COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.

MINERAL RESOURCES SURVEY.

REPORT No. 1945/1..

(Plans Nos.1172 & 1173).

MAGNETIC INVESTIGATION OF SITE OF PROPOSED COMPASS SWINGING BASE, EAST ARM, DARWIN.

By

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CANBERRA. 3rd January, 1945.

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DEPARTMENT OF SUPPLY AND SHIPPING

MINERAL RESOURCES SURVEY

MAGNETIC INVESTIGATION OF SITE OF PROPOSED COMPASS SWINGING BASE, EAST ARM, DARWIN.

(Report No.1945/1, Plans Nos.1172 and 1173).

INTRODUCTION:

The purpose of the investigation was to determine the degree of uniformity of the earth's magnetic field, particularly with regard to magnetic Declination (or Variation), over an area on which it is proposed to construct a compass swinging base for land swinging of aircraft.

Field work commenced on 11th December and terminated on 18th December. Instruments used comprised -

Theodolite-Magnetometer and Earth Inductor No.18 (on extended loan from the Carnegie Institution of Washington). This is used for the accurate measurement of the magnetic elements, Declination, Horizontal Intensity and Inclination.

Declinometer attachment fitted to a theodolite, used for relatively rapid measurement of Declination with an accuracy of 1 to 2 minutes of arc.

Vertical force Variometer used for accurate and rapid measurement of vertical component variations.

RESULTS OF SURVEY:

The accompanying plan, numbered 1172, shows the extent of the survey and the magnetic declination differences at the various observation points expressed in minutes of arc and representing the differences between the declination value at the Base Station and at the observation points, e.g. when the declination at the Base Station is + 3°49' (easterly declination reckoned as positive) the declination at the point B3 is + 3°34'. This information thus indicates the extent of disturbance or anomaly in declination over the area so far as the values at the particular observation points are concerned.

There is a good deal of debris (building materials, anchor blocks, etc.) containing some magnetic material, on the ground between the road and the mangrove swamp and for this reason not many satisfactory observation points could be obtained in that part of the area.

It will be noticed that marked anomaly in declination occurs at a few points while irregularities of small magnitude are general. At the points C9 and C10 the effect of the flat galvanised iron roof of the nearby motor transport shed is probably largely responsible for the anomaly at these points. There is a quantity of large anchor chains on the ground close to the point C2 which may be partly responsible for the high value measured at this point. Elsewhere it seems likely that the irregularities measured are due to natural causes.

The profiles, Plate numbered 1173, show vertical component variations along the lines A, B and C. The values are expressed in gammas relative to the value of the vertical component at the Base Station. These results shed further light on the matter of magnetic uniformity and, as in the case of the declination survey, irregularity of small magnitude is general while at a few points strong anomaly is present. The artificial causes mentioned above are undoubtedly again responsible for a large part of the anomaly i-

the case of points C2, C9 and C10. At the points B3 and B2 however, there is strong anomaly presumably of natural origin. The vicinity is soil and talus-covered, apparently to no great depth. The loose rocks on the surface were tested for magnetic properties but nothing was found exhibiting sufficiently strong properties to give rise to the measured anomaly.

The nature of the declination and vertical component irregularities are somewhat haphazard, showing no definite trend over the area surveyed. This condition is typical where the magnetic material responsible for the disturbances is shallow-seated and in this case it is considered probable that the material is laterite or (ironstone gravel) mixed with the soil and talus. This material which is commonly found to be strongly magnetic, is plentiful on other areas in the district.

Plan numbered 1172 shows a few declination values measured near the existing hangar. A traverse running northwesterly from the hangar was selected for the test because that part is free from other installations containing magnetic material. It will be noticed that the effect on declination along the traverse is negligible at a distance of 100 feet from the hangar.

CONCLUSIONS:

Under the existing terrain conditions in the central part of the proposed Swinging Base area it seems likely that when artificial effects are removed there may still be irregularity in magnetic declination of the order of ¼ degree. The mean-of-day value of declination over the central part of the base will be about + 3¾ degrees.

However, when the necessary earthworks for the proposed construction is completed, it is likely that on the new built-up surface and the new cut-down surface, conditions will be different to the present ones in respect of irregularities and of the actual value of declination. This could result from the disturbance of any superficial magnetic material forming the existing surface and also by the deposition for filling purposes of large quantities of magnetic material such as laterite, over the central part of the Swinging Base. Any magnetic material used in the construction of the paved area or the turn-table might also have appreciable effects.

In connection with the magnetic effect of neighbouring buildings it seems likely that there will be negligible effect in declination at the centre of the base from the buildings to be placed as shown on R.A.A.F. Drawing No.44/45/740. However, cases of this kind are not subject to generalisation as effects will depend on factors other than the distance to the building. For instance the direction to the building and its permanent magnetisation will be important factors in determining its magnetic effect at a point.

Due to the abovementioned factors (and particularly those concerning earthworks) it is considered that it would be advisable to make a re-survey of the area immediately after the swinging base and the "Future Hangar" and "Component Repair Shop" are constructed. The magnetic elements and conditions of uniformity could then be accurately determined in necessary detail for use in the swinging operations.

Results of absolute magnetic determinations made at the base station and near Darwin are attached.

L.A.Richardson

CANBERRA, A.C.T.
3rd January, 1945.

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PARTICULARS OF ABSOLUTE DETERMINATIONS OF DECLINATION AT THE BASE STATION (POINT B5), MADE ON 11TH DEC., 1944.

	° '		h. m.
Declination	+ 3 46.2	at L.M.T.	10.50
	+ 3 48.4	at L.M.T.	12.33
	+ 3 49.6	at L.M.T.	13.43

RESULTS OF ABSOLUTE MEASUREMENT OF MAGNETIC ELEMENTS MADE NEAR DARWIN.

Description of Station: Approximate re-occupation of C.I.W. Station of 1923, near north end of Mindil Beach, in a small open area, 60 feet southerly from centre of road running more or less parallel with the beach and about 300 feet westerly from the road leading to the north end of the beach from the main road, to be marked with a concrete block by R.A.A.F. survey personnel when opportunity is presented. True bearings: centre of ventilator on roof of green roofed house on Myilly Point, 57°24'.6; Point Charles Lighthouse, 105°19'.0; edge of cliff at East Point, 152°42'.7; disc beacon on elevated water tank, 235°50'.5.

Magnetic Results			Date: 16th Dec., 1944.	
	° '			h. m.
Declination	+ 3 45.6	at	L.M.T.	10.46.
	+ 3 46.8	"	"	11.36
	+ 3 47.6	"	"	12.19
	+ 3 48.6	"	"	13.30
Inclination	-38 35.4	"	"	12.04
	-38 34.8	"	"	14.06
Hor. Intensity	0.36109 Gauss	"	"	12.37
	0.36119 "	"	"	13.13
Vert. Intensity (Calc.)	0.28815 "	"	"	12.55
Total Intensity (Calc.)	0.46200 "	"	"	12.55

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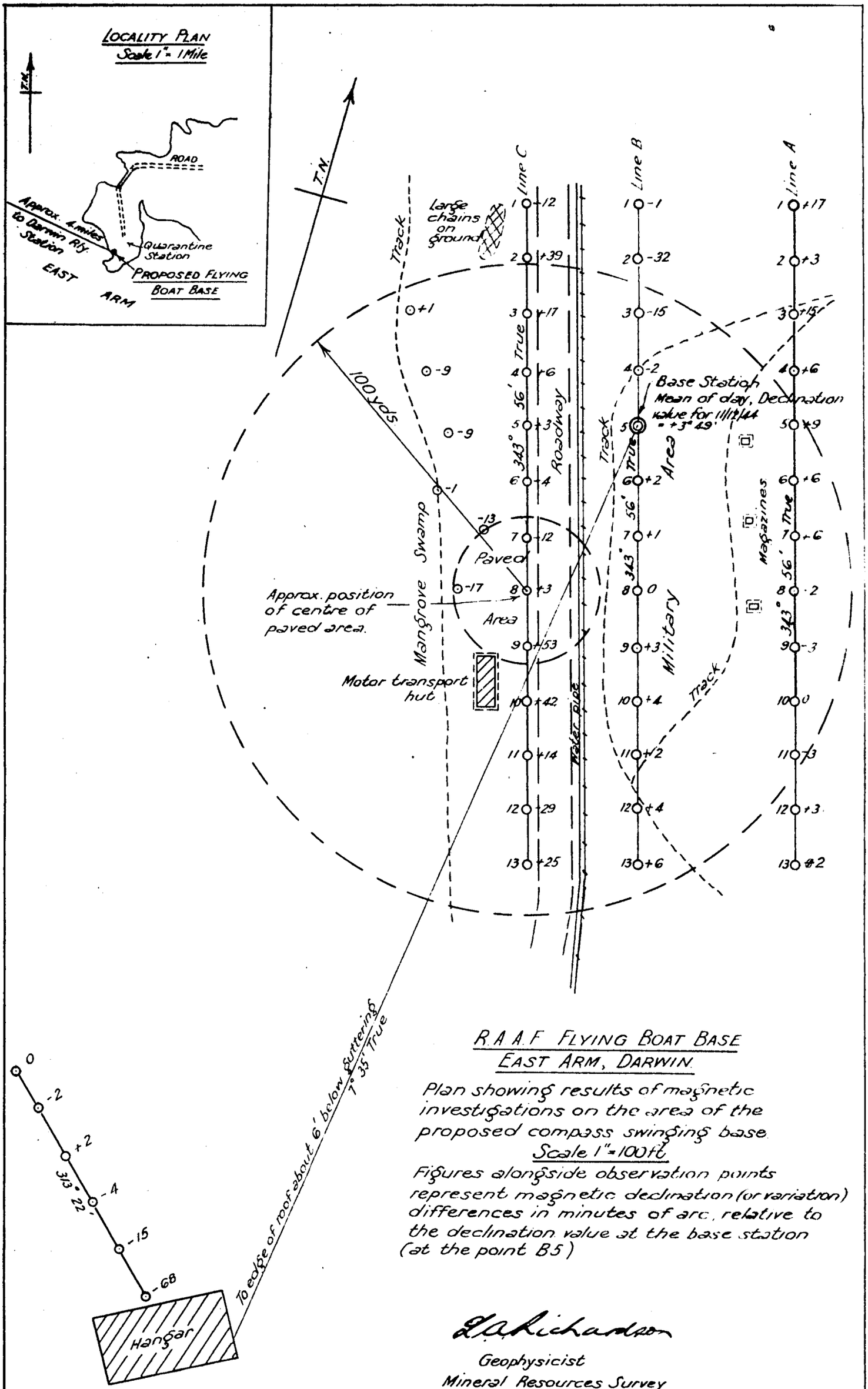

R A A F FLYING BOAT BASE
EAST ARM, DARWIN.

Plan showing results of magnetic investigations on the area of the proposed compass swinging base.

Scale 1" = 100ft.

Figures alongside observation points represent magnetic declination (or variation) differences in minutes of arc, relative to the declination value at the base station (at the point B5)

D.A. Richardson

Geophysicist
Mineral Resources Survey
Dec. 1944

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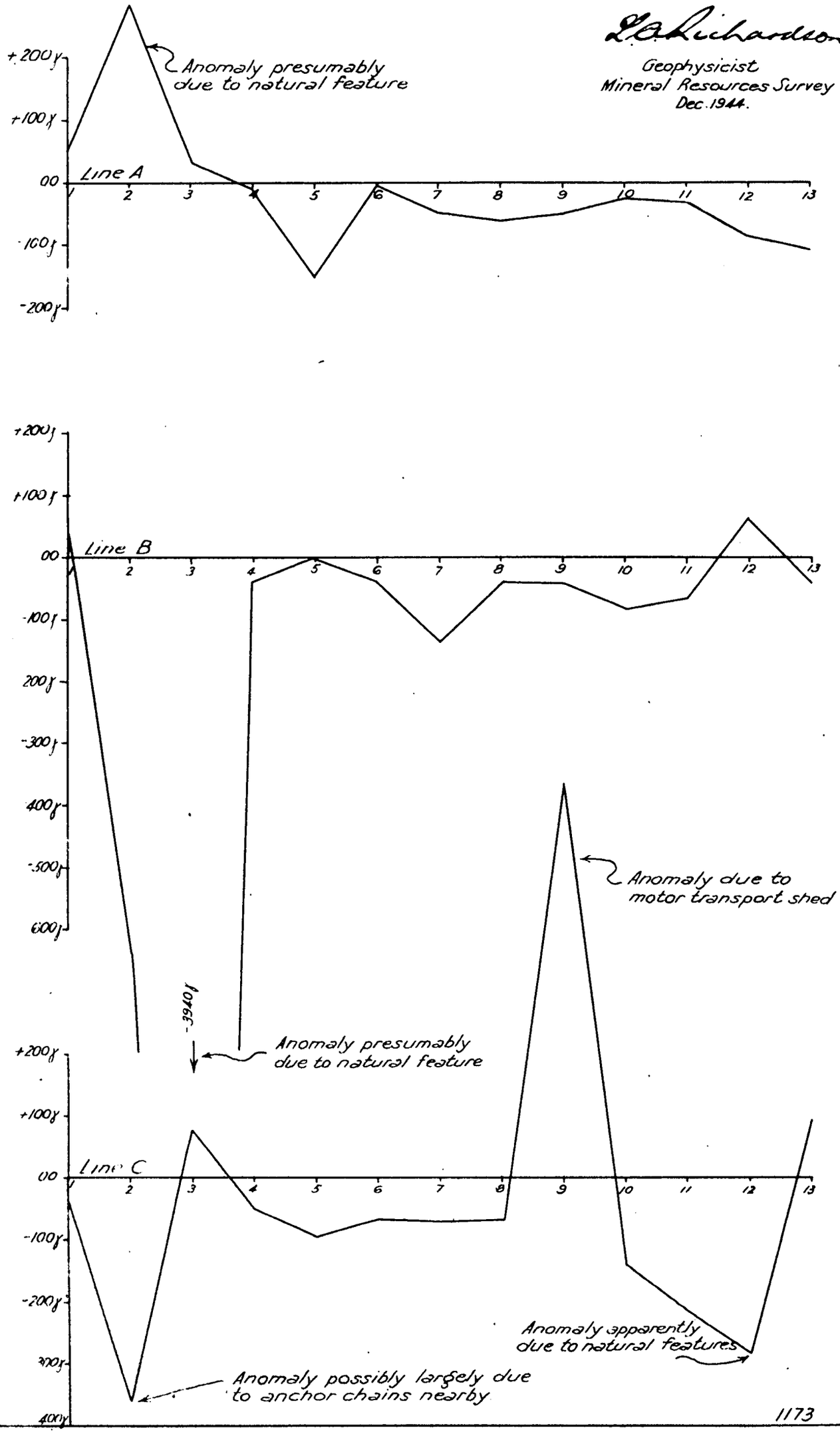
R.A.A.F FLYING BOAT BASE
— EAST ARM, DARWIN —
MAGNETIC INVESTIGATION RESULTS

Plate showing vertical component variations along traverse lines as shown on Plan numbered 1172.

Scales:- Hor. 1" = 100 ft.
Vert. 1" = 200 Gammas (1 Gamma = 10^{-5} Gauss)

L.A. Richardson

Geophysicist
Mineral Resources Survey
Dec. 1944.



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