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INTERPRETATION OF THE COX BIGHT AEROMAGNETIC SURVEY

(S.P.L. 782)

for

A.C.P. Webb

by

Dr J.R. Bishop

AW/MG86/05
Sept., 1986.

701002

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701003

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SUMMARY

A magnetic survey of Cox Bight (SPL 782) has been attempted using a fixed wing aircraft. Rugged topography over most of the area, resulted in only the coastal section being covered. The data over the granite and PreCambrian quartzites are mostly flat, but one anomaly was defined close to the granite contact. It is recommended that a ground magnetic survey be carried out over this response in conjunction with a geochemical program to see if there is any potential for associated economic mineralisation. A summary of specific recommendations is given in Table 1.

INTRODUCTION

Cox Bight (S.P.L. 782) is held by Mr A.C.P. Webb of Melbourne. It is an isolated area, containing a number of old tin workings, on the southern coast of Tasmania. The licence is surrounded by the SouthWest National Park and can only be directly accessed by boat, or by aircraft landing on the beach. The Melaleuca landing strip lies about 3 kms away from the northwest corner of the licence, along the South Coast walking track.

In January, 1986 part of the S.P.L. was covered by an aeromagnetic survey. This report gives an interpretation of the results.

GEOLOGICAL SETTING AND EXPLORATION TARGETS

The geology of the southwest of Tasmania has not been mapped in any detail. The dominant rock types within the S.P.L. are indicated on the 1:250,000 Port Davey Geological sheet as PreCambrian metaquartzite sequences. A Devonian granitic intrusion outcrops on the coast at Cox Bight. A significant proportion of the licence area is covered by recent alluvium.

The area around the granite has been mapped in some detail (see Figure 1). This differentiates the PreCambrian rocks into four types of quartzites and schists although the boundaries of these units are not indicated. The general strike is north-south with generally a westerly dip (Nye, 1927).

Prior interest in the area has been concerned almost solely with tin. This has apparently been shed from the granite and associated quartz veins and has concentrated in the surrounding alluvium. There is little demand for this commodity at present and since this is not expected to improve in the near future, tin is not an immediate exploration target. However it is recommended later in this report that the extent and grade of the alluvial tin deposits should be established and it is noted here that seismic refraction surveys would probably be applicable*.

A number of seismic lines across the area should be able to resolve the thickness of the overburden and possibly the thickness of the tin horizon. McGain and Burger (1974) note the possibility of a tin-rich deep lead following the granite-quartzite contact. A seismic survey would be able to define the depth and extent of any such lead and would thus enable a bulk testing program to be properly sited.

The area does have potential for minerals other than tin. Gold

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* As is the case with many minerals, tin as cassiterite can only be found indirectly with geophysics. Cassiterite is dense, but does not occur in sufficient concentration to produce a gravity anomaly. It has no other contrasting physical properties; eg, it is not magnetic, nor is it electrically conductive.

occurs with the tin in the alluvials and chalcopyrite, sphalerite, antimony, molybdenite and wolframite have also been reported in the granite and quartz veins (McGain and Burger, 1974).

The most desirable target among the various types of potentially economic deposits which might occur within the licence is probably a skarn. Such deposits occur within calcareous lithologies in close proximity to granites (eg, the Kara tungsten mine in the north of the state). Dolomites and other calcareous units do occur within the PreCambrian in south western Tasmania. Generally, they are easily weathered and lie beneath peaty formations such as occur at Cox Bight. (The schists are also readily weathered and underlie many of the peaty areas.) The PreCambrian quartzites are generally unmineralised and it is considered most unlikely that these rocks would host any economic metalliferous deposit.

There are several types of skarns; whilst a tin-bearing skarn is a possibility, the preferred target is a gold or tungsten deposit. A number of geophysical methods can be used in exploration for skarn deposits, but magnetics is perhaps the most applicable. In areas with extensive overburden, such as occur at Cox Bight, where geochemistry is possibly unreliable, geophysical techniques are usually the best approach for target definition.

EXPLORATION HISTORY

Mt Lyell and EZ explored some of the southwest in the late 1950's and early 1960's (the LEE syndicate). An aeromagnetic survey was flown in 1957 and some of the anomalies recorded in the Davey Harbour - South West Cape area were followed up (Warne, 1958; see later). BHP held E.L. 1/64 in the mid 1960's and this licence covered most of south west Tasmania. An aeromagnetic survey was flown for BHP in 1966 and they made a compilation map from these two surveys which covers all of the southwest region, at 1:250,000 scale. The BMR has recently flown an aeromagnetic survey covering all of Tasmania and this should be released in the near future.

As previously mentioned, tin is nearly the only commodity which has been sought at Cox Bight. Heavy minerals within the beach sands being the (?)one exception (Anon., ?1967). King and Fenton (1979) give a brief resume of the history of mining at Cox Bight and the other references listed in this report give details of various attempts to assess the tin potential of the area. All of these investigations have only examined the near-surface.

SURVEY DETAILS

The aeromagnetic survey was flown by Geometrics in January, 1986. Originally, it had been planned to survey all of the S.P.L.. However much of the area has a rugged topography and, since a fixed-wing aircraft was used, only the flatter sections along the coast and adjacent to the southwestern boundary were covered.

A nominal flight line spacing of 100m was used with a nominal terrain clearance of 75m. Actual heights varied considerably, but a majority of the flight lines had mean clearances of around this height. The recording system gives a sampling interval of 30m. A gamma ray spectrometer was also carried on the aeroplane. The results from this have not been processed, but are given as four-channel data on the analogue records.

A residual magnetic contour map (Figure 2), a flight line recovery map (Figure 3) and flight line profiles (Figure 4) were all produced at the scale of the geological base map (Figure 1)*.

INTERPRETATION

Some idea of the regional setting can be obtained from Figure 5 which shows part of the compilation of the LEE and BHP aeromagnetic surveys. Over the PreCambrian, mostly flat profiles were obtained, with a number of isolated anomalies. One of these is centred about 4kms northeast of Point Eric in Cox Bight with a 'tail' extending down to Cox Bight. Geometrics' survey has partially covered this tail and defined it in some more detail.

The amount of information provided by the Geometrics survey is sparse and much of it is over water. Only 8 east-west lines were flown, which covered the southern tip of the granite and the coastal area and only nine northwest-southeast lines, which largely overlapped the western end of the east-west lines. However, the important area around the granite contact is at least partially covered. Integrating the contours with the geology, it can be seen that, as expected, the area of granite outcrop is magnetically flat and the smooth contours to the southwest of the outcrop suggest that the granite may extend for some distance in this direction.

One small low-amplitude anomaly of about 10nt was recorded in this region. It is apparently located just off-shore and could perhaps be due to a steel boat. Inspection of the flight line recovery video film did not show any boats and one could speculate about a submerged wreck. It is most unlikely that the anomaly is caused by a concentration of alluvial magnetite and cassiterite or other economic mineral and whatever its source, its underwater location makes it an unattractive target.

Larger anomalies, both spatially and in amplitude, were recorded at the eastern end of the survey. The strongest anomaly is only, partially defined and lies ouside of the S.P.L. on the Black

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* This was probably originally at 8 inches to the mile (1:7,920). Geometrics have used a scale of 1:8120 to overlay the paper print provided.

Bluff Range. The anomaly to its southwest, lying totally within the licence, occurs within a topographic depression and may have a quite different source. This latter anomaly lies immediately to the south of Pender's Creek and is referred to as the Pender's Creek anomaly in the rest of this report.

It is possible that the Pender's Creek anomaly has a similar source to those investigated by Warne (1958) in the Port Davey area, since the regional geology is the same. Warne (1958) investigated those anomalies labelled in Figure 5. In each case he found graphitic schists, usually pyritic. In one or two cases he also found some associated magnetite and it is likely that localised magnetite within the schists is the source of all of the anomalies examined. There was presumably no encouragement from the samples taken for geochemical analysis, since the LEE syndicate apparently carried out no further work here. The source of the Black Bluff Range anomaly could possibly be determined by an inspection traverse over the range, since there is probably some outcrop on the hill tops. However, the area is apparently thickly forested.

Also considered as a possible source for the anomalies defined by this survey, were ultramafic rocks which may host platinum-group metals, since Austalia's last production of these minerals occurred some 80kms to the north of Cox Bight, at Adamsfield (in 1968). However, the magnetic anomalies recorded at Cox Bight are too small to suggest any possible southern extension of the highly magnetic ultramafic host rocks.

The Pender's Creek anomaly may however, be due to mineralisation associated with the granite. The anomaly is located over peaty swamp deposits with presumably no outcrop, but it apparently lies close to the granite contact, which is the expected location for a skarn deposit. The 40nt amplitude is lower than that normally recorded over magnetite-rich skarns, however skarns show considerable variation in their petrographic and petrophysical properties (Emerson, 1983).

One possible interpretation of the anomaly is given in Figure 6. This shows a wide body (nearly 150m) buried at 235m below the sensor height. The height varied from line to line in the region of the anomaly, but averaged about 90m. Thus a depth below ground surface of around 150m is suggested. A dip to the south east is indicated, which agrees with the expected dip of the granite contact. A low susceptibility of 0.00085cgs was used for the model, which indicates a low magnetite content. A series of narrower bodies with higher susceptibilities could give equally good fits to the data, but more comprehensive modelling *should await the results of the ground surveys recommended below.

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* The modelling done here has used values taken from a contour map, which has been produced from interpolated data points. More confident modelling can be done using profiles of recorded data, such as would be obtained from a ground survey.

CONCLUSIONS AND RECOMMENDATIONS

Although the Pender's Creek anomaly may be due to magnetite in PreCambrian schists, or other uneconomic causes, its location close to the expected position of the granite contact makes it worthy of further investigation. In particular, a skarn with associated gold and bismuth or tungsten and/or tin is the anticipated target. It is therefore recommended that a number of ground magnetic traverses be carried out to locate and properly define the anomaly. The location of the proposed lines are shown in Figure 1. A geochemical bedrock sampling program should also be conducted over the grid. (Although if modelling of the ground magnetic data confirms a deeply buried source, then near-surface geochemical sampling may not be very meaningful.) It may also be possible to do some geological mapping along the creek beds. Depending upon the results of these surveys, a drill program would be suggested.

It was stated above that the Cox Bight area had good potential for tin, but that this was not an attractive target at present. Nevertheless, it may be opportune to properly establish the extent and grade of the tin resource before a return to better prices, so that a more informed and if necessary, rapid judgement can be made as to when it might be economically viable. Such a project would also be logical if no other deposits were forthcoming from the other exploration programs recommended here.

The possibility of heavy mineral sand deposits at Cox Bight has been raised (Anon., ?1967). It is likely that the sampling program required to determine the presence of these minerals (eg, rutile, ilmenite, monazite, zircon) could be combined with the bulk sampling program required for evaluating the alluvial tin deposits.

The aeromagnetic survey discussed in this report has only covered a small proportion of the Cox Bight licence. It is recommended that the results of the soon-to-be-released BMR survey be examined to see whether any further magnetic surveying should be contemplated. For example, a number of broadly spaced ground traverses over the northern region of the granite contact could be considered.

J.R. Bishop
Sept., 1986.

REFERENCES

Anonymous, ?1967. Report on behalf of Alstergren Pty Ltd, Cox Bight Tinfield. Extract of a report on sampling for heavy mineral sands at Cox Bight.

Emerson, D.W., 1983. Physical properties of skarns. Earth Resources Foundation report, Univ. of Sydney.

King, C.D. and Fenton, J., 1979. Small mining settlements, in Gee, H. and Fenton, J., eds; The South West Book. Australian Conservation Foundation.

McGain, A. and Burger, P., 1974. Cox Bight alluvial tin prospect. Metals Exploration Ltd report.

Nye, P.B., 1927. Geological report on the Cox Bight tinfield. Tas. Mines Dept report (no. ?) p 170-176.

Reid, A.Mc., 1928. Cox Bight tinfield. Tas. Mines Dept report (no. ?) p 58-78.

Warne, S.B., 1958. Report on examination of magnetic anomalies 5S/2, 5S/4, 5S/6, 7S/2, 7S/4, 9S/2. Pt Davey-Bathurst Harbour-S.W. Cape area. Report to the LEE syndicate.

Table 1

Summary of Recommendations
Resulting from an Aeromagnetic Survey over Cox Bight.

* A magnetic anomaly, labelled the Pender's Creek anomaly, has been defined close to the expected south-east contact of the Cox Bight granite, beneath a cover of recent alluvium.

* Its amplitude (40nt) is much lower than would normally be expected over a skarn, but further investigation is warranted because of its position.

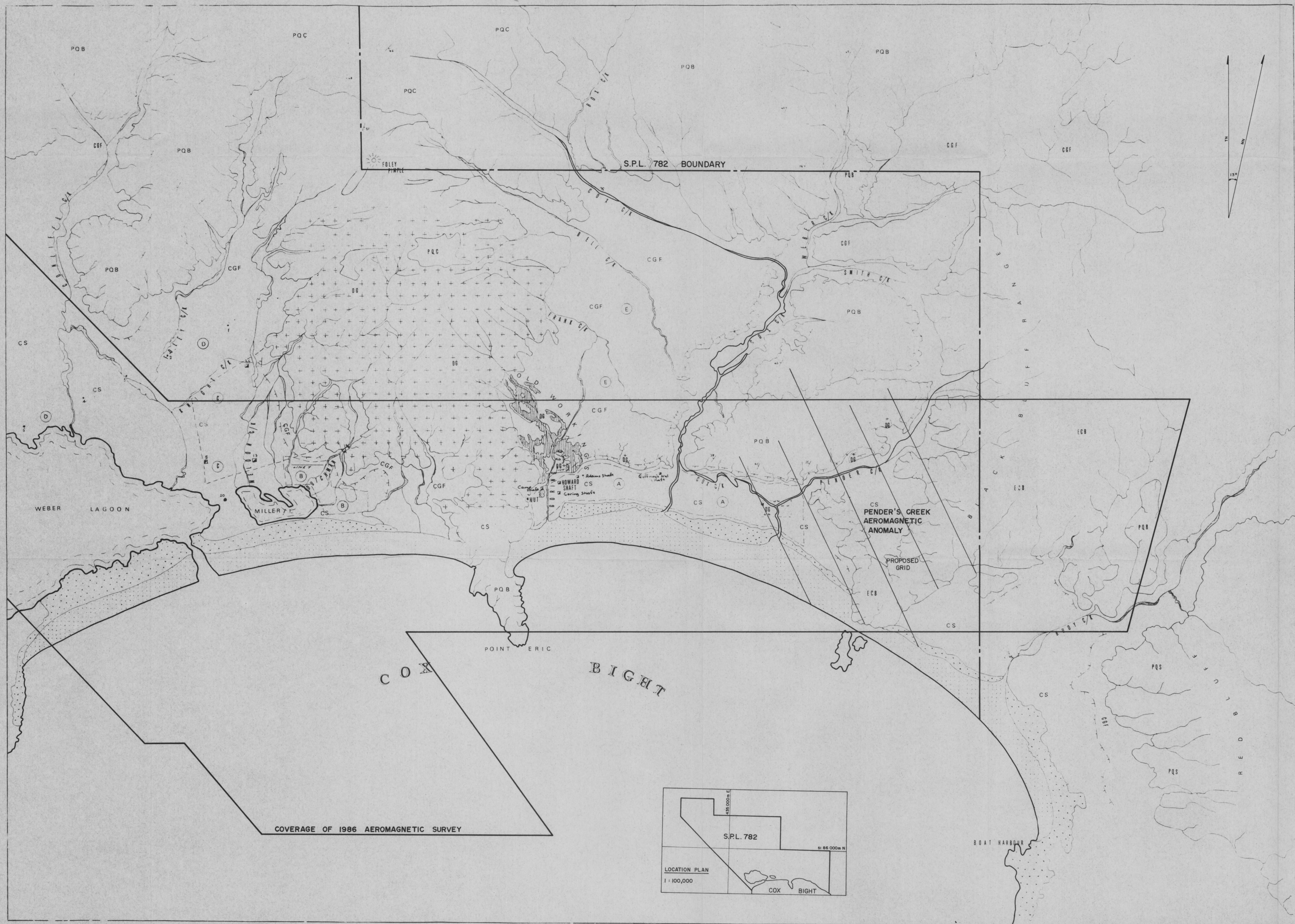
* Other magnetic anomalies in the area are most probably due to magnetite within the schists and this is a possible cause of the Pender's Creek anomaly.

* A series of ground magnetic traverses are recommended over the Pender's Creek anomaly to properly locate the anomaly on the ground.

* Bedrock geochemical sampling is recommended to help determine the anomaly's potential for economic mineralisation. This could include the use of a portable core drilling rig capable of penetrating to perhaps 80m.

* Geologic mapping should also be attempted in the vicinity of the anomaly; eg, there may be some exposure along the creek beds.

* The Cox Bight area's alluvial tin potential should be thoroughly investigated, but this should await the results of the above program.



COX BIGHT GEOLOGIAL PLAN

ALLUVIAL TIN PROJECT
AREAS PREVIOUSLY TESTED AND AREAS OF POTENTIAL ALLUVIUM

5 cm

LEGEND

		BEACH SANDS
		FIXED DUNES
CAIONOZOIC	CS	PEAT COVERED LITTORAL SWAMP DEPOSITS
	CGF	GRAVELS – FLUVATILE SUBANGULAR PLATEAU DEPOSITS
	CGM	GRAVELS – MARINE ROUNDED
DEVONIAN	DG	GRANITE PORPHYRITIC
PRE – CAMBRIAN	PQB	QUARTZITE BEDDED
	PQC	QUARTZITE CRENULATED
	PQS	QUARTZ SERICITE SCHIST
	ECB	EAST COX BIGHT PYRITIC SERICITE SCHISTS
		CREEK DENSE SCRUB
		DETRIAL GRADUATING TO SWAMP DEPOSITS
		DETRIAL GRADUATING TO PLATEAU DEPOSITSITS
		ESCARPMENT

AREAS PREVIOUSLY TESTED

(A) REPORT P B NYE 1927 PENDER C/K 19,360 CU/M 2.2 LB SNO2 PAST TESTED TO 4 METRES POTENTIAL 960 000 CU/M ERHDE ?

(B) WATER JET DRILLING 1967 AREA DRILLED TO A/V DEPTH OF 6 METRES = 84,000 CU/M AT 0.8 LB SN

(C) REPORT A McINTOSH REID 1928 ESTIMATED A/V DEPTH 9 METRES = 2,160,000 CU/M ESTIMATED AT 1 LB SN

(D) METALS EXPLORATION DRILLING

(E) METALS EXPLORATION EASTERN PLATEAU

0 100 200 300 400 500 600 700 800 900 1000

SCALE IN METRES

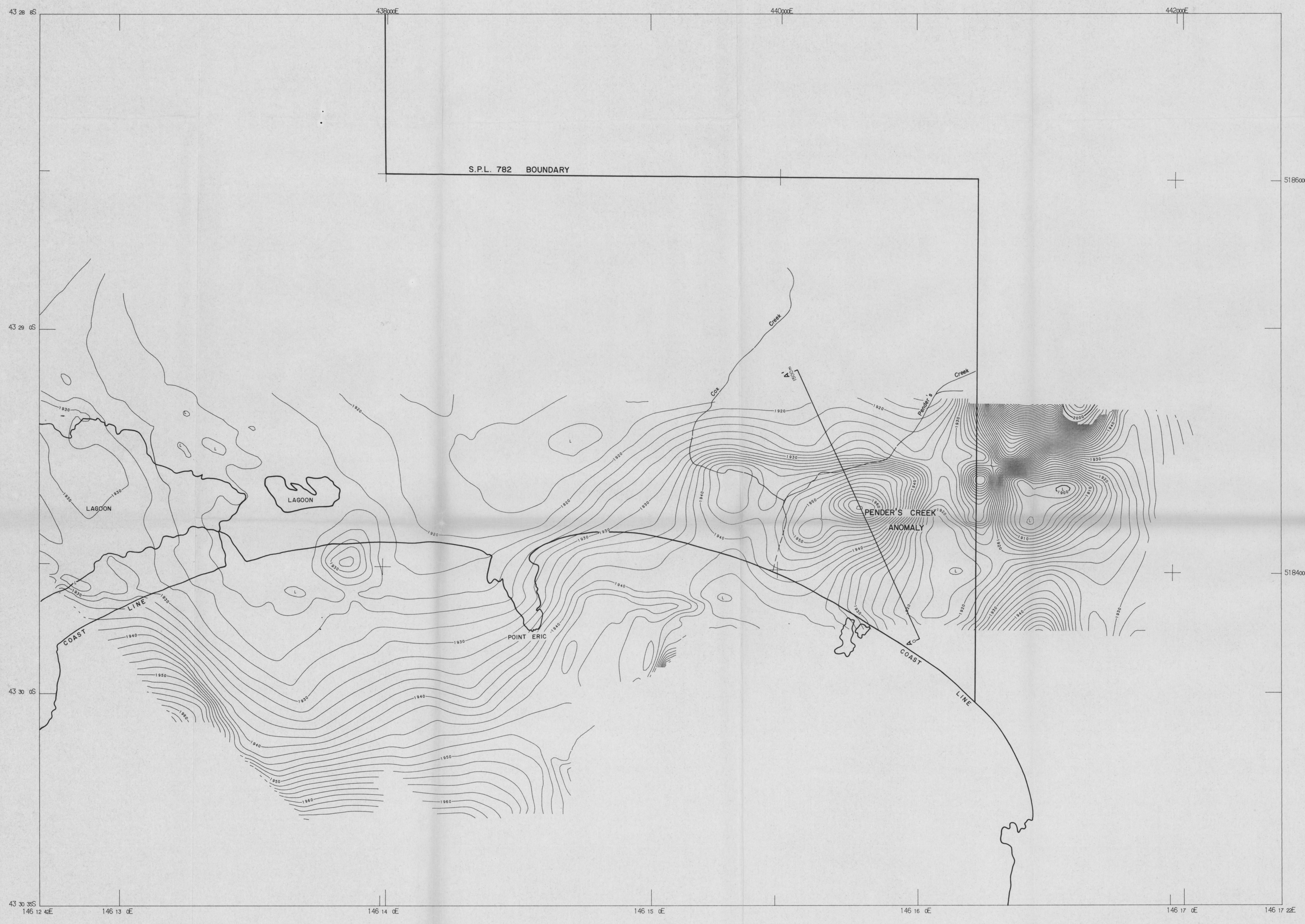
PREPARED BY T. SLOGGETT

DRAWN BY T. SLOGGETT 12/7/78.

ADDITIONS BY J. BISHOP, AUGUST 1986

REF: AW / MG 86/05

FIG. 1



AIRBORNE SURVEY SPECIFICATIONS

MAGNETOMETER :	3 G-813 proton precession magnetometers in tail stinger and wing tips. Sensitivity :, 0.01 nT
RECORDING INTERVAL :	25m sampling
SPECTROMETER :	GR - 800 gamma ray spectrometer Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.8 - 3.00 MeV
POTASSIUM WINDOW :	1.36 - 1.56 MeV
URANIUM WINDOW :	1.66 - 1.86 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	25m sampling
DATA RECORDING :	Geometrics 714 acquisition system, Digital to magnetic tape.
NOMINAL TERRAIN CLEARANCE :	Both detectors in aircraft at 75m.
NOMINAL LINE SPACING :	Traverse lines 100 metres. Tie lines 2 km.
FLIGHT PATH RECORD :	continuous tracking colour video.
FLIGHT LINE RECOVERY :	Visually to 1:80,000 colour photos

RESIDUAL MAGNETIC CONTOURS

Grid notation refers to Australian Map Grid Zone 55
Digitised from colour photos at 1:8000

Magnetics	:Tie Line Levelled.
IGRF (1980)	:Updated to January 1986
IGRF (1980)	:Removed, Datum 2000 nT added
Grid mesh size	:25 x 25 metres
Grid filter	:Polynomial, radius 50 metres

Contour Interval 2,10,50,100 and 200 nT

N

0.0 0.5 Km

SCALE 1:8120

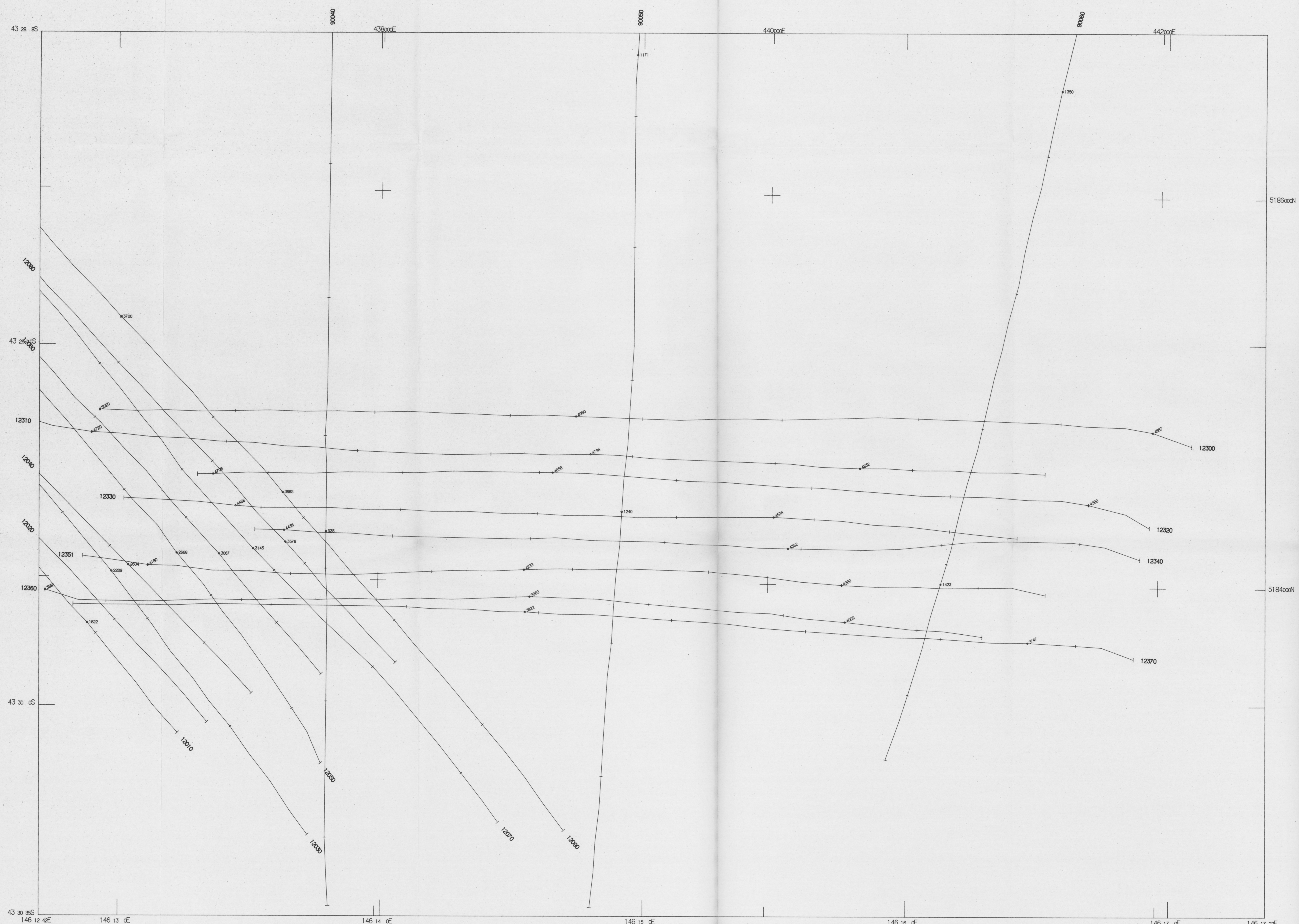
5 cm

JOB NO : 9317
Flown by Geometrics International Corporation
January 1986
Processed by Engineering Computer Services, Bowral

ARTHUR P WEBB, QC

COX'S BIGHT RESIDUAL MAGNETIC CONTOURS

REF: AW/MG86/05 | DATE: 22-JUL-86 | FIG. 2



AIRBORNE SURVEY SPECIFICATIONS

MAGNETOMETER :	3 G-813 proton precession magnetometers in tail stinger and wing tips. Sensitivity :, 0.2 nT
RECORDING INTERVAL :	30m sampling
SPECTROMETER :	GR - 800 gamma ray spectrometer Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.8 - 3.00 MeV
POTASSIUM WINDOW :	1.36 - 1.56 MeV
URANIUM WINDOW :	1.66 - 1.86 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	60m sampling
DATA RECORDING :	Geometrics 714 acquisition system, Digital to magnetic tape.
NOMINAL TERRAIN CLEARANCE :	All detectors in aircraft at 75m.
NOMINAL LINE SPACING :	Traverse lines 100 metres. Tie lines 2 km.
FLIGHT PATH RECORD :	continuous tracking colour video.
FLIGHT LINE RECOVERY :	Visually to 1:80,000 colour photos with Doppler interpolation between recovered points

FLIGHT PATH RECOVERY

Grid notation refers to Australian Map Grid Zone 55
Digitised from colour photos at 1:8000

N

0.00 0.25 0.50 0.75 Km
SCALE 1:8120

5 cm

JOB NO : 9317
Flown by Geometrics International Corporation
January 1986
Processed by Engineering Computer Services, Bowral

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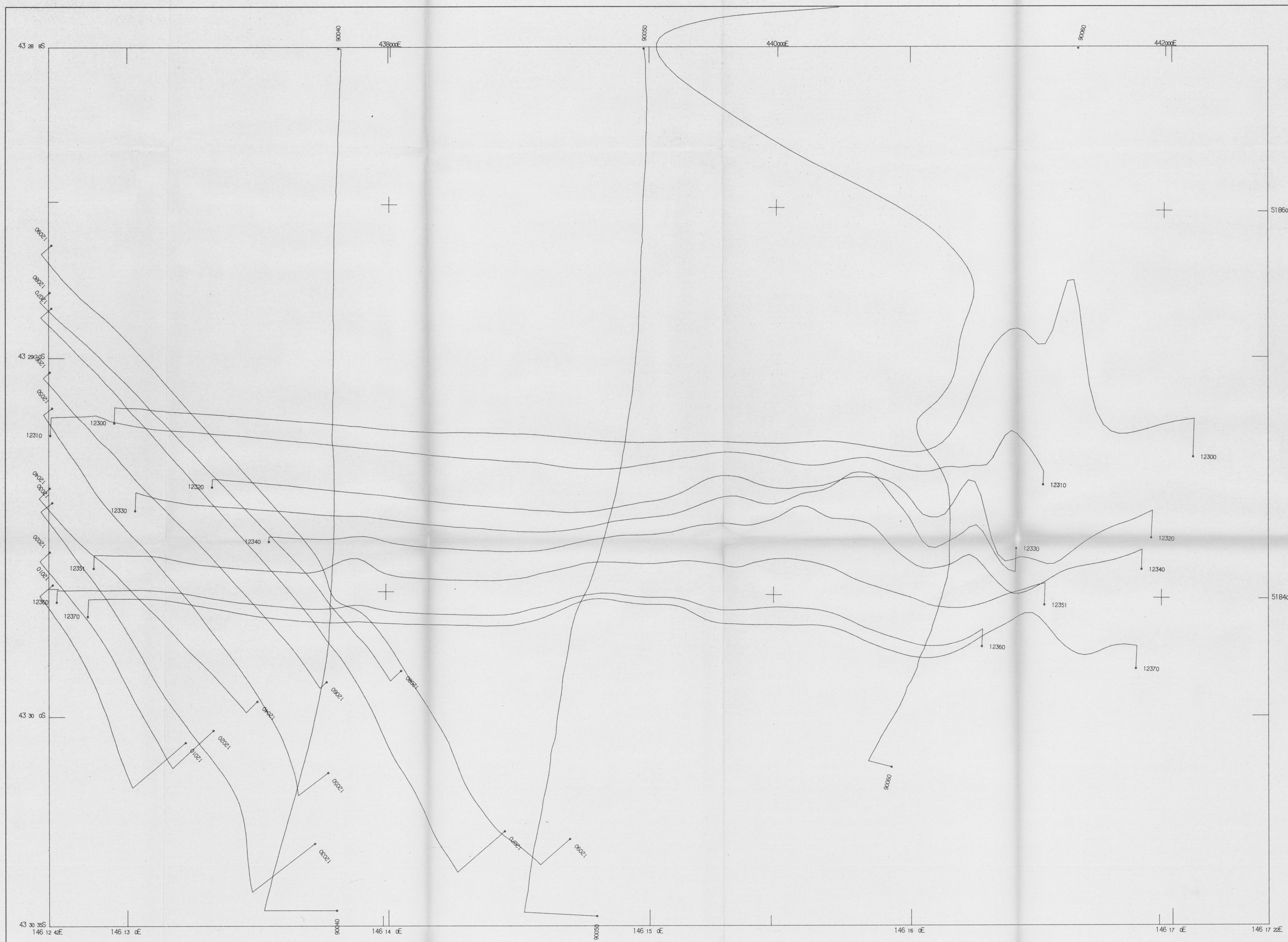
COX BIGHT
FLIGHT PATH RECOVERY

REF: AW/MG86 /05 | DATE: 16-JUL-86 | FIG. 3



AIRBORNE SURVEY SPECIFICATIONS

MAGNETOMETER :	3 G-813 proton precession magnetometers in tail stinger and wing tips. Sensitivity :, 0.01 nT
RECORDING INTERVAL :	25m sampling
SPECTROMETER :	GR - 800 gamma ray spectrometer Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.8 - 3.00 MeV
POTASSIUM WINDOW :	1.36 - 1.56 MeV
URANIUM WINDOW :	1.66 - 1.86 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	25m sampling
DATA RECORDING :	Geometrics 714 acquisition system, Digital to magnetic tape.
NOMINAL TERRAIN CLEARANCE :	Both detectors in aircraft at 75m.
NOMINAL LINE SPACING :	Traverse lines 100 metres. Tie lines 2 km.
FLIGHT PATH RECORD :	continuous tracking colour video.
FLIGHT LINE RECOVERY :	Visually to 1:80,000 colour photos

RESIDUAL MAGNETIC PROFILES

Grid notation refers to Australian Map Grid Zone 55

Digitised from colour photos at 1:8000

Magnetics	:Tie Line Levelled.
IGRF (1980)	:Updated to January 1986
IGRF (1980)	:Removed, Datum 2000 nT added
Vertical Scale	: 10nT per cm.
Horizontal Scale	: 8120/1
Base Value	: 1920nT

N

0.0 0.5 Km

SCALE 1:8120

5 cm

JOB NO : 9317

Flown by Geometrics International Corporation

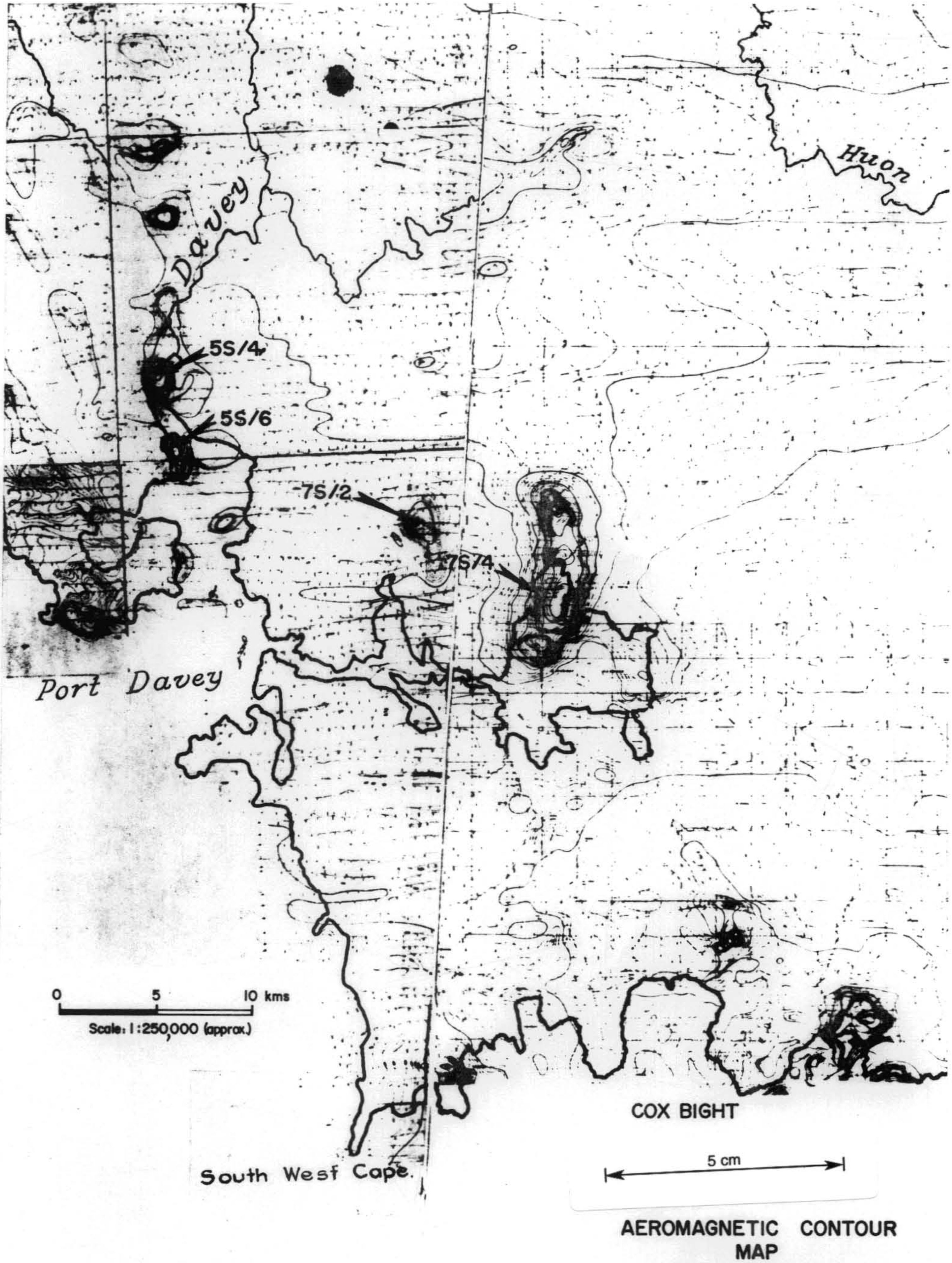
January 1986

Processed by Engineering Computer Services, Bowral

ARTHUR P WEBB, QC

COX'S BIGHT RESIDUAL MAGNETIC PROFILES

REF: AW/MG86/05 | DATE: 21-JUL-86 | FIG. 4



AEROMAGNETIC CONTOUR MAP
Port Davey — Cox Bight Area

SURVEY: Compilation of LEE (1957) & B.H.P. (1966) surveys.

REF: AW/MG86/05

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FIG.5

701017

5 cm

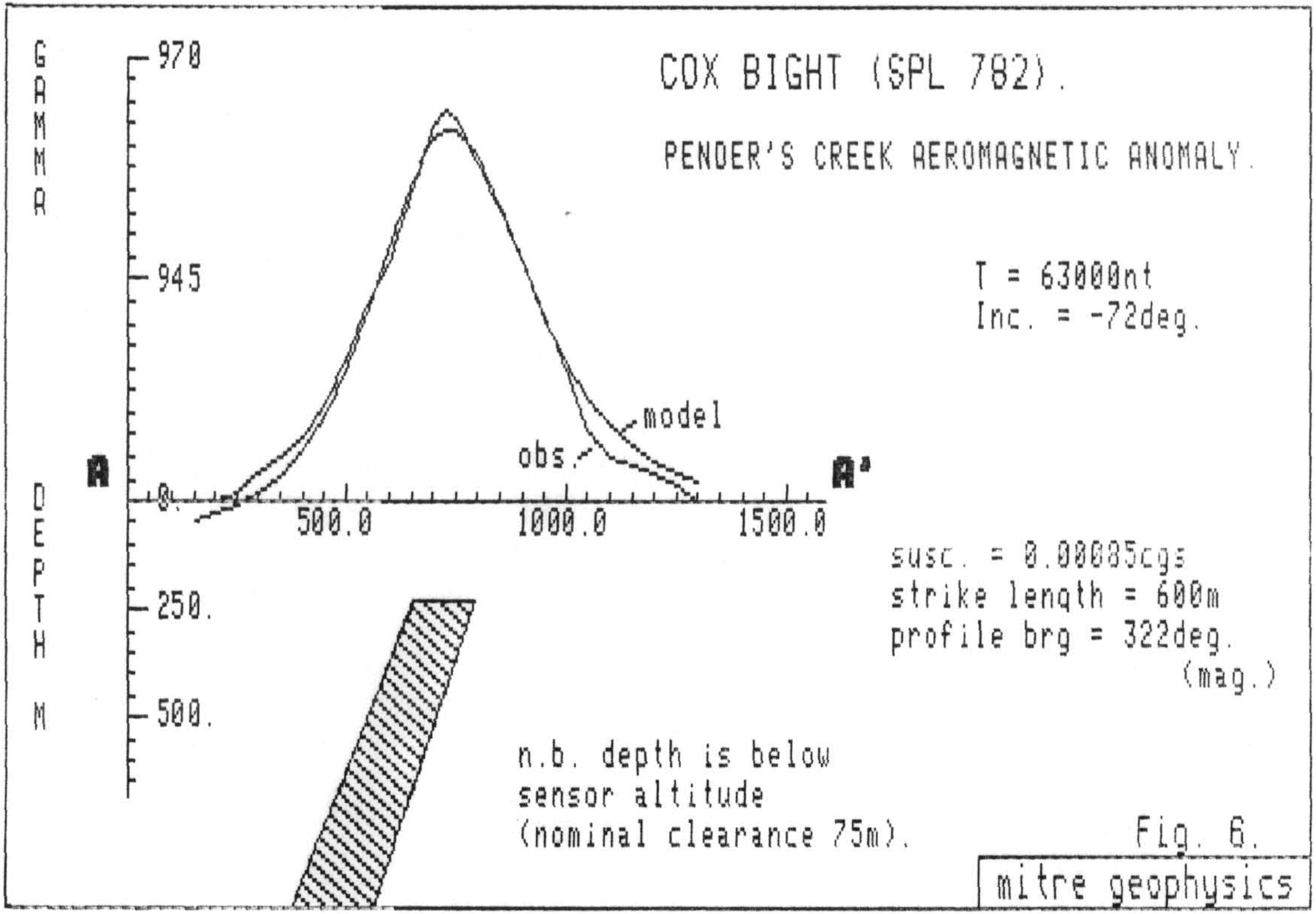

Fig. 6.