

Cleveland Tin Limited

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PROGRESS REPORT

EXPLORATION LICENCE 1/63

FOR THE PERIOD

AUGUST 12, 1981 - FEBRUARY 11, 1982

82-1710

G. J. McARTHUR,
SENIOR MINE GEOLOGIST.

MARCH, 1982.

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1. SUMMARY

- * Due to diversion of funds away from surface exploration towards underground exploration in the Foley W/Sn/Mo prospect, virtually nil work was carried out over E.L. 1/63 during the period.

- * A report by Aberfoyle geophysicist, J. Silic, on the DIGHEM Survey of February, 1981, attempts to explain the lack of response to the Cleveland crown pillars and recommends limited follow up on two minor anomalies.

- * Costs for the 6-month period at \$4,549 represent mainly costs carried over from work performed during the last period.

2. INTRODUCTION

Exploration licence E.L. 1/63 is situated in the north-west of Tasmania, 98 kilometres from Burnie at $41^{\circ}28'S$, $145^{\circ}24'E$.

This exploration licence surrounding the Cleveland Tin Limited Mining Lease (M.L. 27M/71, formerly M.L. 43/66) was granted to Aberfoyle Tin Development Partnership in August, 1963. It has been held by subsidiaries of the Aberfoyle Group of companies since 1963 and is presently held by Cleveland Tin Limited.

3. PREVIOUS EXPLORATION

(See last report for detailed reference listing)

Original reconnaissance geological mapping on E.L. 1/63 was undertaken by Cox (1967) and Glasson and Cox (1969). This work involved stream sediment sampling and analysis, ground magnetometer traverses and some self potential evaluation. On completion of this preliminary work (from 1964 until 1968), Cox (1969) delineated 13 areas within E.L. 1/63 which required follow-up geological evaluation.

Follow-up work included geological mapping, soil, bedrock, stream sediment and water geochemistry with some ground and airborne magnetics, self potential and induced polarization surveys. This work has been summarized in McWatt (1971), Sale (1972), Ransom and Hunt (1972), Ransom (1972), Ransom and Simpson (1973), Ransom (1973), Sale (1974), Stuart-Smith (1974), Palmer (1975a and 1975b), Ransom (1976a and 1976b) and Gentle (1976). No out-cropping orebodies were found outside the Mine area.

Statistical analysis of the geochemical data (Ransom 1977a and 1977b) showed the Mine/Falls Creek sequence was the most prospective rock unit for further exploration.

An escalation of Mine Exploration in 1978 resulted in no exploration being done within E.L. 1/63 from January, 1978 to December, 1978.

In late 1978 exploration recommenced with surface mapping south of the Mine, diamond drilling 500 metres north of the mine and a UTEM survey in selected areas north and south of the mine. The mapping (Eadie, 1979) showed Hall's Formation continued north and south of the immediate mine area. The UTEM survey failed to recognise the B-South mineralization but did delineate several weak electrical conductors in Hall's Formation.

During the year ending in August, 1980 several anomalous areas were further investigated (Ellis 1980a and 1980b). After check mapping in the Washington Hay area two diamond drill holes were drilled to test the anomalous geochemical zone. These intersected

a brecciated fault zone with weak sub-economic mineralization. Mapping to the east and south of the mine showed a sequence of barren shales, volcanics and sandstone. A DIGHEM survey of the granite contact zones in the eastern areas of the licence showed one weakly anomalous zone.

During the summer season of 1980/81. a new grid was cut in the northern portion of the licence on the Magnet Range between the Corinna Highway and the northern boundary. Mapping of the preliminary lines indicated a largely uninterrupted succession of ultrabasics, sandstone, cherts and volcanics with only minor anomalous soil geochemistry. In addition, new aerial photography provided complete topographic coverage of the entire E.L. (Ellis, 1981).

During the late summer to winter period of 1981, anomalous geochemistry was checked on the Magnet Range and eighteen additional lines were cut and surveyed. A stratigraphic diamond drill hole 500 metres south of the present limit of information was abandoned before entering Hall's Formation due to excessive deviation. A previous DIGHEM anomaly on the eastern Granite Contact Zone was investigated and found to be due to gravels beneath the Tertiary basalt cover. A complete DIGHEM survey was carried out over the entire E.L. showing very little of interest. A new interpretation of the E.L. geology at 1:10000 was completed.

4. EXPLORATION COMPLETED DURING THE PERIOD.A. INTRODUCTION

Due to the financial cutbacks operating at Cleveland, there was no active surface exploration over E.L. 1/63 during the report period. Emphasis was placed on drilling the Foley Zone W/Sn/Mo prospect deep in the central footwall at Cleveland mine. During the period some \$133,619 was spent on the Foley Zone investigation.

B. DIGHEM SURVEY FOLLOW UP (Refer to DIGHEM report from last period)

Following receipt of the final report from the DIGHEM Survey consultants in mid-1981, some concern was registered over the lack of response from the remnant crown pillar still existing on the surface at Cleveland. This matter was referred to Aberfoyle geophysicist, J. Silic, for explanation. (See Appendix).

It is suggested that the tonnage remaining in the 20 metre crown pillar of Hall's A-B lens is insufficient to cause a dramatic response in the EM channel. This was made weaker by the fact that by misfortune, the helicopter flight path wandered off line at this point giving a larger spacing than required. This explanation is not totally acceptable and Cleveland Tin Limited finds the lack of EM response to Cleveland pyrrhotite mineralisation unsatisfactory and disappointing.

Of the anomalies recorded by DIGHEM Ltd., Silvic recommends follow up of 2 anomalies; 18G/190 and 32A.

a) Anomaly 18G/190.

This grade 2 EM anomaly with no magnetic response occurs in the magnetic "black argillate" unit near the Meredith Granite Western contact. Follow up is not required since the anomaly exactly coincides with the dam wall of the Magnet Dam near the Corinna Highway, probably built from Magnet Mine mullock.

b) Anomaly 32A

This high rating anomaly occurs in the far northern portion of the licence in ultrabasic rocks. It lies on the Western margin of an intense (3000 γ) magnetic anomaly associated with a N.E. trending belt of dolerite and gabbro. This lies near to a 1000 γ ground magnetic anomaly measured in line NL24W associated with magnetite mineralisation with soil Ni values of up to 1150 ppm. However, the lines cut do not reach the area of the DIGHEM anomaly and until the response is satisfactorily repeated on the ground, this anomaly remains unexplained. Further work is warranted, despite the unattractive geology.

5. FUTURE WORK PROPOSED

While the Foley Zone exists at depth in the Cleveland Mine, there is nothing on the surface in E.L. 1/63 which justifies withdrawing exploration funds from the highly promising tungsten prospect to finance surface exploration on E.L. 1/63. All anomalies existing, both geophysical and geochemical, are of extremely low order with little likelihood of a major discovery to match the promise of the Foley Zone mineralisation.

Therefore, until results in the Foley Zone prove otherwise, all surface exploration on E.L. 1/63 should be postponed.

6. EXPENDITURE

Expenditure for the period July 29, 1981 to February 9, 1982 (to coincide with accounting periods) was as follows:

Geology and administration	\$ 433
Survey	0
Geochemistry	0
Geophysics	2,991
Sampling	55
Petrology	902
Drilling	0
Drafting	568
<u>Total</u>	<u>\$ 4,549</u>

These costs largely represent costs incurred last period but carried over to this period due to late invoicing and accounting.

7. CONCLUSION

Final follow up of the DIGHEM anomalies was recommended by the Aberfoyle geophysicist - one of which warrants further work.

No further work on E.L. 1/63 is proposed while the Foley Zone in the Cleveland Mine demands urgent investigatory drilling.

Total expenditure for the period July 29, 1981 to February 9, 1982 was \$4,549.

APPENDIX

ABERFOYLE

821011 MEMORANDUM

Date 1st October, 1981

Ref JS:JJ

To GARY McARTHUR

From JOVAN SILIC

At CLEVELAND TIN

At EAST HAWTHORN

Copies to

Keep

Subject DIGHEN AIRBORNE E.M. SURVEY OVER THE CLEVELAND EL.

Since the survey was flown as you will recall I have discussed the results with you and Peter Ellis and at that time I left you with copies of 4 maps (EM, Magnetic, Enhanced Magnetics & Resistivity maps) that show the results of the survey. If you don't have these maps please notify me as soon as possible and I'll arrange that copies be sent out to you. Also you should have a copy of the report that was written by the Dighem people, which explains the system and it also includes their recommendations.

Therefore I feel that I should not go into great details explaining the Dighem system to you (not unless you have some particular queries) and as such this memo of mine is meant to be a comment on the recommendations that the Dighem people have made.

(1) QUALITY OF DATA

The quality of data collected was good, and it was within the noise levels specified in the contract.

Power lines around the Cleveland mine did cause problems (the magnetic field due to the current in the power lines was producing high level noise on the EM channels), and because of that, we have to accept the fact that we cannot state with any certainty that there are no subtle or deep conductors in the areas around the power lines.

The ground clearance (one of the most important parameters in an EM survey because EM signals fall off very rapidly with height) was generally good, considering the rugged topography of the area.

The processing and the presentation was of the usual high standard that we can always accept from the Dighem company.

(2) "PROBLEM" WITH THE CLEVELAND HALL LENSES

The Cleveland mineralisation (or should I say what's left of it) was picked up on two lines as a possible conductor, in other words it was assigned the lowest rating on the Dighem scale. These so called possible conductors are only recognised after careful and special processing that compares and processes the measurements from the four EM channels in order to determine the smallest of deviations on any one of the EM channels from the expected "normal" responses which are based on the assumption that no discrete conductors are present.

Therefore the assignment of a possible conductor to a feature indicates three things.

- (1) we may be defining a very good conductor at a depth that is recognised as the limiting depth of penetration for the system.
- (2) we may be defining a close to the surface source which has a small conductivity x volume value. This concept of conductivity x volume is very important, since EM systems not only define good conductors, but they also define how much conducting material happens to be in the ground. This is the reason why when we put figures on the EM response we talk in terms of a parameter known as a conductivity thickness product and not conductivity, when we are describing responses of long sheets that are of considerable depth extent. A good analogy to use here is gravity. For example the size of the gravity anomaly depends on the depth to the feature, the density contrast that the feature has with its surroundings and most importantly it also depends on the volume (ie the excess mass = $\Delta\rho \times V$) of the feature. In EM responses conductivity can be thought of as being analogous to the density contrast in gravity.

To further clarify the critical dependency of the EM responses on the dimensions of the target I will use the following concept.

It is extremely easy to show (from very general considerations of the EM theory) that the parameter that governs the response of any system is $\theta = L \sqrt{2\pi\mu\sigma f}$

where σ is the conductivity of the target

f is the exciting frequency

μ is the magnetic permeability (which does not vary greatly for rocks)

L is the measure of the dimensions that describe the body and the measuring system.

What this means is that, if we had two bodies in two separate systems whose response parameters θ are the same ie

$$2\pi\sigma_1 f \mu L_1^2 = 2\pi\sigma_2 f \mu L_2^2$$

then the responses from them would be identical. For example if,

$$L_2/L_1 = 3$$

then body one has to have a conductivity $\sigma_1 = 9\sigma_2$

in order for body one to have the same amplitude response as body two. As you can see the response parameter is a function of (dimensions)².

A theoretical example that illustrates this point is the solution for the in phase and out of phase components of the EM field for an infinite cylinder of conductivity σ_2 and radius R.

The attached diagram shows that when the response parameter for the cylinder which equals to $\theta = R \sqrt{\sigma_2 \mu_2 2\pi f}$

is about 1.0 on the $\mu_2/\mu_1 = 1$ curve the inphase component is approximately equal to about 0.03 - 0.04. However when the response parameter is increased to 3, the inphase component is equal to about 0.4.

This implies that by keeping the exciting frequency and the conductivity of the cylinder constant, then a 3 fold decrease in its dimensions would imply a ten fold decrease in its response.

-3-

Let us now assume that the response for Cleveland (when it was all in the ground!) was comparable to that of the S-lens at Que River. The Que River inphase response on the Dighem System was about 30 ppm. The S lens has a depth of extent of about 200 meters. This then means that if we mined out the bottom 180 metres, we would expect a 30 - 100 fold decrease in the response for the S - lens i.e. response of the remaining top 20 meters would be less than 1 ppm, which would be well within the noise envelope for the Dighem system.

These somewhat "crude" arguments (they are a few other points which I should have raised), show the critical role the dimensions of the body together with its conductivity have in determining the size of its EM response.

(3) the possible conductor classification is the result of spurious noise levels on the EM channels.

Of the three possibilities I favour the second one. It is very obvious that in a "geophysical sense" very little pyrrhotite is left in the upper portions of the Hall lenses, since there is not even a magnetic anomaly that can be associated with the left overs,

So, (and please take this as a tongue in cheek comment) it just goes to show what an effective technique EM really is

IT NEVER FINDS, MINED OUT MINES!!

And now to the pleasant task of recommending what should be done with the results of the survey.

RECOMMENDATIONS

Anomaly 1 A:

Anomaly 1 is somewhat suspect and it may have been caused by the aerodynamic noise on the EM channels. No follow up is recommended, unless the anomaly is in a very favourable area.

Anomaly 14B is due to the tailings dam

Anomalies 14xA - 17xD are most likely due to cultural effects around Cleveland. They are all low order anomalies.

Anomalies 16A - 17A are tailing dam anomalies.

Anomalies 18G and 19 O

18G a grade 2 EM anomaly with no magnetic response is complicated by the magnetite caused "noise" on the EM channels. Our experience with these sort of anomalies in the Meredith licence has been a frustrating one, i.e. we could not locate them with our ground surveys. The conclusion from that was, that the anomalies were caused by "noisy" magnetite effects on the EM channels. I would recommend a brief follow up of this anomaly, if you felt that the geology of the area was favourable. This was the philosophy that we applied to our Meredith licence, with these sort of anomalies.

OUT OF EL IN
DIPKIN AREA - FURTHER
IN SILVERDALE STAG.

O.K.

O.K. - NO MAGNETIC ANOMALY

O.K.

LOCATED CLOSE TO
GRAND HAY IN 2000
MAPPER AS "BLACK MAGNETITE"
WOULD BE EASY TO
LOCATE AND REPLY IS
EXCELLENT
HOWEVER, FLOOD ON HALL
OF SILVERDALE DAM.

REVISIONS OF O.K.
APPROXIMATE AND GRADIENTS
SAMPLES AND MAGNETIC
ON IF WARRANTED.

IN ULTRAMAFIC/
SIC UNIT. LOW RES.
STRIKING PROBABLY DUE
TO WEATHERING TO
OF THE UNIT
PROBABLY BEING
IN THE AREA
FOR THE WORK

Anomalies 23P, 25xD 27G, are all located in a geological unit of a low resistivity. Considering that they are all low order anomalies, it is concluded that they are outlining minor lateral resistivity variations within the unit.

ES ON THE WESTERN
MARGIN OF AN UNLITE
(2000?) METRIC
DAILY ASSOCIATED
WITH A N.E. TRENDED
MAGNETIC/ULTRAMAFIC UNIT
3A FROM THE
WESTERN PART OF
NS NL 24W TO
17W SHOULD
EXPLAIN THE MAGNETIC

Anomalies 27A - 28A, 32xA - 35A, all lie in a geological units of low resistivity (can you suggest what this unit is), all seem to be caused by broad flat lying sources, they are all low grade anomalies, and are therefore interpreted as outlining minor lateral changes within the low resistivity unit.

Anomaly 32A, Because the response for this anomaly is entirely in the inphase channels this anomaly has been given the highest rating. When evaluating this anomaly we have to keep two things in mind.

(a) although it is not impossible it is extremely rare to come across anomalies that are entirely inphase anomalies (e.g. extremely good conductors will give only inphase anomalies providing the exciting frequency is high enough).

(b) Inphase channels are more noise prone than the out phase of channels ie the inphase measurement is taken at the time when the transmitting field is at its maximum strength, so therefore, any movement (aerodynamic noise) between the transmitting and the receiving coils at the time of the inphase measurement, will result in an erroneous inphase anomaly, since the processing of the signal assumes a certain separation between the receiver and the transmitter at the time of measurement (ie a wrong value for the theoretical primary field is then calculated). This is not the problem for the out of phase measurement, since that measurement is taken at a time when the transmitting field is zero.

PRIMARY
↓
THE LOCATION
TRENCH OF NL 24W
0. 1000% MAGNETIC
PRIMARY IS ASSOCIATED
WITH ANOMALIES
IN SOIL VALUES
1150PPM
NO GROUNDWATER
CORRELATION ON NL 24W
OPEN PIT AND
GRAVELL SCHE
SEE MAPS.

Taking (a) and (b) into account and noticing that the deviations on the inphase EM channels are slightly bigger than the maximum specified aerodynamic caused noise for the system, one has to argue that a very likely explanation for the anomaly is that it is caused by aerodynamic vibrations in the system (ie very minute-less than a 1-2 mm variation in the separations between the receiver and the transmitter.)

Also we must remember that 32A is a one line anomaly with the slightest of possibilities that it may extend to line 33, and therefore this anomaly has to be severely downgraded unless we have a very good geological reason for going into the area.

If in fact this anomaly is real, then it follows, that the causing body must be at a depth greater than 70 meters.

Regards

Jovan Silic.

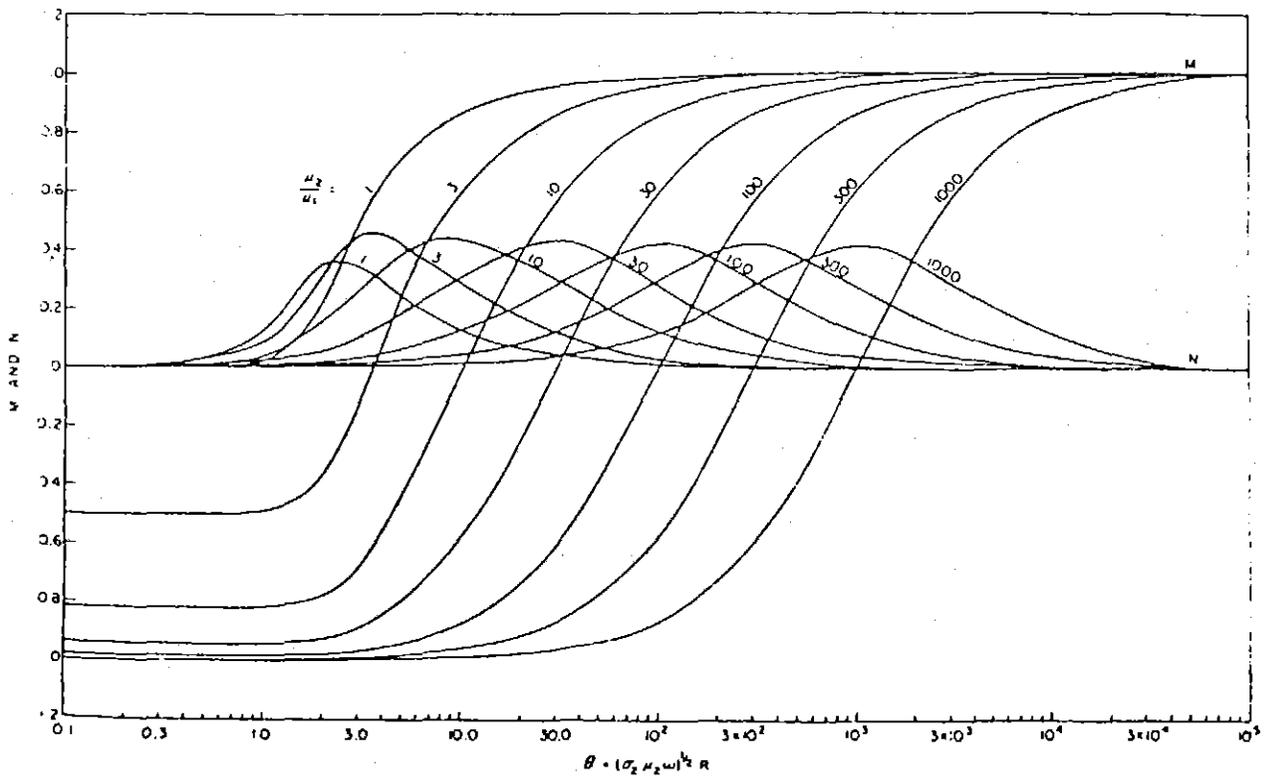


FIG. 7-2. In-phase (M) and out-of-phase (N) components of induced dipole moment of an infinite cylinder in a transverse uniform alternating magnetic field.