believed to be part of the Serpent Formation, and consequent changes in interpretation must be considered.

Bruce Formation

This formation is conglomerate with minor sandstone and argillite: generally, a polymitic paraconglomerate with a schistose greywacke matrix. Pebbles, cobbles and boulders of granite, quartz, schist and greenstone constitute 5 to 50% of the rock. It is very black in appearance and contains angular crystals and fragments of clear quartz which appears black. It characteristically contains sulphides.

Rocks of the Bruce Formation are seen on the property at one location only: well exposed at 4E on the base line, and poorly exposed just north of there between the Breccia Hill and Hannah Lake road. These outcrops seem incongruously placed within surrounding Serpent without any outcropping Espanola Formation between them and the Serpent. However, faults are in evidence and furthermore, the occurrence is suspiciously similar to rocks seen near 9E, 9S which look similar and also contain blocks of quartzite. These have been mapped (O.D.M.) as "paraconglomerate" within Serpent.

Espanola Formation

This is the major calcareous formation in the Huronian sequence. It usually has a discontinuous basal limestone and calcareous siltstone member about 100-200 feet thick, overlain by some 400-800 feet of thinly bedded and laminar siltstone, argillite and fine grained greywacke which is overlain by a calcareous sandstone member 300-700 feet thick, and a discontinuous upper siltstone and limestone member up to 100 feet thick.

These rocks occupy the central region of the property east of about 22E and north of the base line. They have been highly skarnified, and mineralized with copper, tungsten, molybdenite, zinc and minor amounts of tin, bismuth and traces of other metals. Alteration and mineralization are seen to occur erratically within the outcropping Espanola but certain zones are more altered than others and are believed to represent calcareous beds receptive to mineralizing solutions. These zones are portrayed symbolically on the geology map.

Serpent Formation

The Espanola formation grades upwards into the Serpent and there is interbedding over a stratigraphic interval of several hundred feet. Where possible this transition zone is separated in the mapping. The Serpent rocks are generally sandstone, subgreywacke and feldspathic quartzite. There is minor interbedded argillite.

Serpent rocks were observed to lie to the south, the north and the west of the Espanola rocks on the present property. The breccia hill is composed of angular feldspathic (pinkish) Serpent fragments cemented by quartz vein material.

The Breccia Hill

The breccia hill is a prominent topographical feature which has weathered high because of its composition. The breccia occupies a zone roughly ovoid in shape between lines 4E and about 20E stretching from the base line north to about 5N. Blocks of Serpent quartzites ranging in size from a few millimeters to a few feet across form what appears to be a tension breccia cemented by vein quartz ranging in color from white through mottled to black colored. The variability in the quartz probably indicates

more than one pulse of silica. Pink feldspar is common in local areas and at one spot near the top of the centre of the hill pegmatitic looking pink feldspar was found. Only minor rotation of blocks is observed and the breccia appears tensional, cemented by silica.

Geologists familiar with the Huronian of the area describe somewhat similar breccias as a fairly common phenomena, but the breccias they cite seem to be much less extensive and it seems hard to believe that such a volume of silica has been "sweated" out of Serpent rocks which do not appear to have lost silica but if anything, gained silica. The silica appears barren except for occasional needles of rutile (?).

There are several large quartz veins (exceeding 10 feet) which are, with one exception, also barren. A trench at 3 north on line 16E contains sulphides in quartz - mainly pyrite with some chalco. This location is at the base of the breccia hill and close to the contact with Espanola (which is skarnified less than a hundred feet further north).

A considerable area of the hill has been lamped but no scheelite was seen. The environment would be more favourable for tungsten to be present as wolframite in these quartz veins but none was observed. For these reasons no priority was given to investigation of the breccia "pipe?" and winter curtailed work on the property before a systematic look at the breccia could be taken. A few samples were collected, however, and some studies are being undertaken but no results are available at the time of writing.

Unbrecciated Serpent rocks are seen east of the breccia "pipe" between it and the Espanola formation.

Transition Zone

As mapping progressed it became evident that structure might be more involved than was apparent initially. Previous O.D.M. mapping featured faults and often placed gradational contacts along a fault particularly if the gradation straddled it. Great importance could lie in a gradational contact between Espanola and a sandstone since Espanola is in gradational contact with overlying Serpent, and the lower contact of Espanola is with the distinctive Bruce formation. This could however, be further complicated in the rare situation where the Bruce is absent.

Transition zone rocks are mapped between the main trench in Espanola and 24E and the unbrecciated Serpent rocks at approximately 22E. Transition zone is seen between Espanola skarn and the Serpent rocks which are seen at the shore of Elizabeth Lake. They are tentatively mapped south of the base line around 2 south on lines 39E and 43E. They are also reported in the log of a drill hole nearby.

Facies Change

The transition mentioned above in the area of the main trench is interpreted by the author as a transition stratigraphically upwards from Espanola to Serpent seen in the erosional surface of the hillside. Bedding is seen to strike persistently east west in Espanola, transition rocks, and Serpent, although no one bed can be followed continuously uphill.

The alternative interpretation of a ^{change} facies/is adopted by my co-worker S. Fraser and W. Karvinen of the O.D.M. This is further discussed under "Structure" below.

STRUCTURE

Reliable dip and top determinations are not everywhere present.
are
Generally strikes/east west and dips north.

Evidence of minor structural (fold) features are seen in numerous places many of which are deemed to be parasitic, although one (of several) is somewhat chaotic and may be a soft slump feature. The latter is located about 26E, 3N. Drag and fold structures are noted at 26+50 at the base line, 31E at the base-line, 39 E just west of 4N, and east of 3N. Doubtless, others exist. No conclusions have been drawn from these minor features concerning location of axis of any major fold although one minor drag fold is believed to plunge west

Skarn has been formed in calcareous beds of the Espanola. The formation is to contain these calcareous rocks at its top and more particularly at its base. The most prominent sulphide and tungsten rich skarn zone seen on surface on the property begins at the main trench (5N on line 24E) and continues northeast towards the collar of hole F33-6.

Recently released Report 166 "The Sudbury Manitoulin area" by the Ontario Geological Survey, K.D. Card, embodies the findings of continued research into mapping of the Huronian near Foster Township. As a result of some 30,000 feet of stratigraphic study and section measurements, the sandstones and quartzites on the south part of the present Union Carbide property, previously mapped as Mississagi quartzites, have been assigned to the Serpent formation. Consequently, the simple stratigraphic sequence beginning at St. Leonard Lake, progressing north to Elizabeth Lake and formerly thought to begin in Mississagi and continue through Espanola to Serpent (with basal Espanola and Bruce believed missing due faulting), must now be re-constructed.

Considering the mineralization, minor fold features, location of transition rocks, and revelation of the new geologic regional picture, consideration has been given to the possibility of a tight local fold, probably anticlinal with axial plane represented by the spine of favourable mineralization, overturned such that dips are consistently north, probably plunging west. Bill Pearson of the G.S.C. has done limited mapping of the property and also postulated (completely independently) tight folding of the Espanola into westerly plunging folds.

Winter snows prevented the intended next step towards the solution:- detailed mapping in search of further folding indications which might localize major features, and top determinations from sedimentary features.

Solution of the structure might indicate hitherto untested areas with potential for skarns.

MINERALIZATION

At the Foster Township property, mineralization consists of pyrrhotite, chalcopyrite, scheelite, powellite and moly-scheelite with minor molybdenite within calc-silicate skarns of the Espanola Formation. South of the Espanola within the Serpent formation rusty weathering zones, occurring in generally massive quartzite, also have disseminated scheelite mineralization.

In addition to the reconnaissance geological study, a more detailed examination was made of skarns as seen on surface as possible

open pit targets. Trenches were freshened up and examined, and six weeks were spent by geologist S. Fraser aided by bushman Brian Quesnel in locating, stripping by hand, exposing, cleaning off outcrops of skarn, breaking exposed surfaces, lamping and estimating grades of scheelite.

There are 4 major types of skarn: 1) a coarse grained garnet-diopside or garnetite rich skarn often mineralized but of low grade generally 0.2-0.3% WO_3 2) a light coloured calc-silicate skarn generally fine grained but very weakly mineralized. This skarn is often almandine garnet rich. 3) a sulphide, pyrrhotite rich skarn generally well mineralized with disseminated scheelite, powellite and/or molybdo-scheelite, mineralization. This is generally coarse grained often chalcopyrite rich, up to 3% at the main trench. (Chalcopyrite seems to act as a good indicator of mineralization as scheelite often accompanies it.) 4) a diopside rich siliceous skarn, medium grained and as well often mineralized 0.2%-0.4%, particularly so where chalcopyrite is present.

Several zones of skarn were traced (see symbol on geological map), the best of which, by reliable educated estimate, indicate grades in the order of 0.05, 0.16, 0.08, 0.37 % WO_3 over a width of 80 feet and a strike of at least a quarter mile. Other skarn zones exist which are possibly parallel, may or may not be continuous, and are of estimated lower grade. They are laterally removed from the main zone:- the one to the south is separated by at least 300 feet of barren (or nearly so) Espanola. It is conceded that studies were limited by exposure, and unless the rock surface is broken, mineralization is not obvious.

Although not conclusive, there is strong suggestion in the

main zone that mineralization may be better towards the west and decreasing grade eastward.

It is concluded that low grade mineralization is not extensive enough to be considered for open pit and higher grade material is too narrow and inconsistent to be considered for an underground operation should the mineral persist at depth. A considerable amount of tungsten does exist on the property, and if a sweetener zone could be found, it could become an important part of a mining operation. No new trenching was done, and with the exception of a few samples to confirm estimates, no chemical analyses done.

CONCLUSIONS AND RECOMMENDATIONS

Results of the current studies indicate that mineralization as observable at surface is too low in grade and too limited in extent to be considered for open pit. It is too erratic and too low grade, should it persist to depth, to be considered for an underground operation. The known mineralization would be usable in conjunction with a "sweetener" zone of higher grade.

Several possibilities for additional higher grade mineralization would be:

- a) to locate a granite contact at depth below the known Espanola skarns,
- b) to investigate the "breccia pipe" for mineralization at depth.
- c) to find, and drill, new skarn zones.
- d) to drill off mineralization which has not been tested at depth, most

notably the main trench zone, but also rusty zones in the Serpent.

It is recommended that firstly a geological study be undertaken to systematically investigate the breccia zone on surface by rock geochemistry, petrography and careful mapping. The folding and structural picture should be further investigated.

Geophysics should be considered, particularly on the breccia to help outline the most advantageous drill target. Especially useful would be detailed magnetometer work. IP would be invaluable but the technique would be difficult (and possibly unreliable) on the bald, dry surface of the hill.

Targets could then be evaluated, and if worthy, drilled.

Respectfully submitted,

M.L. Halladay

M.L. Halladay, P. Eng.

* Qualifications 2.1142
and on this file

Toronto, Ont.

Dec. 12, 1978

* QUALIFICATIONS 2.1142
AND ON THIS FILE

CERTIFICATE

I, MARGARET LOUISE HALLADAY, of Mississauga, in the County of Peel, in the Province of Ontario, hereby certify as follows:

1. That I am a geologist and reside at 2159 Parker Drive, Mississauga, Ontario.
2. That I hold a Bachelor of Science degree from Sir George Williams University (Montreal), and have completed additional geological studies at the undergraduate and graduate level at McGill University and the University of Toronto.
3. That I am a member of the Association of Professional Engineers of Ontario, a designated Consulting Geologist and a Fellow of the Geological Association of Canada; and that I have been practising my profession since 1963.
4. That I have no personal interest, direct or indirect in the property described in this report, nor do I expect to receive any interest therein.
5. That my report dated December 12, 1978 on the Foster Township property of Union Carbide Exploration is based on a geological survey of the property performed by me, during intervals between September 1 and October 15, 1978, on published Government Geological reports and maps, on data from Government assessment work files, on discussions and assistance from former operators, and on results of additional detailed mineralization studies and estimates completed on the property by Union Carbide geologist S. Fraser.

M. Halladay

M.L. Halladay, F.G.A.C., P.Eng.

PROPERTY OWNERS

Claims optioned by Union Carbide:-

Cl. S.471202-471204 inclusive held by Taisto Tamminen

address: Worthington, Ontario
POM 3H0

Cl. S471438-39 inclusive held by William Alanen

address: Nairn Centre
Ontario
POM 2L0

Claims Transferred to Union Carbide

Cl. 398141-398153 inclusive staked by J. Allard and transferred to
Union Carbide

address: J. Allard
Apt. 2B
536 Birchmount Road
Scarborough, Ontario

Cl. 398131-398140 inclusive staked by M. Halladay and transferred to
Union Carbide

address: M. Halladay
2159 Parker Drive
Mississauga, Ontario
L5B 1W3

PERSONNEL AND DATES OF WORK

Line Cutting:

	<u>Address</u>	<u>Dates Worked</u>
John Allard	John Street Espanola, Ontario	Sept. 1 - Sept. 20, 78
Terrence Allard	John Street Espanola, Ontario	Aug. 21 - Sept. 6, 78
Brian Quesnel	468 Adelaide Street Espanola Ontario	Jul. 28 - Oct. 1, 78
M. Halladay	C/o. Union Carbide 123 Eglinton Ave.E. Toronto, Ontario	Jul. 30 - Aug. 10, 78 Aug. 21 - Aug. 29, 78
S. Fraser		Sept. 22 - Sept. 26, 78

Geological Reconnaissance Survey

M. Halladay (geologist)		(Aug. 29 - Sept. 6, 78 Sept. 26 - Oct. 13, 78 Nov. 1 - Nov. 21, 78)
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Assessment of Mineralization

S. Fraser (geologist)	C/o. Union Carbide 123 Eglinton Av.E. Toronto	(Sept. 27 - Oct. 22, 78 Oct. 28 - Nov. 21, 78)
Brian Quesnel		Oct. 1 - Nov. 20, 78

Typing of Report

Z. Jaffer	C/o. Union Carbide 123 Eglinton Ave.E. Toronto, Ontario	Dec. 12 - Dec. 14, 78
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(ON REVERSE SIDE OF
"LASALLE"
GILBERT-RIOU")

Nairn Twp. - M.883

2.2863

THE TOWNSHIP OF

FOSTER M-814

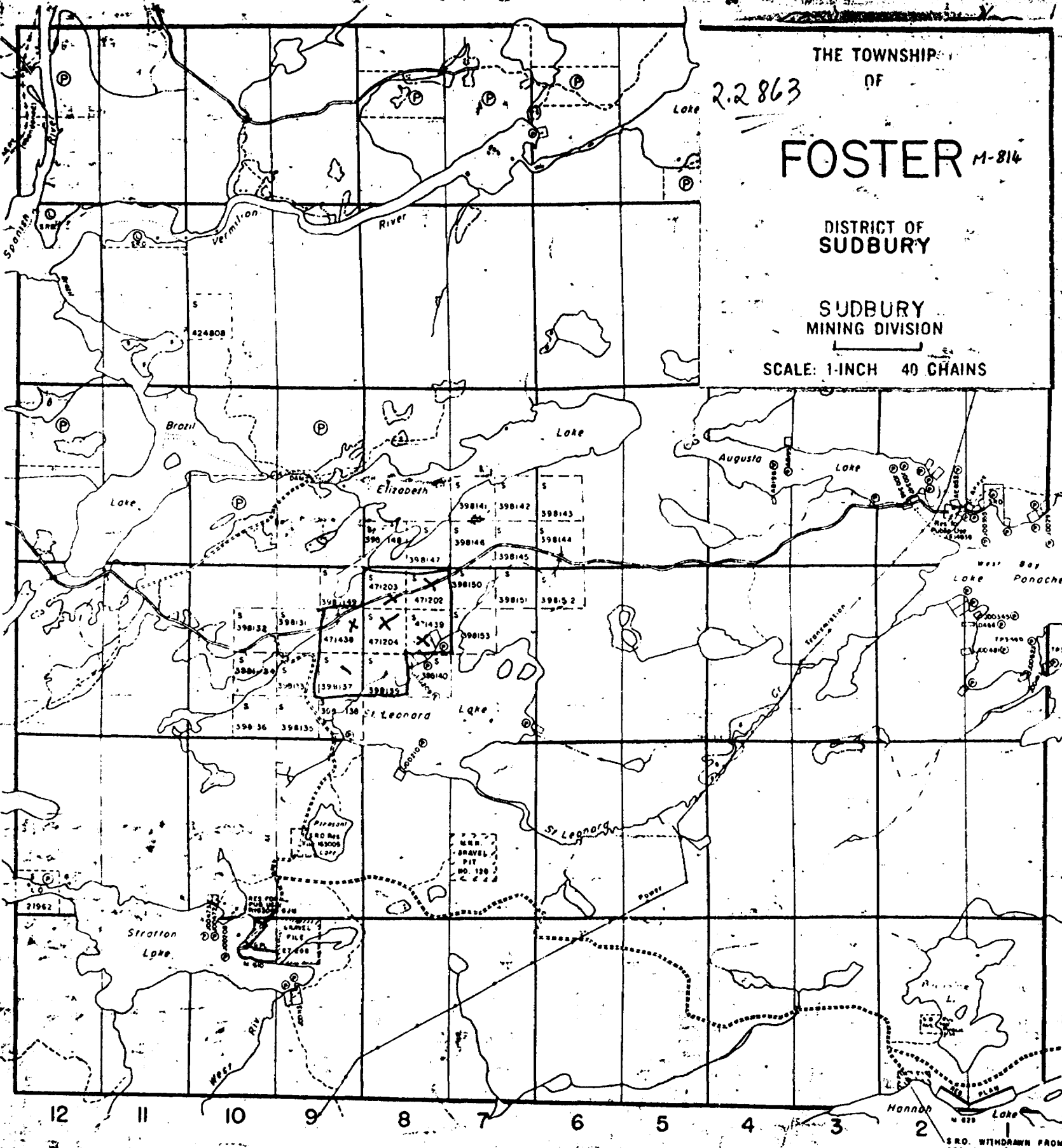
DISTRICT OF SUDBURY

SUDBURY MINING DIVISION

SCALE: 1-INCH 40 CHAINS

Merritt Twp. - M.863

Truman Twp. - M.1164



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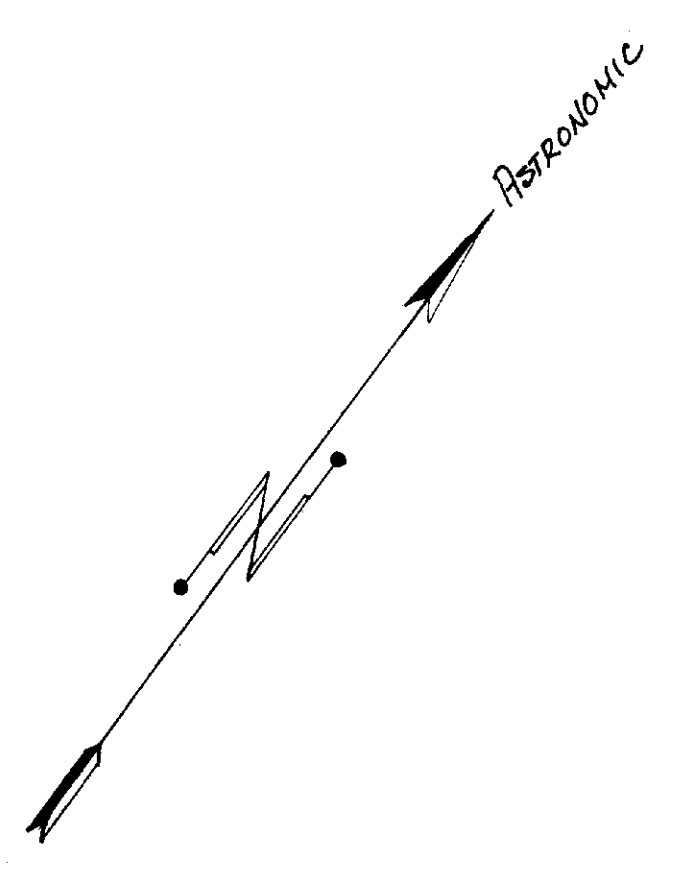
S.R.O. WITHDRAWN FROM



LEGEND

PROTEROZOIC	
Keweenaw Olivine Diabase	8
Nipissing Quartz Diabase	7
HURONIAN	
Serpent Fm.	6
Transition Zone (Espanola-Serpent)	5
Espanola Fm.	4
Intraformational Paraconglomerate	3
Bruce Fm.	2
Mississauga Fm.	1





ELIZABETH LAKE



LEGEND

- PROTEROZOIC**
- Keweenaw Olivine Diabase [8]
 - Nipissing Quartz Diabase [7]
- HURONIAN**
- Serpent Fm. [6]
 - Transition Zone (Esponola-Serpent) [5]
 - Esponola Fm. [4]
 - Intraformational Paraconglomerate [3]
 - Bruce Fm. [2]
 - Mississauga Fm. [1]

SYMBOLS

- Areas of outcrop [circle]
- Strike and dip of beds - inclined [T-shape]
- vertical [vertical line]
- tops [horizontal line]
- Contact - defined [solid line]
- assumed [dashed line]
- Fault [zigzag line]
- Swamp [wavy line]
- Claim post [square]
- Diamond drill hole [circle with dot]
- Trenches [rectangle]
- Skarn beds (where exposed) [circle with dot]
- Breccia [triangle]

UNION CARBIDE EXPLORATION CORPORATION

Geological Map
FOSTER TOWNSHIP
 Scale: 1"=200'

10/2/78
 Dates of Survey Sept. Oct. Nov. 1978

M. Holliday

FOSTER 0016, #1