ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

WEST COAST DEPARTMENT

REPORT ON MAGNETIC ANOMALY 'A' AT

MELBA FLATS E.L. 2/62

BY

D. O'N. HACKETT

Report No. 100. **Date** JULY 1969.

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ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

West Coast Department XXXXXXXX. MINES

MEMORANDUM

TO :— Superintendent. DATE :— 29th. July, 1969

FROM :— Chief Geologist.

SUBJECT :— EXPLORATION - MELBA FLATS E.L. 2/62 - MAGNETIC ANOMALY

Attached is a report by D. O'N Hackett which is concerned with the reassessment of the magnetic anomaly in the Melba Flat E.L. 2/62. The anomaly had been tested by two drill holes which had apparently failed to explain the source of the anomaly.

The reassessment has shown that the source of the anomaly is 10 to 12 per cent disseminated magnetite in tuffaceous sandstone and is therefore of no further interest.

R. L. Bruthinto
CHIEF GEOLOGIST.

RLB.B'B.

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Report on Magnetic Anomaly "A" at Melba Flats E.L.2/62

BY

D.O'N HACKETT

July 1968

Report No. 100

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REPORT ON MAGNETIC ANOMALY 'A' MELBA FLATS E.L. 2/62

Summary

This report is concerned with the reassessment of the magnetic anomaly located in 1965 within E.L. 2/62. Drilling of two holes had failed to locate a recognisable source of the anomaly at the target depths. The traverses were re-run with a magnetometer and the results were plotted in their correct relationships. Cross-sections drawn of the drill holes from the new data indicated that the source should have been intersected in different places to those previously expected. Tests on the core revealed a tuffaceous sandstone with a high magnetic susceptibility in the anticipated zone. The presence of substantial quantities of microscopic magnetic grains in this core was confirmed by petrographic and mineragraphic methods.

1.0 Previous Work

In 1965, a magnetometer survey was made over a grid cut in the northern portion of E.L. 2/62 to try to locate Renison Bell type mineralisation in the area. This survey located two elongate roughly parallel anomalies striking NW-SE. The western anomaly, anomaly 'A', which is the major one, was given a detailed quantitative examination by Webster (Company report dated June, 1967) and as a result a diamond drill hole was sunk to investigate the anomaly at its point of maximum intensity on line 2S. This first hole (MFP 124) failed to intersect any rock recognisable as likely to cause the anomaly and since, in the target zone the rocks were weathered, a second hole, MFP 125 was sunk in order to obtain a deeper intersection in fresh unweathered rocks. MFP 125 passed through a similar sequence of tuffs, argillites and mudstones to that seen in MFP 124 but again no recognisable magnetic source was located.

It was then decided to apply other methods of investigation before drilling again and a survey by geochemical soil sampling was made. This geochemical sampling programme revealed a number of geochemical anomalies, but in no way could any of these be correlated with either of the magnetic anomalies. However, during the process of soil sampling the area, various discrepancies in the positions and directions of the cut lines and instances of mis-numbering of the 100' pegs suggested that a re-examination of the magnetics could reveal variations in the strike and direction of the anomalies since the original plots had been made on the ideal grid rather than the actual one.

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It was then decided that further magnetometer readings over the anomalous portions of Lines 1S and 2S be taken and that some attempt be made to plot these relative to each other rather than where they should have been taken.

2.0 Recent Work.

In June 1969 magnetometer readings were taken at 20' spacings over the anomalous portions of lines 1S and 2S.

The two lines were found to be almost exactly one hundred feet apart in this area and parallel, they were also on the correct direction of the east-west magnetic line. It was also found that there was a displacement of the 100' pegs on line 1S of 100' to the west relative to the pegs on line 2S.

The magnetometer results were first plotted as profiles for comparison with the previous survey. Both profiles were found to compare accurately for shape but the 1S profile was found to be displaced 100' to the east of the original.

The results were then plotted in plan and the 0, 250, 500, 750 and 1000 gamma contours were drawn. The strike of the magnetic source was then measured as 300°M.

Finally cross-sections of the drill holes were drawn and the position of the source on each section was drawn in. The source was assumed to be that as calculated for line 2S by Webster (called 1S in his report) with corrections for the newly obtained strike and for changes from the apparent dip of -45° NE on the line 2S section to a true dip of 64° N.E.

The cross sections showed that:-

(a) M.F.P. 124 would have passed through the top of the source probably in the weathered zone.

(b) M.F.P. 125 would have intersected the source between 165' and 212'.

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The core from M.F.P. 125 was then tested piece by piece against a magnetometer. A marked reaction was found to occur over all pieces of core between 130' and 270' with changes in the reading between 300 ɣ and 600 ɣ. Very little effect was noted on core from elsewhere in the hole.

A length of the core showing the greatest magnetic effect was sent to AMDEL for detailed petrographic and mineragraphic examination and for magnetic susceptibility tests.

3.0 Petrography and Mineragraphy (summary of AMDEL report MP4495/69)

The rock can be described as a fine grained tuff or tuffaceous sandstone comprised mainly of angular to subangular fragments of volcanic material, with minor amounts of detrital quartz and other minerals. Opaque minerals were found to occur primarily in the volcanic fragments and amounted to 10-12% of the total rock.

Mineragraphic examination showed the opaques to consist mainly of magnetite with 1% ilmenite and traces of others.

4.0 Magnetic susceptibility.

Magnetic susceptibility tests were done on two portions of the core, section 'A' being finer grained than 'B'.

The tests showed the following susceptibilities:-

'A'..... $6,500 \times 10^{-6}$ c.g.s. units

'B'..... $8,500 \times 10^{-6}$ c.g.s. units

Either of these values would place the rock well above the level of magnetic intensity normally found in sediments.

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Conclusions and Recommendations.

As a result of a re-examination of the data involved in the discovery of a magnetic anomaly at Melba Flats, and the collection of new magnetometer readings, and the accurate location of the readings relative to one another, more accurate plans and sections of the anomalous area could be made.

It was then found that a section of core from the new target area of M.F.P. 125 was markedly magnetic. Subsequent laboratory examination of this core showed it to contain up to 12% of magnetite and the rock itself to have a far higher than normal magnetic susceptibility.

It can therefore be concluded that the cause of the anomaly is a tuffaceous sandstone containing minor magnetite and is consequently of no economic interest.

Further it would also seem reasonable to assume the eastern anomaly (Webster's anomaly 'B') which has a similar magnitude and strike is likely to be caused by a similar source.

It is recommended that no further work be done on either of these anomalies.

D.O'N HACKETT.

MAGNETITE IN TUFFACEOUS SANDSTONE

Sample: 125/206: TS 23393 (Coarser grained end of specimen.)

Rock Name:
Tuff (lithic sandstone).

Hand Specimen:
Massive, fine grained grey rock with no evidence of layering.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Lithic grains	70-80
Detrital plagioclase	10-15
Detrital quartz	1-2
Detrital clinopyroxene	3-5
Opaque grains (mainly in lithic grains)	10-12
Secondary carbonate	3-5
Secondary chlorite	5-7
Secondary ?luecoxene	3-5

The sediment is composed mainly of sand-sized, angular to subangular fragments of a variety of fine grained volcanic rocks with a few angular fragments of quartz, plagioclase, clinopyroxene, quartzite, chert and opaque grains.
The rock fragments show considerable variation in texture but most of them contain prismatic plagioclase and have a composition of andesite to basalt. Some show flow structure, a few appear to have been vitreous and many contain abundant opaque iron oxide grains (Figure 1). Some contain pyroxene.
The detrital rock and crystal fragments are poorly sorted and vary from 0.05 mm to 0.3 mm with a few larger rock fragments. They are closely packed and there has been very little development of secondary cementing material (Figure 1). Grain boundaries are commonly marked by extremely fine grained material with a light brown colour, high R.I. and D.R. which is tentatively identified as leucoxene.
A little chlorite occurs in some interstices and has replaced minerals in some of the rock fragments.

Traces of carbonate have partly replaced some feldspar crystals. The rock is only moderately well sorted but does not have a matrix: the cement is secondary and appears to be mainly leucoxene with some carbonate.

Polished Section:

An optical estimate of the opaque minerals gives the following:

	%
Magnetite	7-10
Hematite	Trace
Ilmenite	1-2
Chromite	Trace
Pyrite	Trace
Chalcopyrite	Trace

Magnetite occurs as very small (5-10 microns) crystals abundantly scattered through many of the fragments of volcanic rock and also as larger detrital grains in some interstices. Some of the larger grains show exsolved lamellae of hematite. Rare lithic grains contain larger crystals of magnetite.

In some of the rock fragments the magnetite has been oxidized to hematite, and a few of the larger detrital grains have also been partly or completely oxidized. This oxidation probably occurred before the fragments and grains were incorporated in the sediment as fragments with oxidized magnetite are indiscriminently and closely mixed with fragments showing no evidence of oxidation.

Ilmenite occurs mainly as subrounded detrital grains up to 0.15 mm. Most of these have been partly altered to amorphous oxides and leucoxene and many appear partly leached.

Very rare detrital grains of chromite are of variable size up to 0.2 mm. Some are slightly altered around the edges and along fractures. Some are fresh. (Figure 5)

The sulphide minerals pyrite and chalcopyrite occur as generally irregular crystals in a few lithic grains. Cubic pyrite crystals up to 0.2 mm are extremely rare but very fine grained (less than 10 microns) pyrite is more common.

Chalcopyrite occurs in trace amounts only in very few fragments and these commonly show minor amounts of red-brown iron oxide staining.

History:

The sandstone is composed mainly of detrital material derived from volcanic rocks of basic to intermediate composition together with detrital grains of partly altered ilmenite, magnetite and chromite and rare lithic grains containing minor amounts of pyrite and chalcopyrite. Most of the magnetite present occurs as very small crystals in the volcanic rock fragments.
The sediment probably accumulated fairly rapidly.

Sample: 125/206: TS 23392: PS 12796 (Finer grained end of specimen)

Rock Name:

Lithic or tuffaceous sandstone.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Lithic grains	70-80
Fresh detrital plagioclase	10-15
Quartz	Trace
Opaque grains (mainly in lithic grains)	10-12
Fresh clinopyroxene	3-5
Secondary ?leucoxene	3-5
Secondary chlorite	3-5
Secondary carbonate	Trace

This is very similar to TS 23393 except that the detrital material is finer grained (generally 0.5-0.15) and more angular.
Elongate grains and fragments show subparallel orientation (Figure 2). Chlorite has replaced a few fragments and one contains traces of epidote. There are a few orange to red brown, partly weathered or oxidized grains as in TS 23392 and extremely fine grained leucoxenic material

occurs along all boundaries between detrital grains. Fragments of igneous volcanic parentage are dominant.

Polished Section:

An optical estimate of the opaque minerals gives the following:

	%
Magnetite	7-10
Hematite	Trace-1
Ilmenite	Trace
Chromite	Trace
Pyrite	Trace
Chalcopyrite	Minute trace

This is very similar to PS 12797. Magnetite occurs as small crystals in volcanic rock fragments and as larger detrital grains (Figure 4). Some has been oxidized. There are also a few rock fragments containing very fine grained hematite which has crystallized as specular hematite and is not oxidized magnetite.

There is less ilmenite than in PS 12797. Rare chromite grains are partly surrounded by magnetite.

Three microspherular grains of framboidal pyrite were noted in the section. These are 15 microns across and appear to be within larger detrital grains of transparent minerals, however, this cannot be determined with absolute certainty from the section (Figure 6).

Traces of chalcopyrite occur in very few fragments.

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Magnetic susceptibility tests were done at the Mines Department of South Australia.

Results were as follows:

Air		10803			
A	0°	10028	90°	10028	775
B	0°	9803	90°	9805	1000
		10803			

Density 3.4 gms/cc

Core diam. 1.64 inches

End A Susceptibility 6,500 x 10^{-6} CGS units

End B Susceptibility 8,500 x 10^{-6} CGS units

End A is the finer grained end.

End B is the coarser grained end.

The general appearance of the core suggests a gradual transition from coarser to finer grained detrital material with no apparent interruptions, discontinuities or bedding planes.

The magnetic properties of the core are mainly due to the presence of magnetite which occurs as small crystals in many of the volcanic rock fragments. There are also a few detrital magnetite grains. Some have been partly oxidized.

The rock also contains minor amounts of partly altered ilmenite and traces of chromite.

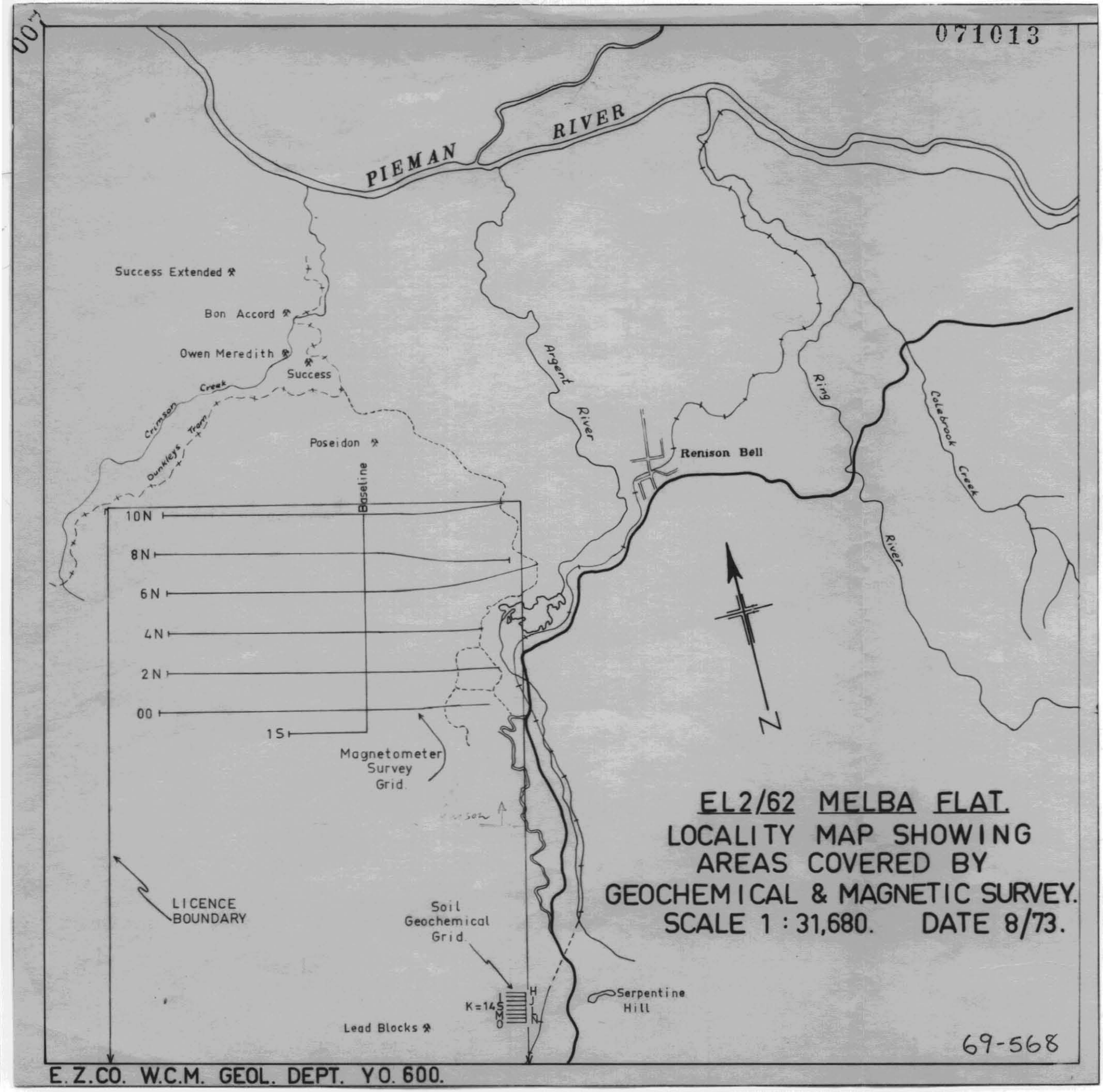

071013
PIEMAN RIVER
Success Extended
Bon Accord
Owen Meredith
Success
Crimson Creek
Dunkleys Tram
Poseidon
Baseline
10N
8N
6N
4N
2N
00
1S
Magnetometer Survey Grid
Argent River
Renison Bell
Ring River
Calabrook Creek
N
LICENCE BOUNDARY
Soil Geochemical Grid
K=14
L
S
M
O
H
J
N
Serpentine Hill
Lead Blocks
EL2/62 MELBA FLAT.
LOCALITY MAP SHOWING
AREAS COVERED BY
GEOCHEMICAL & MAGNETIC SURVEY.
SCALE 1 : 31,680. DATE 8/73.
69-568
E.Z.CO. W.C.M. GEOL. DEPT. YO. 600.

PLATE 1a

340

20'

41°45'

145°30'

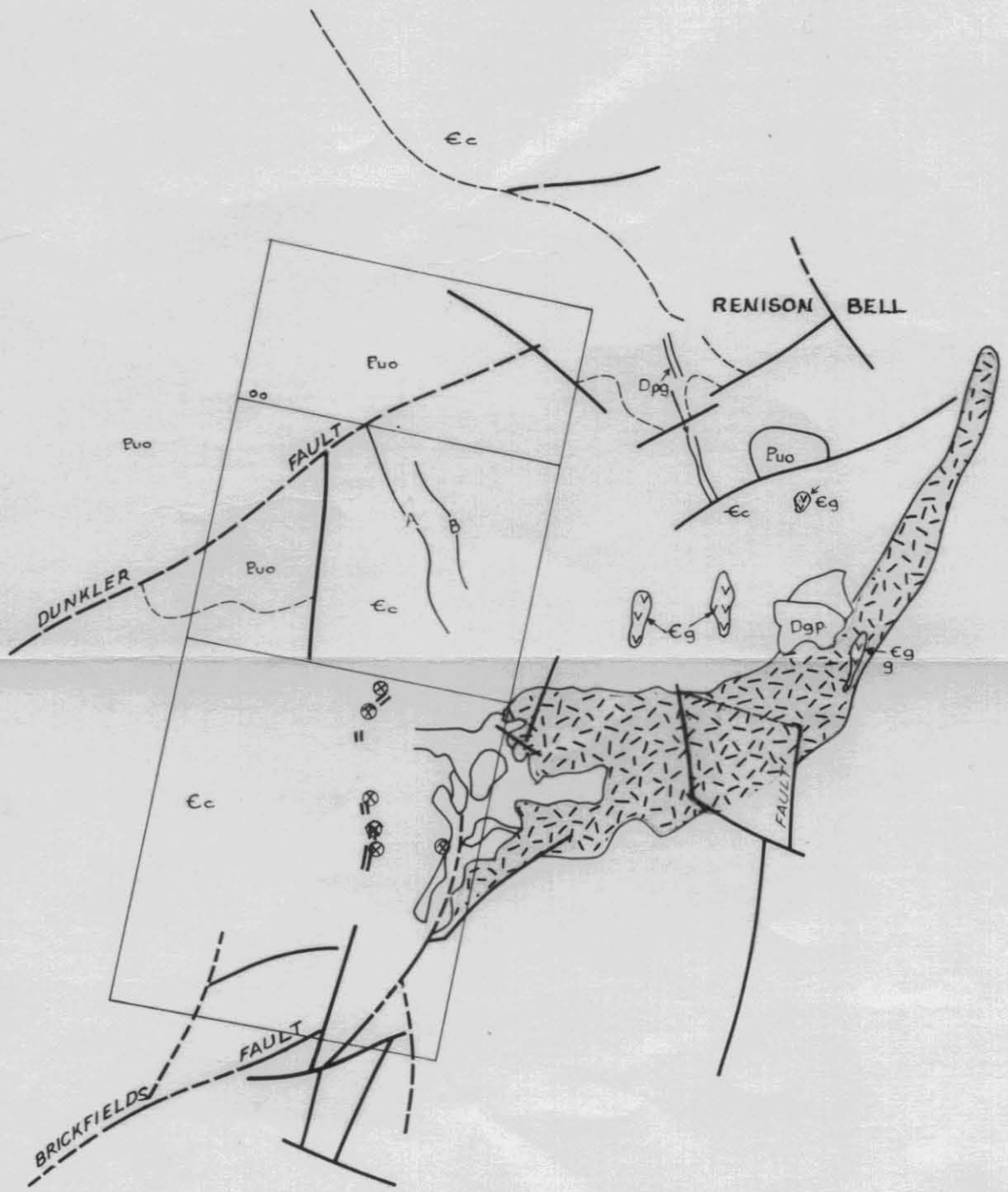
41°45'

PART OF ZEEHAN

Geological Map 1 mile = 1 inch

SHOWING

MELBA FLAT MAGNETIC GRID &
SURROUNDING GEOLOGY



REFERENCE

- Es Cambrian Serpentine.
- Eg Cambrian Gabbro.
- Cu-Ni bearing basic Rock
- Geological boundary
- " Fault
- Mine
- POSITION OF MAGNETIC ANOMALIES

Scale in Miles

0 1 2 3

5 cm

840

840

55'

340

Drawn: V.P.B. 17-5-67

003

Plate 2

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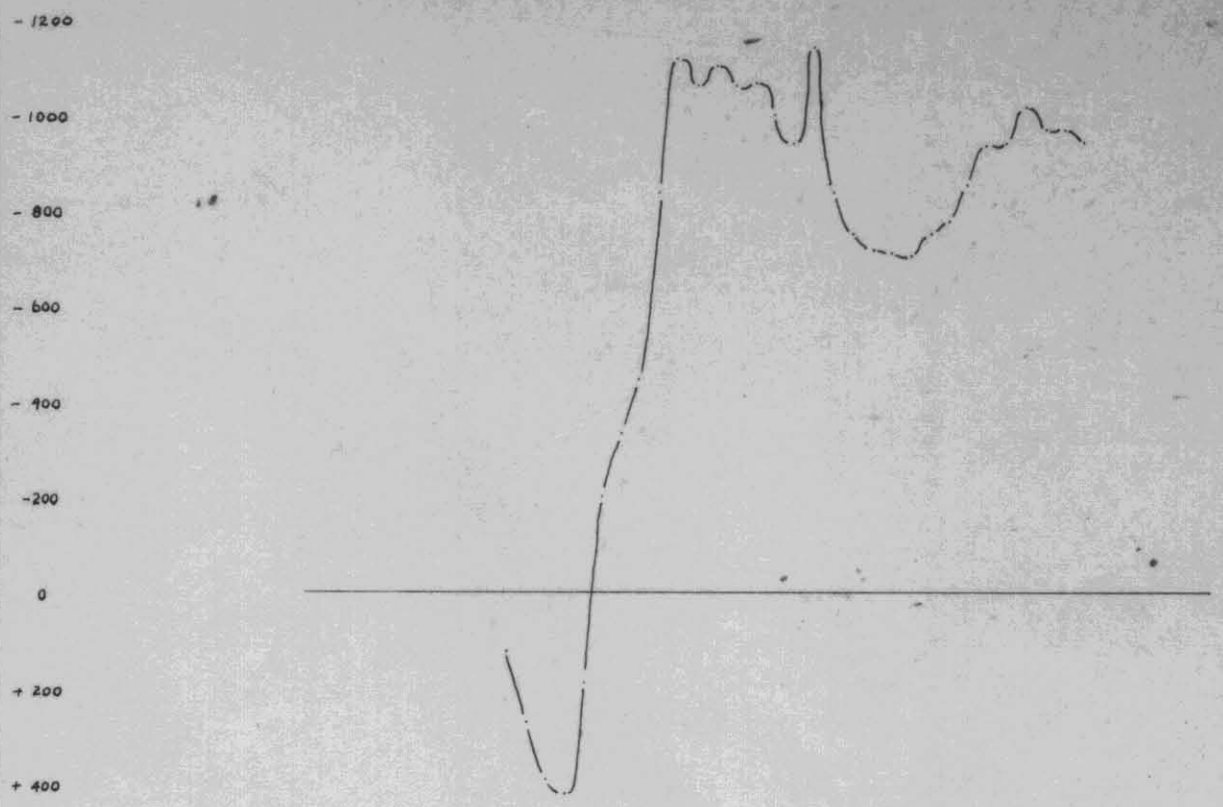

(Corrected relative to Line 2S) 60W 59W 58W 57W 56W 55W 54W 53W

MELBA FLATS E.L 2/62

MAGNETIC SURVEY

Follow-up readings Line 1S

Scales

Vertical 400 γ per inch

Horizontal 200 feet per inch

5 cm

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E.Z.CO. W.C.M. GEOL. DEPT. ZO.283.

Plate 3

010

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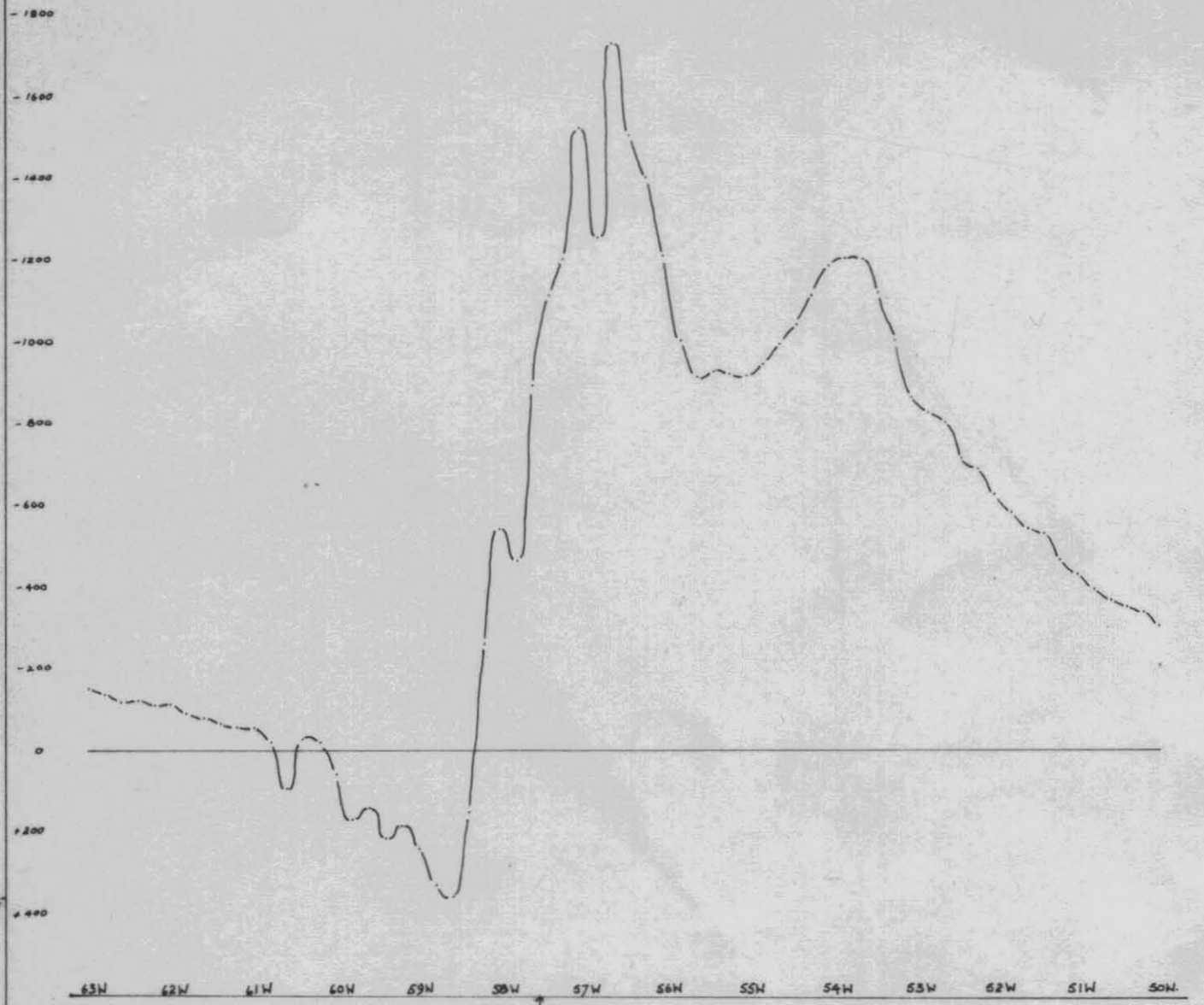
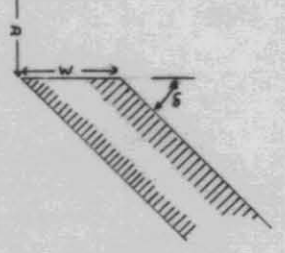




δ = 45°
W = 100'
D = 100'

MELBA FLATS E.L 2/62

MAGNETIC SURVEY

Follow-up readings Line 2S

Scales

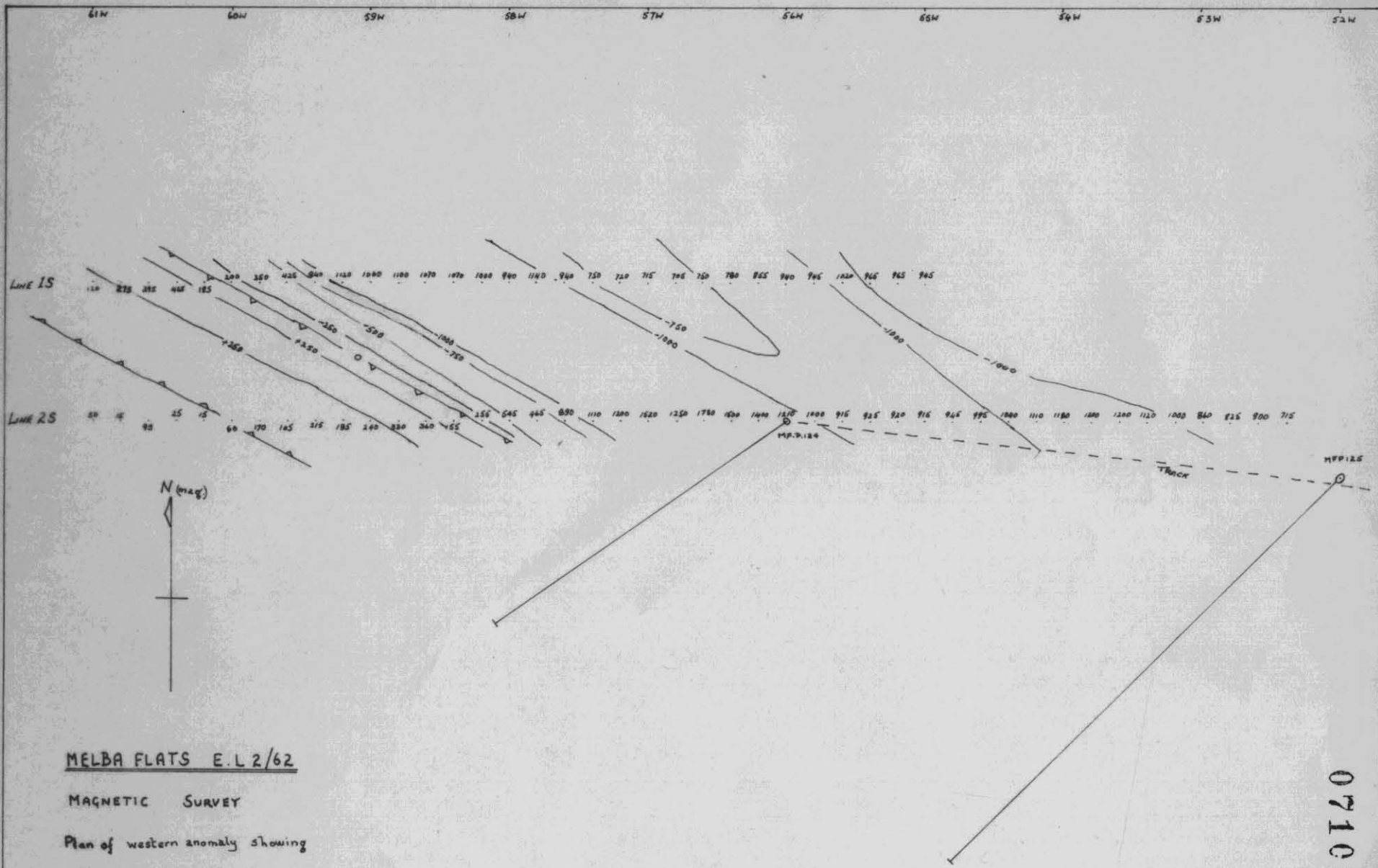
Vertical 400 γ per inch.
200 feet per inch.

Horizontal 200 feet per inch.

5 cm

69-568

E.Z.CO. W.C.M. GEOL. DEPT. ZO. 281.



MELBA FLATS E.L 2/62

MAGNETIC SURVEY

Plan of western anomaly showing magnetometer readings, magnetic contours and drill-hole positions at Lines 1S and 2S

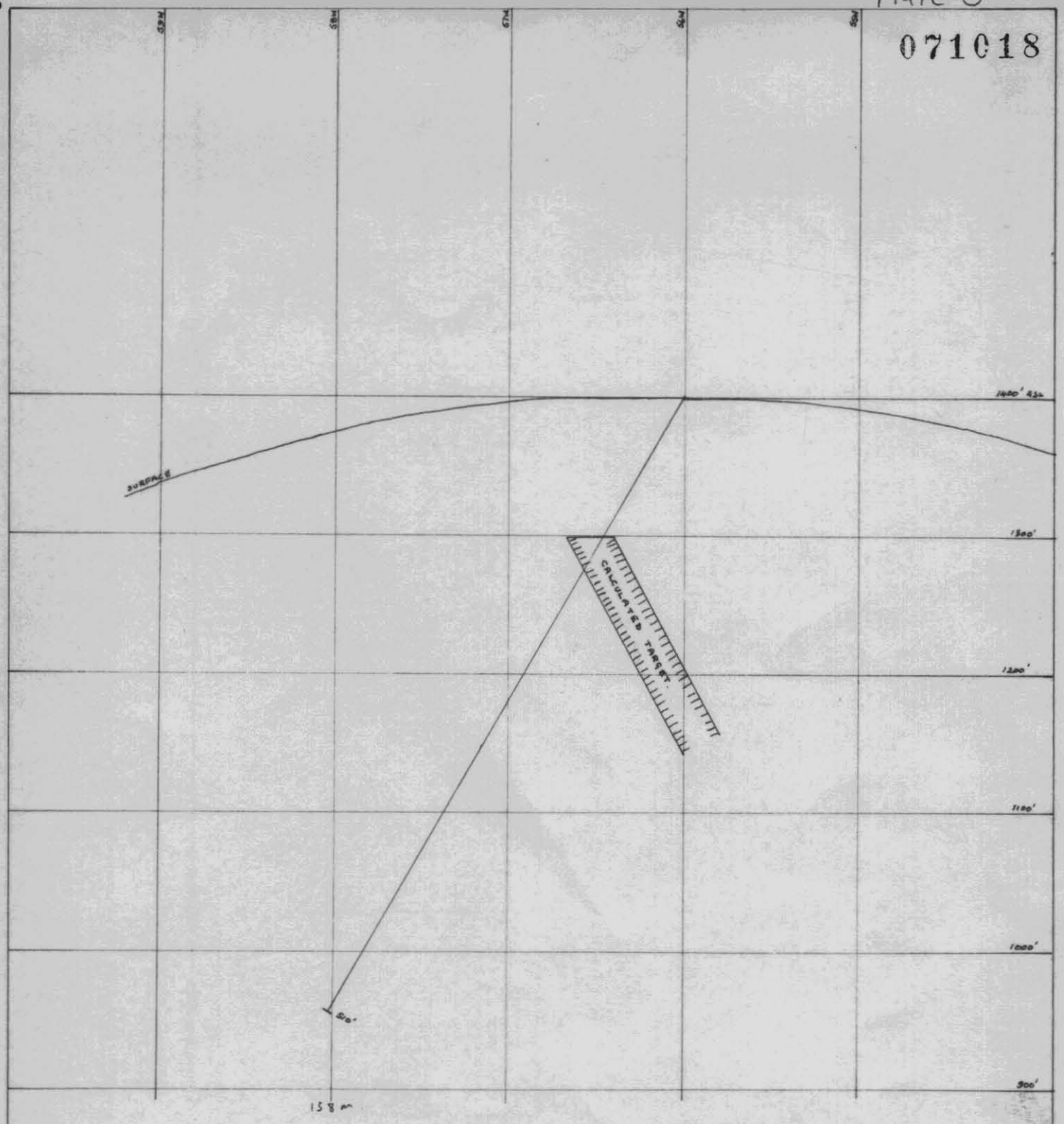
Scale:- 1" - 100 feet

5 cm

012

Plate 5

071018



MELBA FLATS E.L.2/62

CROSS-SECTION OF M.F.P. 124

DIRECTION 235°M.

INCLINATION -60°

5 cm

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E.Z.CO. W.C.M. GEOL DEPT. 20.280

Plate 6

011

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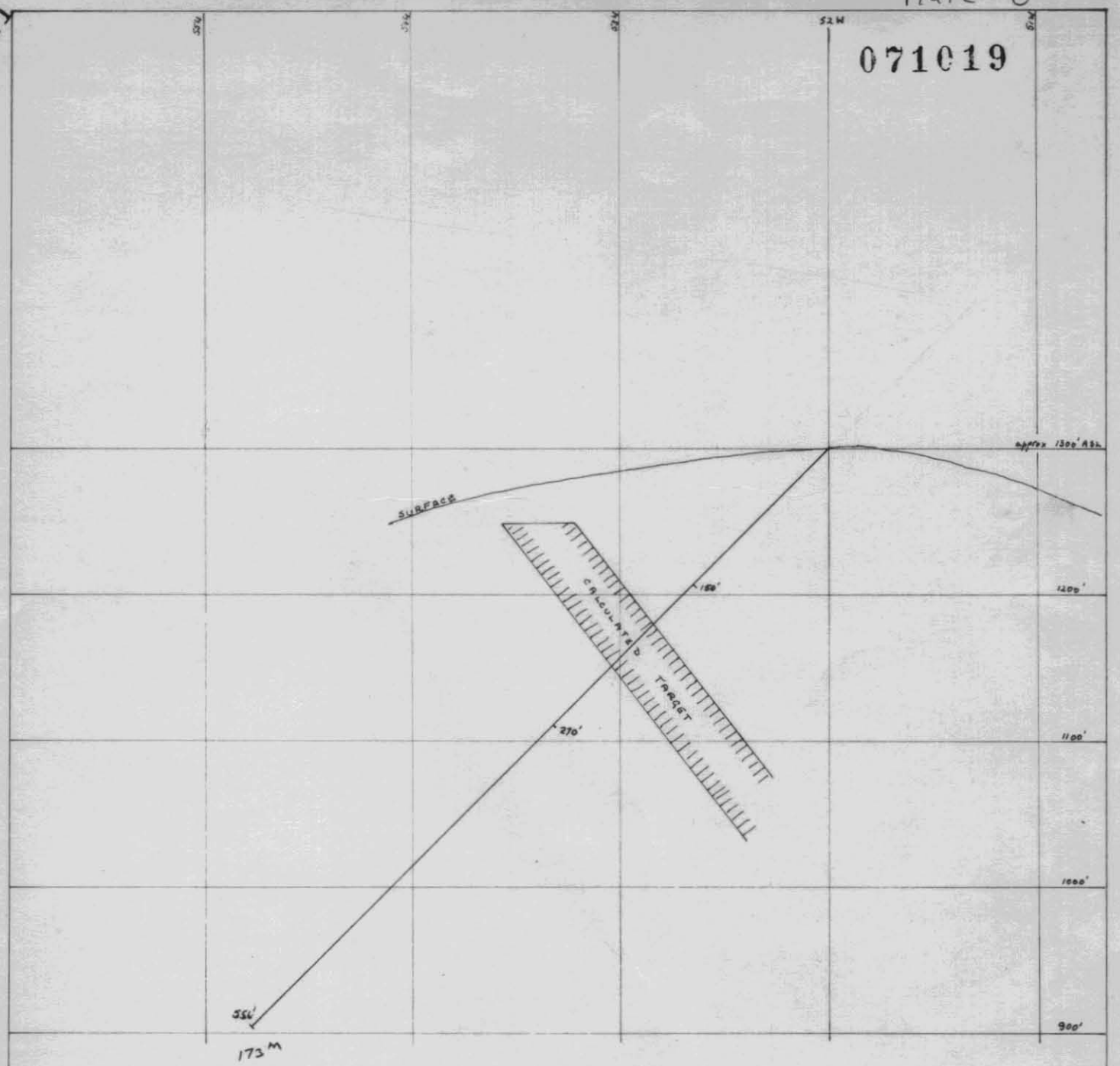

MELBA FLATS E.L.2/62

CROSS-SECTION OF M.F.P. 125

DIRECTION 225°M

INCLINATION -45°

ZONE OF GREEN TUFFACEOUS SANDSTONE WITH HIGH MAGNETIC SUSCEPTIBILITY 130' - 270'.

5 cm

Scale :- 1" - 100'

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E.Z.CO. W.C.M. GEOL. DEPT. ZO 279.