FINAL REPORT

PROJECT NO. 295

QUEBEC MINE - MICHIPICOTEN ISLAND

SUMMARY:

During the summer of 1959 the old workings of a native copper mine on the northwest shore of Michipicoten Island, Lake Superior was unwatered. Although the geologic structure appeared favourable a careful scrutiny of three levels did not disclose an economic concentration of ore. Extension of the Second level to the north and to the south also failed to reveal native copper in workable quantities. The option on the property has now been dropped.

INTRODUCTION:

Michipicoten Island lies in the same geological horizon as Keweenan Peninsula, Michigan the scene of one of America's largest copper producing camps. The Quebec Mine, on the northwest coast of Michipicoten Island, was a development that started about 1855 and continued intermittently until around 1887. The work was largely of a development nature and while the mine was readied for production in its latter stages only small test shipments of ore were ever made. Old reports indicated that a fair grade of native copper occurred in one or more lodes of amygdaloidal lava and that it appeared to be improving with depth. As deposits of this type cannot be reliably appraised by diamond drilling it was decided to de-water the mine and have a first-hand look.

PROPERTY:

The property consists of 12 unpatented mining claims optioned from Mrs. Pauline Leary and her brother, Mr. Wilfred Lehay. They are as follows: SSM 42747 - 42753, incl. and SSM 43177 - 43179, incl.

An additional 109 contiguous claims were staked on the east and south sides of the optioned claims to give protection in depth in the event an ore body was established on the Leary-Lehay property.

LOCATION AND ACCESS:

As previously stated the claims lie on the northwest corner of Michipicoten Island which is located in the northeast angle of Lake Superior. The nearest town is Michipicoten Harbour, approximately 60 miles due east; the divisional point of White River on the transcontinental line of the C.P.R. is 65 miles due north. Sault Ste. Marie is 110 air miles to the southeast.

The island can best be reached by chartered sea plane from White River although similar service is available ex Wawa, Ontario and Sault Ste. Marie. The trip may also be made by boat during the open-water season from Michipicoten Harbour, Montreal River or the 'Soo. An old road, 6 miles in length, runs from the only port, Quebec Harbour, to the mine; it is no longer useable.

TOPOGRAPHY:

The topography of the island is rugged with the tops of some of the rocky hills rising to heights of 700 and 800 feet above Lake Superior.

In the coastal section some level areas exist due to the presence

TOPOGRAPHY (Continued):

of fairly extensive raised beach terraces that are believed to have been caused by glacial Lake Algonquin which covered most of the Great Lakes basin in previous times. These gravel areas are covered by a skimpy layer of rich topsoil and were the scene of limited farming operations of the 1860's and -70's.

The island is heavily wooded, largely with deciduous trees although some evergreens are to be seen in the valleys and swamps.

GEOLOGY:

The island is underlain by a conformable series of basic flows, pyroclastics, extrusives, ash rocks and shore phase sediments of Keewenawan Age. The general strike is northeast-southwest, more or less parallel to the long axis of the island. The dips vary from 60 degrees to the southeast along the north side to as low as 10 degrees in the area just west of Quebec Harbour on the south shore. At the Quebec Mine the beds dip at an average of 47 degrees and strike north 20 degrees east. Local rolls in the bedding planes are common.

With the exception of the traps these rocks are all rich in hematite to give them a characteristic reddish colouration. The traps are basic flow rocks that demonstrate a pronounced ophitic texture that diminishes in size when in close proximity to a contact.

In the vicinity of the Quebec Mine a dark, fine-grained younger intrusive dyke cuts the lavas. Its strike is slightly south of east and dip is essentially vertical.

Quarts and carbonate filled veinlets are common and they both

GEOLOGY (Continued):

out and parallel the Keeweenawan lava beds.

Native copper, in the form of minute disseminations and irregular masses, is found in the amygdaloids and conglomerates and also in the transverse fissure veins. The main source of ore at the Quebec Mine is in the brecciated top of an amygdaloidal lava and, to a much lesser extent in the fissure veins. About a mile south and west of the Quebec Mine several shafts have been sunk on a copper bearing conglomerate bed. The amount of copper in this horizon is not impressive and definitely not of economic significance where seen.

No copper sulphides were noted in place in the mine workings but a small dump near an old inclined shaft some 500 feet north of the Main Shaft at Quebec Mine contained appreciable amounts of disseminated chalcocite. The source of this material is not known but it is believed to have originated in workings opened from the inclined shaft.

Considerable difficulty was encountered in estimating the width of the ore bearing amygdaloidal lava in the mine workings but it is believed to be between 15 and 20 feet. Most of the native copper occurs in the flow top breccia within a few feet of the hanging wall contact with trap; only minor very finely disseminated copper is to be seen in the cellular amygdaloid away from the hanging wall. In the brecciated upper portion of this flow there have been appreciable amounts of quartz and carbonate introduced into the fractured zone. Some portions are highly chloritised and epidote, laumontite, prehnite and datolite are common. No native silver or arsenides were noted.

GEOLOGY (Continued):

On the 323-foot (Fourth) Level, conglomerate was noted on the north wall of the main drift about 60' south of the shaft. In the stub cross-cut north of the shaft on this same level a dark fine-grained trap rock appears to have a 40-degree dip to the west in direct variance to the universal easterly dips elsewhere in the mine. This is believed to be a younger intrusive comparable to the large dyke found on surface south of the mine proper. These younger barren dykes are not found in the Michigan deposits. This cross-cut was probably laid out to connect with the workings from the "Batter's Shaft", 23 feet away.

No mineralization was noted in the conglomerate or the silicic mud rock, exposed in the northwest footwall cross-cut on the fourth Level.

The First Level, at a depth of 70 feet was very limited in extent and was not surveyed or mapped. Fragmental amygdaloid in contact with trap does occur there. This Level connects with the old "Office Shaft", 150 feet to the southwest.

WORK DONE:

After losing a scowload of mining equipment in a June storm on Lake Superior the underground rehabilitation programme finally got under way toward the end of July. After the workings had been dewatered they were surveyed and the geology mapped. For guidance, Dr. T. M. Broderick, retired chief geologist for Calumet and Hecla, the big Michigan copper producer, was brought in to examine the property. Dr. Broderick reported that the fragmental amygdaloidal lava seen in the Quebec Mine workings

WORK DONE (Continued):

was very similar to the productive horizons in the Michigan camp and recommended that the Second Level (183.0' vertical depth) be extended for 500 feet both north and south, that a slice be taken off the back of the old drifts and that the drift walls be slashed here and there to expose the hanging wall contact of the amygdaloid with the trap, as this was considered to be the favourable zone for deposition of native copper in the mines of the Keweenaw.

This programme was carried out only in part due to budget considerations. The back and walls of the old Second Level drift had to be slashed in any event to permit access by our mucking machine so this recommendation was fairly well followed. Due to the cost factor we decided to only drive 200 feet in either direction as it was felt this should give us a fair picture of the distribution of the copper.

Dr. Broderick also suggested that long, flat diamond drill holes be bored in the footwall to determine if more important amygdaloid beds did not occur at a lower stratigraphic horizon than the bed we were testing; unfortunately, this could not be done as no mining rights were held under the waters of Lake Superior due to a Provincial mining regulation that forbids staking of lands under this body of water.

In addition to the underground work the surface geology in the vicinity of the mine was mapped on a scale of one inch equals 400 feet.

DESCRIPTION OF MINE WORKINGS:

It was decided to dewater the so-called "Main Shaft" as most of the previous development work had been done from it. Two other shafts

DESCRIPTION OF MINE WORKINGS (Continued):

are nearby but either were not deep enough ("Office Shaft - 80') or did not connect with the main workings (Batter's Shaft" - 353' vertical). Still another shaft, located 790 feet N 50°E from the Office Shaft is a large inclined opening that is believed to be the "Bevan Shaft". The dump from this working is largely cellular amygdaloid but from the size of the muck pile considerable sub-surface work must have been done here. No native copper was seen in the dump material but a small pile of sorted basic trap rock on the north side of the main dump contained moderate disseminated chalcocite that would grade 5 - 6% in copper. An old photograph that appeared in the "Engineering and Mining Journal" in 1898 showed an elevated tramway leading from the shaft directly to the mill so it would appear that production from this area was at least contemplated. As there is no report of production from the mill it is doubtful if this objective was ever attained. The fill used for the elevated haulageway probably also originated from the Bevan Shaft workings.

The Main Shaft's dimensions are approximately 8' x 12' outside the timbers, has hoisting and manway compartments and is vertical to the Second Level at a depth of 183.0'. The First and Second Level Stations are cut on the west side of the shaft. Below the Second Level the shaft is inclined to the east at 52 degrees and in places pinches to a tight 6-foot width. The old timers had an elaborate system of rollers to guide their skip past the Second Level "Knuckle" that we could not duplicate with our equipment.

DESCRIPTION OF MINE WORKINGS (Continued):

The shaft was timbered to the Fourth Level at a vertical depth of 323 feet; it continues beyond this for a possible slope distance of 120 feet and may have two stations cut at 60-foot intervals; the upper one having a small amount cross-cutting and drifting. As the Fourth Level was the maximum depth we could hoist from with our equipment, no attempt was made to go deeper. The shaft timber was sound once below the collar sets and most of the old ladders could be used, although landings had to be established at 16-foot intervals in the vertical part of the shaft.

The water pumping system by the early operators was really something to conjure with; huge plunger-type pumps with 20-foot wooden pistons were actuated from the surface by cable and an 8-9' diameter sheave wheel in the head frame. A 10-inch high pressure steam line with huge bolted flanges provided steam for the rock drills that were used at the time. The average length of drift round was about 3 feet in a 6' x 7' heading. As a result we had to do considerable slashing of the backs and walls on the Second Level in order to gain access for our small Copco mucking machine. Grades in the old drifts were steep to facilitate hand tramming. Some of the light gauge track was still useable and the hand-wrought track spikes were used again by us when our supply ran low. The wrought-iron air and water lines in the mine were in good condition despite the fact the last recorded de-watering was in 1903 by the Standard Oil Company.

The First Level consists of a short cross-cut from the Main Shaft, plus approximately 100 feet of drift to connect with the stub

DESCRIPTION OF MINE WORKINGS (Continued):

cross-cut from the Office Shaft. This Level was filled with broken muck and surface debris that had washed down from the Office Shaft. Due to the short length of the drift it was not surveyed or geologised, although some fragmental amygdaloid was noted in the vicinity of the Office Shaft. This is presumably the same horizon as cut on the Second Level.

The Second Level has a stub cross-cut immediately west of the shaft that is filled with waste and debris to within a foot or so of the back so this was not surveyed. A crawl-in peek on top of the muck pile disclosed the footwall contact of the amygdaloid with the trap which suggested a total width for the former of about 15 feet - at least 10 feet of this is the fragmental variety.

The north drift had a straight line length of 147 feet with some slashing of the east wall 40 feet north of the shaft. We slashed this drift for a length of 110 feet and then drifted another 40 feet. In addition a considerable portion of the back had to be slashed to permit raising of the mucking machine dipper. The south drift had a straight line distance of 95 feet that once again required considerable slashing of the east wall and back; we advanced this heading another 160 feet endeavouring to follow the rolling hanging wall contact of the amygdaloid.

The Third level north drive has a straight line distance of 161 feet from the shaft while the south is 267 feet from the shaft to the face. Minor slashing of the walls had been done in the north drift while a 30-foot length of the east wall had been slashed in the south drift. A thin slice had also been taken from the back at this point. Weak, but

DESCRIPTION OF MINE WORKINGS (CONTINUED):

persistent, disseminated copper was found in the last 110 feet of this drive and a winze had been sunk along the hanging wall at a point 190 feet south of the shaft.

The Fourth Level appeared to be exploratory in that footwall cross-cuts were turned off at a point 52 feet north of the shaft and 75 feet south of the shaft. The main drive, 140 feet long was entirely in fragmental amygdaloid but no native copper was seen.

At the start of the north foot-wall cross-cut a short stub cross-cut had been angled into the hanging wall ostensibly to connect up with the workings from the Batter's Shaft. Why this was not completed is not known as the old maps indicate that only 23 feet separate the two openings at this elevation.

The north foot-wall cross-cut has a length of 155 feet directly across the strike of the formations. It is notable in that it exposes a 68-foot width of red pebble and cobble conglomerate on top of which lies a 13-foot width of sandy mudstone that now resembles a jasper. No copper was noted in the conglomerate or mud rock. Strong strike-faulting gives bad ground part way along this cross-cut.

The south foot-wall cross-cut is entirely in ophitic trap and proceeds west across the strike for 60 feet before turning south for 20 feet.

The short stub cross-cut in the hanging wall immediately north of the shaft was much filled and was not mapped.

DESCRIPTION OF MINE WORKINGS (Continued):

The Batter's Shaft was obviously laid on as the production shaft as it was vertical and situated very close to the mill. It is believed to have been sunk in the 1880's just prior to the final closure of the mine. The old sections show no openings or stations cut until the Fourth or 323-foot level of the Office Shaft is reached. At this elevation a 180-foot foot-wall cross-cut was driven until a bed of amygdaloid was intersected; this bed was then followed southerly on strike for a length of 80 feet to bring the face within 23 feet of the Fourth Level stub previously described. The lode they were following lies in the hanging wall of the Office Shaft workings and is reported to carry some copper.

None of the work done in the Batter's Shaft could be verified by us, as we made no attempt to rehabilitate it other than clean away the debris from around the collar and fence it off as a safety measure. Despite the fact that the two shafts are not connected it was noted that the water level in Batter's Shaft slowly dropped as we pumped out the Office Shaft but at a much lower rate. The presumed connecting cross-cut on the Fourth Level north was making considerable water along joint planes in the intrusive trap rock and it is believed this was draining from the Batter's Shaft workings.

Our Second Level drift and slash muck was hoisted to surface and a dump established north of the shaft parallel to the shore. This material was spread out by bulldozer in order to permit close examination

DESCRIPTION OF MINE WORKINGS (Continued)

by the geological staff. Considerable native copper was found in some of this muck but the overall amount was definitely not of ore grade.

RESULTS OF WORK:

As considerable finely disseminated native copper had been found in the drift muck with occasional patches of "mass" copper the size of a human forearm it was decided in mid-September to ask Mr. James Pollock, the present chief geologist of Calumet and Hecla, to inspect the workings to see if that Company could be interested in participating in further underground development work on the property. After spending three days carefully going over all phases of our work, Mr. Pollock came to the conclusion that there was insufficient copper in this particular horizon to interest Calumet and Hecla. He pointed out that if the property was in their home area of operations, with treatment facilities already established, they would probably carry out the same type of operation as we had underway. He felt that the horizon we were in could not hope to produce a grade of ore in sufficient quantity to withstand transportation costs from Michipicoten Island to Calumet, Michigan.

Faced with such an expert opinion it was decided to stop further work immediately; this shut-down decision was also influenced by the following factors:

RESULTS OF WORK (Continued):

(1) The Second Level drive to the south had failed to disclose ore of as good a quality as had been seen on the Third Level below where the last 110 feet of drift was believed to be ore grade. Unfortunately, the Third Level could not be rehabilitated at a reasonable cost due to the fact that the shaft, which was vertical to the Second Level, was inclined at 52° below that point, to create a difficult hoisting problem for the broken ore.

(2) The north drift, after advancing about 75 feet, had completely changed from the favourable fragmental to the cellular-type amygdaloid with an extreme flattening of the hanging wall trap contact. No copper had been seen at all in this heading once the fragmental amygdaloid was left behind.

(3) Surface mapping had revealed the presence of a dense, fine-grained, younger intrusive dyke rock, several hundred feet wide, cutting through the favourable lava flows at a distance of about 500 feet to the south of the mine workings. As this dyke could not be expected to contain copper mineralization the drive through it would have been entirely in waste. It is believed the favourable

RESULTS OF WORK (Continued):

amygdaloid continues on the south side of this cross-cutting dyke but at that point it would undoubtedly lie under Lake Superior, where no mining rights are held.

(4) No ore had been seen on the 323-foot or Fourth Level although a good width of fragmental amygdaloid is exposed in the drift.

CONCLUSIONS:

In view of the foregoing points plus the desire to remove the mining equipment while water navigation permitted, it was decided to stop the operation without further delay.

RECOMMENDATIONS:

It is recommended that no further work be carried out on the property. The contiguous staked claims may be permitted to lapse as they are not thought to be of value without the mine itself.

Respectfully submitted,

O. A. Seeber

O. A. Seeber
Chief Geologist

TORONTO, Ontario
November 24, 1959

C E R T I F I C A T E

I, ORVILLE ALEXANDER SEEBER, of the Township of Etobicoke, County of York, in the Province of Ontario, do hereby certify as follows:

1. THAT I am a Mining Geologist and reside in the Township of Etobicoke in the Province of Ontario.

2. THAT I am a graduate of Queen's University, a Bachelor of Arts in Geology and Mineralogy and have been practising my profession since 1937.

3. THAT I have no personal interest, direct or indirect in this property, and do not expect to receive any interest therein.

4. THAT my report dated the 24th day of November, 1959 is based on personal examination and supervision of the work.

O. A. Seeber, B. A.

Dated at Toronto, Ontario
this 24th day of November, 1959

020

	ATTEN	INITIAL
M. J. B.		
R. J. L.		
G. L. M.		
J. W. G.		
C. B. B.		
W. T.		
J. D. A.		
O. A. S.		
FILE #		

REPORT TO THE ATTENTION OF

M. J. BOYLEN

SUITE 908 -- 330 BAY STREET

TORONTO 1, ONTARIO

PROJECT 295 - MICHIPICOTEN ISLAND

Introduction

Copper mineralisation of the Keweenawan formation near Lake Superior has thus far been found to be commercial in a belt about twenty-six miles in length, extending outward from the towns of Houghton, Hancock and Calumet, Michigan. A huge chalcocite deposit about 75 miles from this belt has recently been drilled and it may be in part commercial. Other copper deposits occur in Wisconsin, Minnesota, Isle Royal Island, Michipicoten Island and Point Mamainse. None of these has been found to be commercial. However, the Michipicoten showing has enough similarity to the Keweenaw Point ore district to warrant further work in the area which you control.

General

On July 21, 1959, I flew to Michipicoten Island in your plane, arriving there late in the afternoon, and left the island near noon on the 23rd, arriving in Calumet late that afternoon. Because of unfavorable weather, the pilot and Mr. Seeber stayed over night and we had the opportunity to visit one of the large mine dumps, showing a great variety of Copper Country rocks and ores. This general distribution of time and place within such a short period gave me the opportunity of seeing your major set-up and gave them the chance of seeing good examples of the major ores of this district.

Location

No especial study of your land distribution was made except to ascertain that you were well protected on the western part of the island. Your main efforts thus far have been in the old location on the north shore, a few miles from the western end of the Island.

Program

On Tuesday afternoon, the 21st, we looked over maps in the office and walked over the surface, seeing specimens of copper near the mine dump and visiting the old shafts, mills, buildings and dumps of the location. The grown-over area and general wreckage contrasts with the place as shown in the picture published in 1892.

Wednesday morning was entirely spent underground in the shaft (the main shaft) which you have unwatered. All of the levels from the first to the fourth were studied. Wednesday afternoon was spent in visiting old shafts to the southwest of your camp, and later on, to visiting several rock exposures up and down the shore for a quarter of a mile each way from camp.

On Thursday, various exposures were examined along the trail from the camp to the airplane.

On Friday morning, about two hours were spent on the dump near Calumet & Hecla Nos. 10 and 11 shafts.

History

Your files contain part of what we found in the literature on the district and I am sending copies of the other parts which we have, to complete your set. You therefore have the details available and I do not believe that a summary is justified now. As is so frequently the case, the literature is very optimistic, and one would expect to find the mineralization at the several locations considerably less than the publicity would indicate.

One of your accounts gives a brief history of the explorations. The first work was by Mr. H. Fletcher in 1860 - 1861, and "several barrels of copper" were produced. Work was dropped, but resumed by Quebec & Lake Superior Association from 1875 to 1880.

In 1880, Michipicoten Native Copper Company started in and spent $370,000. In 1884, property, heavily in debt, was purchased by Matthew Curtis, Mayor of Manchester, England. He spent $70,000, and after his death in 1887, property was purchased by Joseph Cosens. He got the property in about the same shape as it now is. In addition to the amygdaloid in the "mine," other showings of native copper were examined, particularly a conglomerate 1-1/4 miles to the westward.

You will find several references in the records to the testing of samples sent to various plants. Some went to England and some to Bruce mines. Hand-picking had been done and the results were accordingly higher than the ore ran, as broken.

In more recent years there have been explorations of the property, of which your records are more complete than mine. Some of these include diamond drilling and some geophysical work. Some further reference to this will be made later.

Geology of Keweenaw Point, Michigan

The main object in having me look at your property was to get a direct comparison on the part of one who had a thorough familiarity with Keweenaw Point geology. Some of the important points follow.

In Keweenawan times some hundreds of lava flows were poured out on

the surface. Each one as it cooled gave off large volumes of gas and many of the bubbles were entrapped near the top, forming a layer eight to fifteen feet (more and less) of bubbly porous lava. In many cases the movement of the flow and the evolution of gas broke up the crust and it now is fragmental in appearance. The exuding gases and the air oxidized the iron and it exists in many little hematite needles, giving the flow top a red color. Now and then flowage of lava was held up and water could get in its work, breaking up the flow top and bringing in pebbles of other material, such as rhyolite, and laying them down, forming a bed of conglomerate. In Michigan there are around 350 flows, with about twenty interbedded conglomerates.

These lavas and conglomerates were tilted, forming a great rock basin around Lake Superior. They were intruded by basic and acidic rocks which in cooling gave off solutions containing the usual metals of the late Precambrian of the area. These solutions worked their way up through permeable channels such as faults, amygdaloids and conglomerates, and the dissolved material, reacting with the wall rocks, caused their metals to be precipitated, forming the deposits which are mined. Copper is the chief metal but it has smaller amounts of silver, gold, nickel, cobalt, arsenic and antimony. Silver goes with the copper, a common amount being around ten ounces per ton of copper. White Pine ore gives a silver content of about 30 ounces per ton of copper. Arsenic occurs with the copper, the different lodes carrying 0.0003-% in the copper, up to 0.56%. The several copper, nickel and cobalt arsenides can be seen in the more massive deposits in cross fissures, and efforts are made to refrain from breaking such ores in mining because of their deleterious effects.

Ore Deposits

In Michigan, the original discoveries were the mass fissure deposits, the great bulk of the copper occurring in masses weighing up into the hundreds of tons each.

In 1852, work was started on mining the Isle Royale amygdaloid near Houghton, and in 1856, the Pewabik amygdaloid near Hancock. In 1864 the Calumet conglomerate deposit was discovered near Calumet. Later, other amygdaloids, fissures, and minor deposits in other sediments were discovered and mined.

In recent years the need for copper within the United States induced exploration of the Nonesuch black shale and diamond drilling outlined a large chalcocite orebody. Metallurgical studies developed a method of recovery of a large proportion of the copper from this shale and a mine has been started on it adjacent to the old White Pine mine which had mined native copper in the nearby sandstone.

In summary, the district has produced over 10 billion pounds of copper since its start in 1845, and the various deposits have contributed approximately as follows:

Conglomerates (Practically all the Calumet & Hecla deposit)	43.6%
Amygdaloids (A total of about 7)	50.0%
White Pine shale and sandstone	4.0%
Fissure deposits	2.4%

The Calumet & Hecla conglomerate produced over 2-1/2% copper, and the amygdaloids and the White Pine produced about 1% copper. Total dividends paid to-date are around a third of a billion dollars, and the market value of the production was well over a billion dollars.

At the present time, Calumet & Hecla is mining both amygdaloid and conglomerate ore, and is reworking old tailings. Copper Range is mining amygdaloid and black shale (the White Pine) and Quincy is reworking some of its old tailings.

Exploration

The effort to discover new orebodies is most difficult. In the early days the small proportion of outcrops was examined and explored. An early, prehistoric group of miners had dug shallow trenches and many of the mineralized beds were rediscovered by cleaning out the old pits. Then came the time of diamond drilling and the district has had many drill cross-sections and subsequent detailed drilling along its length of over a hundred miles. Underground explorations from the going mines were driven. Finally the era of geophysics came along and all methods which showed any promise were tried out. Beyond the tracing of the strikes of lavas, the geophysics has thus far been of almost no use.

Application to Michipicoten Island Explorations

The above picture shows that a large part of the shore of Lake Superior is the Keweenawan group of lavas and conglomerates dipping into the Lake. Native copper and copper sulphides, with the other metals of the general area, occur in these rocks with special intensity on Keweenaw Point, Michigan. May they not occur elsewhere around the basin with similar intensity? In Wisconsin, explorations have uncovered numerous deposits but none of them thus far of commercial grade. On Isle Royal Island, deposits in fissures, amygdaloids and conglomerates all encouraged a recurrence of explorations over the years. Fine copper was found and masses up to six tons in weight. On Point Mamainse, explorations over the years have found fine and coarse copper and chalcocite in fissure veins.

Similarly, on Michipicoten Island enough copper has been found to stimulate exploration for a hundred years. The shaft which you have unwatered is opened upon a fragmental amygdaloid, mineralized with calcite, chlorite, some prehnite and native copper. It is dipping nearly 60 degrees. Its thickness varies, and it has the rolling lenticular structure which is common in the commercial Michigan deposits. The latter usually have a greater variety in the gangue minerals, but there are deposits in some amygdaloids which are similar, for instance in the Ashbed.

There is both arsenic and silver on Michipicoten and there is copper mineralization also in conglomerate and fissures.

Geophysics has been tried on the Island, with apparently the same lack of success as on Keweenaw Point.

The relative proportion of acidic rocks seems greater than on Keweenaw Point and it would be well in the mapping to show the basic rocks as definitely as possible as they are more favorable as hosts of copper.

The main problem here is to get an idea of the amount of copper. We see it in the lode underground, and it can be found in the Lake where it has been washed out of the older broken rock. We know it exists but the question is, how much is there?

My first recommendation would be to drive the 200 level in both directions, perhaps 500 feet each way, and save the rock. A little cutting of the rock along the drifts already driven would also give an idea of the copper content. As this work progresses you would be able to determine whether or not to prepare for a mill test, or whether to continue driving.

The distribution of copper in an amygdaloid is erratic and a picture of the possibilities would develop as the drifts advance.

If the fine dots indicate fine copper and the larger patches the heavier copper, one can realize whether the drifts shown above give a fair sample, a

poor sample or a rich sample at any one time.

The mineralization mentioned in the notes as occurring in the other beds should be examined. Perhaps if diamond drilling has not already done so, a drill could be used to penetrate the beds near the old opening. This is especially important if the bed is a conglomerate, since sedimentary ore is more uniform.

Any study of earlier drilling which could develope into a map would be important. Perhaps some of the basic phases of the formation have not yet been cut by old explorations or by drilling.

In the Michigan area, the Nonesuch shale is a high bed, stratigraphically, and any black shale high up on the south side of the Island (or in any other place on the Island) would deserve examination. In Michigan the chalcocite is exceedingly fine and its detection requires care.

I note that Caribou Island is shown as upper sandstone wherein the Nonesuch shale mineralization is found. Perhaps a recheck on what has been done here would be in order. Is there any shale or mineralization here?

Treatment of Ore

One of the problems is concerned with the relative proportions of coarse and fine copper. Tests with sink-float separation have shown some encouragement and a study of grain size might make a lower grade ore of greater interest if the copper is coarse grained.

Summary

Geological features and earlier explorations demonstrate the presence of copper on Michipicoten Island in favorable rocks. You have unwatered what was regarded as the main deposit, and you are now in a position to ascertain more as to the copper content of the rock. You may find that you have a local small deposit, as the old map suggests, or you may find that there is a considerable deposit there. Your mapping does not indicate that the acidic rocks, about a quarter of a mile in each direction, cut off the deposit. If the deposit is local, perhaps underground drilling in the wall rock, especially the footwall, might locate a larger deposit.

Further explorations on the other lodes which were located in early days, and perhaps diamond drilling across any areas of basic rocks, would complete your work.

T. M. Broderick

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July 28, 1959.

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The relative proportion of acidic rocks seems greater than on Keweenaw Point and it would be well in the mapping to show the basic rocks as definitely as possible as they are more favorable as hosts of copper.

The main problem here is to get an idea of the amount of copper. We see it in the lode underground, and it can be found in the Lake where it has been washed out of the older broken rock. We know it exists but the question is, how much is there?

My first recommendation would be to drive the 200 level in both directions, perhaps 500 feet each way, and save the rock. A little cutting of the rock along the drifts already driven would also give an idea of the copper content. As this work progresses you would be able to determine whether or not to prepare for a mill test, or whether to continue driving.

The distribution of copper in an amygdaloid is erratic and a picture of the possibilities would develop as the drifts advance.

If the fine dots indicate fine copper and the larger patches the heavier copper, one can realize whether the drifts shown above give a fair sample, a

COPY

41N13SW9243 41N13SW18A1 MICHIPICOTEN ISLAND

900

M. J. BOYLEN ENGINEERING OFFICES
Suite 908 - 330 Bay Street
Toronto 1, Ontario

Telephone Empire 3-3292

November 18, 1959

Mr. D. A. Jodouin
Mining Recorder
Ontario Department of Mines
Sault Ste. Marie, Ontario

Project 295 - Michipicoten Island

Dear Dan:

Herewith two copies of the underground level plans of the Quebec Mine on the northwest shore of Michipicoten Island to accompany our recent work submission on behalf of Mrs. Pauline Leary, the registered owner.

On the attached plan the solid line represents the drift outlines at the time the mine was unwatered and surveyed - the broken line represents our work of last summer. In addition, we had to slash the back of all the old drift on the second, or 200-foot level, to permit entry with our mucking machine.

The shaft, which is vertical to the second level had to be retimbered to accommodate our equipment but only in the hoisting compartment; the manway compartment was in good condition.

The first level, about the 125-foot mark was largely muck filled and, being only opened for a short distance, was not rehabilitated or surveyed.

The shaft continues beyond the 325-foot level but was not timbered. As this was considered to be the safe depth limit for our equipment we did not attempt to reopen it beyond the fourth level.

As these native copper deposits are not amenable to sampling or appraisal by diamond drilling none of this work was done underground.

.....2

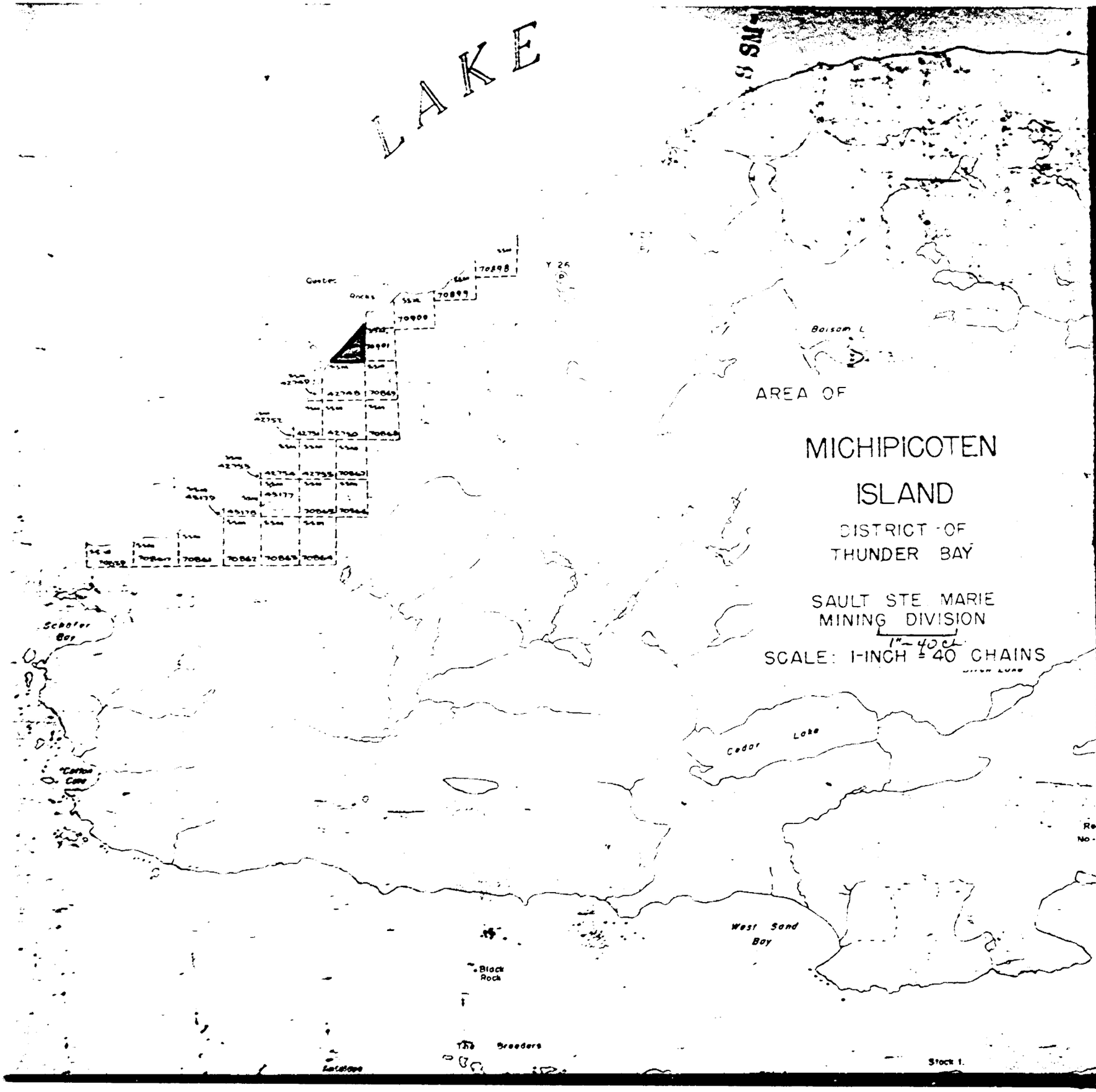
I trust the foregoing along with the attached plan will be of some use to Mrs. Leary.

Sincerely yours,

M. J. BOYLEN ENGINEERING OFFICES

(Sgnd.) O. A. Seeber
Chief Geologist

OAS:r
Enc.


LAKE
AREA OF
MICHIPICOTEN
ISLAND
DISTRICT OF
THUNDER BAY
SAULT STE MARIE
MINING DIVISION
SCALE: 1-INCH = 40 CHAINS
Schafer Bay
Cedar Lake
West Sand Bay
Black Rock
The Breeders
Stock I.
Boisom L

FOR ADDITIONAL

INFORMATION

SEE MAPS:

4IN/13SW-0018-AL # 1

2

3

4

5

6

North

Deepwater Lake

Coldwater Lake

Cygnus Harbour

Folsom L.

Loon Lake

Channel Lake

Trail

Trail

QUEBEC MINE

Creek

Quebec Harbour

Cedar Lake

Road

Road

Hope Island

Stack Island

Long Island

Ship Island

Green Island

Gull Rocks

GEOLOGICAL LEGEND

1 ... BASIC ERUPTIVES (FLOWS)

2 ... ACID ERUPTIVES

3 ... SANDSTONES and CONGLOMERATES

REVISIONS	M. J. BOYLEN ENGINEERING OFFICES TORONTO ONTARIO
	MICHIPICOTEN ISLAND LAKE SUPERIOR ONTARIO
	GENERAL GEOLOGY
	DRAWN: C.A.H. / CHECKED: / DATE: November 7th, 1956
	APPROVED: / SCALE: 2" = 1 mile / DRAWING NO.:

4IN/135W-0018-A1 #1

46,000 E

48,000 E

50,000 E

52,000 E

54,000 E

56,000 E

22,000 N

20,000 N

18,000 N

16,000 N

LAKE SUPERIOR

QUEBEC MINE

MAIN SHAFT

SKIP SHAFT

BATTEN'S SHAFT

POND

B SHAFT

LANDING LAKE

LEGEND

6	DARK, FINE-GRAINED INTRUSIVE
5	OPHITIC TRAP
4	AGGLOMERATE
3	AMYGDALOID
2	SANDSTONE
1	CONGLOMERATE

41N/13SW-0018-A1

41N13SW9243 41N13SW18A1 MICHIPICOTEN ISLAND

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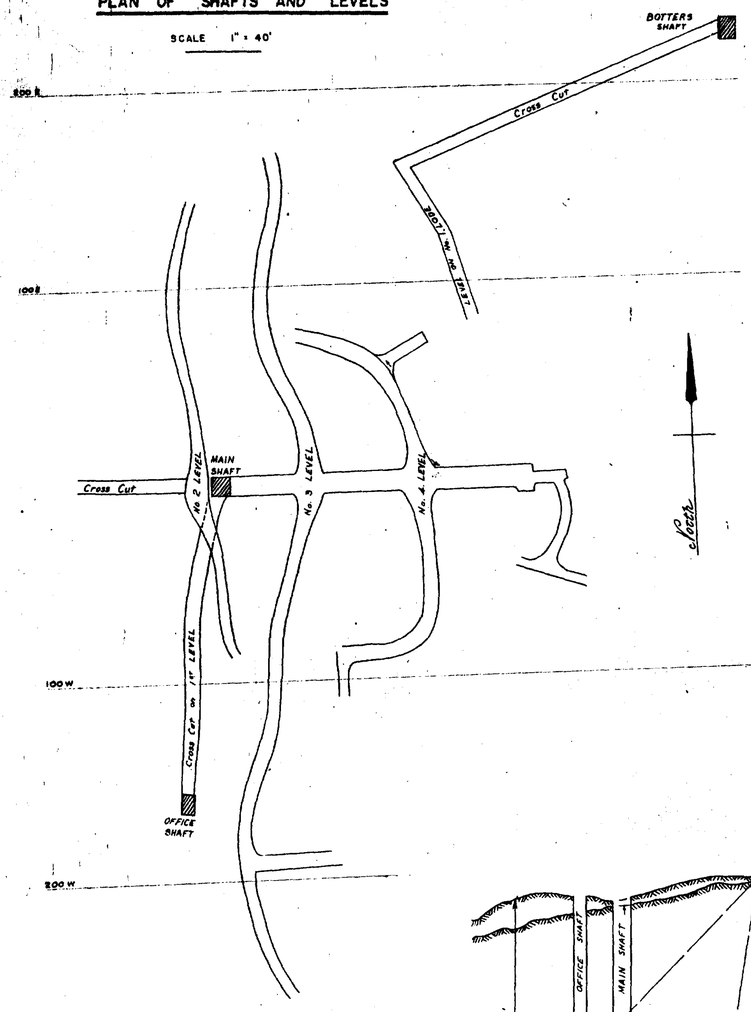
41N/13SW-0018-A1 #2

REVISIONS	M. J. BOYLEN ENGINEERING OFFICES TORONTO ONTARIO
	MICHIPICOTEN ISLAND PROJECT 295
	GEOLOGICAL PLAN
	DRAWN: O. A. S. CHECKED: DATE: NOV. 1959
	APPROVED: SCALE: 1"=400' DRAWING NO.

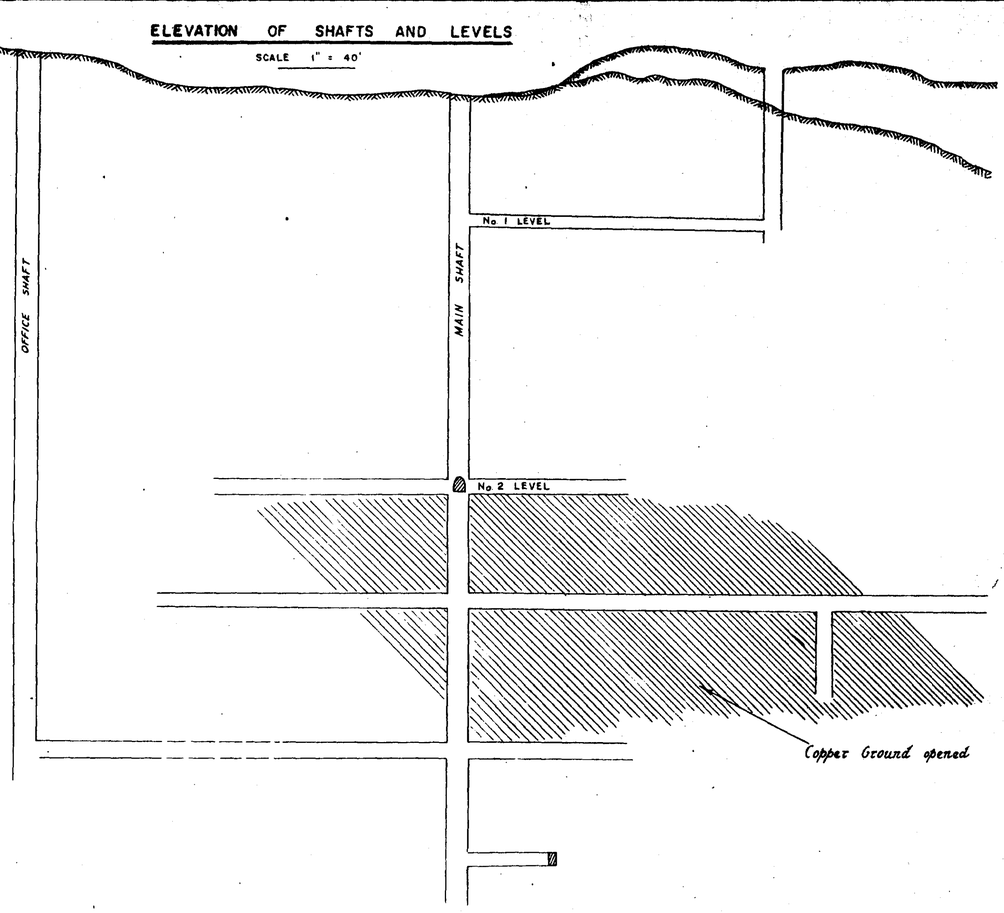
PLAN OF SHAFTS AND LEVELS

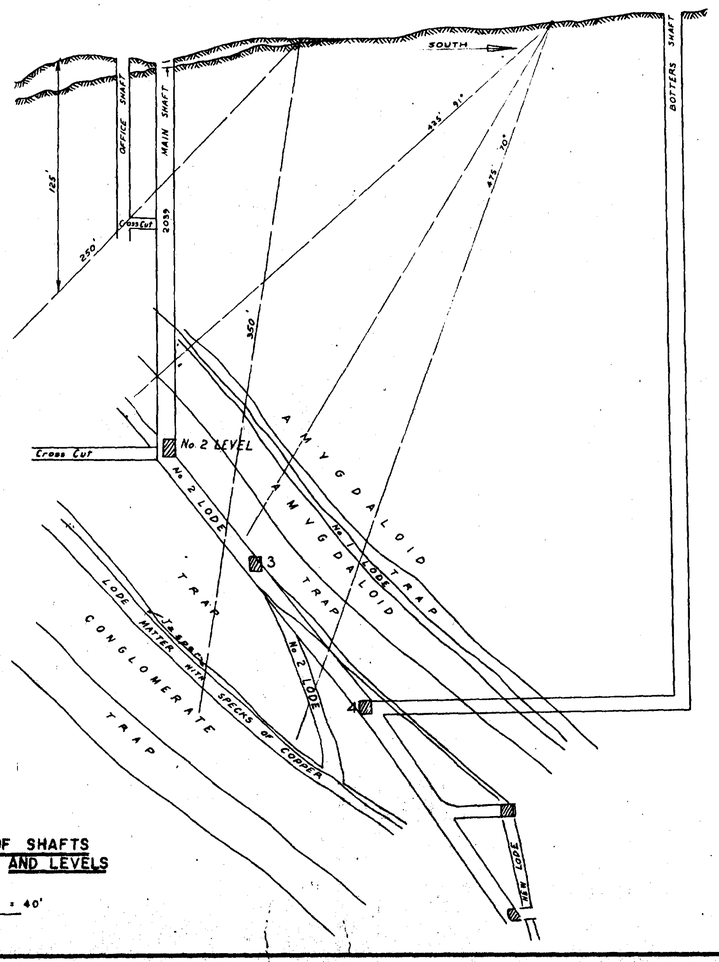
SCALE 1" = 40'



ELEVATION OF SHAFTS AND LEVELS

SCALE 1" = 40'

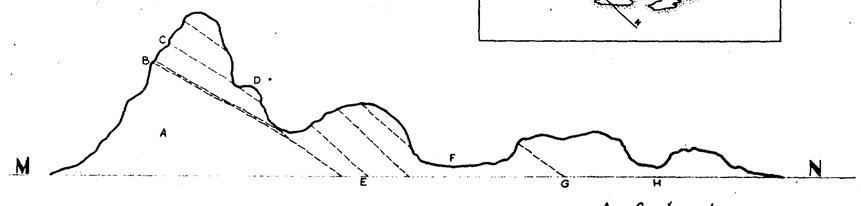


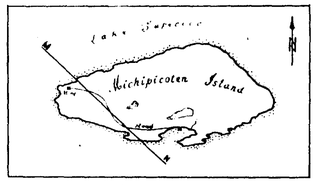


CROSS SECTION OF SHAFTS AND LEVELS

SCALE : 1" = 40'

HYPOTHETICAL SECTION THROUGH LINE M–N.





A Conglomerate
B Fred's Stone
C Diabase Porphyrite
D Ash-Bed Diabase
E Porphyrite
F Tufaceous Amygdaloid
G Amygdaloid
H Diabase

SSM-632-1

REVISIONS	M. J. BOYLEN ENGINEERING OFFICES TORONTO ONTARIO
	MICHIPICOTEN ISLAND CLAIM GROUP PROJECT 295
	DRAWN: CAH · CHECKED: · DATE: DEC 31st 1958
	APPROVED: · SCALE: AS SHOWN · DRAWING NO.:

41N13SW9243 41N13SW18A1 MICHIPICOTEN ISLAND

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41N/13SW-0018-A1 #3

M.J.BOYLEN ENGINEERING OFFICES

PROJECT 283

MINE DEVELOPMENT PLAN

NOTE – SURVEYED BUT LOCATIONS AND OUTLINES NOT PRECISE. #3 SHAFT NOT PLUMBED.

18,400N 18,600N 18,800N 19,000N 19,200N 19,400N 19,600N 19,700N

49,800E 49,900E 50,000E 50,100E 50,200E

-200FT. LEVEL-

-250FT. LEVEL-

-325FT. LEVEL-

183.0'

249.0'

313.0'

SHAFT NOT TIMBERED BELOW 325' LEVEL

20300N 20200N 20100N 20000N 19900N 19800N 19700N

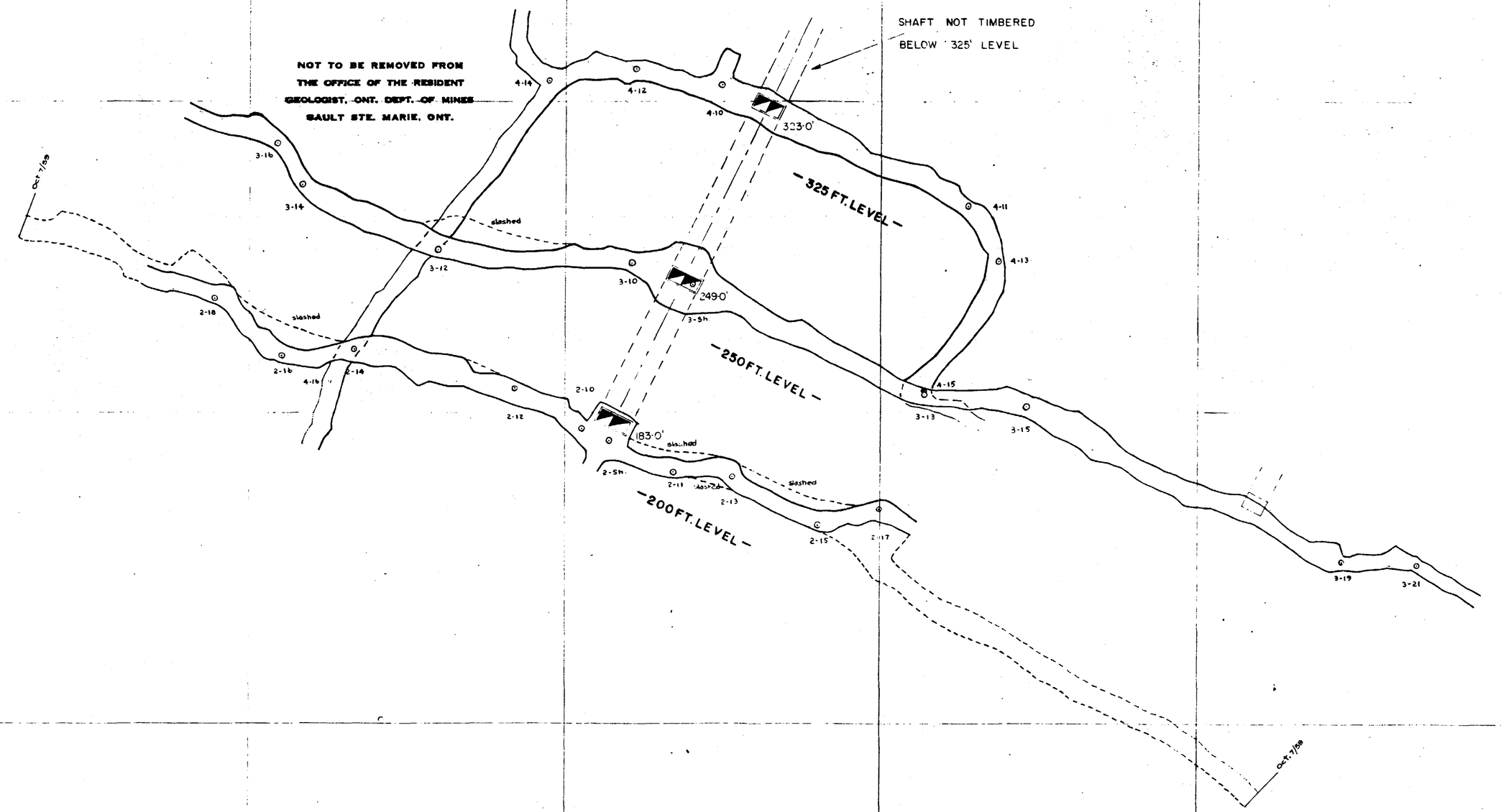
50,200E

50,100E

50,000E

49,900E

49,800E



NOTE - SURVEYED BUT LOCATIONS AND OUTLINES NOT PRECISE AS SHAFT NOT PLUMBED.

S SM-632

M.J. BOYLEN ENGINEERING OFFICES

PROJECT 295

MINE DEVELOPMENT PLAN

SCALE:— 1" = 20'
DRAWN BY: J.L.M. DATE: AUG 28, 1964.
UPDATED TO OCT 64

41N/13SW-0018-A1 #5

On claim SSM 42747.

20,300N | 20,200N | 20,100N | 20,000N | 19,900N | 19,800N | 19,700N

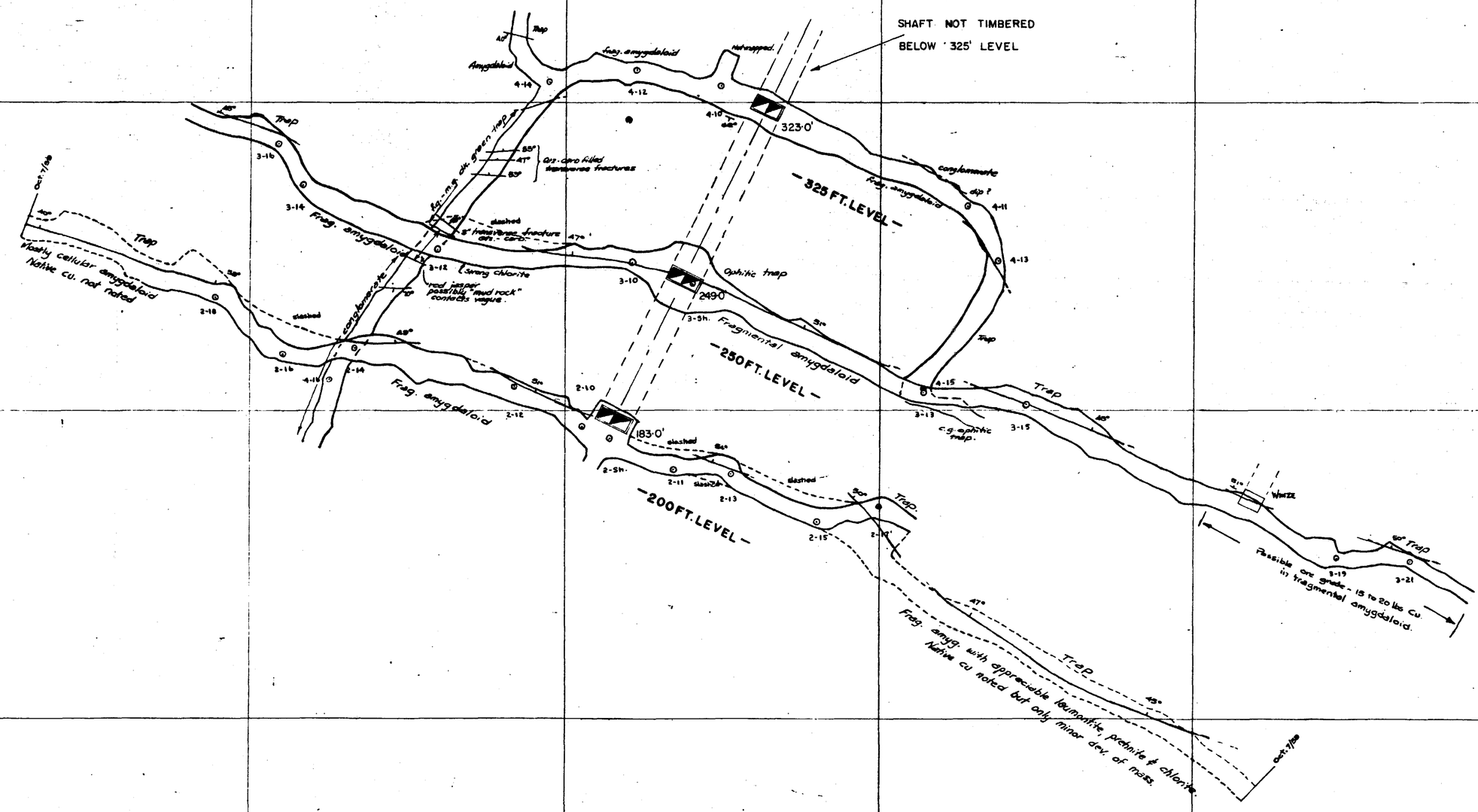
50,200E

50,100E

50,000E

49,900E

49,800E



NOTE – SURVEYED BUT LOCATIONS AND OUTLINES NOT PRECISE AS SHAFT NOT PLUMBED.

M.J. BOYLEN ENGINEERING OFFICES

PROJECT 295
MICHIPICOTEN

MINE DEVELOPMENT PLAN

SCALE — 1" = 20'

DRAWN BY: J.L.M. DATE: JULY 15, 1968.

41N/135W-0018A1

#6