COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1965/157

MAGNETIC SURVEY
OF
TWO COMPASS SWINGING SITES
KINGSFORD SMITH AIRPORT
MASCOT, N.S.W.

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OF

TWO COMPASS SWINGING SITES,

KINGSFORD SMITH AIRPORT

MASCOT N.S.W.

by

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ILLUSTRATIONS

SUMMARY

A magnetic declination survey of two sites at Kingsford Smith Airport was made to establish aircraft compass swinging sites.

Diagrams are presented showing the values of magnetic declination at 55 stations distributed over each site. Magnetic bearings were determined at 12 stations on a circle of 100 ft radius from the centre of each site. Values have been given of the monthly mean solar daily variations of declination at Kingsford Smith airport.

The magnetic effect of the aircraft tug was determined. The tug will have an effect of 1 to 3 minutes on the compass of the Boeing 707-138B but an negligible effect on the Boeing 707-338C.

1. INTRODUCTION

A magnetic declination survey of two areas on Kingsford Smith aerodrome at Mascot N.S.W. was made between the 5th and 8th July, 1965.

The survey was undertaken at the request of Qantas Empire Airways to establish two areas for aircraft compass swinging.

The following data were required :

(i) The values of magnetic declination at 55 stations distributed over each site

(ii) For checking the aircrafts' compass bearings, the magnetic bearings to two prominent objects at 12 stations on a circle of 100 ft radius from the centre of each site.

(iii) The magnetic effect at various distances of the aircraft tug. This is the vehicle pulling the aircraft into position during compass swinging operations.

2. PREPARATION OF SITES

Each site had been surveyed ahead by surveyors of the Department of Civil Aviation. A central station was marked, and also stations at 50, 100, 150 and 200 feet from the centre along each of 12 radial lines 30 degrees apart.

Every 60 degrees apart a station was marked 300 feet from the centre, making a total at each site of 55 stations. One radius of the grid was oriented towards true north. The stations were marked with wooden pegs in grassed areas and by nails with yellow paint marks on the bitumen taxi ways.

3. INSTRUMENTS

An Askania declinometer no.580 3201, mounted on an Askania base circle, was used.

4. PROCEDURE

The torsion was removed from the declinometer fibre before commencing observations.

Observations of magnetic declination were started from the centre station, then stations were observed proceeding outward along the true north radius. The outermost station on the opposite radius was used as an azimuth mark. After completion of the first radius, the instrument was set up at the end of the next radius and the azimuth mark was moved to the end of the opposite radius. Then the stations were read proceeding inward until the centre station was occupied again, thus providing control on time variations.

This procedure was carried out until all 54 radial stations were observed. At each 100 ft mark, magnetic bearings were taken of two prominent objects.

Mark and magnet were each sighted once, and the magnet remained in the erect position throughout.

After the survey of the two compass swinging sites, the magnetic effect of the aircraft tug was measured at various distances.

5. RESULTS

Plate 1 shows the location of the two areas. The mean magnetic declination for each station for July 1965 at the two sites is shown on Plates 2 and 3. Also on these plates are listed the mean magnetic bearings of two prominent objects from the points at 100 ft from the respective centres.

The mean values of the declination of the two sites are :

Site 1 11° 11' East

Site 2 11° 13' East

The variation of magnetic effect with distance of the aircraft tug is as follows:

A. Tug magnetic north or south of declinometer

distance in feet	deflection of magnet
37	less than 1 minute
25	2 minutes
12.5	4 minutes

B. Tug magnetic east or west of declinometer

distance in feet	deflection of magnet
50	less than 1 minute

distance in feet (cont)	deflection of magnet (cont)
36.5	2 minutes
27	4 minutes
25	8 minutes

6. DISCUSSION OF RESULTS

Both sites are magnetically disturbed, which can be mainly attributed to the building materials used when constructing the airport. The blue stone filling was tested and was found to be magnetic. It is suspected that underground drains have been built from re-inforced concrete.

The departure of the mean declination does not exceed ± 6 minutes at most stations, but there are some isolated cases of departures of up to 30 minutes.

The distance of the compass of the Boeing 707-138B to the towbar attachment is 24 feet. The towbar is 9 feet long. This places the tug at 33 feet from the compass. At this distance the magnetic effect of the tug, depending of its position, is from 1 to 3 minutes. The effect of the towbar was not measured and could increase the combined effect.

The Boeing 707-338C has wing tip sensors. The distance of these to the towbar attachment is more than 50 feet. The effect of tug and towbar on this aircraft will be negligible.

The month of July was a favourable month for this type of survey as the mean solar daily variation of the magnetic declination is small during July at Kingsford Smith airport. Table 2 shows the hourly values of daily variation for each month of the year during daylight hours at the airport. This table has been derived from Vestine et al (1948).

The rate of secular variation at Sydney is at present + 2.5 minute per year, i.e. the magnetic declination increases easterly by 2.5 minutes per year.

The value of 11° 11' and 11° 13' East for the two sites is remarkably low compared with the expected value of 11° 40' East according to the isogonic map of Australia for the epoch 1965.0 (van der Linden 1964). However the values agree with the value of 11.0° East found for Richmond RAAF station by Cook (1959).

7. RECOMMENDATIONS

To ensure that magnetically quiet conditions exist during compass swinging, it is advisable to contact the Ionospheric Prediction Service Elizabeth Street, Sydney, telephone number 20340, before and after compass swinging.

There is still an uncertainty about the magnetic effect of the 9 feet long tow bar. A tow bar made of metal of low magnetic susceptibility e.g. stainless steel, would not have a serious effect.

8. REFERENCES

COOK, B.G. 1959 Magnetic survey of compass swinging sites, R.A.A.F. station, Richmond, N.S.W. Bur. Min. Resour. Aust. Rec. 1959/136

VAN DER LINDEN, J. 1964 Isomagnetic map of Australia and New Guinea for the epoch 1965.0. Bur. Min. Resour. Aust. Rec. 1964/160

VESTINE, E.H. 1948 Description of the Earth's main magnetic field and its secular changes, 1905-1945.
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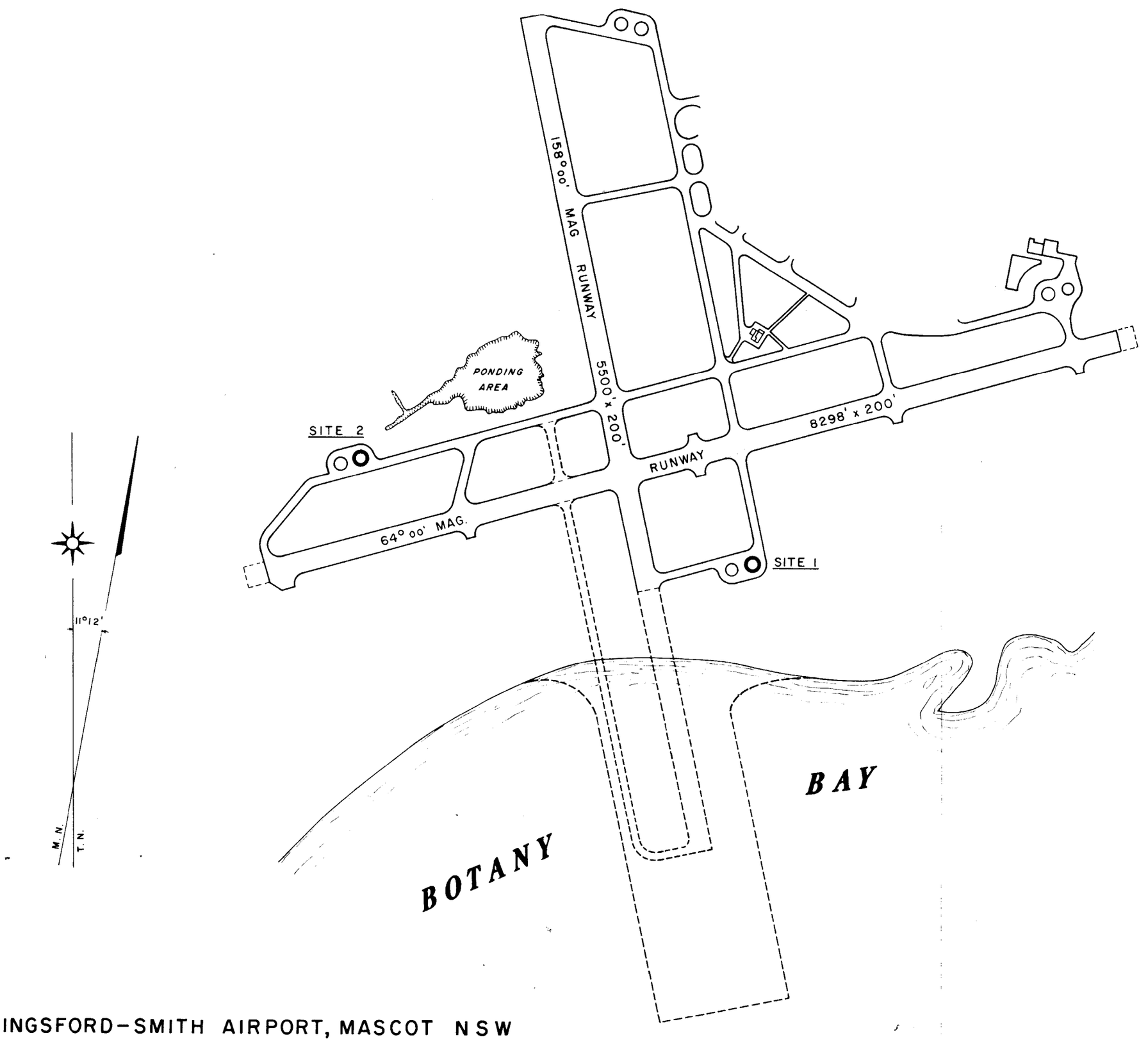
TABLE 1

Monthly mean solar daily variation of declination on quiet days in minutes

Kingsford Smith Airport

At Local Hour													
6	7	8	9	10	11	12	13	14	15	16	17	18	Month
-4	-4	-4	-3	-1	+1	+3	+4	+3	+3	+2	+1	+1	January
-2	-3	-4	-4	-3	-1	+1	+3	+4	+4	+3	+2	+1	February
-1	-2	-3	-4	-4	-2	+1	+3	+4	+3	+2	+2	+1	March
0	-1	-2	-3	-3	-2	0	+2	+3	+3	+2	+1	0	April
0	0	-1	-2	-2	-2	0	+1	+2	+2	+2	+1	0	May
0	0	0	-1	-1	-1	0	+1	+2	+2	+1	0	0	June
0	0	0	-1	-2	-1	0	+1	+2	+2	+2	+1	0	July
0	0	0	-1	-2	-1	0	+1	+2	+2	+2	+1	0	August
0	-1	-2	-3	-4	-3	-1	+1	+2	+3	+2	+2	+1	September
-1	-2	-4	-5	-4	-2	+3	+3	+4	+4	+3	+2	+1	October
-2	-3	-5	-5	-4	-2	+1	+3	+4	+4	+3	+2	+1	November
-2	-4	-5	-5	-3	-1	+1	+3	+4	+4	+3	+2	+1	December

PLATE 1



KINGSFORD-SMITH AIRPORT, MASCOT NSW

AIRCRAFT COMPASS SWINGING SITES
LOCALITY MAP

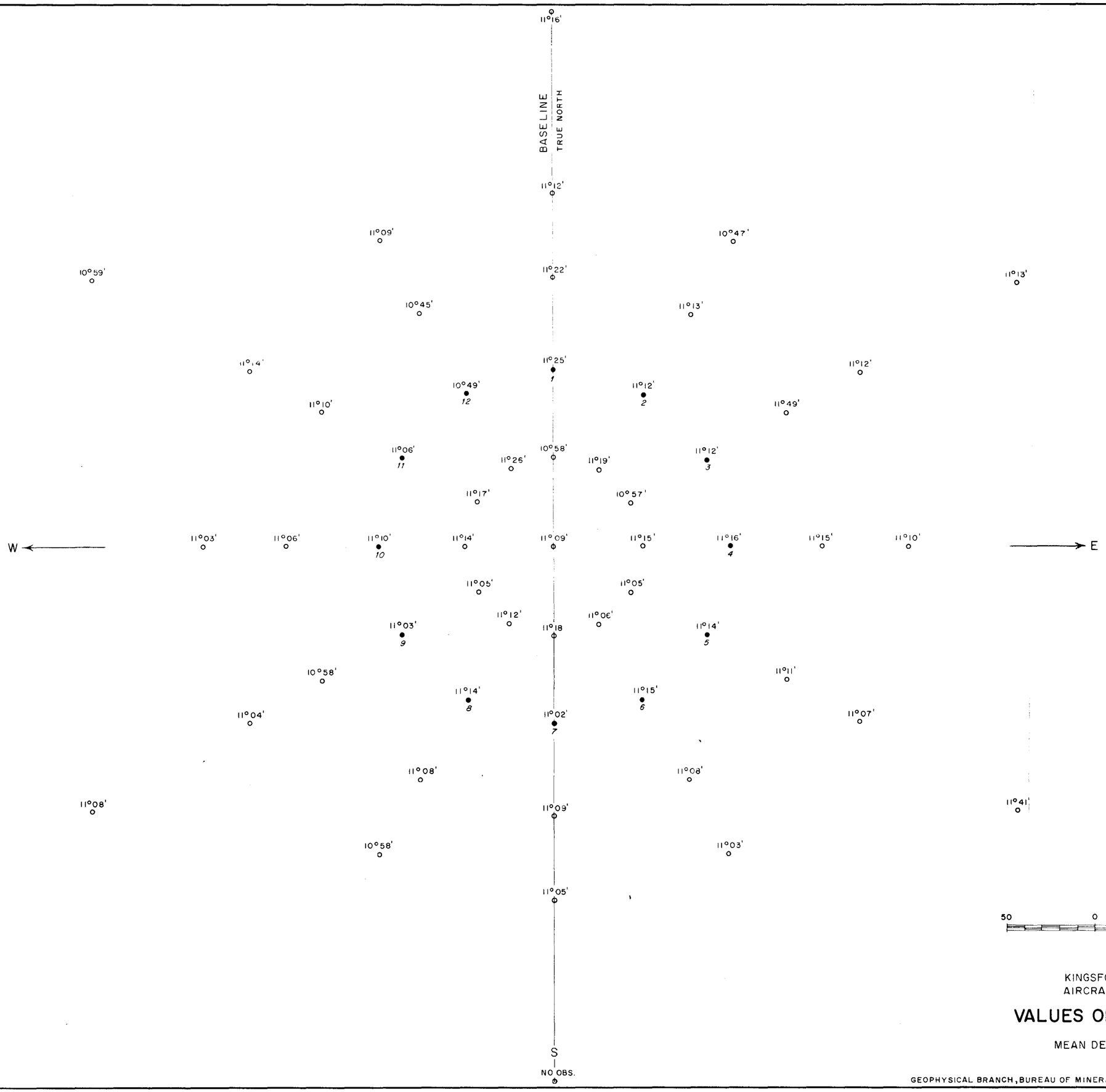
FEET

1000 0 1000 2000 3000

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. G 188 - 18

TO ACCOMPANY RECORD No

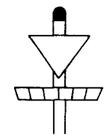
PLATE 2



Magnetic bearings from points on radius of 100 feet from centre:

STATION	TO FLAGPOST ON PENFOLDS BUILDING Dist. approx. 1½ miles	TO BEACON IN WATER Dist. approx. ¾ mile
1	319°07·5'	128°21·5'
2	319°06·6'	128°47·1'
3	319°01·7'	128°49·7'
4	319°04·9'	128°37·4'
5	319°20·4'	128°20·9'
6	319°38·1'	127°56·1'
7	320°08·2'	127°47·2'
8	320°11·9'	127°25·9'
9	320°27·0'	127°33·0'
10	320°16·5'	127°35·5'
11	320°04·4'	127°55·4'
12	320°02·8'	128°37·3'

BEACON :



KINGSFORD-SMITH AIRPORT, MASCOT, NSW
AIRCRAFT COMPASS SWINGING SITE No.1

VALUES OF MAGNETIC DECLINATION

MEAN DECLINATION OF AREA IS 11° 11' EAST

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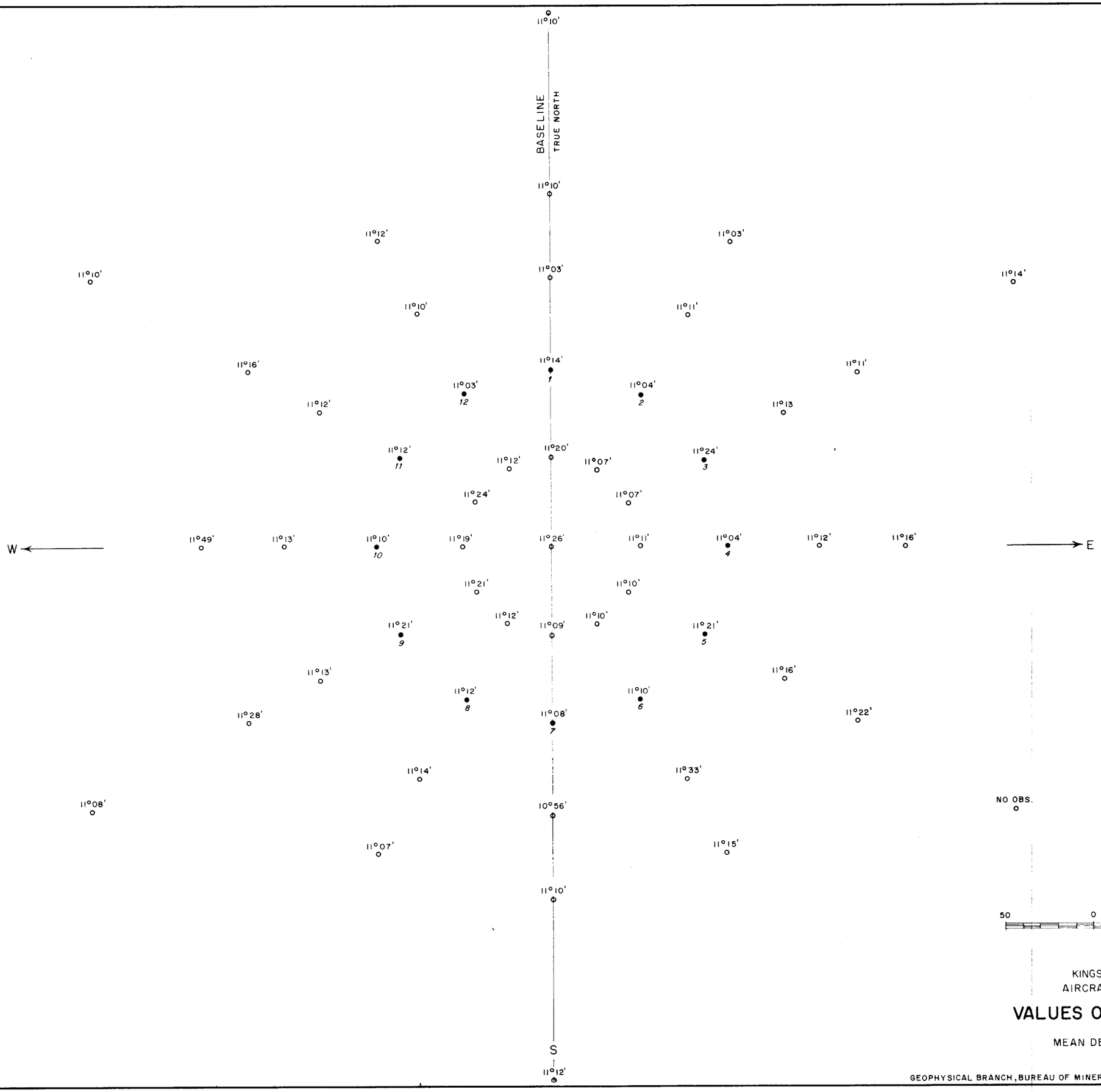
PLATE 3



Magnetic bearings from points on radius of 100 feet from centre:

STATION	TO FLAGPOST ON PENFOLDS BUILDING Dist. approx. 3/4 mile	TO CHURCH SPIRE Dist. approx. 2 miles
1	343°24·0'	211°42·5'
2	343°05·7'	212°03·5'
3	342°30·5'	211°56·5'
4	342°46·5'	212°28·5'
5	342°39·0'	212°18·0'
6	343°11·0'	212°28·5'
7	343°34·5'	212°22·0'
8	343°55·0'	212°06·0'
9	344°05·5'	211°46·0'
10	344°22·0'	211°45·5'
11	344°10·0'	211°36·0'
12	343°59·5'	211°46·5'

KINGSFORD-SMITH AIRPORT, MASCOT, NSW
AIRCRAFT COMPASS SWINGING SITE No. 2

VALUES OF MAGNETIC DECLINATION

MEAN DECLINATION OF AREA IS 11° 13' EAST

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