

59/69 A

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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS

RECORDS:

1959/69A

SPECIAL RECORDS - 1959/69A

Notes to accompany gravity maps and Profiles, Great Barrier Reef Area.

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NOTES TO ACCOMPANY GRAVITY MAPS AND PROFILES,
GREAT BARRIER REEF AREA.

The gravity work has been carried out in two stages. Firstly in 1954 a survey was carried out using an Atlas gravity meter and taking readings on the mainland, and on islands and reefs where landings could be made from a boat. The results of this have been presented on three maps on a scale of eight miles to an inch as Bouguer anomalies. These are attached. Some notes which were prepared to accompany the maps are also attached.

The second stage was a survey by underwater gravity meter during October-December 1958, described briefly in the Introduction to BMR Records No. 1959/69, which covers Traverses 6 and 7 of the survey. The methods of operation, surveying, and correcting results are similar to those described in Records 1959/69. Pendulum stations at Cairns, Townsville, and Rockhampton were used for gravity datum and drift control, as well as previously established gravity meter stations at Thursday Island and Cooktown.

Profiles for Traverses 1, 2, 3, 4 and 5 are attached to these notes. The values for Traverse 2 and for some of the stations of the north-south regional traverse have been overplotted on the Bouguer anomaly map G69-308, but the contours have not been altered to conform with these values. Locations, depths, and Bouguer anomalies for the regional traverse are listed in the accompanying table.

This information has been compiled with a view to making available the existing information in its present state, and the results should therefore be regarded as provisional and subject to slight adjustments. However, it is believed that they are substantially correct, and no major alteration should be necessary.

NOTES ON BOUGUER ANOMALY GRAVITY MAPS OF NORTH
QUEENSLAND COASTAL AREA AND ADJACENT GREAT BARRIER REEF ISLANDS.

(by J.C. DOOLEY)

The maps are based on simple Bouguer anomalies, and no corrections for topography have been made. It is estimated that such corrections are unlikely to exceed about 2 milligals, and, therefore, the general trends and major features of the gravity countours would not be affected substantially by omission of these corrections.

The major feature shown is the rise from landward to seaward, from -40 milligals in the Atherton-Herberton region, to +80 milligals on the outer reef off Cooktown. Isostatic corrections (based on Hayford system with depth of compensation 113.7 Km.) have been calculated at six points, with the following results:-

	Correction to Bouguer Anomaly	Isostatic Anomaly
Station 92 Atherton	+ 29.7 mg.	- 10.6
1 Cairns	- 2.1	+ 14.3
S4 Green Is.	- 10.4	+ 43.2
S40 Milln Reef	- 31.1	+ 33.9
145 Millaa Millaa	+ 30.1	+ 0.8
148 Innisfail	+ 5. 1	+ 16.8

These figures indicate that the rise to seaward is only partly accounted for by isostatic compensation. This is a common feature at continental margins where the rise in the Mohorovicic discontinuity may not be coincident with the edge of the continental shelf.

One theory which the gravity survey hoped to resolve is the theory that block faulting parallel to the coast is the major structural control in this area. The gravity rise from west to east has a fairly even gradient, which would be disturbed considerably by a major fault. Thus a preliminary conclusion is that major block faulting has not occurred.

The present survey is limited to some extent by the locations of stations. For example, off-shore work was confined to islands and reefs where a gravity meter could be set up; thus any structural difference between reef areas and intervening sea "valleys" would not be apparent. On land, this applies to a smaller extent, insofar as readings were not taken on the highest mountain blocks, as time and facilities were not available for climbing these on foot, and the roads naturally tend to follow valleys and plateaus. It is hoped that some gaps will be filled in the near future by an underwater gravity meter survey.

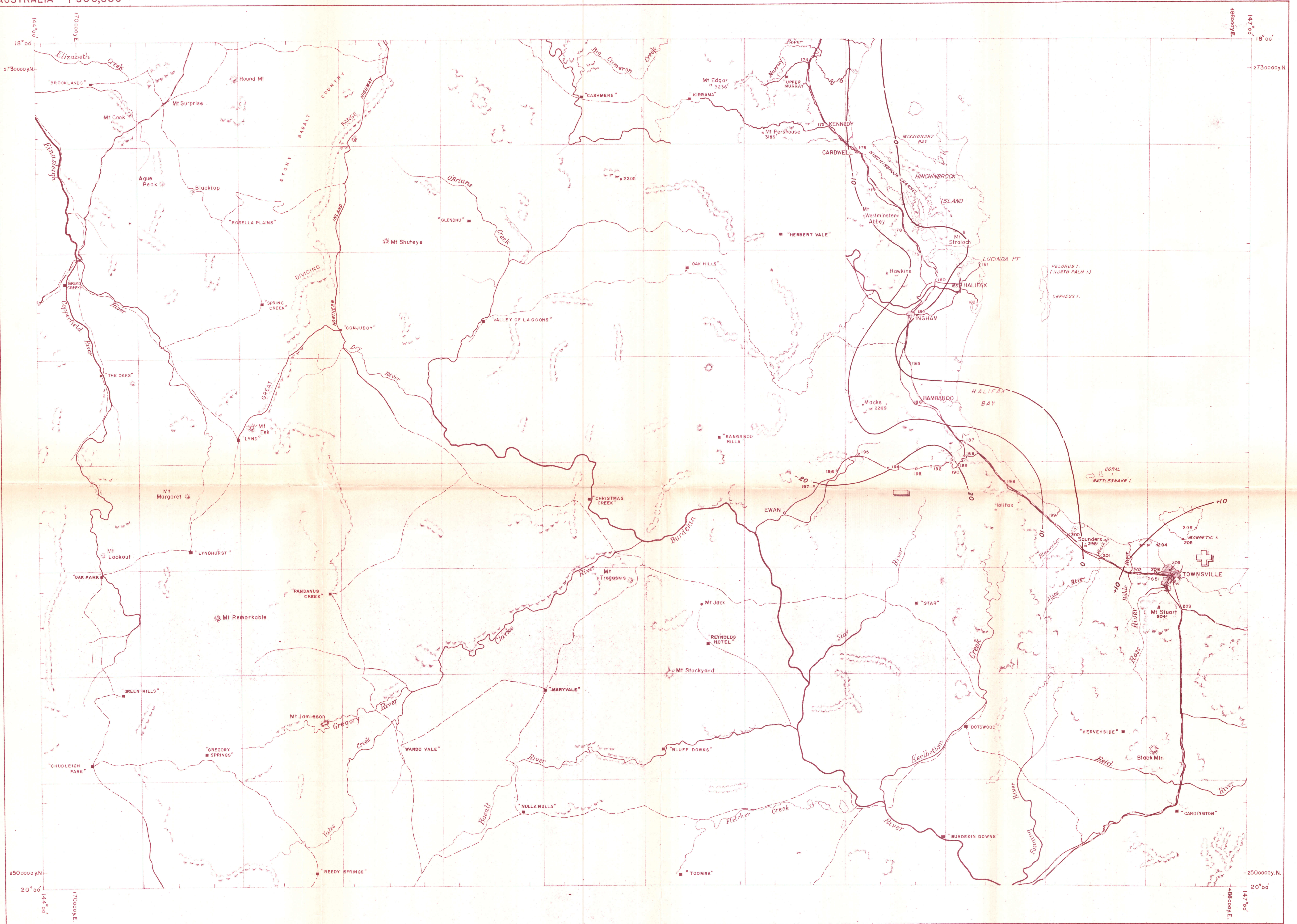
Comparatively high gravity anomalies occur in the island area west of Cooktown. This seems surprising at first sight as the geological maps shows Jurassic-Cretaceous sediments in this area, surrounded by Devonian. The general level of the terrain in this area is much lower than that to the south, and the positive Bouguer anomalies may be caused by a deep-seated change.

An eastward swing in the predominantly north-south countours occurs south of Undine Reef, and a similar feature occurs east of Cape Grafton. The interpretation of these features, together with sundry other features on land, require further investigation before definite conclusions can be drawn.

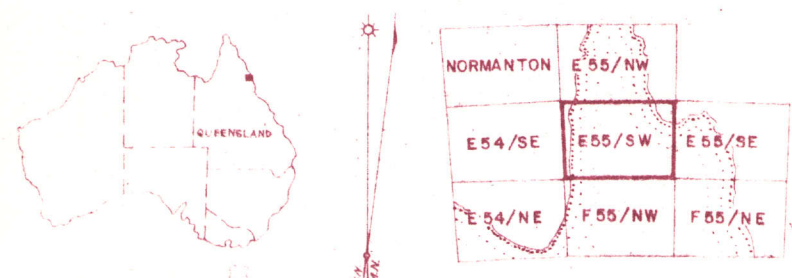
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REGIONAL GRAVITY SURVEY.

Station	South Latitude	East Longitude	Depth (Feet)	Bouguer Anomaly Milligals
BR 1	10° 42.6'	142° 35.3'	52.8	+ 35.5
BR 2	10° 53.8'	142° 45.4'	50.8	+ 35.8
BR 3	11° 14.2'	142° 54.7'	86.7	+ 48.9
BR 4	11° 35.3'	142° 56.5'	83.1	+ 55.4
BR 5	11° 46.9'	143° 04.7'	92.2	+ 45.2
BR 6	11° 59.8'	143° 15.5'	144.4	+ 28.9
BR 7	12° 15.0'	143° 15.4'	96.5	+ 48.3
BR 8	12° 35.5'	143° 24.5'	20.3	+ 33.0
BR 9	12° 53.1'	143° 35.2'	84.6	+ 44.3
BR 10	13° 08.5'	143° 36.9'	81.3	+ 47.1
BR 11	13° 28.4'	143° 41.0'	52.6	+ 53.3
BR 12	13° 40.6'	143° 41.0'	79.4	+ 56.5
BR 13	13° 56.1'	143° 44.7'	58.5	+ 55.6
BR 25	14° 20.8'	144° 39.3'	34.4	+ 47.7
BR 26	14° 32.3'	144° 59.2'	46.0	+ 46.3
BR 27	14° 51.3'	145° 17.0'	50.8	+ 57.7
BR 28	15° 05.0'	145° 28.5'	106.4	+ 56.3
BR 29	15° 16.5'	145° 24.1'	88.1	+ 43.3
BR 30	15° 26.4'	145° 20.0'	59.5	+ 32.0
BR 31	15° 27.8'	145° 15.1'	19.9	+ 22.9
BR 32	15° 44.6'	145° 26.0'	46.6	+ 28.1
BR 33	16° 02.7'	145° 33.0'	96.8	+ 31.7
BR 34	16° 25.8'	145° 29.4'	52.8	+ 19.9
BR 35	16° 23.9'	145° 39.2'	108.4	+ 40.3
BR 36	16° 55.5'	145° 46.8'	36.1	+ 12.2
BR 37	16° 47.0'	145° 55.8'	106.7	+ 41.2
BR 38	16° 54.9'	146° 07.4'	144.5	+ 57.4
BR 44	17° 30.7'	146° 17.9'	126.2	+ 18.9
BR 45	17° 44.2'	146° 09.8'	32.1	+ 29.6
BR 46	18° 02.8'	146° 12.9'	77.9	+ 10.0
BR 47	18° 20.5'	146° 20.2'	52.0	+ 5.6
BR 48	18° 40.3'	146° 29.8'	85.1	+ 12.8
BR 70	19° 44.2'	147° 44.5'	19.9	+ 4.9
BR 71	19° 49.8'	148° 03.6'	79.3	+ 19.9
BR 86	20° 23.4'	148° 56.3'	133.0	+ 21.3
BR 87	20° 41.5'	149° 02.9'	54.8	+ 24.9
BR 88	20° 58.8'	149° 12.0'	33.3	+ 19.4
BR 89	21° 06.6'	149° 13.5'	17.1	+ 21.1
BR 90	21° 24.3'	149° 46.9'	60.3	+ 10.9
BR 91	21° 36.8'	149° 46.9'	39.7	+ 2.4



LOCATION



REFERENCE TO AUSTRALIAN NATIONAL 8 MILE MAP SERIES

MAP DATA

PROJECTION: TRANSVERSE MERCATOR, AUSTRALIAN SERIES
 CONTROL: EXISTING 1 AND 4 MILE MILITARY MAPS.
 DETAIL: GRID AND GRATICULE COMPUTED AND COMPILED BY THE GEOPHYSICAL DRAWING OFFICE.
 PLANIMETRIC DETAIL FROM 1 AND 4 MILE MILITARY MAPS.
 GEOPHYSICAL DETAIL FROM BUREAU OF MINERAL RESOURCES SURVEYS.
 RELIABILITY: (A) PLANIMETRIC — RELIABLE SKETCH.
 (B) GEOPHYSICAL — REGIONAL GRAVITY.

REGIONAL GRAVITY SURVEY 1954
 NORTH COASTAL AREA, QLD
 BOUGUER ANOMALY MAP

SCALE IN MILES



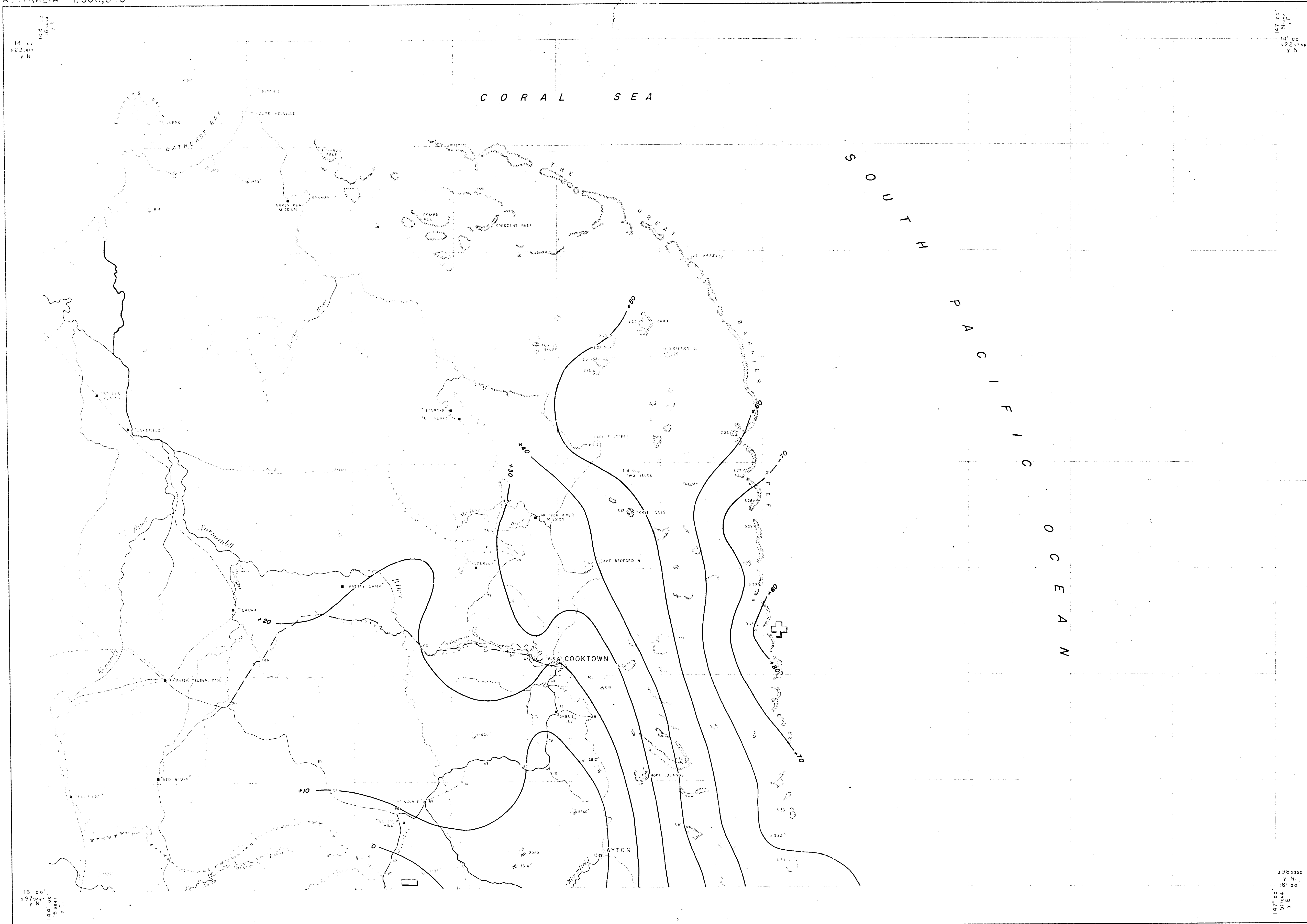
LEGEND

- | | |
|------------------------|-------------------------------------|
| TOPOGRAPHY | |
| — WATERCOURSE | — ROAD |
| ■ HOMESTEAD | - - - TRACK |
| GRAVITY | |
| • GRAVITY STATION | - - - GRAVITY CONTOURS IN MILLIGALS |
| 201 STATION NUMBER | + GRAVITY HIGH ANOMALY |
| 420.3 ALTITUDE IN FEET | - GRAVITY LOW ANOMALY |

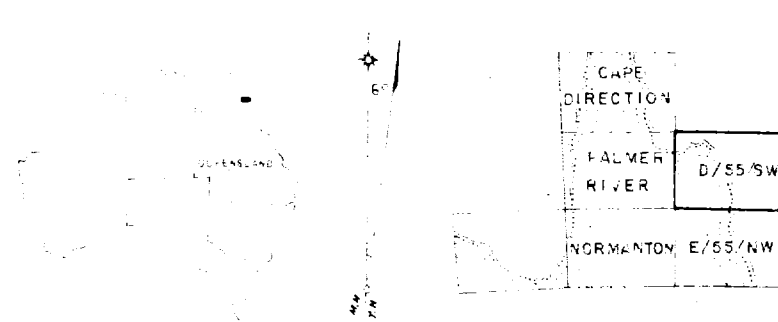
EXPLANATION

GRAVITY DATUM — CAIRNS PENDULUM
 STATION EQUALS 978,499.4 MILLIGALS.
 ELEVATION DATUM — M.S.L. CAIRNS.
 DENSITY USED IN CALCULATING BOUGUER ANOMALIES EQUALS 2.67

J. C. Dooley
 GEOPHYSICIST



LOCATION



REFERENCE TO AUSTRALIAN NATIONAL 6 MILE MAP SERIES

MAP DATA

PROJECTION: TRANSVERSE MERCATOR, AUSTRALIAN SERIES
CONTROL: 4 MILE MILITARY MAPS AND QLD. DEPT. OF LANDS 4 MILE MAPS
DETAIL: GRID AND SPATIAL COORDINATES COMPUTED AND COMPILED BY THE GEOPHYSICAL DRAWING OFFICE
PLANIMETRIC DETAIL FROM 4 MILE MILITARY MAPS, QLD. DEPT. OF LANDS 4 MILE MAPS, I.C.A.C. CHARTS AND ADMIRALTY CHARTS
GEOPHYSICAL DATA FROM B.M.R. SURVEYS
RELIABILITY: (A) PLANIMETRIC - RELIABLE SKETCH
(B) GEOPHYSICAL - REGIONAL GRAVITY

REGIONAL GRAVITY SURVEY 1954
NORTH COASTAL AREA, QLD.
BOUGUER ANOMALY MAP

SCALE IN MILES



LEGEND

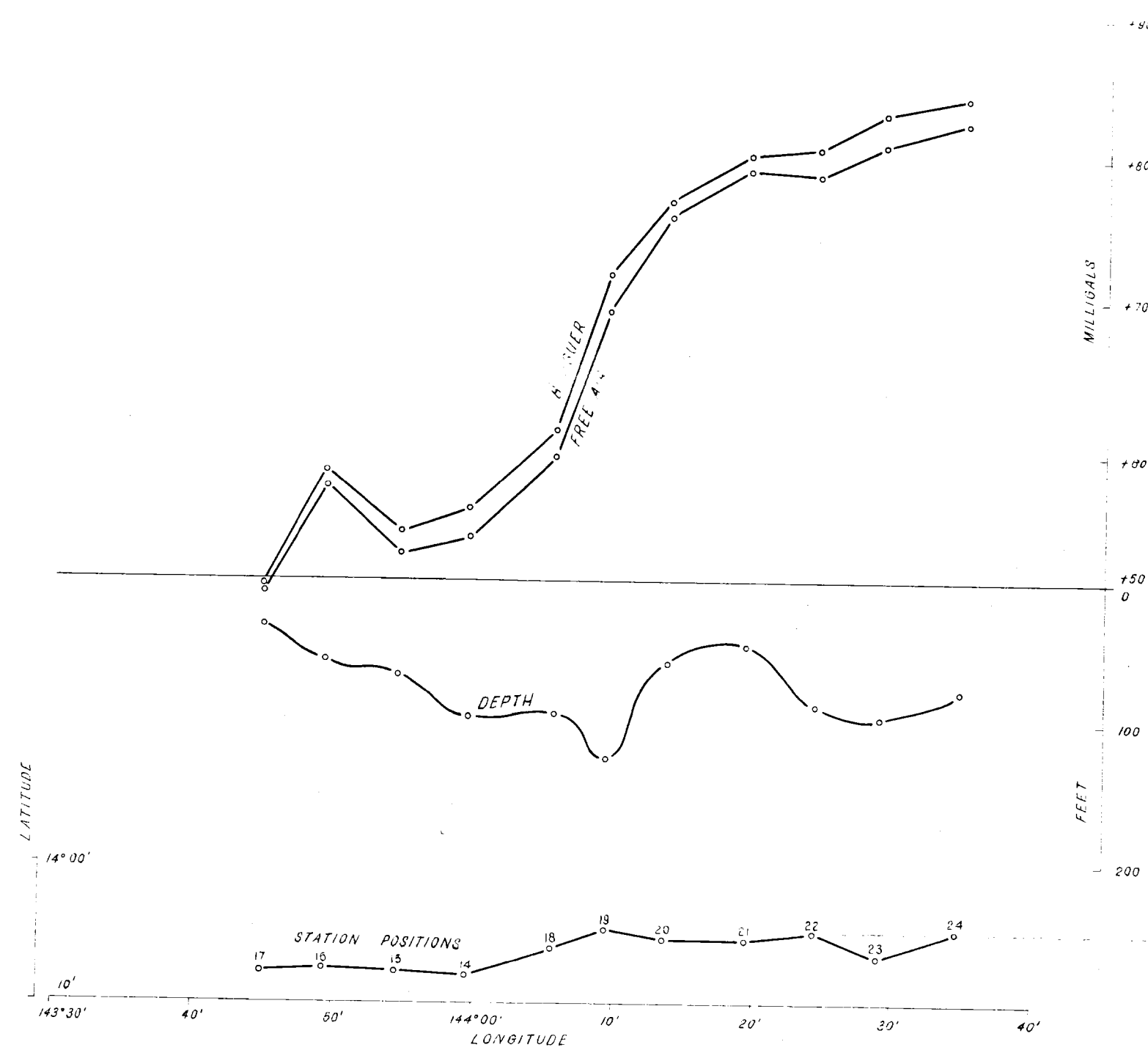
TOPOGRAPHY	
	WATERCOURSE
	HOUSEHOLD
	ROAD
	TRACK
GRAVITY	
	GRAVITY STATION
	STATION NUMBER
	GRAVITY CONTOUR IN MILLIGALS
	GRAVITY HIGH ANOMALY
	GRAVITY LOW ANOMALY

EXPLANATION

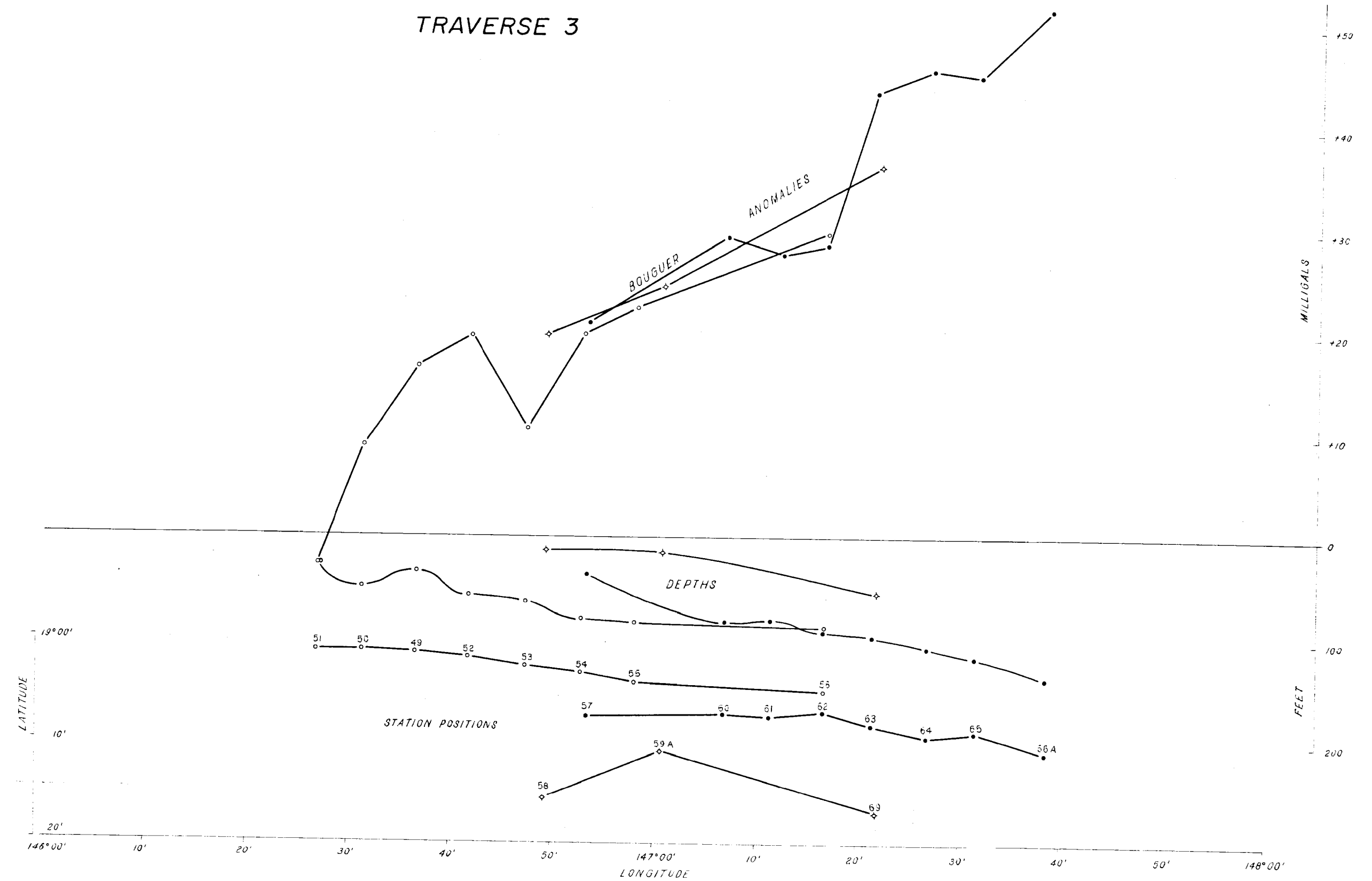
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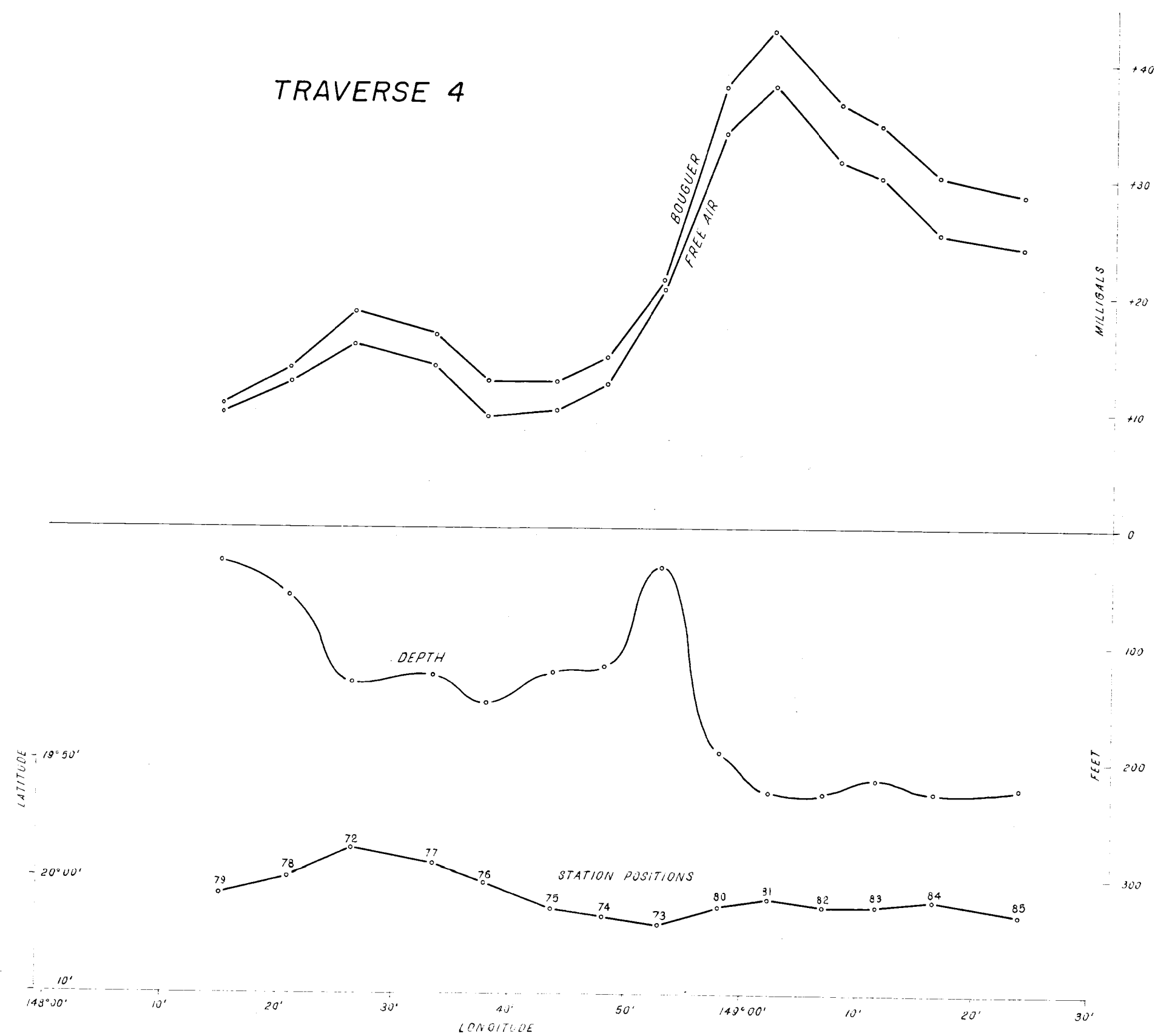
TRAVERSE 1



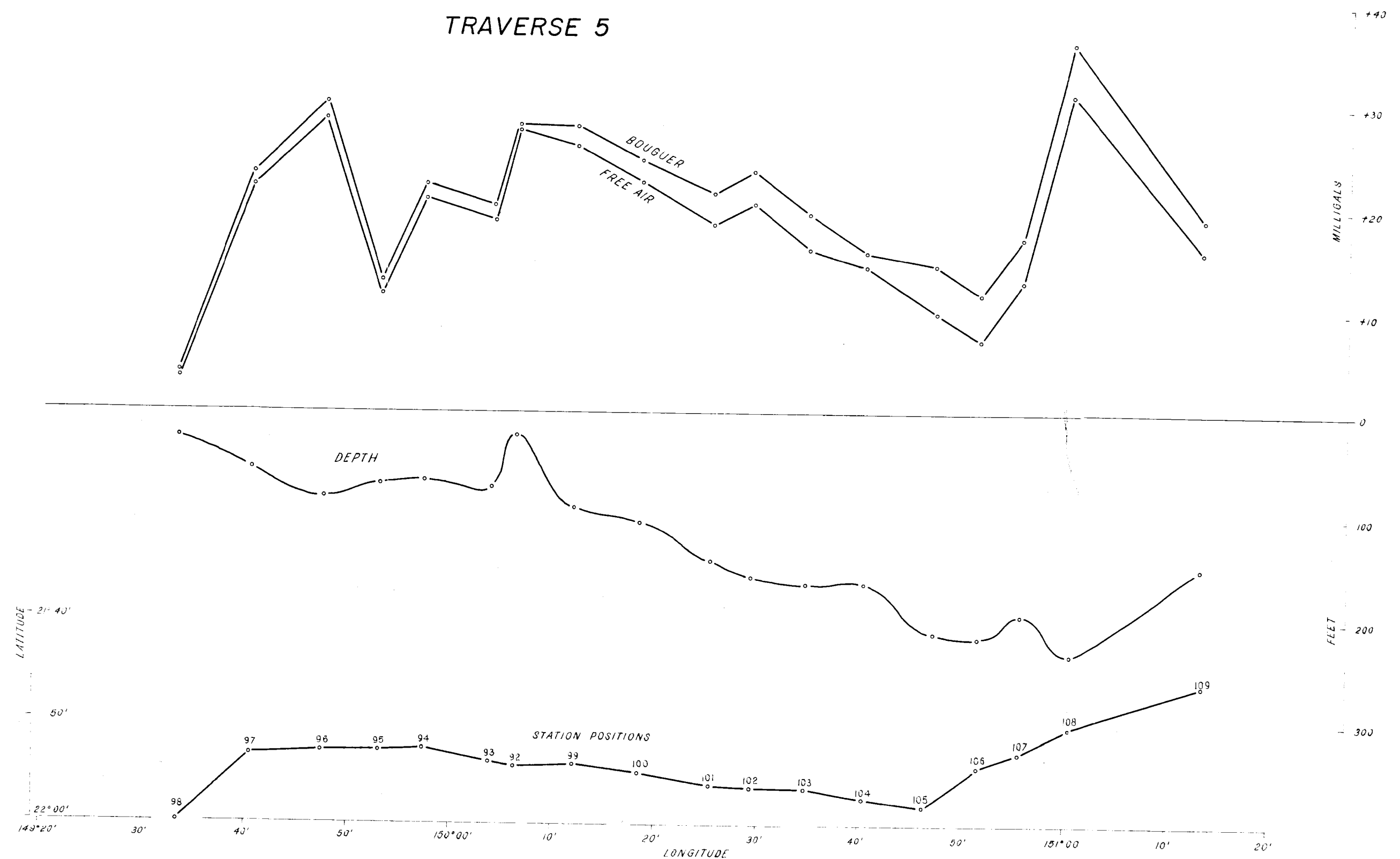
TRAVERSE 3



TRAVERSE 4



TRAVERSE 5



PRELIMINARY REPORT ON UNDERWATER GRAVITY SURVEY
OF GREAT BARRIER REEF
PROFILES SHOWING GRAVITY ANOMALIES
AND SEA DEPTHS
(Provisional Results only)