

1944/39

c. 1

COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.
MINERAL RESOURCES SURVEY.

REPORT No. 1944/39.
(Plan No. 1148)

REPORT ON MAGNETIC INVESTIGATIONS IN THE
VICINITY OF FREMANTLE,
IN CONNECTION WITH NAVAL DEGAUSSING OPERATIONS.

by

L.A. Richardson,
Geophysicist.

CANBERRA.

26th October, 1944.

DEPARTMENT OF SUPPLY & SHIPPING.

MINERAL RESOURCES SURVEY BRANCH.

REPORT ON MAGNETIC INVESTIGATIONS IN THE
VICINITY OF FREMANTLE.
IN CONNECTION WITH NAVAL DEGAUSSING OPERATIONS.

REPORT NO. 1944/39. PLAN NO. 1148.

These investigations were carried out at the request of the Secretary for the Navy. The following report is intended to confirm provisional information made available to naval personnel during and at the conclusion of the surveys.

The Fremantle Degaussing Range is situated in Gage Roads near Fremantle Harbour. The position of the coils forming the shallow and deep ranges is shown in Fig. 1. Deperming operations are carried out in Careening Cove, Garden Island.

The objects of the investigation were-

(1) To determine the average normal values of the vertical (Z) and horizontal (H) force components of the Earth's magnetic field in that part of the harbour which would be occupied by a ship in passing over the coils.

(2) To determine the average normal values of Z and H in the vicinity of Careening Cove, Garden Island.

The equipment used for the survey consisted of-

(1) Theodolite-Magnetometer and Earth Inductor No. 18 (obtained from the Carnegie Institution of Washington) for absolute determinations of the magnetic elements.

(2) Vertical Force Variometer No. 15977 (made by Watts and Company, London) for relative determinations of the vertical force component.

(3) Horizontal Force Variometer No. 16165 (Watts) for relative determinations of the horizontal force component.

These instruments are designed for accurate measurement of the magnetic elements on land.

During this survey I was assisted by Mr. N.G. Chamberlain B.A. Geophysicist.

Absolute determinations of the magnetic elements, Declination, Inclination and Horizontal Intensity were made at a station in North Cottesloe and at another station on Fremantle Golf Links. Particulars of these determinations are given below.

As shown in Fig. 1, the survey to test the homogeneity of the magnetic field in the vicinity of the Range was carried out on the beach along a traverse to the north and south of the range Hut. Observations were confined to those parts of the traverse which were free from artificial disturbances arising from installations and tramways. Similar observations were made along the traverses shown on the Golf Links and near the Reservoir. Observations were also made along traverses at Careening Cove and Sulphur Bay on Garden Island. For this part of the survey the variometers were used to determine differences in Z and H relative to the Cottesloe Station, and the absolute values determined at Cottesloe were used in placing the observations with the variometers on an absolute basis.

The positions of all the traverses used for the variometer surveys are shown on Fig.1. The results of the variometer surveys are shown as profiles on Fig.2.

The profile for the traverse along the beach in front of the Range Hut shows some irregularities in Z and H with a range of less than 1 milligauss, except for one point at the southern end of the traverse. It is likely that installations adjacent to the beach such as oil pipe lines and buildings are responsible for some of these irregularities.

Profiles along traverses on the Golf Links and near the Reservoir show much more uniformity. These traverses are clear of any installations likely to cause magnetic disturbance.

The profile for the traverse along the beach at Careening Cove is disturbed in Z and H in the vicinity of the two jettys. It seems likely that installations or iron objects covered by the sand are responsible for these disturbances. The range of the disturbances is $1\frac{1}{4}$ milligauss in Z and $2\frac{1}{4}$ milligauss in H . The profiles show uniform conditions at the ends of the traverse.

At Sulphur Bay observations at 3 points show fairly uniform conditions and normal values.

In Fig.1 the calculated absolute values of Z and H are shown for those portions of the traverses where the magnetic field is reasonably uniform. For the traverse along the beach in front of the Range Hut, the profiles have been smoothed as shown by the dotted lines and absolute values calculated for the terminal points of the smoothed profiles.

From an examination of these absolute values which show a fairly high degree of uniformity, and, after making due allowance for the normal gradient of the Earth's Magnetic Field, it is concluded that the normal present day values for Z and H are -

For Fremantle area	Z	=	- 532 milligauss
	H	=	238 "

For Careening Cove	Z	=	- 533.5 "
	H	=	237 "

The uniformity in Z and H over the area surveyed accords well with what is known of the geology of the Perth-Fremantle district. In the search for water, bores have been sunk to various depths (2537 feet at Rottnest Island) and have penetrated sedimentary rocks such as shales, marls, sandstones and limestones of Tertiary age. These rocks are normally non-magnetic in character.

Canberra
26/10/44.

L.A. Richardson
(L.A. Richardson)
Geophysicist

DETAILS OF ABSOLUTE DETERMINATIONS.

Cottesloe Station.

Description of Station. Close reoccupation of Carnegie Institution of Washingtons Station of 1914 and 1921 in Government Educational Endowment Reserve north east of the junction of Grant ^{and} Marmion Streets, 146 feet from southern boundary of Reserve and 188.5 feet from Western boundary of Reserve, marked by a concrete block 12" long, 4" diameter with a brass screw set in top, sunk flush with the surface. True bearings :- Right edge of tank near windmill, $21^{\circ} 29'.0$; left edge

of near chimney on BEL-AIR , flats, $720^{\circ} 43'.5$; ornament on front gable of cottage, about $\frac{1}{4}$ mile, $120^{\circ} 02'.6$; pointed top of tank near windmill, on slope, about 1 mile to north, $186^{\circ} 46'.9$; left edge of chimney on green roofed cottage, $220^{\circ} 13'.6$; base of ornament on top of red-roofed house, about 150 yards, $262^{\circ} 14'.3$; left edge at bottom of nearer of two cottage chimneys prominent on the skyline, $299^{\circ} 52'.2$.

Results of Observations Reduced to International Magnetic Standard by Provisional Corrections determined at Watheroo Magnetic Observatory by W.C. Parkinson, Feb. 1940.

Magnetic Element.	Date.	Local Mean Time.	Value.	Mean of day Value.
Declination (D)	16/8/44	11.23	$30^{\circ} 25'.0$ W	
		12.37	$24'.7$	
		14.13	$22'.2$	$30^{\circ} 23'$ West
		15.23	$21'.1$	
Inclination (I)	"	11.06	$65^{\circ} 52'.0$ S	
		12.57	$52'.4$	
		13.59	$52'.2$	$65^{\circ} 52'$ South
		15.58	$51'.7$	
Hor. Intensity (H)	"	11.41	.23803 Gauss	
		12.17	.23807 "	
		14.30	.23789 "	.23803 Gauss
		15.05	.23805 "	
Ver. Intensity (Z)	Calculated from mean of day values of I and H			
and H Z	= .53134 Gauss.			

Fremantle Golf Links Station.

Description of Station. In south eastern part of Royal Fremantle Golf Links, 849.4 feet from eastern boundary of Golf Links and 66.3 feet from southern boundary of Golf Links, marked by a concrete block 12" long, 4" dia., with a brass screw set in top, sunk flush with surface. True bearings :- Near gable end of old stone shed, about $\frac{1}{2}$ mile, $306^{\circ} 41'.5$; near cross on top of church, $48^{\circ} 45'.3$; centre at top of War Memorial at North Fremantle, $104^{\circ} 32'.1$.

Results of observations Reduced to International Magnetic Standard by Provisional Corrections determined at Watheroo Magnetic Observatory by W.C. Parkinson, Feb. 1940.

Magnetic Element.	Date.	Local Mean Time.	Value.	Mean of day Value.
Declination (D)	25/8/44	10.23	$30^{\circ} 29'.3$ W	
		11.37	26.6	
		13.17	25.6	$30^{\circ} 26'.5$ West
		14.57	24.6	
Inclination (I)	"	10.07	$65^{\circ} 57'.1$ S	
		11.57	57.4	
		12.50	57.5	$65^{\circ} 57'.4$ South
		15.32	57.7	

(contd.)

contd.

Magnetic Element.	Date.	Local	Value.	Mean
		Mean Time.		of day Value.
Hor. Intensity(H)	25/8/44	10.42	.23746 Gauss	
		11.18	.23745 "	
		13.39	.23740 "	.23742 Gauss
		14.32	.23739 "	

Vert. Intensity (Z) Calculated from mean of day values of *I* and *H*
~~I~~ and ~~H~~, $Z = .53220$ Gauss.

FREMANTLE DEGAUSSING RANGE AND GARDEN ISLAND DEPERMING BASE, W. A.
PLAN TO ACCOMPANY MAGNETIC INVESTIGATIONS REPORT NO. 1944/39.

0 1000 2000 3000 4000 5000 6000 Yds

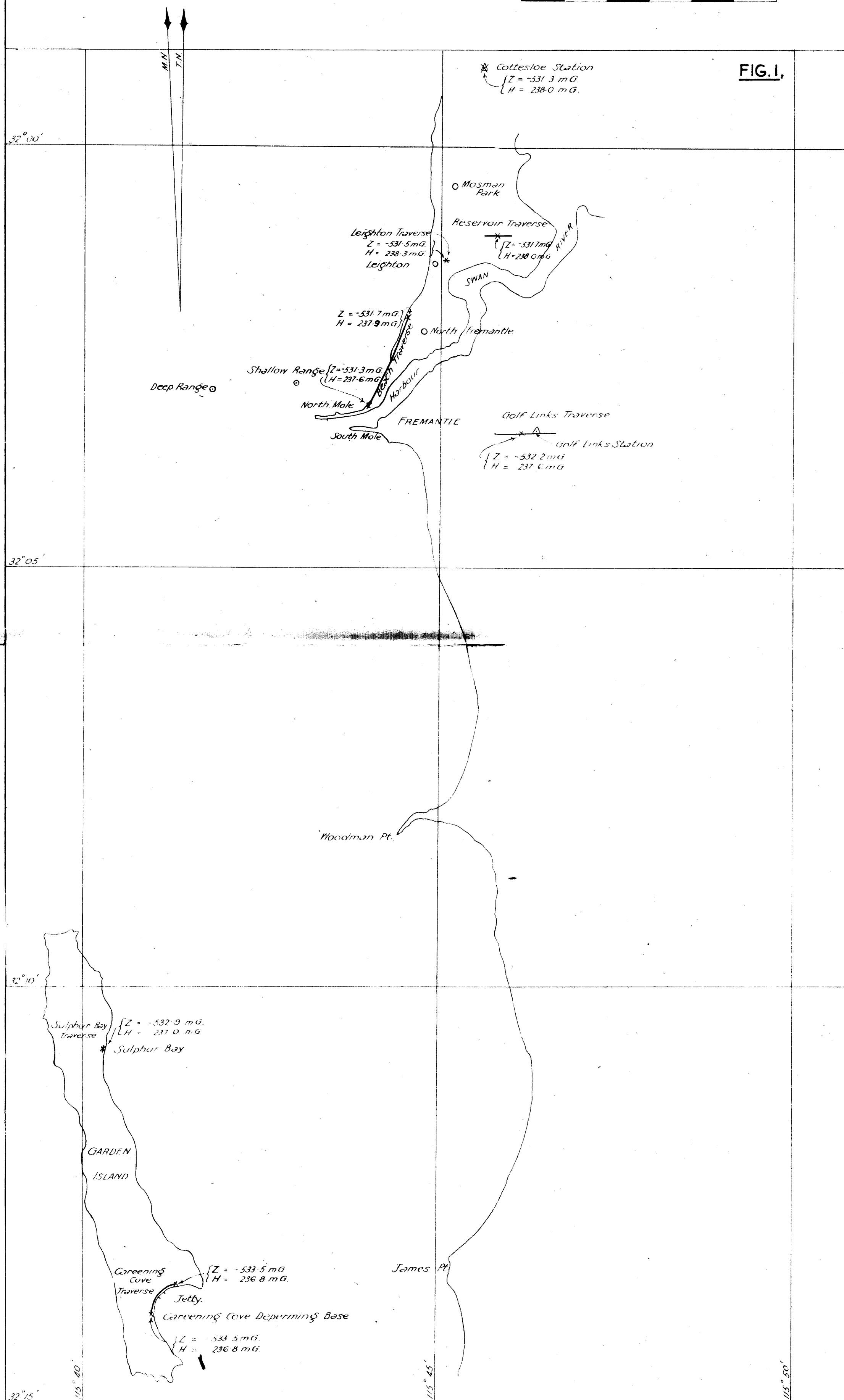
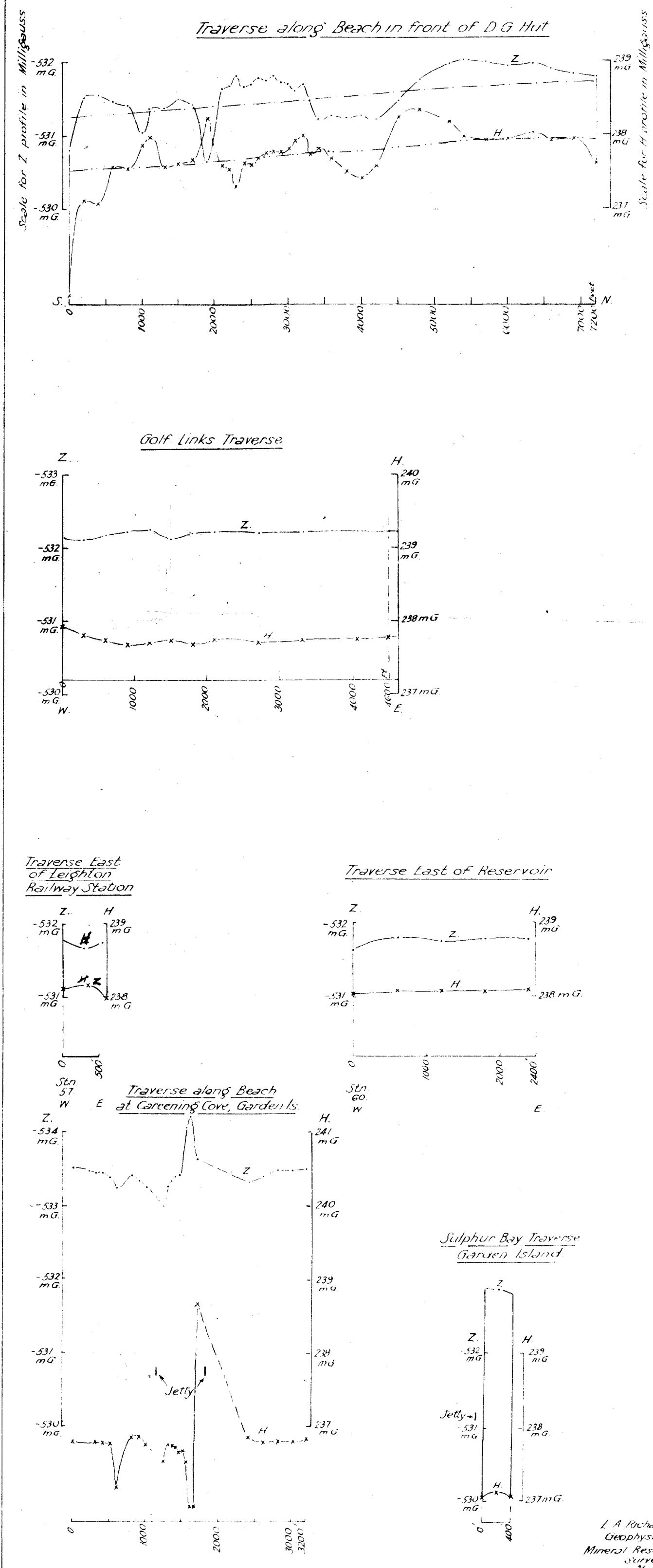


FIG. 2

MAGNETIC PROFILES ALONG TRAVERSES ON FIG. 1 SHOWING VERTICAL & HORIZONTAL FORCE COMPONENT VARIATIONS AS DETERMINED BY VARIOMETER SURVEYS AND ABSOLUTE VALUES BASED ON OBSERVATIONS MADE AT COTTESLOE ON 16.8.44 USING C.I.W. MAGNETOMETER EARTH INDUCTOR NO. 18.



L. A. Richardson
Geophysicist
Mineral Resources
Survey 25.12.44