

000

238001

E.L. 3/65

AIRBORNE PROTON MAGNETOMETER

SURVEY

BEACONSFIELD AREA - TASMANIA

GEOPHYSICS

FOR

THE BROKEN HILL PROPRIETARY COY. LTD.

BY

AMEG PTY. LTD.

MICROFILMED

August, 1965

*For overall plan and transparency
see K. Kendall B.H.P. folders
EK*

AMG REFERENCE POINT ADDED

query Beaconsfield Gas for B.H.P. Co. 65-401

Date	Date returned to:
14/72	18/4/72
72	31-5-7
-1	-1

MICROFILMED

The term Mt Sugarloaf is incorrect - it should read
Peaked Hill - the data base has been amended
accordingly - Editor, April 1991.

CONTENTS

	<u>Page</u>
INTRODUCTION	1
OPERATIONAL SUMMARY	2
RESULTS	4
DISCUSSION OF RESULTS	6
CONCLUSION AND RECOMMENDATIONS	10

----- 000 -----

Maps:

- | | | | | | |
|-----|--|---|---|---|--------------|
| 1. | Aeromagnetic survey - Beaconsfield area | | | | |
| 2. | ✓ | ✓ | ✓ | ✓ | |
| 3. | ✓ | ✓ | ✓ | ✓ | |
| 3A. | ✓ | ✓ | ✓ | ✓ | |
| 4. | ✓ | ✓ | ✓ | ✓ | |
| 5. | ✓ | ✓ | ✓ | ✓ | Location map |
| 6. | ✓ | ✓ | ✓ | ✓ | |
| 7. | ✓ | ✓ | ✓ | ✓ | |
| 8. | ✓ | ✓ | ✓ | ✓ | |
| 9. | Beaconsfield asbestos project - Vertical magnetic contours | | | | |

INTRODUCTION

In May, 1965, an airborne proton magnetometer survey was conducted over an area of approximately 160 square miles west of Beaconsfield in Tasmania.

The aim of the survey was to assist in geological mapping and prospecting for iron ore and base metals. The survey was divided into a reconnaissance at half mile line spacing and 500 foot mean terrain clearance, and detailed follow up flights at 250 foot mean terrain clearance. A limited ground inspection of some areas of interest was conducted with the aid of a portable magnetometer.

Flight line coverage at the nominal half mile spacing could only be considered moderately satisfactory as navigation over rugged tree covered terrain at 500 foot clearance proved difficult, and was further complicated by a rather poor navigational photo mosaic.

The original survey plan included the flying of the SE portion of the area in more detail at 250 foot terrain clearance, with the flight lines heading NE/SW. This plan was partly abandoned in favour of some NW/SE lines designed to avoid the effect of large NE trending magnetic gradients.

In the far south western area detailed low level flying proved impossible to execute satisfactorily because of sharp topographic relief and the further complication of persistent low level fog and rain squalls.

OPERATIONAL SUMMARY

The survey party arrived at Devonport on 3rd May. The advantage of two days good weather, on the 4th and 5th, was lost while eliminating an unusual equipment fault. The survey flying was commenced on the 6th and extended to the 15th May, with considerable interruption by high winds, cloud, rain and fog.

Personnel:

Geophysicist and operations

supervisor	..	J.K. Newman
Operator/Navigator	..	J. Dawson
Pilot	..	H. Grieve

Aircraft:

Cessna 182A

Airborne Magnetometer:

A Barringer Research (Aust) Pty. Ltd. AM102 proton magnetometer was fitted with detector head located in a bird towed below and behind the aircraft on 60 feet of cable. The magnetometer displayed the earth's field in absolute units and read out in digital/analogue form on a two pen Hagan potentiometric recorder in such a manner that one pen had a 4 inch full scale deflection indicating 0 to 200 gammas in 1.0 gamma increments and the second pen the same 4 inch full scale deflection, but indicating 0 to 2000 gammas in 10 gamma increments. This two pen arrangement was an improvement on

previous single pen displays in that fine detail could be recorded on one pen while the second pen outlined large magnetic anomalies without numerous "backing off" steps. The reading interval was once per second. The chart speed was set at the low value of one inch per minute, owing to a delay in the delivery of a 4 inch per minute motor for the new recorder.

Ground Magnetometer:

A Barringer Research Limited (Toronto) portable proton magnetometer type GM102 was employed for diurnal control and ground follow up.

Radio Altimeter:

A radio altimeter type APN-1 was fitted to the aircraft and used to assist in flying the aircraft at constant terrain clearance.

Camera:

A modified Bolex 16 mm movie camera, fitted with a Fairey extreme wide angle "fish eye" lens, was employed to photograph the ground once every 4 seconds at 500 feet and once every 2 seconds at 250 feet to enable flight path recovery.

Flight Path Navigation:

Flight path navigation was by means of photo mosaic strips assembled by AMEG compilation staff.

RESULTS

The area covered by the survey is indicated on Sheet No. 5. The results are presented as follows:-

Sheets nod. 1, 2, & 3 - magnetic contour maps of the results of 500 foot flying to a scale of 20 chains to the inch and designed to overlay Forestry Commission maps and a Beaconsfield geological map of the same scale.

Sheet no. 4 - magnetic contour map of NE/SW flying at 250 feet terrain clearance and average line spacing of $\frac{1}{4}$ mile, plus five profiles of flying perpendicular to the normal flight direction. Also to an approximate scale of 20 chains per inch, but fitting an enlarged photo mosaic made up by AMEG compilation personnel.

Sheet no. 6 - a composite magnetic contour map including the results of sheets nod. 1, 2 & 3 reduced to a scale of one mile to the inch.

Sheet no. 7 - Three profiles transcribed from records flown over an iron laterite deposit on a ridge intercepted by flight line no. 23 - one flown at constant barometric height to clear the ridge by 300 feet, the second also at constant barometric height but clearing the ridge by 600 feet, and the third flown at a mean terrain clearance of 500 feet. A fourth profile transcribed from the record of flight line no. 20 where it intercepted a 4000 gamma high.

Sheet no. 8 - Plot of anomalous areas suggested by profiles in the Mt. Sugarloaf/Flowery Gully area.

In the ground follow up with portable proton magnetometer the following areas were inspected:-

- (a) Iron rich clays and gravels at Barnes Hill in the vicinity of the larger anomaly on profile C, sheet 3. Field variations of the order of several thousand gammas were recorded over distances of 20 feet.
- (b) A haemetite lode on the western slope of Mt. Sugarloaf approximately $2\frac{1}{2}$ miles NW of Flowery Gully. A sharp dike form anomaly with a positive peak of the order 800 gammas and a negative peak of the order -300 gammas was recorded on several traverses along the hillside. A parallel traverse run over sediments along the valley floor discovered no anomaly within the ± 10 gamma resolution of the magnetometer and suggested that the haemetite lode was cut short by the sediments in the valley.
- (c) Limestone in the vicinity of Flowery Gully. A traverse was run over alluvium cover on limestone. Most of this line proved magnetically featureless. On the western end of the traverse, on a hillside near the contact with Cabbage Tree conglomerate, several very sharp anomalies of the order of 1500 gammas were detected. The source of these anomalies was obviously very close to the surface, but still concealed by overburden.

DISCUSSION OF RESULTS

The reduced reconnaissance magnetic contour map, sheet no. 6, indicates that the magnetic features of the survey area fit a rather simple pattern. There is evidence that more complex but local magnetic detail is hidden in the large magnetic gradients in the south east.

Western Perimeter: The weakly anomalous areas near the mouth of Port Sorrell in the west appear to be associated with pyritic shales. More to the south it is possible that a similar anomalous area is associated with dolerite, which is mapped in the area, though the low magnetic relief does not tally with the normal character of this rock type.

Central Pre-Cambrian: The utter lack of any feature in the large central area would suggest that the pre-cambrian is undisturbed by any basic intrusion.

* Ultra-Basics and Lateritic Iron: Near the eastern perimeter the long line of large amplitude anomalies trending north generally coincides with the mapping of ultrabasics and iron rich lateritic clays and pebbles. The more westerly anomaly on profile C, interpreted as due to a body near surface, does not have any surface expression in the geological mapping. ? chromite
magnetite
garnet
A ground inspection of Barnes Hill, roughly at the position of the larger anomaly on profile C, proved that the lateritic cover was strongly and non-uniformly magnetised, with variations of several thousand gammas in twenty or thirty feet.

Profiles were reconstructed from lines A, B, C, D drawn to intersect the larger anomalies on sheets 2 and 3, and depth

interpretations for these profiles ranged from near surface to 1000 feet and more.

J. Daly has suggested that the variably magnetised sheet of lateritic clay and pebbles overlying the ultrabasics could appear as a body with relatively low bulk magnetisation from a survey height of several hundred feet. This assumption could be tested by running several high resolution ground profiles across the laterite and integrating the results. If proved, this assumption would leave the ultrabasics immediately underlying the laterites with a relatively high susceptibility.

The magnetic contours drawn from low level flying at 250 feet, sheet no. 4, present the same general picture as the reconnaissance magnetics, sheets 2 and 3, though there is more local detail and the field values are higher. The comparison supports the theory of several bodies of moderate susceptibility underlying the surface material at shallow depths.

The ultrabasics occur in an area where the topographic relief is six or seven hundred feet. It proved impossible to keep religiously to a mean terrain clearance of 500 feet and 250 feet, particularly on the approach to a ridge, and this became an obvious source of error in contouring so that some "smoothing" of the contours had to be resorted to. To test the magnitude of errors due to altitude changes and to assist in interpretation, two profiles were flown at constant barometric altitude over a high ridge coincident with the large anomalies on line 23. The barometric lines were designed to clear the ridge by 300 feet and 600 feet. On sheet no. 7

the two barometric profiles are compared with the 500 foot terrain clearance profile from line 23. All profiles are plotted on a linear time base. Distances scaled from the flight path recovery plot are indicated on the profiles, together with ratios of indicated distance versus time. As profiles D and E were flown at constant speed, variations in distance/time ratios indicate the magnitude of plotting errors in routine flight path recovery over relatively featureless terrain.

Consideration of the profiles on sheet no. 7 indicates the magnitude of the errors that can occur in an area similar to Beaconsfield, but also suggest that no very serious error would occur in an interpretation based on any one of these profiles.

Anomalies near Beauty Point: Five lines were flown perpendicular to the normal flight direction, at 250 feet terrain clearance, close to the NE limit of the survey area. An irregularly magnetised area was detailed just west of Beauty Point and possibly coincides with tertiary basalt on or near the surface. Profiles from these lines are superimposed on the contour map of sheet no. 4.

Mt. Sugarloaf/Flowery Gully Area: Ground inspection in the Flowery Gully area indicated that a low level high resolution survey would be useful in detailing small sharp magnetic features such as that associated with the haemetite lode on the western slope of Mt. Sugarloaf and the anomalies in the limestone contact west of Flowery Gully.

The problem in surveying the Flowery Gully area is that the local magnetic detail has to be mapped in the presence

010

of large but relatively uniform magnetic gradients on the flank of the ultrabasic anomalies. The solution was to fly closely spaced low level lines parallel to the strike of the ultrabasic anomalies, and along the main topographic strike. Several lines were flown with rather unsatisfactory results. It proved impossible to maintain a straight course and anything like a constant low level terrain clearance over the relatively rough topography. The few lines that were flown are plotted on sheet no. 8. The haemetite lode and the anomalous area on the limestone contact both appear to have registered on the profiles as small, relatively insignificant anomalies 10 to 15 gammas in amplitude. The positions of these small anomalies, together with others similar in nature, are indicated on sheet no. 8. It proved impractical to contour the data from these lines owing to the wandering flight track and varying terrain clearance in an area of strong magnetic gradients.

A ground traverse across the limestone at Flowery Gully suggested the possibility of this material being outlined as simply an area devoid of local magnetic relief. To do this from the air again required low level constant altitude flight, preferably at right angles to the topographic strike, and proved impractical with the Cessna 182.

CONCLUSION AND RECOMMENDATIONS

The Beaconsfield area has been covered satisfactorily by reconnaissance flying at 500 feet with the results discussed above.

The evidence from limited ground work is that detailed magnetic survey of the south eastern portion of the area could assist in the mapping of limestone and in the location of small deposits of magnetite and haemetite/magnetite as on the western slope of Mt. Sugarloaf and possibly in the limestone near Flowery Gully. Our experience, in the topography of the SE, was that a fixed wing aircraft was unsatisfactory for the type of low level detailed magnetic survey required. It is probably true that a more persistent effort at flying the SE area with the Cessna 182 could have produced useful results, but only at the cost of much unproductive flying and serious problems in compilation. For satisfactory work in this area the choice is between helicopter and ground traverses.

The following recommendations are based on the results of the airborne survey and the limited ground follow up. They should be reviewed when the new geological map of the Beaconsfield area, based on The Broken Hill Proprietary Coy. Limited mapping, comes to hand.

Main Anomaly Intersected by Run 20

The site of the 4000 gamma anomaly should be

012

inspected on the ground with a view to running a gravity traverse. If the topography is simple enough to allow terrain corrections, gravity would help prove whether the main source of this anomaly is a body rich in iron underlaying the laterite. A ground magnetometer traverse should be run simultaneously because of the relatively low extra cost and the possibility of additional interpretive information being gained.

Results of these traverses and any follow up drilling would guide the investigation of the main features intersected by profile C.

Small Anomalies West of Beauty Point

These anomalies are probably due to basalt, but should be followed up with a portable magnetometer and checked on the ground.

Mt. Sugarloaf/Flowery Gully Area

The anomalous area near the limestone/conglomerate contact at Flowery Gully is caused by material lying within a few feet of the surface. A more detailed magnetic survey, a few short ground traverses, should guide trenching designed to identify the magnetic material.

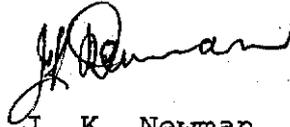
The other anomalies suggested by the airborne profiles should be identified by ground follow up with a magnetometer.

GENERAL

To assess the possible worth of detailed helicopter

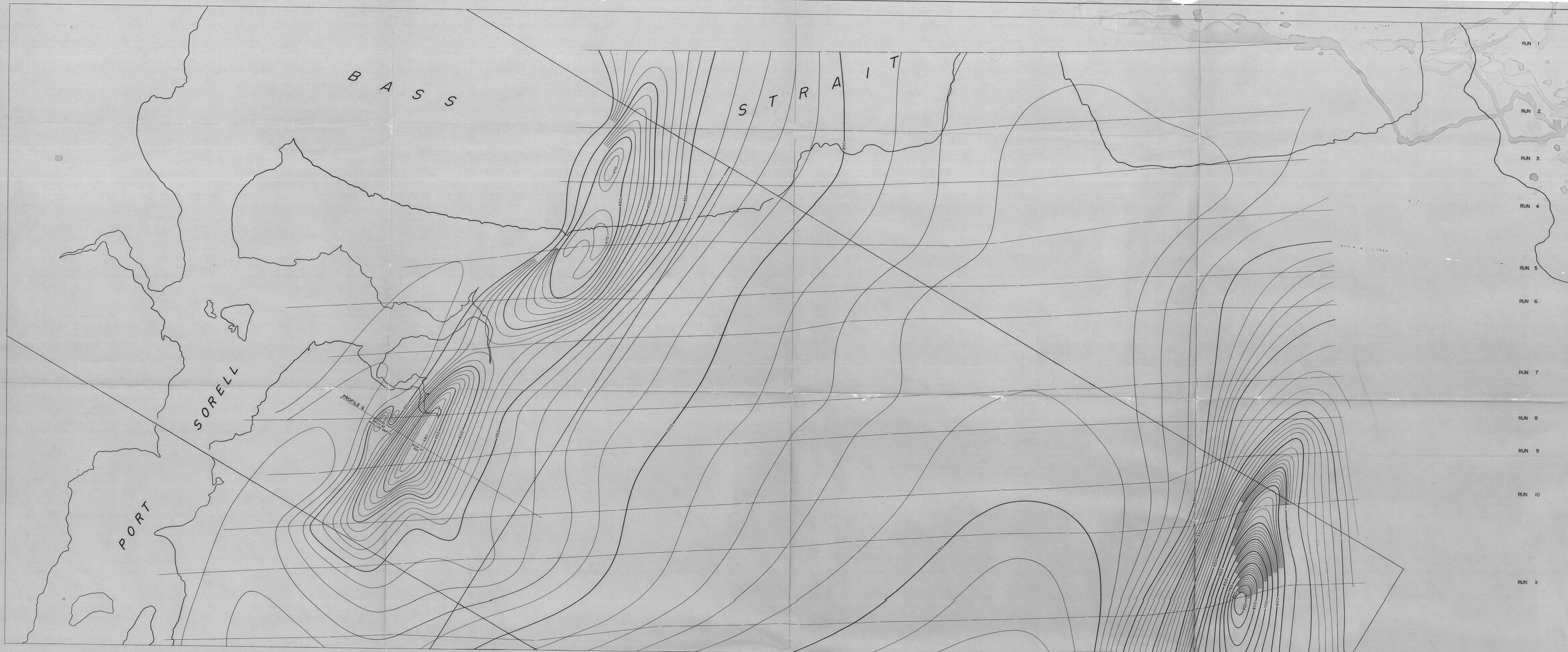
013

or ground traverses some additional ground magnetometer work would be useful. Two traverses across the limestone at Flowery Gully, with stations every 10 feet, would be sufficient to check this method of mapping the limestone. A general follow up of the recent geological mapping with ground magnetometer inspection of rock types and geological situations would suggest where further magnetometer traverses could prove useful, and would provide basic information which would help in the planning and interpretation of future surveys in northern Tasmania.

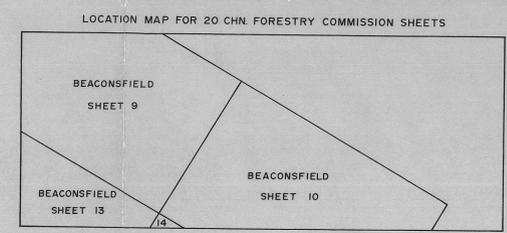


J. K. Newman

Geophysicist.



RUN 1
 RUN 2
 RUN 3
 RUN 4
 RUN 5
 RUN 6
 RUN 7
 RUN 8
 RUN 9
 RUN 10
 RUN 11
 RUN 12



LEGEND

CONTOUR VALUE 54,000

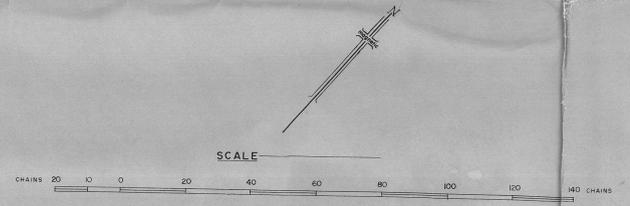
LOW 53,000

HIGH 54,200

CONTOUR INTERVAL 10 GAMMAS

FLIGHT LINE

FLYING HEIGHT 500 FT. M.T.C.



MAP N° A 618



65-401

TOTAL MAGNETIC INTENSITY
 AEROMAGNETIC SURVEY - BEACONSFIELD AREA
 TASMANIA
 FOR
 BROKEN HILL PROPRIETARY CO. LTD.
 BY
 AMEG PTY. LTD.
 TO ACCOMPANY REPORT BY J. DALY.
 DATUM VALUE 62,000 gammas

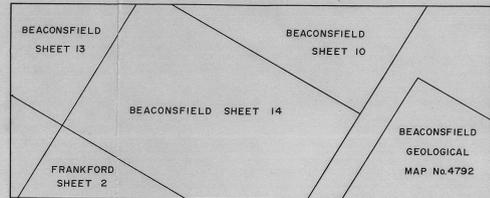
4519

238015
 4519 SHEET No. 1

RUN 12
RUN 13
RUN 14
RUN 15
RUN 16
RUN 17
RUN 18
RUN 20
RUN 21
RUN 22



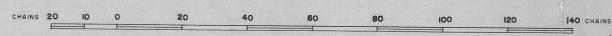
LOCATION MAP FOR 20 CHN. FORESTRY COMMISSION SHEETS



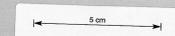
LEGEND

- CONTOUR VALUE 54,000
- LOW 53,100
- HIGH 54,200
- CONTOUR INTERVAL 10 GAMMAS
- FLIGHT LINE
- FLYING HEIGHT 500 FT. M.T.C.

SCALE



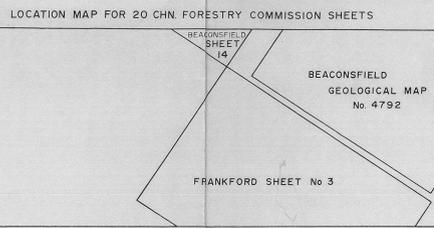
MAP N° A 619



65-401

TOTAL MAGNETIC INTENSITY
AEROMAGNETIC SURVEY - BEACONSFIELD AREA
TASMANIA
FOR
BROKEN HILL PROPRIETARY CO. LTD.
BY
AMEG PTY. LTD.
TO ACCOMPANY REPORT BY J. DALY.
DATUM VALUE 62,000 gammas

4520



LEGEND

CONTOUR VALUE 54,000

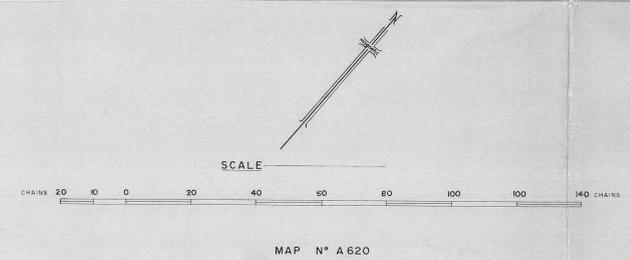
LOW 53,000

HIGH 54,200

CONTOUR INTERVAL 10 GAMMAS

FLIGHT LINE

FLYING HEIGHT 500 FT. M.T.C.



65-401

TOTAL MAGNETIC INTENSITY

AEROMAGNETIC SURVEY - BEACONSFIELD AREA

TASMANIA

FOR

BROKEN HILL PROPRIETARY CO. LTD.

BY

AMEG PTY. LTD.

TO ACCOMPANY REPORT BY J.DALY.

DATUM VALUE 62,000 gammas

238017

4522

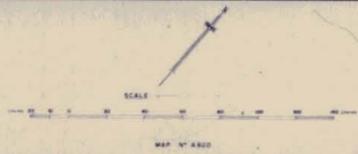
SHEET No. 3

4522



5 cm

LEGEND
 CONTOUR VALUE HIGH
 LOW
 CONTOUR INTERVAL 10 METRES
 FLYING HEIGHT 500 FT W.P.E.



65-401
 TOTAL MAGNETIC INTENSITY
 AEROMAGNETIC SURVEY - BEACONSFIELD AREA
 TASMANIA
 FOR
 BROKEN HILL PROPRIETARY CO LTD
 BY
 AEGIS PTY LTD
 TO FIGURED REPORT BY JGALY

238018

4521

SHEET 3A

RUN 44

RUN 46

RUN 48

RUN 50

RUN 52

RUN 54

RUN 56

RUN 58

RUN 60

RUN 62

RUN 64

RUN 66

RUN 68

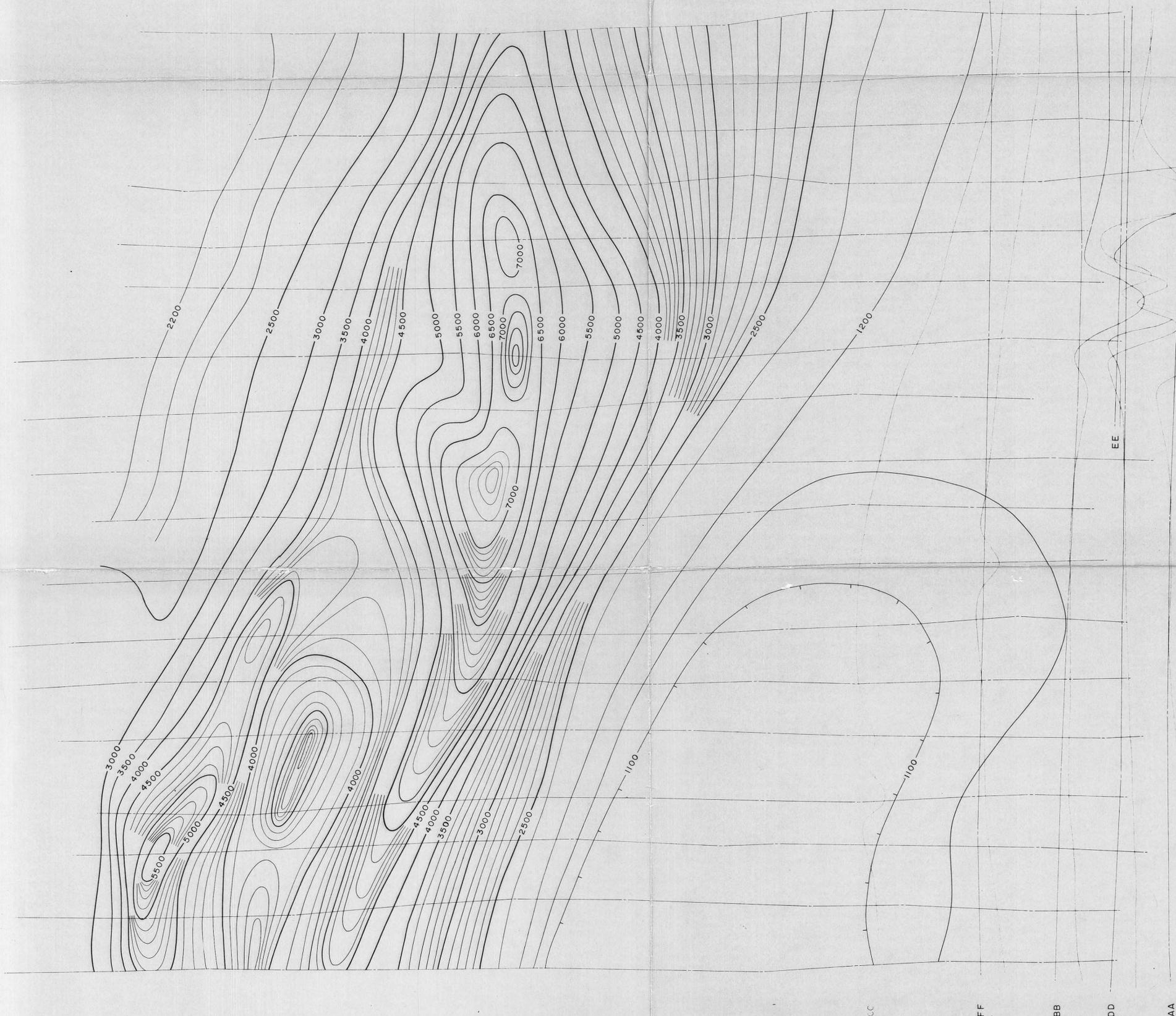
RUN 70

RUN 72

RUN 74

RUN 76

RUN 78



PROFILES: VERTICAL SCALE 100 gammas = 1 inch

65-401

LEGEND

CONTOUR VALUE 54,000

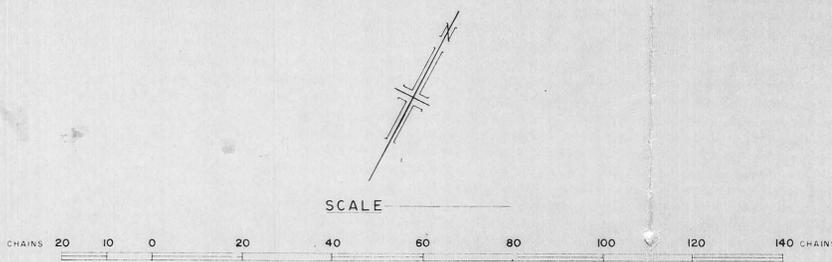
LOW 53,100

HIGH 54,200

CONTOUR INTERVAL 100 GAMMAS

FLIGHT LINE

FLYING HEIGHT 250 FT. M.T.C.



MAP N° A 621

TOTAL MAGNETIC INTENSITY

AEROMAGNETIC SURVEY - BEACONSFIELD AREA

TASMANIA

FOR

BROKEN HILL PROPRIETARY CO. LTD.

BY

AMEG PTY. LTD.

TO ACCOMPANY REPORT BY J.DALY.

4523

238019

SHEET No. 4

POINT
SORREL

AMG
460500E
5447800N

238020

BADGER HEAD

WEST HEAD

PORT SORREL

SHEET 1

TAMAR

Brown Creek

Branch Creek

SHEET 2

SHEET 4

BEAUTY POINT

Franklin River

Anderson Creek

BEACONSFIELD

Franklin River

SHEET 3

SIDMOUTH

HOLWELL

FLOWERY GULLY

WINKLEIGH

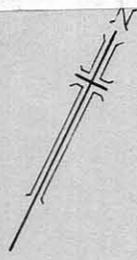
5 cm

AMG REFERENCE POINT ADDED

65-401

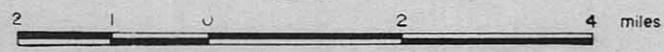
LEGEND

- Sheet edges shown thus ---
- Rivers and Creeks 
- Roads 
- 2nd class roads 
- Towns 



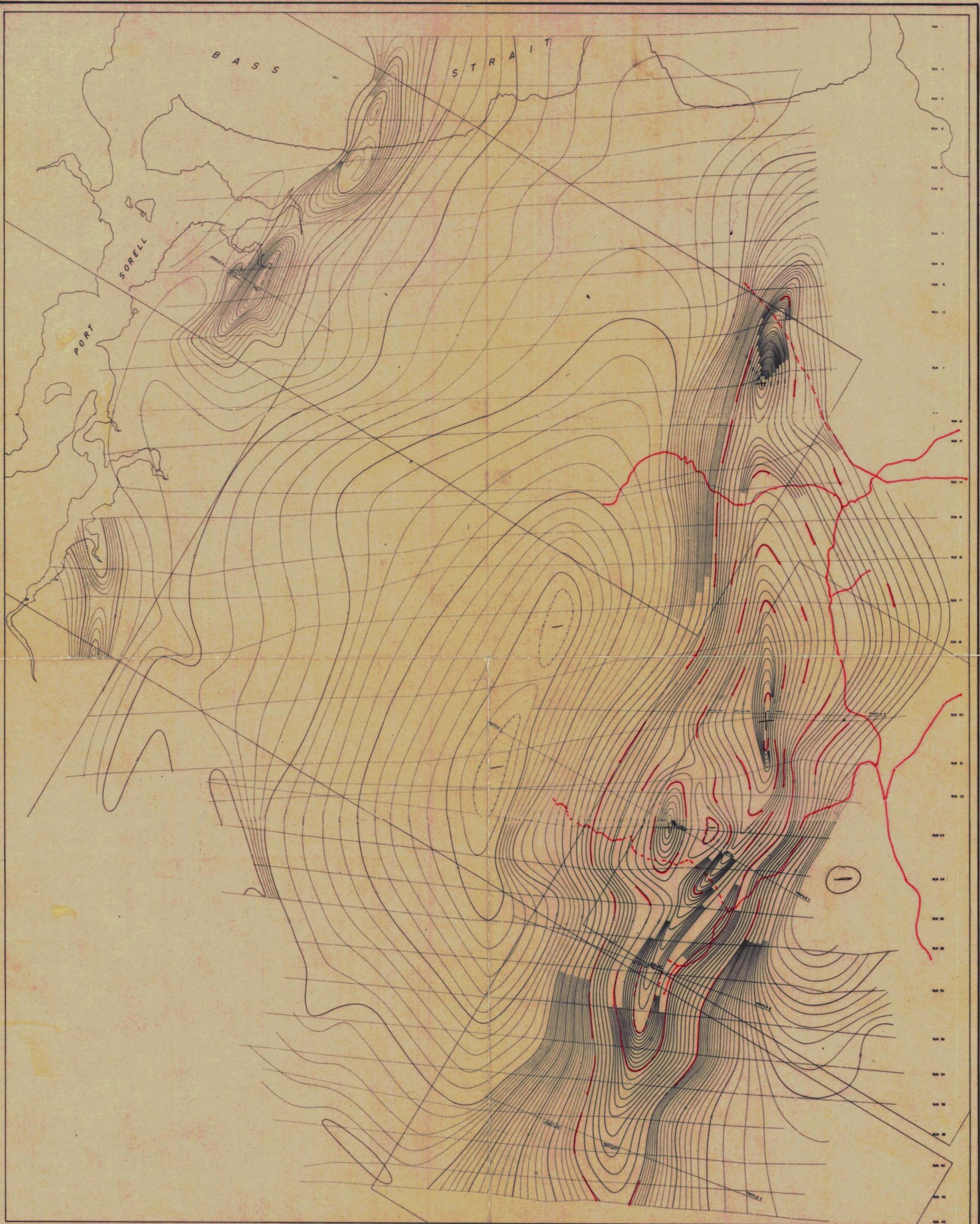
LOCATION MAP
AEROMAGNETIC SURVEY
BEACONSFIELD AREA
TASMANIA
MAP N° A622

SCALE



SHEET 5

4524



5 cm

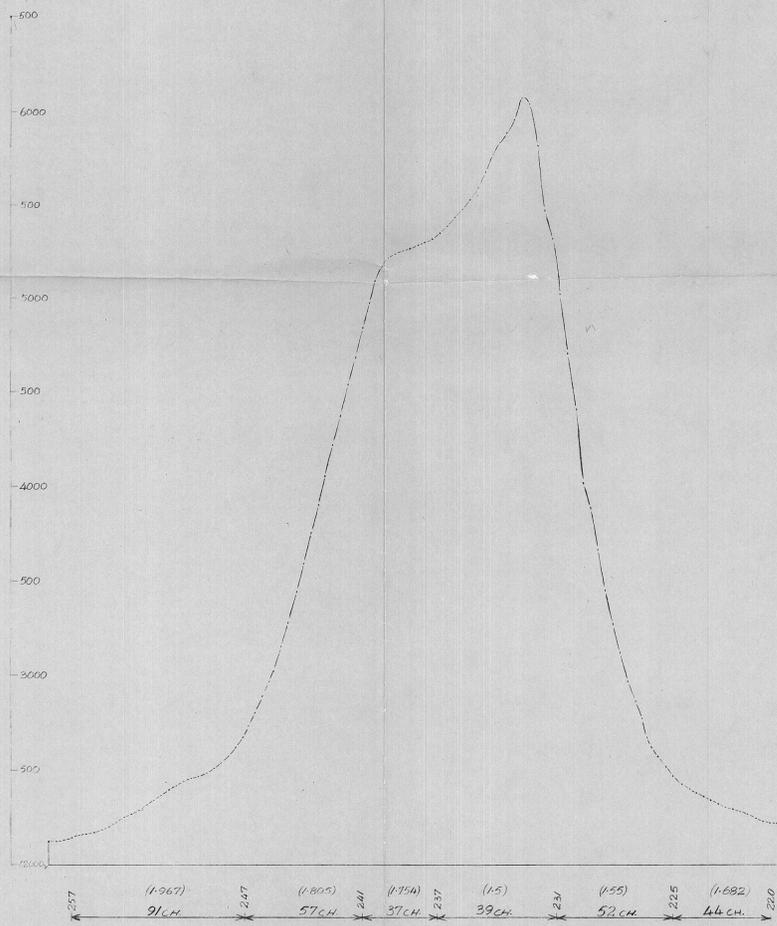
LEGEND
 CONTOUR VALUE
 LOW
 HIGH
 CONTOUR INTERVAL
 FLIGHT LINE
 FLYING HEIGHT
 100 FT. M.T.C.

SCALE
 MAP OF AREA

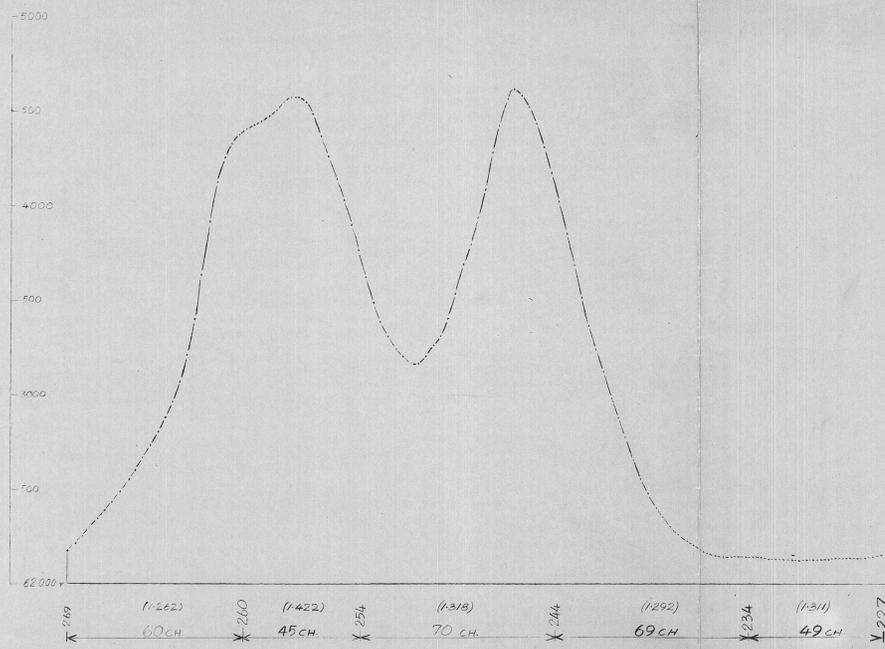
238021 65-401

TOTAL MAGNETIC INTENSITY
 AEROMAGNETIC SURVEY - BEACONSFIELD AREA
 TASMANIA
 FOR
 BROKEN HILL PROPRIETARY CO. LTD.
 BY
 AMES PTY. LTD.
 TO ACCOMPANY REPORT BY AGALY

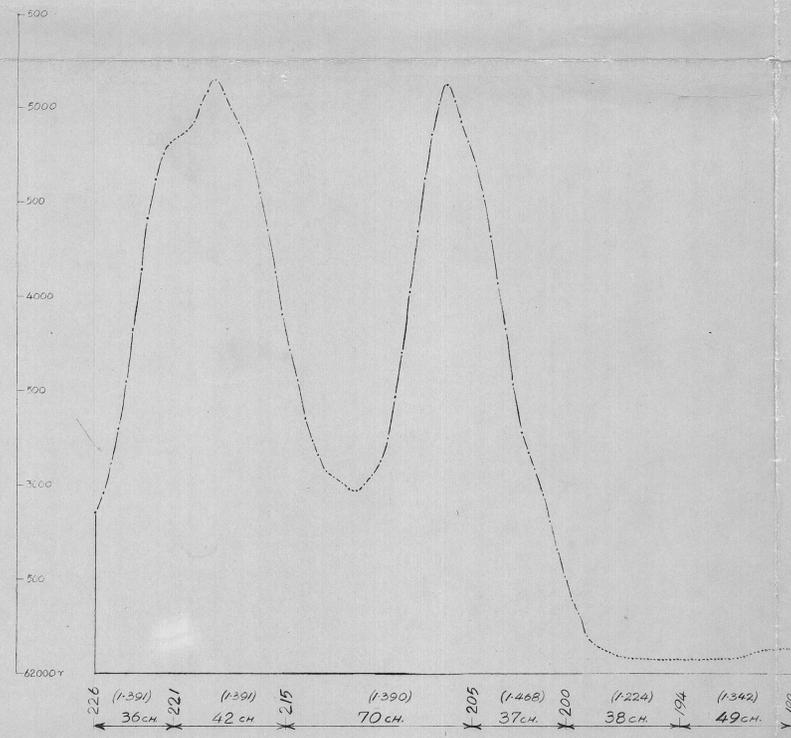
4525



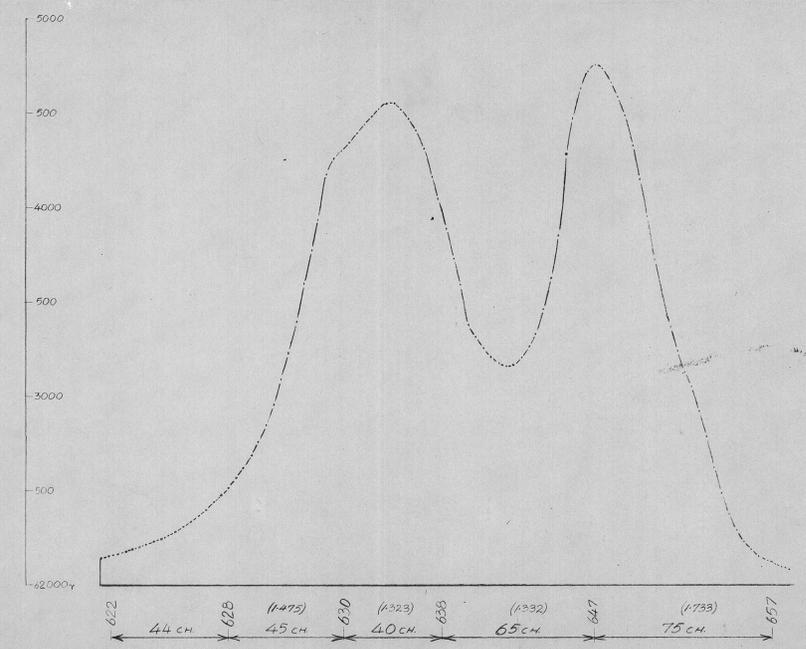
Run "20" 500' M.T.C.



Run "E" 600' M.T.C.



Run "D" 300' B.A.R.

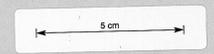


Run "N 23" 500' M.T.C.

65-401

MAGNETIC PROFILES
20 - 23 - D - E

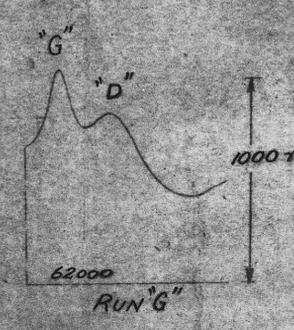
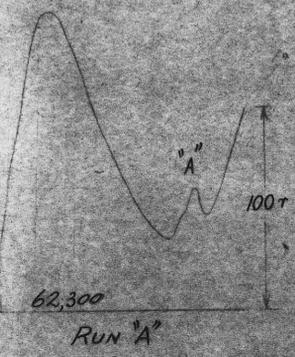
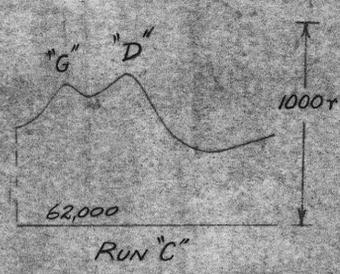
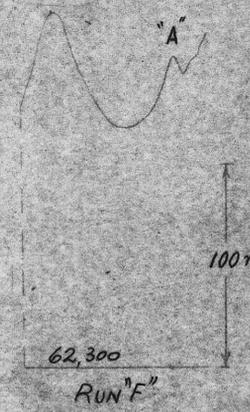
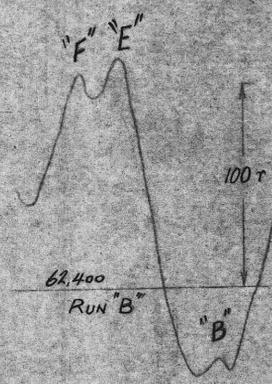
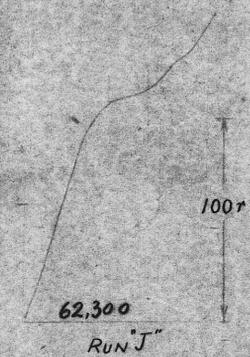
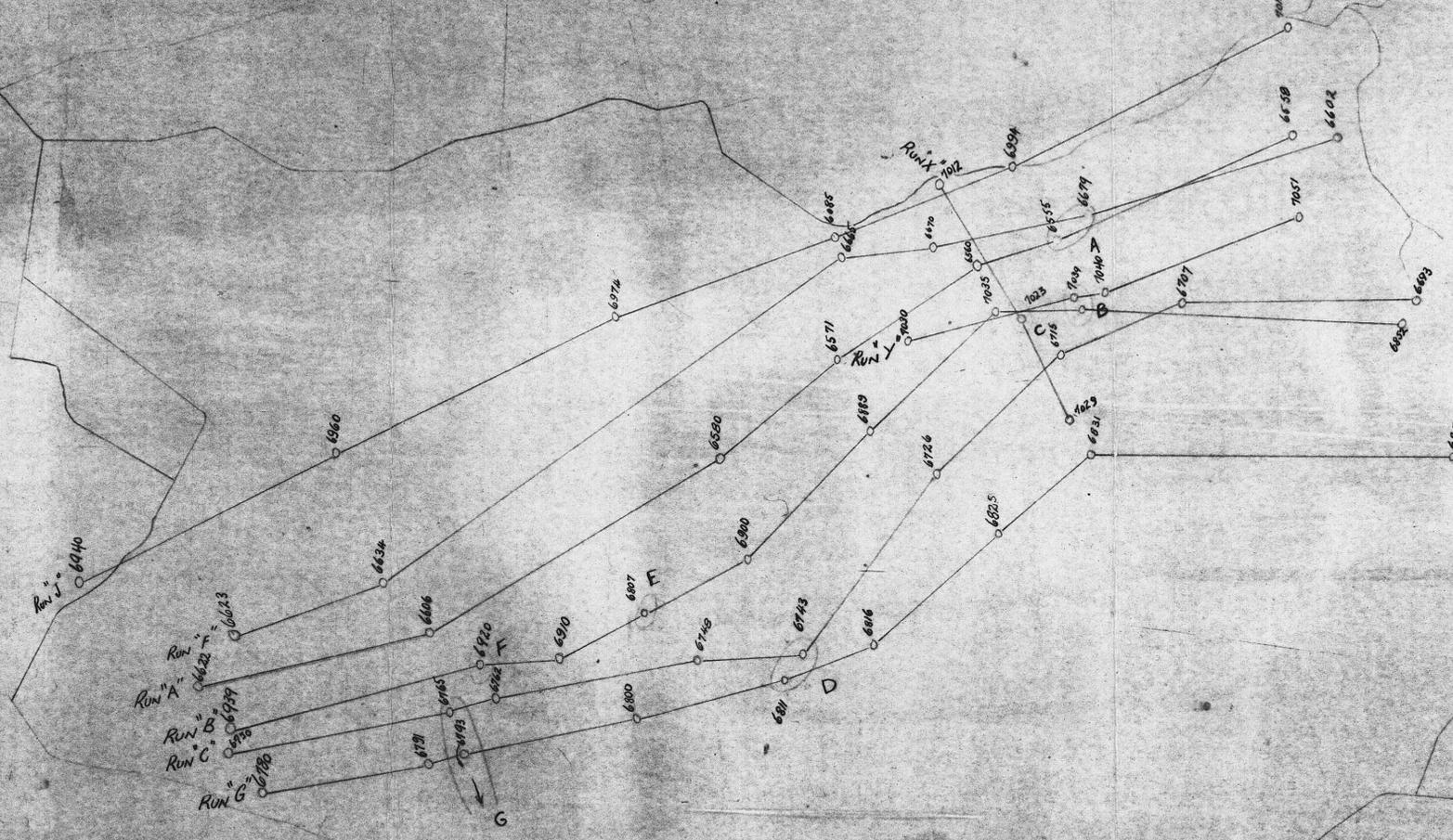
TOTAL MAGNETIC INTENSITY
AEROMAGNETIC SURVEY - BEACONSFIELD AREA
TASMANIA
FOR
BROKEN HILL PROPRIETARY CO. LTD.
BY
AMEG PTY. LTD.



238022

4526

SHEET No. 6



TOTAL MAGNETIC INTENSITY
 AEROMAGNETIC SURVEY - BEACONSFIELD AREA
 TASMANIA
 SURVEY FLOWN OVER
 MT SUGARLOAF - FLOWERY GULLY
 FOR
 BROKEN HILL PROPRIETARY CO. LTD.
 BY
 AMEG.
 TO FORM AN OVERLAY TO ENLARGED
 PHOTOS T-379/380

*Original filed
 in Mapping Room*

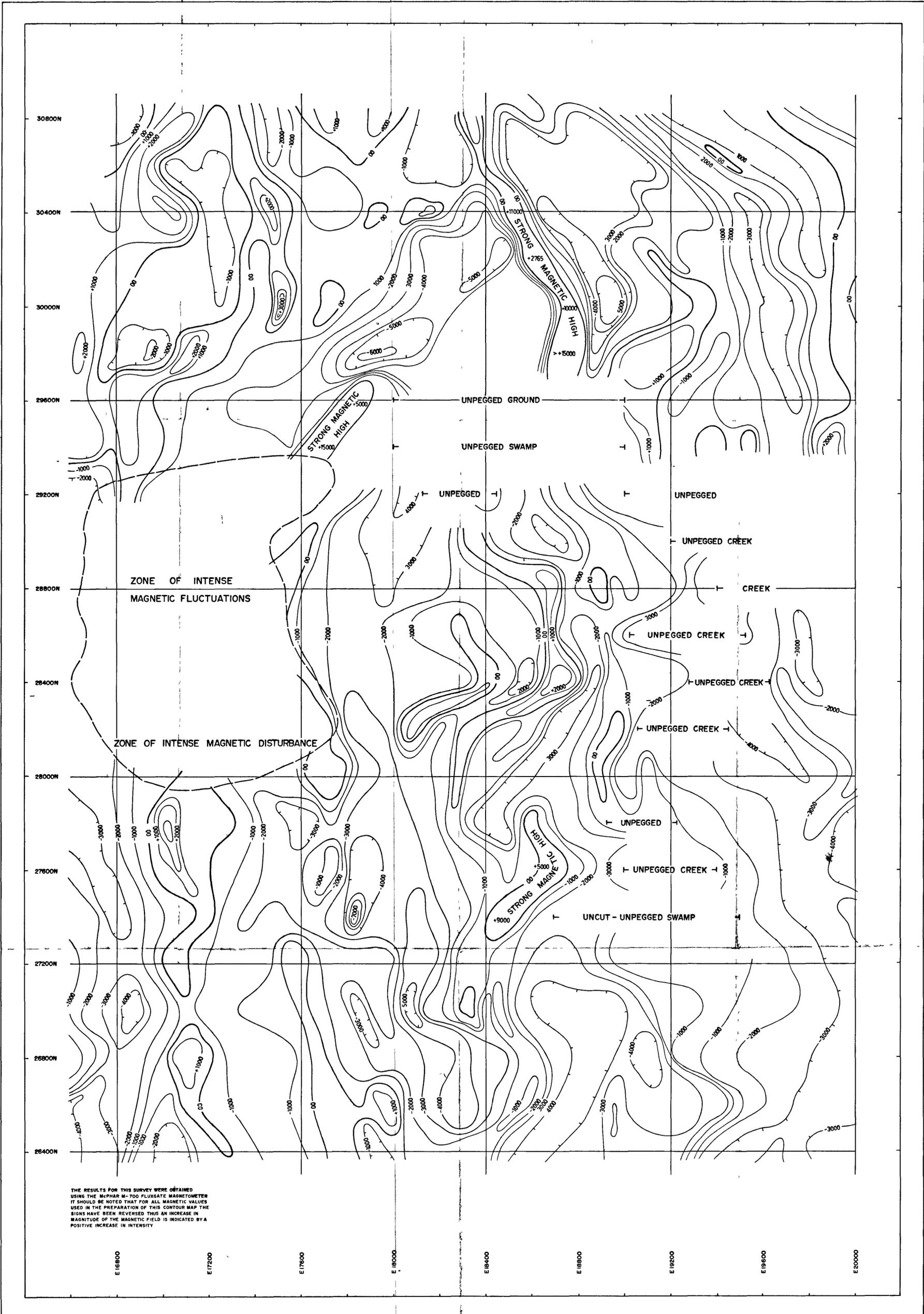
65-401

238023

SHEET No 8

4527

MN



THE RESULTS FOR THIS SURVEY WERE OBTAINED USING THE McPHAR M-700 FLUXGATE MAGNETOMETER. IT SHOULD BE NOTED THAT FOR ALL MAGNETIC VALUES USED IN THE PREPARATION OF THIS CONTOUR MAP THE SIGNS HAVE BEEN REVERSED. THAT AN INCREASE IN MAGNITUDE OF THE MAGNETIC FIELD IS INDICATED BY A POSITIVE INCREASE IN INTENSITY.

E 16800 E 17200 E 17600 E 18000 E 18400 E 18800 E 19200 E 19600 E 20000

72-922

ALLSTATE EXPLORATIONS N.L.
 BEACONSFIELD ASBESTOS PROJECT, TASMANIA.
 VERTICAL MAGNETIC INTENSITY CONTOURS

DRAWN- J R G
 DATE 29 9 71
 APPROVED- S S W

DATE 29 9 71

FEET 200 100 0 200 400 600 FEET

1263

238024 9