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DEPARTMENT OF MINES

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DUE INVESTIGATION OF AEROMAGNETIC ANOMALIES IN MINGARIOS CARIBA, CHANDADA, EYRON IN WESTERN EYRE PENINSULA

by

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GEOLOGICAL SURVEY

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THE INVESTIGATION OF AEROMAGNETIC ANOMALIES IN HUNDREDS CARINA, CHANDADA, RIPON IN WESTERN EYRE PENINSULA

ABSTRACT

This report summarises regional geology and the results of geophysical surveys and drilling. Ultrabasic rocks underlie the centres of the anomalies and contain sufficient magnetite to account for each aeromagnetic anomaly and are sufficiently dense to account for each gravity anomaly. Spectrographic analyses do not disclose any high concentration of any potential ore element.

Further work should be restricted to detailed testing of elongate asymmetric anomalies for iron and reconnaissance testing of equidimensional symmetrical anomalies for other metals and kimberlite.

1. INTRODUCTION

Eyre Peninsula, with the Tarcoola District to the north west, forms the eastern edge of the West Australian Shield in South Australia.

For some years investigations of iron formations and aeromagnetic anomalies in the eastern half of the Peninsula have been carried on with some economic success in the Middleback Ranges and technical successes elsewhere.

More recently investigation of aeromagnetic anomalies in the western half of Eyre Peninsula have been initiated. This report records results of testing in Hundreds Carina, Chandada and Ripon. See Plate 58-395 attached for locations.

2. ACKNOWLEDGEMENTS

2.1 Previous Work - published

Bulletins 1, 3, 17, 33 & 37 deal with parts of the Peninsula as do numerous unpublished reports.

Virtually all of the Peninsula is covered by published 1M. aeromagnetic maps and these have been the basis of recent prospecting.

Taking all information into account nearly 40% of Eyre Peninsula south of 32°S latitude has been mapped geologically and published on 1 Mile scale. Approximately 60% (of which 90% has been published) has been mapped on a scale of 4 Miles to 1 inch or better.

For a summary of the geology of the whole Peninsula see Pps. 61-70. Vol. 5, Part 2, Journal of the Geological Soc. of Aust.

2.2 Previous Work - unpublished Geological Survey reports

i. "Post-Mesozoic Cover on Aeromagnetic Anomalies, Western Eyre Peninsula.", J. F. Hayball, November 1968.

ii. "Gravity and Magnetic Traverses over Aeromagnetic Anomaly, Hd. Carina." I. B. McMurtrie and L. Moorcroft, June 1969.

iii. "Gravity and Magnetic Surveys over Aeromagnetic Anomaly, Hd. Chandada", D. R. Dowling and L. Moorcroft, July 1969.

iv. "The Investigation of Aeromagnetic Anomalies on Eyre Peninsula and the Search for Iron Ore there." G. F. Whitten, May 1960.

v. "Gravity and Magnetic Surveys over Aeromagnetic Anomaly, Hd. of Ripon, Co. Robinson, Eyre Peninsula." J. E. Webb, February, 1961.

2.3 Other References

The following were consulted to evaluate spectrographic analyses of drill core.

i. Fleischer M., "Recent estimates of the abundances of the Elements in the Earth's Crust", U.S.G.S. Circular 285, 1953 and 1969.

ii. Mason B., "Principles of Geochemistry", New York, John Wiley & Sons , 1952.

iii. Rankama, K. & Sahama, T.G., "Geochemistry", The University of Chicago Press 1950.

iv. Wilson, H.D.B., "Geology and Geochemistry of Base Metal Deposits." Economic Geology, Vol. 49, No. 5, pp.370-407.

2.4 General

The disciplinary effect of the many stimulating and usually lengthy discussions with the members of the Geophysical Section which

carried out the geophysical surveys is gratefully acknowledged.

Petrographic examinations and Spectrographic determinations were carried out in the Australian Mineral Development Laboratories, Parkside. T. E. Frost, Chief Analyst, and A.W.G. Whittle, Chief Petrologist. R. A. Both carried out most of the petrological examinations.

3. PHYSIOGRAPHY

Eyre Peninsula falls naturally into 4 main physiographic divisions. See plate 50-396.

3.1 Eastern Coastal Plains

This borders the western shores of Spencers Gulf. It is underlain at shallow depth by Pre-Cambrian sediments which are responsible for a number of aeromagnetic anomalies. These drilled disclosed iron formations and this technical success led to the testing in Western Eyre Peninsula.

3.2 The Eastern Highlands

Six upland areas represent peneplained and partly dissected blocks of Pre-Cambrian sediments west of the Gulf Fault system. The Marble Range, which is Archaean, and the Blue Range and the Corunna Ranges which are Proterozoic have no reported metalliferous mineral occurrences and are without significant anomalies.

The Lincoln Uplands, the Kisha-Cleve Upland and the Middlebank Ranges are Archaean and contain iron formations responsible for large anomalies of the asymmetric type. In addition they contain numerous metallic (e.g. Lead, Silver, Copper, Manganese) and nonmetallic (e.g. Graphite, Magnesite, Asbestos etc.) occurrences.

3.3 The Gawler Range Highlands

Across the north of the Peninsula lies a tableland formed by a flow (?) of Gawler Range Porphyry which is highly dissected but effectively blankets the underlying bedrock.

It has no record of mineral deposits and is not characterised by well developed anomalies.

3.4 Western Plain and Basin Area

The western half of the Peninsula is an undulating plain characterised by Pleistocene to Recent sands overlying shallow Tertiary Basins and with basement outcrops at widely spaced intervals.

The basins have been investigated near Port Lincoln (Uley-Wanilla Basin) Polda (Polda Basin) and Streaky Bay (Robinson Basin) but to date none have been evaluated completely.

The basement outcrops are largely granite of igneous appearance though on Westall Peninsula granitic gneisses of possible metasedimentary origin outcrop on the sea shore.

This might be taken to suggest a relatively unmineralised basement igneous complex, entrenched in places to form freshwater basins and the whole covered by Pleistocene to Recent sands fixed or partly fixed. The presence, of significant though isolated, aeromagnetic anomalies however suggested that the PreCambrian basement was by no means uniform or that there were anomalous rocks between the basement and the cover. In view of the iron formations and other mineralisation in the PreCambrian basement in the adjoining Eastern Highlands ground work was initiated.

4. GEOLOGY (See Plate 50-395)

As a background to the testing in Hundreds Carina, Chandada and Ripon a brief and generalised geological history follows. For more details of the Eastern Highlands see Bulletins 33 and 37. For a summary of the whole Peninsula see Pps. 61-70, Vol. 5, Part 2, Journal of the Geol. Soc. of Aust.

4.1 Archaean

The oldest rocks in the area are Archaean sediments (Flinders Gneisses of Johns, Gneiss complex of Miles) which have suffered intense regional metamorphism. Rock types range from undigested sediments (chiefly mono-mineralic rocks such as quartzites and dolomites) through metasediments (such as schists, amphibolites and migmatites) to foliated and banded quartzose-felspathic gneisses with massive granitic types forming the centres of areas of more intense metamorphism. The granitic gneisses of Pt. Westall are correlated by the writer with the above.

Conformably overlying these are schists and quartzites (Hutchison Schists of Johns, Middleback Group of Miles) which in general are similar to the Gneiss Group but have suffered less intense metamorphism.

4.2 Proterozoic

Unconformably overlying these Archaean metasediments in the Koonabie Range near Whyalla are the Proterozoic Koonabie Grits and the late Proterozoic Corunna Group.

4.3 Tertiary to Recent

In the Eastern Coastal Plains occur marine limestones overlain by grits and sandstones. Of more economic importance are the Tertiary Basins in the Western Plain and Basin Area which consist of paralic sands, clays, lignites, grits and gravels forming fresh and salt water basins.

Overlying these, more especially in the Western Plain and Basin Area are Pleistocene calc-aeolianite with thickness up to 424' + (Bd. Ripon) and 700' (Thistle Is.).

Windblown siliceous dune sands, mostly fixed by vegetation are the most recent deposits and cover large areas.

4.4 Intrusive Igneous Rocks

4.4.1 Basic Dolerite Dykes occur in the Middlebacks and near Port Lincoln where their metamorphism attest to their "older" age. Younger dolerites also occur in the Middlebacks near Whyalla.

4.4.2 The Gawler Range Porphyry runs for 150 miles west and north west of Iron Knob and is 50 miles wide at its widest point. It is considered to be a flow. It has intruded Corunna Conglomerate (Iron Knob and elsewhere), jaspilite (Wilgena Hill) and granite (Glenloth) so that it is certainly Post Corunna Conglomerate (now considered Late Proterozoic). If the Glenloth granite were intruded during the Lower Palaeozoic orogeny it could best be correlated with a late stage of that orogeny.

The Koonabie Porphyry has invaded the Koonabie Grits. Other porphyries outcrop on the coast north of Whyalla are there overlain by conglomerates which may be equivalent to the Corunna Conglomerate or possibly a later conglomerate in the Corunna Group.

4.5 Granite, Gabbros etc.

4.5.1 Fine to medium grained Massive Granites form cores in areas of intense metamorphism in the Flinders Group (e.g. Mabrie Hill) and in the Gneiss Complex (e.g. Barkett Hill).)

The Charleston Granite, a coarsely crystalline, porphyritic, massive, unstressed granite lies south of the Middleback Ranges and intrudes the Moonabie Porphyry.

In the Western Plains outcrops of bedrock of any kind are rare and where exposed are wholly coarse grained, massive unstressed granites (e.g. Minnipa Hill, Yarwondutta Rocks, Paris Peak etc.), sometimes with large phenocrysts of felspars (e.g. Calca Hill, Calca Bluff). These appear to be of igneous origin.

4.5.2 Gabbros have been intersected in the drilling (see 6, 7, 8 below) in Hundreds Carina, Chandada and Ripon. A weathered floater of somewhat similar material has been found at Granite Pt., Hd. Ripon by the writer but none have been reported from outcrop anywhere in the Peninsula.

4.5.3. Banded Gneiss, Augen Gneiss, Granite porphyry and Granite have been mapped by Segnit near Pt. Westall, Hd. Ripon. The gneisses in these rocks could be sediments intensely metamorphosed. In any case drilling in Hd. Chandada intersected "a gneissic granite which appears to be of metamorphic origin" (Pet. Report 196).

This raised the question whether all of the other outcropping granites may be or may stem from mobilised metasedimentary cores and that some at least of the anomalies could be due to iron formations in such a sedimentary sequence.

Drilling in the three areas under review however penetrated gabbro which cannot be considered a metasediment. Macroscopic examination too suggests that the coarse grained massive unstressed granites with or without large idiomorphic zoned phenocrysts of felspars are igneous.

5. GEOPHYSICS

5.1 Aerial Surveys

One mile aeromagnetic maps have been published for all of the Peninsula, except for the most northerly portion which is being processed.

Flying was carried out by the Bureau of Mineral Resources and Adastra Hunting and reduction and publication by the South Australian Department of Mines or the Bureau of Mineral Resources. Earlier surveys were carried out at 1500' but at the request of the S.A. Department of Mines the latest surveys have been carried out at 500' which gives better detail. These maps are being reduced to 4 miles to 1 inch for more detailed comparison with 4 mile geological maps.

Following an appraisal of the aeromagnetic maps and ground reconnaissance surveys a ¼ mile spacing by 300' height low-level aeromagnetic survey of Warramboo, Kopi and adjoining anomalies was proposed and was carried out by Adastra Hunting. Because of increased flying efficiency sufficient hours were available to carry out low level reconnaissances of Fancy, Mindappa, Carina, Chandada, Ripon and Coffin Bay anomalies and most of the Lincoln Uplands. This work actually followed the detailed ground surveys and drilling in Hds. Carina, Chandada and Ripon but the inclusion of these areas will allow them to be used as controls in evaluating the other anomalies.

This work was under the supervision of the Geophysical Section. Reduction is complete at Photo scale. (For Warramboo, Kopi and adjoining anomalies 1" = 1350'-1400').

An aerial scintillometer survey was carried out of the Lincoln Uplands and adjoining areas during the search for Uranium.

5.2 Ground Surveys

Detailed ground magnetometer surveys have been carried out in the Middlebacks, in the Cowell District (Minbrie and Bungalow anomalies), Port Neill (Carrow Anomaly), Hd. Carina (Minnipa and Yakster Anomaly), Hd. Chandada, Hd. Ripon (North Anomaly) Hd. Warramboo. Reconnaissance ground surveys have been carried out in Hd. Yaninee and at Moonlight Flat, Hd. Warramboo and Hd. Ulyerra (Kopi).

Detailed and reconnaissance gravity traverses have been carried out over the same areas as the magnetic surveys and a regional gravity picture is being built up by a coverage of gravity stations on main highways.

The degree of coverage and results obtained for the Carina, Chandada and Ripon North anomalies are discussed in the sections following. The detailed work elsewhere is not discussed; it served as a very necessary background for any appraisal of the province.

6. Ed. CARINA (Inkster Anomaly)

6.1 Geophysics

This is an elliptical anomaly centred in Sec. 40, Ed. Carina and on the border of Inkster and Winnipa 1E aeromagnetic Sheets.

Plan S 2026 attached indicates its configuration, the ground traverses covering it and the location of the six rotary drill holes testing it. At approximately 15 s. miles this was the largest anomaly examined to that date in the state.

The country is undulating, with flats of red and brown soil between NE-SE trending sand dunes and with surface kunkar in places. The ground is covered with thick scrub which hindered surveying so much that a bulldozer was used for the major part of the clearing.

No information re subsurface geology was available to interpret geophysical results. Generally approximately 100' of Post-Mesozoic cover was expected with the occurrence of a deeper Tertiary Basin not impossible (see III 4 below). While the occurrence of inliers of Archaean (?) granite suggested that bedrock would be granite, the presence of an aeromagnetic anomaly suggested a local variation in the nature of the bedrock or less likely (in view of the thinness of the Mesozoic cover) the occurrence of anomalous rocks between the bedrock and the cover.

Eight lines 2000' apart and averaging 20,000' long were located NE-SW across the anomaly. Stations were occupied at 200' centres and readings taken by both magnetic and gravity methods. (See Report by McMurtrie and Moorcroft for details). Results were plotted as profiles (59-75 and 59-76. Not attached).

A broad (> 15000') magnetic anomaly with a peak of 6000 gamma was found centred on 16000'N, diminishing to 2000 gamma on lines 10000N and 24000N. Coincident with this magnetic disturbance a broad gravity anomaly was found rising from 4 milligals on 10000N to 11-12 milligals on 14000N, 16000N and 18000N and diminishing to 5 milligals on 24000'N.

McMurtrie and Moorcroft discussed in detail the interpretation of their results. They considered the magnetic and gravity peaks were too broad, too indistinct and with too marked variation in direction to indicate "regularly bedded rocks". Magnetically they felt that the anomaly was of a class "which are most often due to extensive masses of volcanic and crystalline

rock rich in magnetite but very rarely of economic importance." Resolution of individual peaks was not possible but they estimated "the depth to the disturbing material will be less than 400'." Gravimetrically they felt there existed a large zone of rocks with a centre of gravity at 4-5000', with an SG 0.5 gm/cc greater than its surround and with irregular occurrences of magnetite.

Taking all factors into account they felt that "a widespread zone of more basic rocks is responsible for the gravity anomaly." They recommended shallow drilling to determine overburden thickness and nature of the bedrock without defining targets.

6.2 Testing

Six rotary holes totalling 1246'6" were put down (See Plan 52026). Hole IR 1 tested a coincident magnetic and gravity high on line 14000'N at 10200'E while the remainder were located on line 16000'N. Hole IR 2 tested a coincident magnetic and gravity high at 10600'E. Holes IR 3 and 6 tested smaller magnetic peaks at 11600'E and 9600'E on the flank of the gravity anomaly while Holes IR 4 and 5 tested "background" at 00E and 16000E on the edge of the anomaly. Plan 61-792 attached shows the relations of these holes to each other and to the magnetic and gravity profiles of line 16000'N.

All samples unless otherwise noted in the detailed logs (see Appendix 1) were sludges. These were collected every 5' by the driller and logged microscopically by the writer. This procedure was only partially successful as usually samples passed directly from a sludge of quartz sand into core of unweathered bedrock. This indicated that the driller had noticed a change in water return or machine performance which warranted the change in drilling technique, but such change could not be determined from the sludge nor was it recorded in the driller's log. Consequently depth to bedrock is over generous except in IR 2 where the core is partly clay and partly weathered gabbro. In addition in IR 6 gabbro at 145' is underlain, if one could believe the sludge (see detailed log), by 90' of sand dunes. This indicates the necessity of core samples every 20' in rotary drilling of mineral deposits and the desirability of geological supervision.

6.3 Results

Summarised logs are as follows -

Hole No.	Co-ordinate		Log	
IR 1	14000'N	10200'E	0 - 170	Overburden
			170 - 200	Labradorite. SG 3.16
IR 2	16000'N	10600'E	0 - 194	Overburden
			194 - 217'6	Hypersthene-Gabbro. SG 3.20
IR 3	16000'N	11600'E	0 - 188	Overburden
			188 - 194	Uralitized-Gabbro.
IR 4	16000'N	00'E	0 - 150	Overburden
			150 - 240?	Lignitic overburden
			240?- 251	Adamellite. SG 2.64
IR 5	16000'N	16000'E	0 - 145?	Overburden
			145?- 149	Adamellite. SG 2.64
IR 6	16000'N	8600'E	0 - 145	Overburden
			145 - 147'6?	Weathered hypersthene Gabbro. SG 2.85
			147'6?- 235	Sludge is quartz sand.
			235 - 247'6	No samples.

Samples from all these holes were sent for petrological determination (See Appendices 4 & 5) with the results as indicated above. Holes IR 1, 2, 3 and 4 i.e. the gabbro, all show 5-10% opaques and accessories, the opaques being magnetite, pyrite and ilmenite while apatite is the main accessory. A polished section of hypersthene-gabbro showed 7.2% magnetite by volume, i.e. 11.7% by weight, certainly sufficient to cause a significant anomaly. The magnetite, (7.2%), ilmenite (1.2%) and the pyrite (1.3%) (i.e. a total of 9.7% by volume. 15.5% by weight) occur as irregular shapes in interstices. The adamellites show zircon and sphene in addition to apatite and only traces of opaques.

A comparison of SG's is of interest, the adamellite being 2.64 and 2.64 as compared with 2.7 used by McMatrie and Moorcroft for "background" in their calculations while the gabbroid rocks are 3.16 and 3.20 as compared with 3.20 assumed by McMatrie and Moorcroft. The figure of 2.85 obtained for a weathered gabbro from Hole IR 6 may fairly be ignored as it was soft enough for another 90' of rotary drilling to be carried out using roller bits.

A theoretical examination of drilling results by D. H. Pegum Geophysicist suggests that the anomaly could be caused by an 8000 diameter cylindrical plug of gabbro of infinite length, with its axis vertical, its uppermost point below the surface and with an SG difference of + 0.5 with respect to the surrounding rocks.

Clearly the geophysical interpretation both before and after the drilling fits the observed facts so well that no further testing can be justified on geophysical arguments and the problem must be considered as one which has been solved wholly by geophysics.

One slight geological query remains, viz. the trough at 16000N 9400'E determined by 4 stations in the magnetic profile but not in the gravity profile. The writer has previously suggested that to tidy up the problem geologically a shallow rotary hole be located at this spot to determine if an acidic dyke is present. However it is unlikely that such a hole would make an intersection of economic importance.

See also Section 9 for a discussion of Spectrographic analyses.

7. HD. CHANDADA

7.1 Geophysics

On the Cangeas 1 M aeromagnetic sheet this is a simple elliptical anomaly centred on Sec. 16, Hd. Chandada. Plan S 1947 attached shows the general configuration of the aeromagnetic anomaly. Plans 59-231 and 59-233 show the ground traverses over it and the three rotary drillholes testing it.

The country is gently undulating, lightly timbered in part. Access is easy. Geological considerations as for the anomaly in Hd. Carina apply.

Six east-west magnetic and gravity traverses each approximately 15000' long and spaced 2000' apart were read with stations at 200' intervals. Over the centre of the anomaly 2 additional EW traverses 15000' long were put in reducing the line spacing there to 1000'. A NS tie line with stations at 200' intervals also added to the coverage over the centre. Results were plotted as profiles (59-233, not attached) and also as contour plans (59-231, 59-232 attached) using arbitrary values for the local datum (10000N, 10000E).

Magnetic results indicated an irregular crescent shaped anomaly centred near 10000N, 11400'E while gravity results indicated a simple almost circular anomaly based on 10000N 9400'E. However the half-value contours (viz. 1270 gravity units and -500 gammas) define almost the same position suggesting that the anomalies are related to the one cause.

Dowling and Moorcroft (op. cit.) postulated that the gravity anomaly was the result of a basic differentiation within the predominantly

granitic bedrock and that the magnetic anomaly would be explained by the presence of magnetite finely disseminated through the basic material. The writer would have preferred to have considered the basic rock as an independent intrusion rather than as a differentiation product of a granitic magma.

7.2 Testing

Three rotary drill holes totalling 698' were put down on line 10000'N. CR 1 tested background at Peg 17 near 10000'E. CR 2 tested the magnetic peak at 11400'E and CR 3 tested the gravity peak at 9400'E.

Plan 61-790 shows the relationship of the holes to each other and to the magnetic and gravity profiles of line 10000'N. All samples unless otherwise noted in the detailed logs (See Appendix 2) were sludges collected at 5' intervals by the driller and logged microscopically by the writer. Sample collection was unsatisfactory, as much as 107' of hole (CR 2) being drilled without recovering a sample. However depth to bedrock was determined more closely than at Mt. Carina.

7.3 Results

Hole No.	Co-ordinates		Log	
CR 1	10000'N near	10000'E	0 - 140	Overburden
			140 - 152'8	Gneissic granite
CR 2	10000'N	11400'E	0 - 222	Overburden
			222 - 254'8	Gabbro
CR 3	10000'N	9400'E	0 - 250?	Overburden
			250?- 290'9	Uralitised basic igneous rock.

Samples were sent for petrological determination (See Appendices 6 and 7) with the above results. Opaques though less common than at Carina are present and their smaller quantity may account for the lower magnetic value of the anomaly. The uralitisation in CR 3 not present in CR 2 no doubt accounts for the lower magnetic reading in CR 3 yet not effecting the density sufficiently to affect gravity readings.

The gneissic granite intersected in CR 1 was examined petrologically in great detail to determine its origin. Microcline porphyroblasts occur in a granulose matrix of quartz, oligoclase and biotite with minor muscovite. The plagioclase is highly sericitised. It also occurs with quartz as

inclusions in the microcline porphyroblasts which are fresh and unaltered and with no crystal outline having formed in interstices.

These general features point to a metamorphic origin and it is thought to be a feldspathized arkosic metasediment.

Concluding -

It therefore appears that the Chandada aeromagnetic anomaly is due to a gabbroid intrusion (uralitised in part) into a possible metasedimentary gneissic complex of presumably Archaean age.

8. MD. RIPON

8.1 Geophysics

The Ripon 1 M aeromagnetic sheet contains 2 large anomalies cut off by the coast on the western side and trailing south easterly away from the coast. Plan 5 1966 indicates the configuration of the anomalies and their location with respect to the town of Streaky Bay. The more northern anomaly centred in Sec. 148, Hd. Ripon was the one chosen for investigation as it is discrete, the centre of the more southerly one appearing to be out to sea.

The country is undulating being made up of calc-aeolianite dunes. Part is under cultivation but most is used for grazing.

In the immediate vicinity of the anomalies no outcropping bedrock occurs even though the cliffs on Sec. 3a approach 150'. Three water bores near the edge of the northern anomaly (Sec. 317 - 197'; Sec. 319 - 77'6"; Sec. 306 - 90') have failed to penetrate to bedrock. (See Bull. 17, p. 16 for details of the 197' well and bore). Segnit however mapped Granite, Banded Gneiss, Augen-Gneiss and Granite Porphyry 6-8 miles SW near Pt. Westall and in figure 4 indicates that the succession is Banded and Augen gneiss, amphibolite, granite, granite porphyry.

The writer feels that the granitic-gneisses of Point Westall are metasediments, an opinion supported by the petrological determination carried out on the gneissic granite from CR 1, Hd. Chandada. In which case the granite and granite porphyry may represent mobilised portions at a later stage.

Six EW lines 2000' apart and up to 14000' long covered the anomaly with 2 additional lines 1000' apart across the centre of the anomaly. These

and a N-S tie line were read by magnetic and gravity methods on stations 200' apart. Results are shown in contour plans (59-274, 59-275 attached) and in profile (59-276 not attached).

These closely confirmed the aeromagnetic anomaly indicating an 10000N a magnetic peak at 8600'E and a gravity peak at 7200'E. Rotary holes were therefore proposed at these points as well as one at 10000N 17400'E to determine background. The separation of magnetic and gravity peaks is rather reminiscent of Hd. Chandada.

6.2 Testing

Three rotary holes aggregating 969' were therefore put down. Overburden thickness as indicated by the total depth was greater than usual aggravating drilling and sampling difficulties. One hole, the deepest, had to be abandoned before penetrating bedrock. Over 330' of this hole was drilled without recovering samples. Plan 61-791 shows the relation of the 3 holes to each other and to the magnetic and gravity profiles.

6.3 Results

Summarised results are as follows (For Details see Appendix 3):-

Hole No.	Coordinates		Log
RR 1	9900'N	8600'E	0 - 305 Calc-scolisnite 305 - 323'1 Gabbro
RR 2	10000'N	17400'E	0 - 95 Calc-scolisnite 95 - 424'7 No samples presumed calc-scolisnite
RR 3	10000'N	7200'E	0 - 59 Calc-scolisnite 59 - 205'11 No samples 205'11-211'4 Diorite SG 2.89

Samples for RR 1 and RR 3 were sent for petrological determination (See Appendices 7 and 4) with the results as indicated above. The diorite of RR 3 contained 3-5% accessories of which the chief were magnetite and pyrite with possibly some other iron oxides. These figures are a great deal less than for Hd. Carina.

It is suggested therefore that the anomaly is due to a large body of low density contrast, the gravity peak in part reflecting the shallower depth to bedrock at RR3 and the increasing depth to bedrock to the east. The shift of the magnetic peak may be the result of oxidation of rock under the gravity high by waters draining seawards.

9. SPECTROGRAPHIC ANALYSES

9.1 General

Geophysics, like all indirect methods suffers from the inability to define a target with sufficient accuracy that one can be certain when one has penetrated to or through the area of interest. The "peak" of an anomaly may be hundreds of feet wide and depth estimates can only be regarded as "best guesses". Consequently there is always the feeling that a drill hole, which at best is only a few inches in diameter, may not have penetrated the best target and that the core or sample obtained by drilling might have been different were it obtained from a few feet laterally.

Geophysicists have attempted to overcome this problem by various down the hole methods which for example in uranium, attempt to achieve a mass effect by a single detector. Alternately they attempt to extend the volume of influence by connecting 2 elements either in the same or different holes or between one hole and the surface.

In the case of the gabbros penetrated in the 3 anomalies reported on above it has been tacitly assumed that the magnetite mineralisation was not evenly distributed through the intrusive mass. The S.G. of gabbro ranges from 2.76 to 3.27. As magnetite is more magnetic and more dense (SG 5.2) than a barren gabbro the magnetic and gravity highs were first tested with discouraging results. It is a fairly safe assumption that no economic concentration of magnetite within detectable distance of the surface occurs outside these zones.

As the gabbro is itself anomalous, could there be other constituents, nonmagnetic and less dense, worth testing for? Without these or other significant properties search would be undirected were it not for the fact that many mineral deposits have a "halo" of low grade mineralisation around them.

Consequently specimens from the holes penetrating bedrock were sent for spectrographic analysis for trace metals with the results as detailed in appendices 1. 2, and 3.

9.2 Results

The results plotted diagramatically according to drill hole positions are shown on plates S2961/2/3; S2954/5; S2956 for Mds. Carina, Chandada and Ripon respectively. It will be noticed that for both Carina and Chandada, Manganese, Nickel, Zinc, Copper, Vanadium and Cobalt tend

to "peak" in the gabbro while Chromium and Lead tend to "trough" in the gabbro. Arsenic, Antimony, Cadmium, Tin, Molybdenum, Gold, Platinum, Bismuth and Silver have values too low to be compared quantitatively. As granite was not intersected in Bd. Ripon no direct comparisons can be made there.

Values in granite and gabbro, however, may not be strictly comparable, owing to the differing modes of origin. For this reason Plates S2947/8 and S2949/50 have been appended. Plates S2947/8 prepared from Fleischer 1953, op. cit. graphs of different estimates of the abundance in the earth's crust of the elements referred to above. For some, notably Cadmium and Zinc, but see also chromium and nickel there are significant differences of opinion.

Plates S2949/50, prepared from Mason (op. cit) and from Rankama and Sahama (op. cit.) compares abundances (a) "in the earth's crust", (b) "average granite" (c) "average gabbro" (d) "average igneous rock" and particularly in Nickel, copper, cobalt, chromium and tin shows significant variations between acid and basic igneous rock.

It should be noted that these results may in part be based on too few determinations or alternately many determinations, through the enthusiasm of one writer, from too small an area. However they will serve as a guide for comparison in examining results from Western Eyre Peninsula.

In the following tabulation "A" indicates average; "+" indicates 2 to 4 times average; "++", more than four times average; "-" indicates ½ to ¼ average; "--" less than ¼ average while "a" indicates that the results appear to be average but are so influenced by the lower limits of accuracy of the spectrograph as to be of limited value. For this reason also arsenic (??) is not discussed.

TABLE 1

AREA	Hd. Carina		Hd. Chandada		Hd. Ripon	
Rock Type	Granite	Gabbro	Granite	Gabbro	Granite	Gabbro
Mn	-	A	-	+		A
Zn	A	++	A	++		+
Ni	A	A	A	+		A
Cu	A	A	A	A		A
Co	A	A	A	A		A
V	A	A	A	+		+
Cr	++	--	+	A		A
Pb	++	-	++	-		-
Sn	a	a	a	a		a
Bi	a	a	a	a		a
Cd	a	a	a	a		a
Mo	a	a	a	a		a
As	??	??	??	??		??
Sb	a	a	a	a		a
Au	a	a	a	a		a
Ag	a	a	a	a		a
Pt	a	a	a	a		a

From the above it will be seen that the only element with anomalously high readings in the gabbro is zinc at Carina and Chandada. It is doubtful whether anywhere in the world is there a significant zinc mine recorded from such basic host rock. Lead and to some extent chromium are anomalously high in the granite also in Carina and Chandada. Other elements determined approach "average".

Thus no further testing is warranted on geochemical grounds.

10. CONCLUSION

Drilling of 3 equidimensional anomalies with symmetrical profiles in Eyre Peninsula has disclosed basic igneous intrusions. These rocks have sufficient magnetite to explain the aeromagnetic anomalies and also an S.G. contrast with respect to the surrounding rock sufficient to explain the gravity anomalies.

It is therefore suggested that no further testing is required on these particular anomalies.

Further testing of aeromagnetic anomalies on Eyre Peninsula should be restricted to

(1) detailed testing of elongate anomalies with asymmetrical and/or serrated profiles representing iron formation.

(2) when convenient reconnaissance testing of symmetrical anomalies for spectrographic analyses of their rocks to determine if other metals e.g. nickel, chromium, platinum etc. are present.

There is a possibility that an equidimensional ferromagnetic anomaly could indicate a diamond bearing Kimberlite plug. Several such plugs have been found in South Africa by geophysical prospecting.

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Senior Geologist
IRON EXPLORATION SECTION

GFW:CRBF
6/12/61

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO. IR 1

Project: Iukster Aeromagnetic Anomaly — D.M. 823/60

Sec. 41 Hd. Carina — Co. Robinson — Hole Ser. No. 25/59

14000'N, 10,200'E — R.L. 462.2 — Grid Local

Vertical — Depth: 200' — Plan Ref. 52026

Date Hole Commenced: 17/4/59 — Completed 23/4/59 — Driller R. S. Munro

Hole Logged by: G.F.M. — On 16/6/60 — Miner: D. of M.

OBJECT: To test the peak of a magnetic and gravity anomaly

RESULT:

0 - 170	"Overburden"
170 - 200	Labradorite

LOG: Comprises

Geological Log
Spectrographic Analyses
See also Petrological Descriptions

Depth	Description
	Sludge samples collected - logged microscopically every 5' unless otherwise noted.
Surface	Brown sandy loam, made up predominantly of fine grained quartz, traces only of dark minerals.
0 - 15	50% fine grained quartz grains, 50% rounded carbonate grains (not travertine) traces dark minerals.
15 - 25'	Mainly medium grained quartz grains, minor carbonate, traces dark minerals.
25 - 50'	Fine grained rounded quartz grains, 5-10% limonite stained, traces opaques.
50 - 100'	Fine grained rounded quartz grains with 5% of medium grain size; less than 5% are limonite stained; opaques rare.
100 - 145'	As 50'-100' but the bulk of the quartz grains are still finer grained.
145 - 165'	As 50-145' but with minor amounts of angular quartz grains.
165 - 170	20% medium sized rounded quartz grains, remainder mainly fine grained angular quartz grains, less than 5% limonite stained, traces non-magnetic dark minerals. This sludge is darker coloured than 25'-165'.
170 - 195'	As 165' - 170' but with minor nonmagnetic dark minerals or rock fragments and with 10%+ of extremely fine grained dark minerals. This sludge is darker coloured and appears to represent the top of the weathered gabbro contaminated by quartz grains from the open hole.
1958 - 200'	Core: Weathered coarse grained ortho-amphibolite or basic igneous rock, a coarse grained gabbro.

Log of Rotary Drillhole No. IR 1 (Cont'd.)

Depth	Description

Note: that this hole was completed without casing.

See Petrological Description

SPECTROGRAPHIC ANALYSIS

Mark		A1263/60
Lead (Pb)	±	10
Cobalt (Co)		100
Nickel (Ni)		1000
Vanadium (V)		100
Molybdenum (Mo)	±	20
Zinc (Zn)		1500
Tin (Sn)	±	50
Copper (Cu)		300
Antimony (Sb)	±	100
Arsenic (As)	±	500
Cadmium (Cd)	±	100
Chromium (Cr)		100
Manganese (Mn)		1500
Gold (Au)	±	10
Silver (Ag)		1
Platinum (Pt)	±	10
Bismuth (Bi)	±	10

± = less than Results in p.p.m.

Locality: Hd. Garina, Section 41. Inkster Rotary Hole No. 1, B/S No. 25/59. Co-ords. 14000N, 10200'E at 199°.

Department of Mines, South Australia

IRON KNOB/IRON KNOB AREA

LOG OF DIAMOND DRILL HOLE NO. IR 2

Project: Iron Knob Aeromagnetic Anomaly — R.N. 823/60

Sec. 41 Hd. Corina — Co. Robinson — Hole Ser. No. 26/59

Collar Coords: 16000'N, 10600'E — R.L. 474.8 — Grid. Local

Vertical — Depth 217'6" — Plan Ref. 52026

Date Hole Commenced 18/5/59 — Completed 18/5/59 — Driller: E. Munro

Hole Logged by S.F.N. — On 17/6/60 — Miner D. of M.

OBJECT: To test magnetic and gravity peaks

RESULT: 0 - 194 "Overburden
194 - 217'6 Hypersthene Gabbro

LOG: comprises Geological Log
Spectrographic Analysis
See also Petrological Log.

Depth	Descriptions
	Sludge samples collected and logged microscopically every 5' unless otherwise noted.
0 - 10	Fine grained quartz grains with possibly 80% of carbonate.
10 - 20'	80% fine grained quartz grains (some slightly angular) 20% medium grained, traces red quartz grains, traces dark minerals, traces carbonate grains.
20 - 30'	Fine to medium grained rounded quartz grains, minor angular grains amongst smaller sizes.
30 - 40'	As 20-30 but slightly finer grained.
40 - 65'	As 30-40 but with 60% of grains partly coated by limonite giving the sand a red appearance.
65'- 75'	As 20-30.
75 - 150'	As 30-40.
150 - 170'	Fine to medium grained quartz grains, 40-50% of which are angular, traces limonite-stained grains, rare opaque grains.
170 - 190'	As 150-170' but with possibly 10% of extremely fine grained angular quartz grains.
190 - 194'est.	Core: Clay overlying and derived from gabbro. It contains rounded quartz grains and is structureless.
194 - 195'	Core: Extremely weathered gabbro.

Log of Rotary Drillhole No. IR 2 (Contd.)

Depth	Description
195 - 210'	Fine to medium grained clear quartz grains, perhaps 10% limonite stained. An occasional rare "grain" sized fragments of dark rock possibly representing the gabbros that must exist in this section of the hole.
210 - 211'	No sample
211 - 213'2	Core: Weathered gabbro
213'2-217'6	Core: Gabbro.

Note: The sludge samples from 195'-210' illustrate the necessity for
(1) Core samples at 20' intervals in rotary drilling
(2) The driller should report changes in water or mud return in his log. Thus at 190' approx. a change in water return must have indicated the change to clays which prompted him to core the next 5' and to stop the hole, even though most of this core is "overburden."

See Petrological Description

SPECTROGRAPHIC ANALYSIS

Mark		A1264/60
Lead (Pb)	±	10
Cobalt (Co)		50
Nickel (Ni)		150
Vanadium (V)		200
Molybdenum (Mo)	±	20
Zinc (Zn)		400
Tin (Sn)	±	50
Copper (Cu)		100
Antimony (Sb)	±	100
Arsenic (As)	±	500
Cadmium (Cd)	±	100
Chromium (Cr)		60
Manganese (Mn)		1500
Gold (Au)	±	10
Silver (Ag)	±	1
Platinum (Pt)	±	10
Bismuth (Bi)	±	10

± = less than Results in p.p.m.

Locality: Hd. Carina, section 41, Minster Rotary Hole No. 2 S/S No. 26/59. Co-ords 1600N-1060E at 217'

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO. IR 3

Project: Iukster Aeromagnetic Anomaly — **D.E.** 023/60

Sec. 41 **Hd.** Carina **Co.** Robinson — **Hole Ser. No.** 27/59

Collar Coords 16000'N 11600'E **R.L.** 483.1 — **Grid** Local

Vertical — **Depth:** 194' — **Plan Ref.** 52026

Date Hole commenced: 4/5/59 **Completed:** 6/5/59 — **Driller:** E. S. Munro

Hole Logged by: G.F.W. **On** 21/6/60 — **Miner:** D. of M.

OBJECT: To test a magnetic high near a gravity high.

RESULT:

0 - 180	"Overburden"
180 - 194	Uralitized gabbro

LOG: Comprises
Geological Log
Spectrographic Analysis
See also Petrological Descriptions

Depth	Description
	Sludge samples were collected and logged microscopically every 5' unless otherwise noted.
0 - 10'	50% fine grained quartz grains and 50% carbonate grains.
10 - 20'	75% quartz grains, 25% carbonate approx.
20'- 125'	Fine to medium grained rounded and angular quartz grains 10-50% coated with limonite and/or clay. Red quartz grains and opaques rare.
125 - 180'	Fine and medium grained rounded and angular quartz grains, traces only of limonite and/or clay coated grains.
180 - 190	As 125 - 180 but with an occasional basic rock fragment.
190 - 194'	Core: Gabbro. Upper surface uncertain.
	See Petrological Description

Log of Rotary Drillhole No. IR 3 (Contd.)

SPECTROGRAPHIC ANALYSIS

Mark	A1265/60
Lead (Pb)	10
Cobalt (Co)	20
Nickel (Ni)	150
Vanadium (V)	300
Molybdenum (Mo)	≤ 20
Zinc (Zn)	500
Tin (Sn)	≤ 50
Copper (Cu)	100
Antimony (Sb)	≤ 100
Arsenic (As)	≤ 500
Cadmium (Cd)	≤ 100
Chromium (Cr)	100
Manganese (Mn)	2000
Gold (Au)	≤ 10
Silver (Ag)	≤ 1
Platinum (Pt)	≤ 10
Bismuth (Bi)	15

≤=less than. Results in p.p.m.

Locality: Hd. Carina, Section 41. Inkster Rotary Hole No. 3. E/S No. 27/59. Coords 16000°N-11000°E at 193°.

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO: IR 4

Project: Iakster Aeromagnetic Anomaly — D.E. 023/60

Sec. 41 Hd. Carina — Co. Robinson — Hole Ser. No. 29/59

Collar Coords 16000'N 00'E — R.L. 442.7 — Grid Local

Vertical — Depth 251' — Plan Ref. S2026

Date Hole commenced 20/5/59 — Completed: 27/5/59 — Driller R. S. Munro

Hole Logged by G.F.W. — On 21/6/60 — Hirer D. of M.

OBJECT: To test the SW margin of a gravity and magnetic anomaly.

RESULT:

0 - 150	"Overburden"
150 - 240?	Lignitic material
240?- 251	Granite

LOG: Comprises
- Geological Log
- Spectrographic Analysis
- "Coal" Analysis
- See also Petrological Log

Depth	Description
	Sludge samples collected and logged microscopically every 5' unless otherwise noted.
0 - 15'	30% fine rounded quartz grains, 50% carbonate grains, remainder is fine material.
15 - 25'	50% rounded quartz grains, 30% carbonate grains, remainder fine material.
25 - 40'	80-90% rounded quartz grains, 10-20% clays etc. traces carbonate.
40 - 45	No sample.
45 - 55'	As 25-40' but with less clay.
55 - 75'	90% rounded quartz grains, much limonite and clay staining, remainder carbonate, clay etc.
75 - 80'	Banded quartz grains, traces only of limonite staining, carbonate, clay etc.
80 - 85'	No sample.
85 - 120'	60% fine grained subangular quartz grains, 30% medium sized 10% larger quartz grains; limonite stained grains rare.
120 - 125	No sample.

Log of Rotary Drillhole No. IR 4 (Contd.)

Depth	Description
125 - 140'	As 85'-120'
140 - 145'	No sample
145 - 150'	As 85-120' and 125-140'.
150 - 155'	As 85-120' and 125'-140', 145-150' but with 10-20% of grains limonite or clay stained and with the whole sludge a greyish colour owing to carbonaceous material.
155 - 160'	Core: Fine grained carbonaceous sandstone. See Palaeontological Report and Analytical Results.
160 - 175'	Fine grained sand grains, discoloured by carbonaceous material.
175 - 240'	Fine to coarse grained rounded sand grains with increasing amounts of carbonaceous material.
240 - 246'	No sample.
246 - 251'	Core Granite.

See Petrological Descriptions

SPECTROGRAPHIC ANALYSIS

Mark	A1266/60
Lead (Pb)	150
Cobalt (Co)	2
Nickel (Ni)	250
Vanadium (V)	± 10
Molybdenum (Mo)	± 20
Zinc (Zn)	± 100
Tin (Sn)	± 50
Copper (Cu)	30
Antimony (Sb)	± 100
Arsenic (As)	± 500
Cadmium (Cd)	± 100
Chromium (Cr)	1000
Manganese (Mn)	150
Gold (Au)	± 10
Silver (Ag)	± 1
Platinum (Pt)	± 10
Bismuth (Bi)	± 10

± = less than Results in p.p.m.

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO. IR 5

Project: Iukster Aeromagnetic Anomaly		D.M. 823/60
Sec. 40 Hd. Carina	Co. Robinson	Hole Ser. No. 29/59
Collar Coords 16000'N 16000'E	R.L. 481.2	Grid Local
Vertical	Depth: 149'	Plan Ref. 32026
Date Hole commenced 12/5/59	Completed 15/5/59	Driller R. Munro
Hole Logged by G.F.W.	On 21/6/60	Hirer D. of M.

OBJECT: To test the N.E. margin of a magnetic and gravity anomaly.

RESULT:

0 - 145?	"Overburden"
145?- 149	Adamellite.

LOG: Comprises

Geological Log
Spectrographic Analysis
See also Petrological Descriptions

Depth	Description
	Sludge samples collected and logged microscopically every 5' unless otherwise noted.
0 - 10'	50% rounded quartz grains, 30% carbonate grains, remainder clays etc.
10 - 25'	80% rounded quartz grains, remainder mostly travertine.
25 - 100'	Mostly rounded quartz grains limonite or clay stained to varying amounts - red sand.
100 - 145'	Rounded quartz grains - white sand . Traces limonite stained grains and a few clay stained grains. Note that no real signs of the underlying granite occur in this sludge.
145 - 149'	Core: Granite
	See Petrological Descriptions

Log of Rotary Drillhole No. IR 5 (Contd.)

SPECTROGRAPHIC ANALYSIS

Mark	A1267/60
Lead (Pb)	150
Cobalt (Co)	2
Nickel (Ni)	250
Vanadium (V)	10
Molybdenum (Mo)	< 20
Zinc (Zn)	< 100
Tin (Sn)	< 50
Copper (Cu)	20
Antimony (Sb)	< 100
Arsenic (As)	< 500
Cadmium (Cd)	< 100
Chromium (Cr)	800
Manganese (Mn)	700
Gold (Au)	< 10
Silver (Ag)	< 1
Platinum (Pt)	< 10
Bismuth (Bi)	< 10

< = less than. Results in p.p.m.

Locality: Hd. Corina, Section 46, Inkster Rotary Hole No. 5. E/S No. 29/59. Co-ords. 16000'N 16000'E at 149'.

Note Specimens from 145' sent to Chief Geophysicist, Bureau of Mineral Resources, Melbourne.

Log of Rotary Drillhole No. IR 4 (Contd.)

Spectrographic Analysis (Contd.)

Locality: Hd. Carina. Section 41. Inkster Rotary Hole No. 4 B/S No. 28/59. Coords 16000'N-00'E at 25°.

"COAL" ANALYSIS

Mark	Footage	Moisture	Volatile Matter	Fixed Carbon	Ash
A943/59	156'-156'6"				
	As received:	4.67	-	-	81.90
	Air dried:	12.00	-	-	75.60

Sample from Rotary Bore No. 4. 156'-156'6". Inkster Anomaly Mianipa. Hundred Carina.

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO. IR 6

Project:	Inkster Aeromagnetic Anomaly		R.N. 623/60
Sec. 41	Hd. Carina	Co. Robinson	Hole Ser. No. 1/60
Collar Coords	16000'N 8600'E	R.L. 476.6	Grid Local
Vertical		Depth 247'6"	Plan Ref. S2026
Date Hole commenced	6/7/59	Completed 9/7/59	Driller R. S. Munro
Hole Logged by	S.F.W.	On 21/6/60	Hirer D. of M.

OBJECT: To test a magnetic peak near a gravity peak.

RESULT:

0 - 145	Overburden
145 - 147'6	Gabbro
147'6-247'6	Presumably gabbro

LOG: Comprises
- Geological Log
- Spectrographic Analysis
- See also Petrological Description

Depth	Description
	Sludge samples collected and logged microscopically every 5' unless otherwise noted.
0 - 15'	Fine grained quartz grains, carbonate and clay.
15 - 30'	Less carbonate, more than 20% clay.
30 - 55'	Mainly rounded quartz grains but approximately 20% finer grained material including clays.
55 - 80'	Fine grained rounded quartz grains, reddish sand.
80 - 145'	Fine grained rounded quartz grins, only minor limonite and/or clay - white sand.
145 - 147'6	Core: Basic igneous rocks. (Hypersthene gabbro)
145 - 150	70% fine grained rounded and angular quartz, remainder medium grained rounded quartz grains - white sand.
150 - 195'	As 145'-150'.
195 - 235'	90% rounded - angular quartz grains of various sizes but with up to 10% of finer grained dark material colouring the whole sludge dark grey.
235 - 247'6"	No samples.

See Petrological Description

Log of Rotary Drillhole No. JR 6 (Contd.)

SPECTROGRAPHIC ANALYSIS

Mark	A1268/60
Lead (Pb)	10
Cobalt (Co)	50
Nickel (Ni)	200
Vanadium (V)	300
Molybdenum (Mo)	< 20
Zinc (Zn)	600
Tin (Sn)	< 50
Copper (Cu)	50
Antimony (Sb)	< 100
Arsenic (As)	< 500
Cadmium (Cd)	< 100
Chromium (Cr)	200
Manganese (Mn)	1200
Gold (Au)	< 10
Silver (Ag)	< 1
Platinum (Pt)	< 10
Bismuth (Bi)	< 10

< = Less than. Results in p.p.m.

Locality: Hd. Carina, section 41, Inkster Rotary Hole No. 6. B/S. No. 1/60. Co-ords 16000°N 0600°E at 147°.

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY PERCUSSION NO. CR 1

Project: Chandada Aeromagnetic Anomaly		D.M. 823/60
Sec. 10 Hd. Chandada	Co. Robinson	Hole Ser. No. 2/60
Collar Coords: 10000'N.16000'E	R.L. 500	Grid Local
Vertical	Depth 152'8"	Plan Ref. 59-231/232
Date Hole commenced 21/1/60	Completed 2/2/60	Driller: L. Norstrom
Hole Logged by G.F.W.	On 16/6/60	Hirer D. of M.

OBJECT: To test the margin of a magnetic and gravity anomaly.

RESULT: 0 - 140 Aeolianite etc.
140 - 152'8 Gneissic "granite", a metamorphosed felspathized arkesic sediment.

LOG: Comprises Geological Log
Spectrographic Analyses.

Depth	Description
	Sludge collected and logged microscopically every 5' unless otherwise noted.
0 - 15'	Travertine
15 - 20'	Travertine, minor sand grains.
20 - 135'	Fine grained well rounded quartz grains with angular fragments of soft sandstone 40-45, 50-55, with traces of non-magnetic dark minerals 55-70, with much carbonate 115-120'.
135 - 140'	As 20-135' but with minor angular or platey translucent grains.
140 - 145'	Mainly fine grained well rounded clear quartz grains w but with minor angular clear quartz grains and with traces of angular platey and blocky translucent grains, presumably felspar.
145 - 147'8	No sludge.
147'8-152'8	Core: Gneissic granite of metamorphic origin probably being derived from a felspathized arkesic sediment. Dip approx. 30°.

Log of Rotary Drillhole No. CR 1 (Contd.)

SPECTROGRAPHIC ANALYSIS

Mark	A1269/60
Lead (Pb)	150
Cobalt (Co)	2
Nickel (Ni)	250
Vanadium (V)	± 10
Molybdenum (Mo)	± 20
Zinc (Zn)	± 100
Tin (Sn)	± 50
Copper (Cu)	25
Antimony (Sb)	± 100
Arsenic (As)	± 500
Cadmium (Cd)	± 100
Chromium (Cr)	500
Manganese (Mn)	300
Gold (Au)	± 10
Silver (Ag)	± 1
Platinum (Pt)	± 10
Bismuth (Bi)	± 10

± = less than. Results in p.p.m.

Locality: Ed. Chandada. section 10. Rotary Hole No. 1 E/S No. 2/60. Coords approx. 10000°N 16000°E at peg No. 17. Depth 150'.

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO. CR 2

Project:	Chandada Aeromagnetic Anomaly		D.M. 623/60
Sec. 10	Hd. Chandada	Co. Robinson	Hole Ser. No. 3/60
Collar Coords	10000N, 11400'E	R.L. 516.3	Grid Local
Vertical		Depth 254'8"	Plan Ref. 59-231/232
Date Hole Commenced	4/2/60	Completed 17/2/60	Driller: L. Norstrom
Hole Logged by:	G.F.W.	On 16/6/60	Hirer D. of M.

OBJECT: To test a magnetic high near a gravity high.

RESULT:

0 - 222	Aeolianite etc.
222 - 254'8"	Gabbro.

LOG: Comprises Geological Log
Spectrographic Analysis

Depth	Description
	Samples collected and logged microscopically every 5' unless otherwise noted.
0 - 45'	Travertine, traces silica grains, no iron ore minerals.
45 - 50'	50% quartz grains, remainder clay minerals, traces travertine.
50 - 60'	40% unconsolidated quartz grains, remainder is quartz grains cemented by minor limonite.
60 - 65'	Ditto but the unconsolidated quartz is sustained and forms 60% approx. of sample.
65 - 115'	Fine grained well rounded clear quartz grains, traces medium sized grains and cloudy quartz, typical windblown quartz sand.
115 - 222'8	No water return, no sludge.
222'8-225'	Weathered bedrock, fine "clayey" brown sludge with no determinable minerals.
225 - 235'	Weathered bedrock but with rock fragments.
235 - 249'	Unoxidized, though apparently still soft bedrock.
249 - 254'8	Core: Gabbro
	See Petrological Description

Log of Rotary Drillhole No. GM 2 (Contd)

SPECTROGRAPHIC ANALYSIS

Mark	A1270/60
Lead (Pb)	< 10
Cobalt (Co)	100
Nickel (Ni)	500
Vanadium (V)	30
Molybdenum (Mo)	< 20
Zinc (Zn)	600
Tin (Sn)	< 50
Copper (Cu)	250
Antimony (Sb)	< 100
Arsenic (As)	< 500
Cadmium (Cd)	< 100
Chromium (Cr)	200
Manganese (Mn)	2000
Gold (Au)	< 10
Silver (Ag)	< 1
Platinum (Pt)	< 10
Bismuth (Bi)	< 10

< = less than. Results in p.p.m.

Locality: Md. Chandada, section 10, Rotary Hole No. 2
R/S No. 3/60. Coords 10000'N 11400'E, depth 254'6"

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY PERCUSSION NO. GR 3

Project: Chandada Aeromagnetic Anomaly		**B.M.** 823/60
Sec. 15 **Hd.** Chandada	**Co.** Robinson	**Hole Ser. No.** 4/60
Collar Coords 10000'N 9400'E	**R.L.** 490.8	**Grid** Local
Vertical	**Depth** 290'9"	**Plan Ref.** 59-231/232
Date Hole Commenced 18/2/60	**Completed** 24/2/60	**Driller** L. Korstrom
Hole Logged by G.F.W.	**On** 16/6/60	**Miner** D. of M.

OBJECT: To test a gravity high near a magnetic high.

RESULT:
0 - 250? Acellanite etc.
250?- 290'9" Uralitised basic igneous rock.

LOG: Comprises
Geological Log
Spectrographic Analysis
See also Petrological Description

Depth	Description
	Sludge collected and logged microscopically every 5' unless otherwise noted. Two sets of samples are available for the first 45', differing in composition.
0 - 25'	Travertine, traces silica grains, no iron ore minerals.
25 - 40'	No sludge return.
At 40'	Cemented quartz grains.
0 - 25'	Fine grained well rounded clear quartz grains; 20-30% are limonite stained.
25 - 40'	No sludge return.
40 - 55'	As 0-25'.
55 - 120'	No sludge.
120 - 130'	As 0-25 and 40-55'.
130 - 170'	No sludge.
170 - 190'	Fawn clays with minor quartz. Bentonite contaminations high for these samples.
190 - 200'	Fawn clays with much quartz as grains.
200 - 250'	Fawn clays with traces only of quartz, minor carbonate and numerous soft amorphous whitegrains thought to be gypsum.
250 - 265'	As 200-250 but with 25% approx. of rock fragments.

Log of Rotary Drillhole No. CH 3 (Contd.)

Depth	Description
265 - 280'	75% rock fragments (felspar, ferromg., minor biotite) and 25% clays etc.
280 - 284'9	No sample
284'9-290'9	Core: Gabbro.

See Petrological Description

SPECTROGRAPHIC ANALYSIS

Mark	A127/60
Lead (Pb)	± 10
Cobalt (Co)	200
Nickel (Ni)	600
Vanadium (V)	20
Molybdenum (Mo)	± 20
Zinc (Zn)	1500
Tin (Sn)	± 50
Copper (Cu)	250
Antimony (Sb)	± 100
Arsenic (As)	± 500
Cadmium (Cd)	± 100
Chromium (Cr)	80
Manganese (Mn)	2000
Gold (Au)	± 10
Silver (Ag)	± 1
Platinum (Pt)	± 10
Bismuth (Bi)	± 10

± = less than. Results in p.p.m.

Locality: Hd. Chandada, section 15. Rotary Hole No. 3. B/S No. 4/60. Coords 10000'N. 9400'E. Depth 290'6".

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO. BR 1

Project: Ripon Aeromagnetic Anomaly		**D.H.** 323/60
Sec. 148 **Hd.** Ripon	**Co.** Robinson	**Hole Ser. No.** 5/60
Collar Coords 9900'N, 8600'E	**R.L.**	**Grid** Local
Vertical	**Depth** 323'1"	**Plan Ref.** 59-274/275
Date Hole commenced 1/3/60	**Completed** 16/3/60.	**Driller** E. Fahey
Hole Logged by G.F.W.	**On** 17/6/60	**Hirer** D. of M.

OBJECT: To test a magnetic high near a gravity high.

RESULT:

0 - 305	Calcarenite
305 - 323'1	Gabbro

LOG: Comprises

Geological Log
Spectrographic Analysis
See also Petrological Description

Depth	Description
	Sludge samples collected and logged microscopically every 5' unless otherwise noted.
0 - 70'	Calcarenite, traces quartz and mafic minerals.
70 - 74'6	No sample.
74'6- 75'	Core: Recemented calcarenite with dark coloured rock fragments to ¼"
75 - 124'	No samples.
	Below 124' core samples were taken at intervals, the following footages referring to the bottom of individual samples: 138', 163', 218', 243'6", 250', 260', 273'6", 279'3", 284'3", 295', 300', 300'9". All were recemented calcarenite with increasing proportions of macrofossils. This core has been skeletonised, approx. 6" per sample being retained.
300'9-305'	Core: Recemented arenite with minor quartz grains.
305 - 312'est	Core: Weathered gabbro.
312 - 323'1"	Core: Gabbro.
	See Petrological Description.

Log of Rotary Drillhole No. RR 1 (Contd.)

SPECTROGRAPHIC ANALYSIS

Mark	A1272/60
Lead (Pb)	10
Cobalt (Co)	40
Nickel (Ni)	300
Vanadium (V)	150
Molybdenum (Mo)	± 20
Zinc (Zn)	1000
Tin (Sn)	± 50
Copper (Cu)	300
Antimony (Sb)	± 100
Arsenic (As)	± 500
Cadmium (Cd)	± 100
Chromium (Cr)	100
Manganese (Mn)	1500
Gold (Au)	± 10
Silver (Ag)	± 1
Platinum (Pt)	± 10
Bismuth (Bi)	± 10

± = less than. Results in p.p.m.

Locality: Hd. Ripon, section 148, Rotary Hole No. 1
R/S No. 5/60. Coords 9980'N, 8600'E. Depth 322'6".

Department of Mines, South Australia

[illegible]

LOG OF ROTARY [illegible] NO. RH 2

Project: Ripon Aeromagnetic Anomaly		D.M. 823/60
Sec. 151 Hd. Ripon	Co. Robinson	Hole Ser. No. 6/60
Collar Coords. 10000N 17400E	R.L.	Grid
Vertical	Depth: 424'7"	Plan Ref. 59-274/275
Date Hole commenced 16/3/60	Completed 24/3/60	Driller E. Fahey
Hole Logged by G.F.W.	On 17/6/60.	Hirer D. of M

OBJECT: To test the NE margin of a gravity and magnetic anomaly.

RESULT: 0 - 424'7" Soft rock, poor sample recovery
Failed to penetrate to bedrock.

LOG: Comprises Geological Log
Spectrographic Analysis

Depth	Description
	Sludge samples were collected and logged microscopically every 5' unless otherwise noted.
0 - 55'	Calc-acolianite, traces quartz.
55 - 88'8"	No samples.
88'8- 94'10	Cemented calc-acolianite.
94'10-424'7"	No samples.
	Hole failed to penetrate to hard rock.
	End of Log.

Department of Mines, South Australia

IRON EXPLORATION SECTION

LOG OF ROTARY DRILLHOLE NO BH 3

Project:	Ripon Aeromagnetic Anomaly		S.M. 823/60
Sec. 148	Hd. Ripon	Co. Robinson	Hole Ser. No. 7/60
Collar Coords.	10000N 7720E	R.L.	Grid Local
Vertical		Depth 211'4"	Plan Ref. 59-274/275
Date Hole commenced	20/3/60	Completed 13/5/60	Driller Fahey & Thompson
Hole Logged by	G.F.W.	On 17/6/60	Mngr D. of M.

OBJECT: To test a gravity peak near a magnetic peak.

RESULT: 205'11 - 211'4" Diorite

LOG: Comprises Geological Log
Spectrographic Analysis
See also Petrological Description

Depth	Description
	Sludge samples were collected and logged microscopically every 5' unless otherwise noted.
0 - 20'	Travertinised calc-scolianite.
20 - 30'	Slightly travertinised calc-scolianite with ¼" fragments of dark grey calcareous material.
30 - 59'	Calc-scolianite with traces of quartz, the quantity increasing with depth.
53 - 53'6"	Est. Core: Travertinised calc-scolianite.
53'6- 55'	Core: Cemented calc-scolianite.
59 - 205'11	No samples.
205'11-211'4	Diorite.
	See Petrological Description

Log of Rotary Drillhole No. MR 3 (Contd.)

SPECTROGRAPHIC ANALYSIS

Mark	A1273/60
Lead (Pb)	± 10
Cobalt (Co)	30
Nickel (Ni)	200
Vanadium (V)	80
Molybdenum (Mo)	± 20
Zinc (Zn)	200
Tin (Sn)	± 50
Copper (Cu)	150
Antimony (Sb)	± 100
Arsenic (As)	± 500
Cadmium (Cd)	± 100
Chromium (Cr)	150
Manganese (Mn)	1200
Gold (Au)	± 10
Silver (Ag)	± 1
Platinum (Pt)	± 10
Bismuth (Bi)	± 10

± = less than. Results in p.p.m.

Locality: Hd. Ripon, section 140, Rotary Hole No. 3.
R/S No. 7/60. Coords 10000'N 7200'E at 2.0°.

MINERALOGY & PETROLOGY SECTION

REPORT NO. 1.2.0/810.813-817

MATERIAL: Drill Core

SUBMITTED BY: Mr. G. Whitten, Iron Section, Department of Mines

DATE RECEIVED: 5/7/60

MARKS OR NO's. P678-683/60

SOURCE OR LOCALITY: Eyre Peninsula.

INFORMATION REQUIRED: Petrological descriptions and specific gravities.

METHODS OF EXAMINATION: Microscopic examination (Thin Section)

RESULTS OF EXAMINATION:-

No. P678/60 (T.S. 6680) Bd. Carina, Inkster Rotary Hole No. 1 (199°)(Inkster Aeromagnetic Anomaly) Section 41, Co-ords 14000N, 10200°E

Composition: (With approximate percentages.)

Plagioclase	45 - 50 %
Amphibole	30 - 35 %
Chlorite	10%
Iron Oxide	5 - 10%

The felspar is labradorite and , although it has been very strongly crushed and fractured, there is very little evidence of alteration. Fractures are filled with limonite and fine chlorite (variety penninite). Masses of fibrous amphibole (tremolite-actinolite) and chlorite fill the spaces between the felspar crystals. The rock is impregnated with fine limonite, and some magnetite and, possibly, ilmenite are also present. The magnetic minerals would make up less than 5% of the rock.

Texture: Coarse grained. The rock has undergone severe crushing.

Classification: This rock appears to have originally been a labradorite segregation associated with a basic intrusion. Ferromagnesian minerals were introduced following crushing.

S.G. = 2.16

No. 679/60 (T.S. 6681) P.S. 5833 (Bd. Carina, Section 41, Inkster Rotary Hole No. 2. (217°) Inkster Aeromagnetic Anomaly. Co-ords 16000N, 10600E

Composition:

Plagioclase	45%
Pyroxene	25%
Amphibole	15%
Biotite	5%
Opaques and accessories	10%

The plagioclase is again labradorite which is very fresh and occurs as subhedral crystals. The pyroxene (hypersthene) has undergone alteration to hornblende and biotite. Opaque iron minerals occur as irregularly shaped interstitial occurrences. Apatite is a common accessory mineral.

A polished section was prepared and a quantitative examination carried out. The results are as follows:-

Non-opaque minerals	90.3 %
Magnetite	7.2 %
Ilmenite	1.2 %
Pyrite	1.3 %

Texture: Medium grained, hypidiomorphic. The opaque minerals tend to exhibit a poikilitic texture.

Classification: Hypersthene-gabbro.

This rock is rather similar to the gabbro recently examined from the hundred of Chandada (P350/60). Report No. 439.) The rock from Chandada, however, contained bronzite instead of hypersthene and also the opaque content was a little lower.

S.G. = 3.20

For hole No. 3 see Appendix 5.

No. P680/60 (T.S. 6682) Hd. Carina, Section 41. Inkster Rotary Hole No. 4 (251°) (Inkster Aeromagnetic Anomaly.) Co-ords 15000N 00E

Composition

Microcline	40 %
Plagioclase	35 %
Quartz	20 %
Biotite + accessories	5 %

The plagioclase present is albite-oligoclase and exsolution bodies of albite occur in the microcline. Myrmekitic intergrowths are common along quartz-felspar boundaries. Accessory minerals include zircon, apatite, opaques and sphene.

Texture: Medium to coarse-grained, and hypidiomorphic granular.

Classification: Leucocratic adamellite.

S.G. = 2.64

No. P681/60 (T.S. 6683) Hd. Carina, Section 40, Inkster Rotary Hole No. 5 (149°). Inkster Aeromagnetic Anomaly Co-ords. 16000N 16000E

Composition

Microcline	40 %
Plagioclase	30 %
Quartz	20 %
Biotite, hornblende, accessories	10 %

The plagioclase is oligoclase. Some crystals exhibit zoning and most of the felspar is undergoing alteration to sericite. Myrmekitic intergrowths can again be observed along quartz-felspar boundaries. Quartz exhibits strain extinction. Pleochroic haloes can be observed within the biotite. Accessory minerals are sphene, zircon, opaques and apatite.

Texture: Coarse grained and hypidiomorphic granular.

Classification: Leucocratic adamellite

S/G. = 2.64

No. P662/60 (T.S. 4684) Rd. Carina. Section 41. Inkster Rotary Hole No. 6 (147°) (Inkster Aeromagnetic Anomaly) Co-ords 16600N 8600°E

Composition:

Plagioclase	50 %
Pyroxene	30 - 35 %
Amphibole	5 - 10 %
Biotite	5 % or less
Opaques and accessories	5 - 10 %

The felspar is andesine - labradorite, and the pyroxene is hypersthene. The pyroxene shows some alteration to hornblende and biotite. The opaques present are magnetite pyrite, and ilmenite. The main accessory mineral is apatite.

Texture: Medium-grained, hypidiomorphic. The opaques and the hornblende both have a tendency to be poikilitic in parts.

Classification: Hypersthene-gabbro.

This is essentially similar to P.679/60, except that the content of opaques is a little lower in this case.

S.G. = 2.85

No. P663/60. (T.S. 4685) Rd. Ripon. Rotary Hole No. 3 (210°). (Ripon North Aeromagnetic Anomaly) Section 14S Co-ords 1800°N 7000°E

Composition

Plagioclase	50 %
Amphibole	40 %
Quartz	5 - 10 %
Accessories	3 - 5 %

The plagioclase consists of very heavily sericitised andesine. The amphibole is hornblende and the accessory minerals are opaques, zircon and sphene. Opaques are the chief accessories and include magnetite and pyrite, with possibly some other iron oxides.

Texture: Medium-grained and hypidiomorphic.

Classification: Diorite

S.G. = 2.89

R. A. Both
MINERALOGIST

APPENDIX 5

MINERALOGY & PETROLOGY SECTION

REPORT NO. M.P.N.C. 165/59

MATERIAL:	Drill core
SUBMITTED BY:	E. Moorcroft, Geological Survey
DATE RECEIVED:	20th May, 1959
MARKS or NOS:	Sample I. P 926/59
SOURCE or LOCALITY:	Imbster Rotary 3, 193'-194'. County of Robinson, Hundred of Carina, Section 40.
INFORMATION REQUIRED:	Petrological description
METHODS OF EXAMINATION:	Thin-section, polished section.

RESULTS OF EXAMINATION:

P.926/59 (T.S. 4714)

In hand-specimen the rock appears to be a coarse-grained gabbro with pegmatitic phases containing crystals of sphene; pyrite is conspicuous. In thin-section, the rock is a uralitized gabbro, with typical subophitic to intergranular fabric. Clinopyroxene has been largely replaced by fibrous amphibole, and labradorite is partly saussuritized. Clusters of clinozoisite-epidote crystals occur. Some of the opaques are marginally altered to sphene. A briquetted and polished methylene iodide heavy fraction of the crushed rock showed the presence of titaniferous magnetite, haematite-ilmenite intergrowths, and pyrite.

Examined by: H. W. Fander.

APPENDIX 6

MINERALOGY & PETROLOGY SECTION

REPORT NO. 194

MATERIAL:	Rock Sample
SUBMITTED BY:	Mr. G. Whitten, Iron Ore Section Department of Mines.
DATE RECEIVED:	24/2/60
MARKS or NOS:	P126/60
SOURCE OR LOCALITY:	Md. of Chandadin, Sec. No. 10 Rotary drill hole No. 1 at 150 ft.
INFORMATION REQUIRED:	Origin of rock
METHODS OF EXAMINATION:	Thin section

RESULTS OF EXAMINATION:

The rock is a gneissic granite which appears to be of metamorphic origin. The texture is gneissic and porphyroblastic. Microcline porphyroblasts occur in a granulose matrix of quartz, oligoclase and biotite, with a small amount of muscovite. The porphyroblasts of microcline are lacking in crystal outline, and appear to have been formed in the interstitial spaces of the rock. Inclusions of quartz and plagioclase are common in the microcline. It is also apparent that the microcline is fresh and unaltered, while the plagioclase is highly altered (sericitised). Other minerals which were observed were occasional grains of opaques, and rare grains of sphene and zircon.

The general features of this rock all point to a metamorphic origin and it would appear that it is a feldspathised arkosic sediment.

Examined by R. A. Both.

MINERALOGY & PETROLOGY SECTION

REPORT NO. 692

MATERIAL: Rock samples

SUBMITTED BY: Mr. G. Whitton, Iron Ore Section, Department of Mines.

DATE RECEIVED: 14/4/60

MARKS OR NUMBERS: P349-351/60, P126/60

SOURCE OR LOCALITY: Eyre Peninsula

INFORMATION REQUIRED: Petrological description

METHODS OF EXAMINATION: Thin section

RESULTS OF EXAMINATION:

No. P.349/60 T.S. 6331 Locality: - Hd. Ripon, Hole No. 1 at 322'6".

Classification: Gabbro

Composition:

The main components are plagioclase (andesine-labradorite) and augite, which shows partial replacement by hornblende. Minor constituents are biotite and opaque iron minerals.

Texture: Medium-grained and hypidiomorphic

No. P.350/60 T.S. 6332 Locality: - Hd. Chandada at 254'6" - 264'6" Hole No. 2.

Classification: Gabbro

Composition:

Plagioclase (labradorite), bronzite, and olivine are the main constituents. The bronzite has undergone partial alteration to hornblende. Biotite and opaques are common accessory minerals, and a trace of calcite and chlorite are also present.

Texture: Medium grained and hypidiomorphic.

No. P.351/60 T.S. 6333 Locality: Hd. Chandada, Hole No. 3 at 290'3" - 298'9".

Classification: Uralitised basic igneous rock.

Composition:

The main constituents originally were pyroxene and felspar. The pyroxene (augite) exists as remnants only and has been replaced by tremolite and masses of chlorite. The felspar (labradorite) is also present as ragged remnants and has undergone alteration to sericite and other clay minerals. Olivine appears to have been present in small amounts and amphibole and limonite now form pseudomorphs after olivine. Spinel and tourmaline are also conspicuous, and traces of apatite and opaques were observed.

An X-ray spectrograph was taken to determine the identity of the spinel. This method is capable of detecting only those elements with atomic numbers greater, than or equal to atomic numbers 22 (viz. Ti).

The results were as follows:

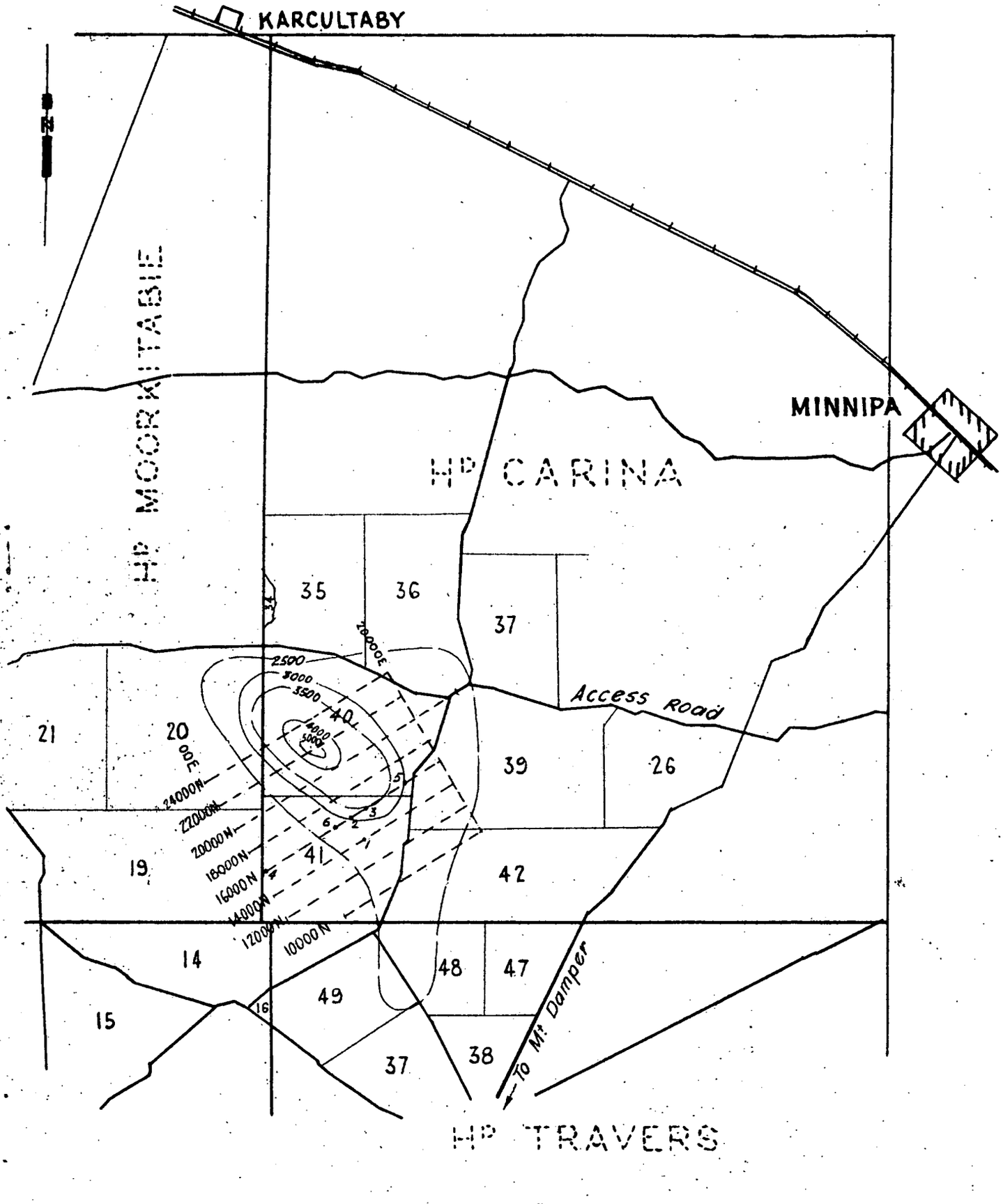
Major	Fe, Ca
Trace	Mn, Ni
Small trace	Cu, Zn, Cr, Sr

The spinel is probably hercynite.

Mn. P.120/60 T.S. 6148 Locality: Bd. Chandada. Hole No. 1

The gneissic granite examined earlier (See report No. 196) was re-examined as requested. It is still considered that this is probably a felspathised arkosic sediment. Although it is difficult to give a definite answer on the basis of microscopic evidence alone, the characteristics of the specimen appear to indicate a metamorphic origin.

Examined by R. A. Both



SCALE

MILE 1 ½ 0 1 2 3 4 5 MILES

Aeromagnetic contours (in gammas) 2500 3000

Surveyed traverses

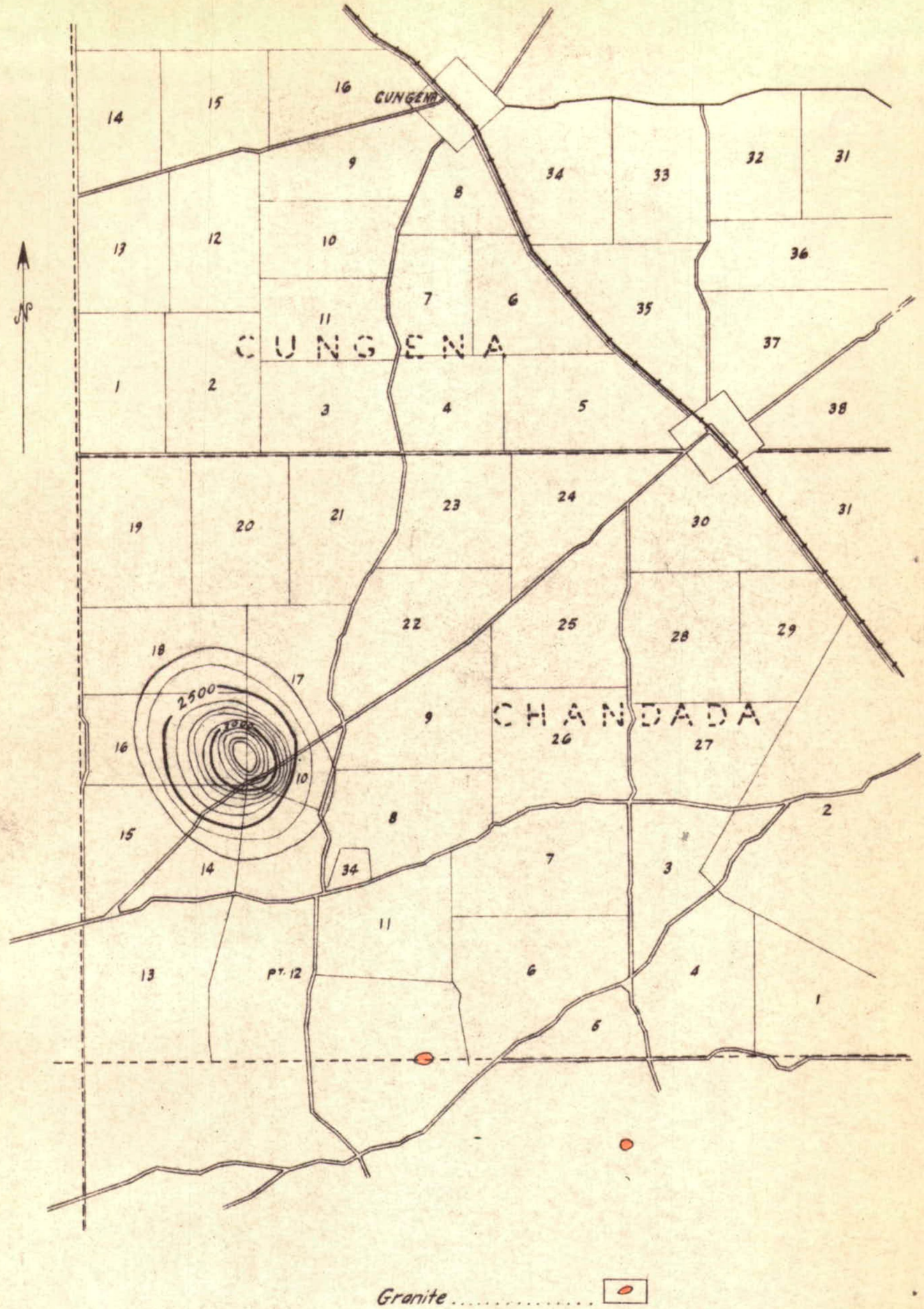
Rotary Holes IR's 1 to 6

To accompany report by G.F. Whitten

S.A. DEPARTMENT OF MINES

Approved	Passed	Drn.	INKSTER AEROMAGNETIC ANOMALY LOCALITY PLAN	D.M.	Scale 2 miles to 1in.
		Tcd. M.B.L.		Req.	S 2026
		Ckd.			
Director		Exd.			Date 23-3-59 Dg14/15

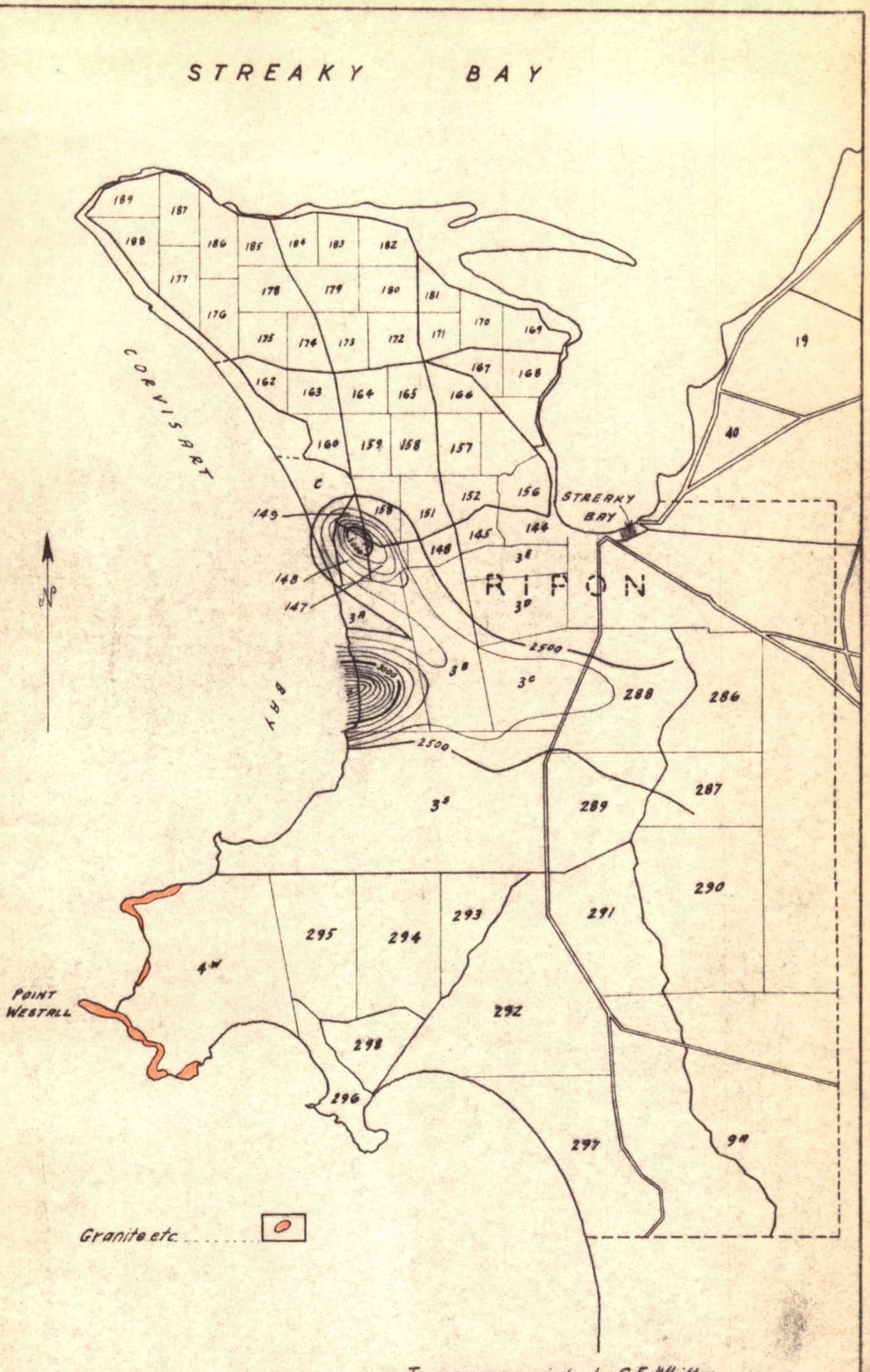
200--10.58 2018



To accompany minute by. G.F. Whitten

S. A. DEPT. OF MINES

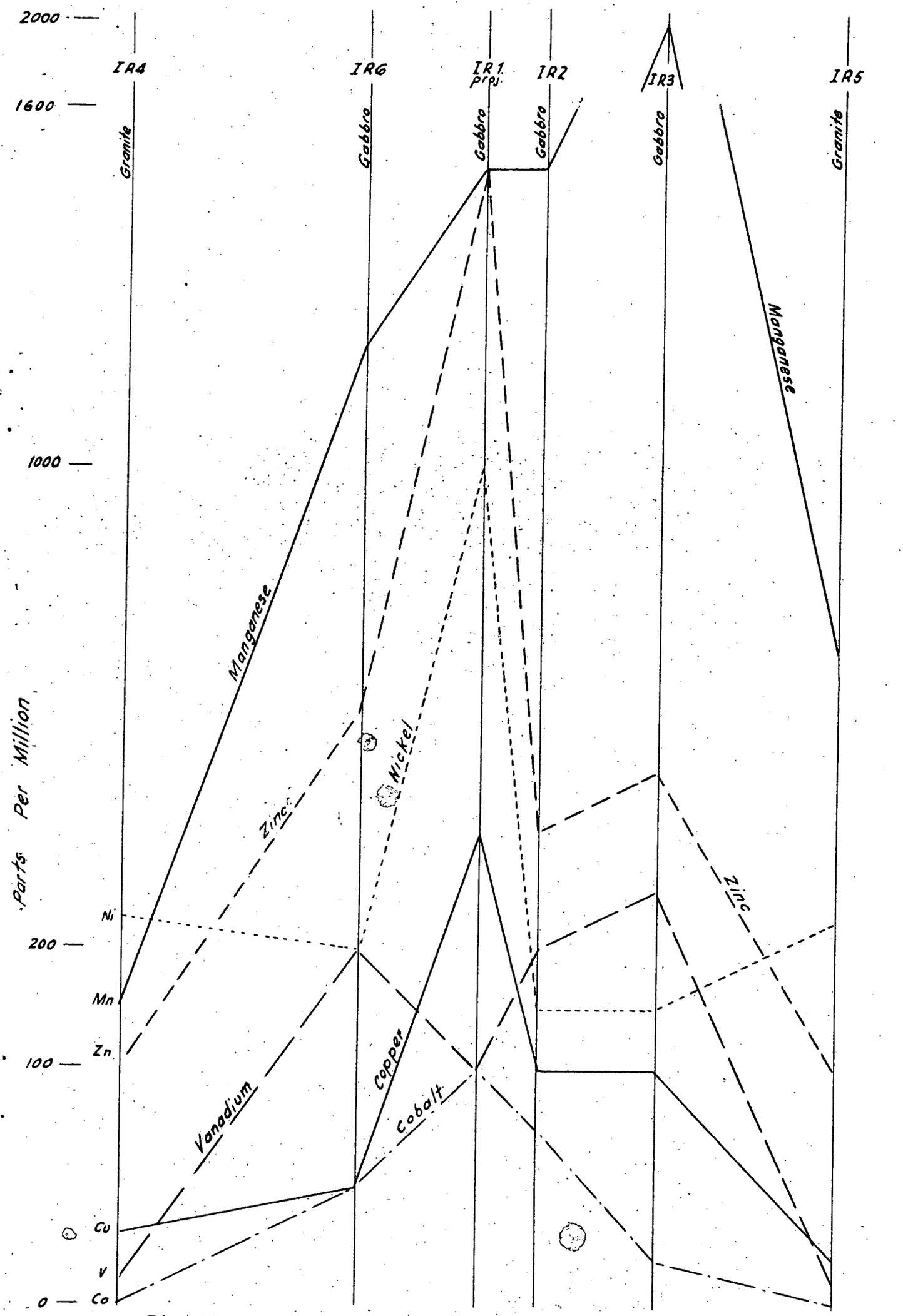
Approved	Passed	Drn.	LOCALITY PLAN CUNGENA ANOMALY Hd. CHANDADA	D.M.	Scale 2 MLS TO 1"
		Tcd. A.W.		Rec.	S1947
		Chd. K.R.			Dg 7
Director	C.D.	Exd.			Date 10-11-58



To accompany minute by G.E. Whitten

S. A. DEPT. OF MINES

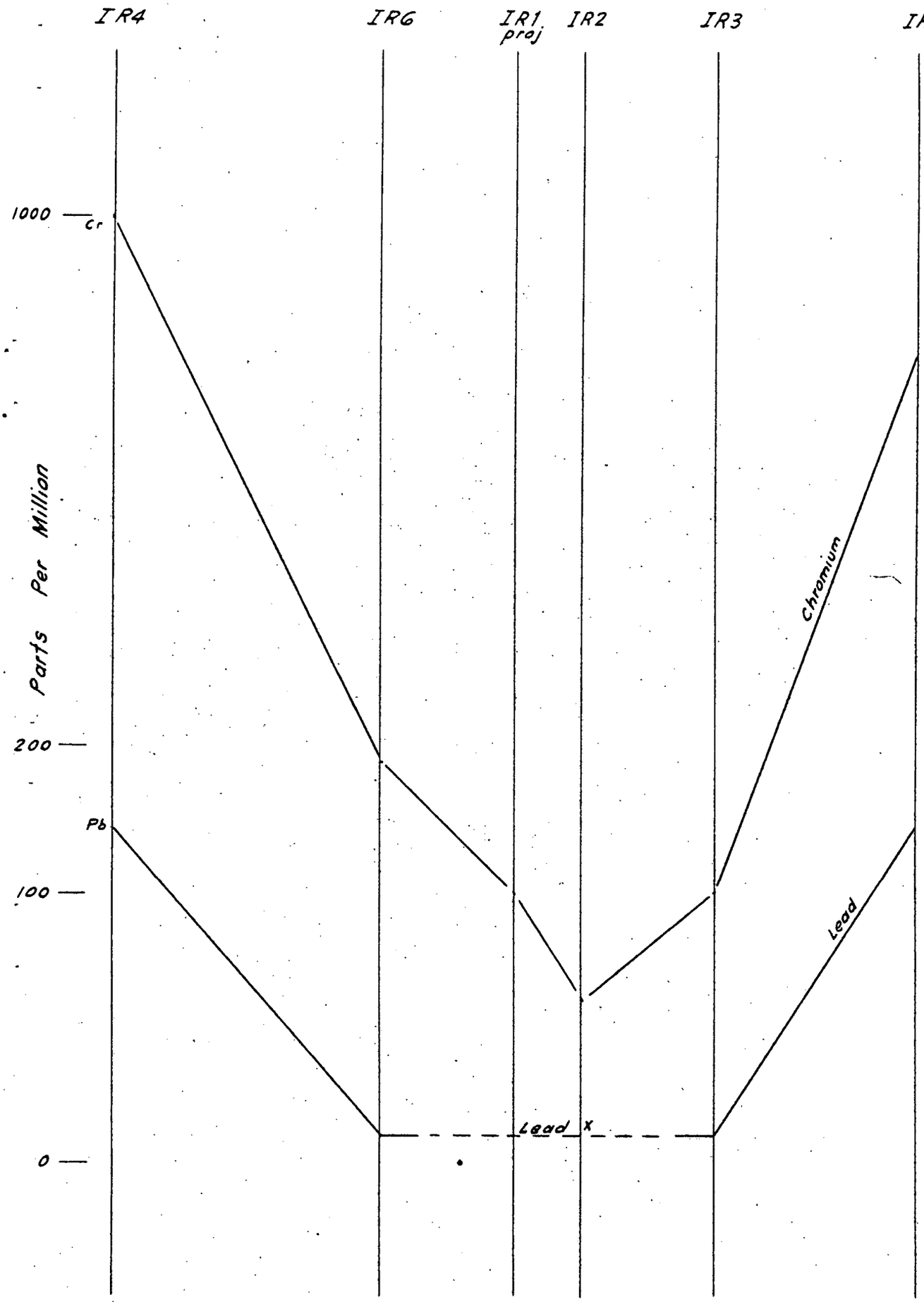
Approved	Passed	Drn.	LOCALITY PLAN AERO MAGNETIC ANOMALY CORVISART BAY Hd. RIPON	D.M.	Scale 2 MLS TO 1"
		Tcd. A.W.		Req.	S1946 Dg 10
		Ckd. K.K.			
Director	C.D.	Exd.			Date 7-11-58



Zinc, Nickel, Copper, Cobalt "peak" in IR 1
Manganese, Zinc, Vanadium "peak" in IR 3

To accompany report by G.R. Whitten.

S.A. DEPARTMENT OF MINES			SHEET 1 OF 3		
Approved	Passed	Drn.	SPECTROGRAPHIC ANALYSES BORES IR 1/6 SECS. 40/41 HD. CARINA	D.M.	Scale —
		Tcd. A.W.		Req.	S 2951
		Ckd.			Dg. 15
Director		Exd.			Date 22-11-61



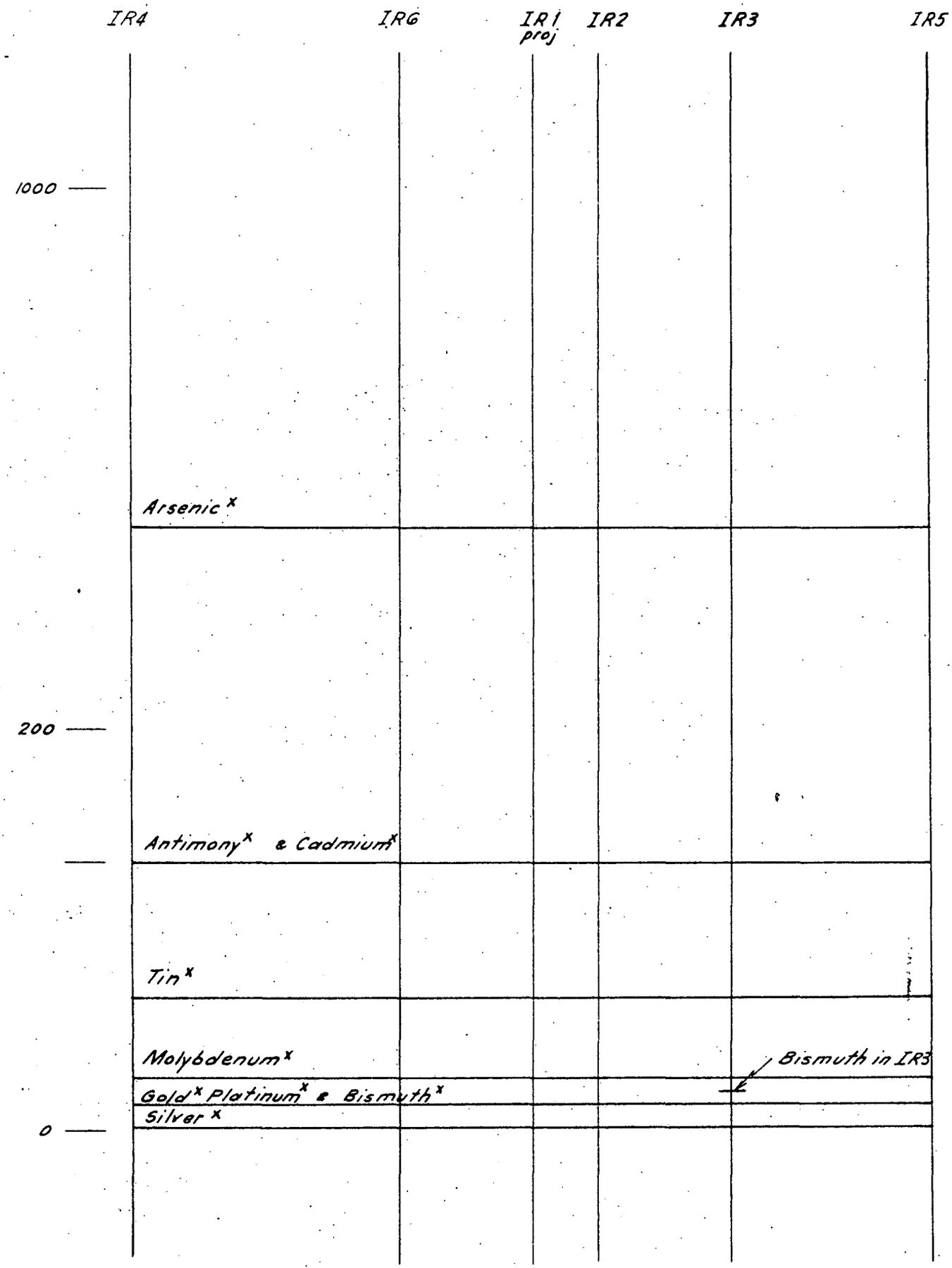
SHEET 2 OF 3

Note:- X means "less than"

To accompany report by G.F. Whitten

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	SPECTROGRAPHIC ANALYSES BORES IR 1/6 SECS. 40/41 HD. CARINA	D.M.	Scale –
		Tcd. A.W.		Req.	52952
		Ckd.			Dg. 15
Director		Exd.			Date 24-11-61

390 - 6.60 0049



Note:- X mean "less than"

SHEET 3

To accompany report by G.F. Whitten

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	SPECTROGRAPHIC ANALYSES BORES IR 1/6 SECS. 40/41 HD. CARINA	D.M.	Scale —
		Tcd. A.W.		Req.	52953
		Ckd.			Dg. 15
Director		Exd.			Date 24-11-61

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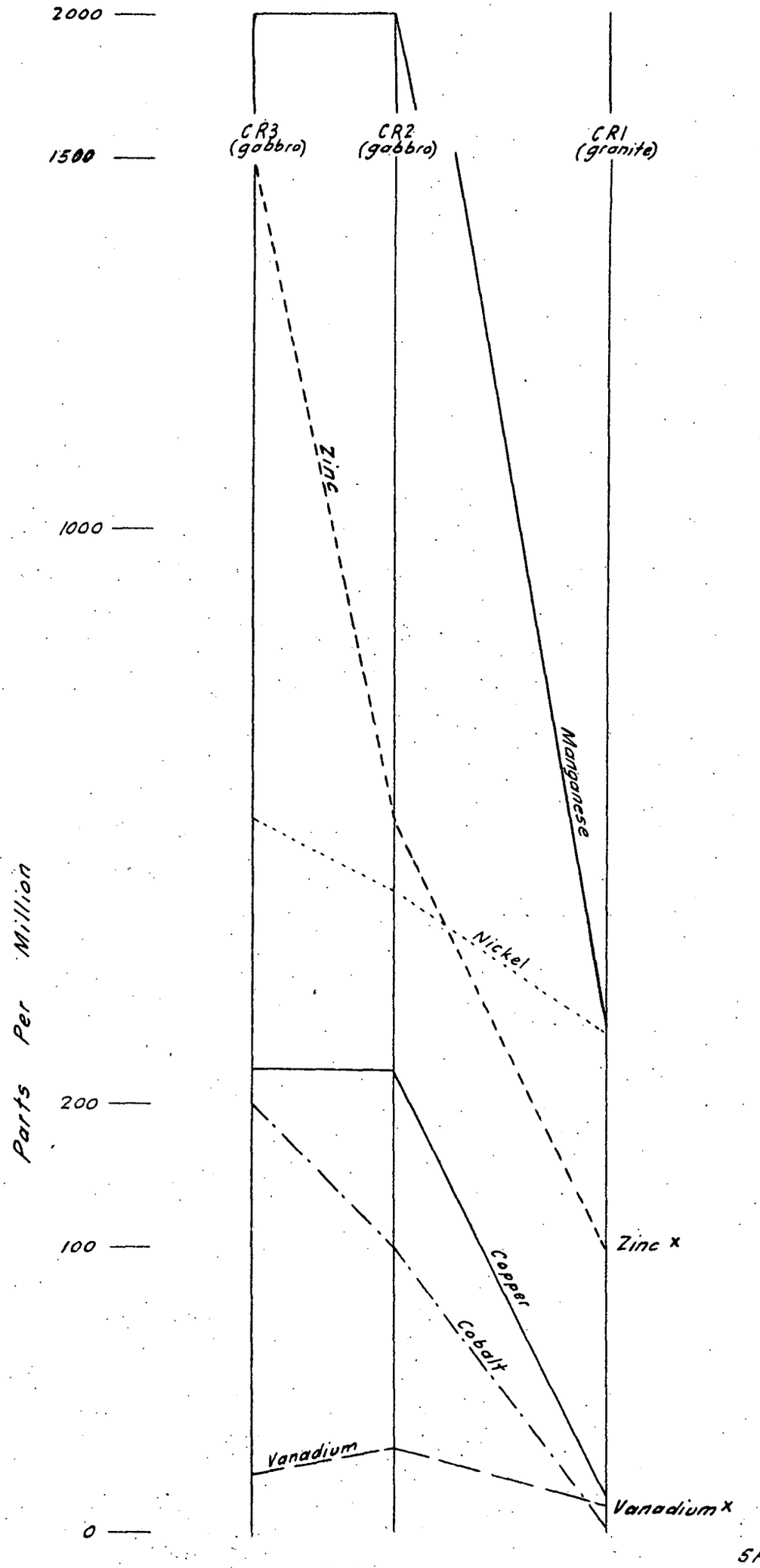

SHEET 1 OF 2

Note:- X means "less than"

To accompany report by G.F. Whitten

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	SPECTROGRAPHIC ANALYSES BORES CR 1/3 SECS. 10 & 15 HD. CHANDADA	D.M.	Scale 1
		Tcd. A.W.		Req.	52954
		Ckd.			Dg. 7
Director		Exd.			Date 27-11-61

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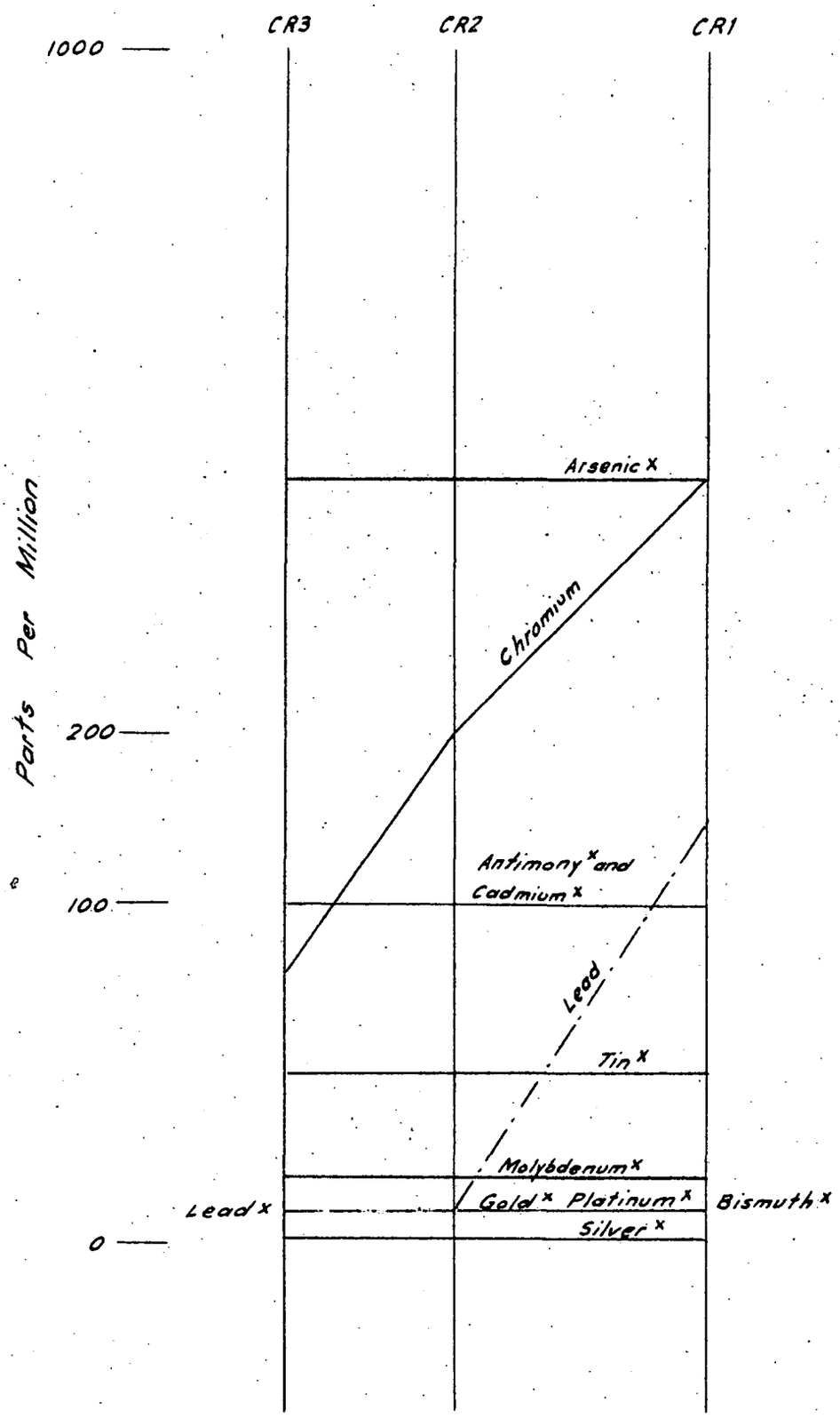


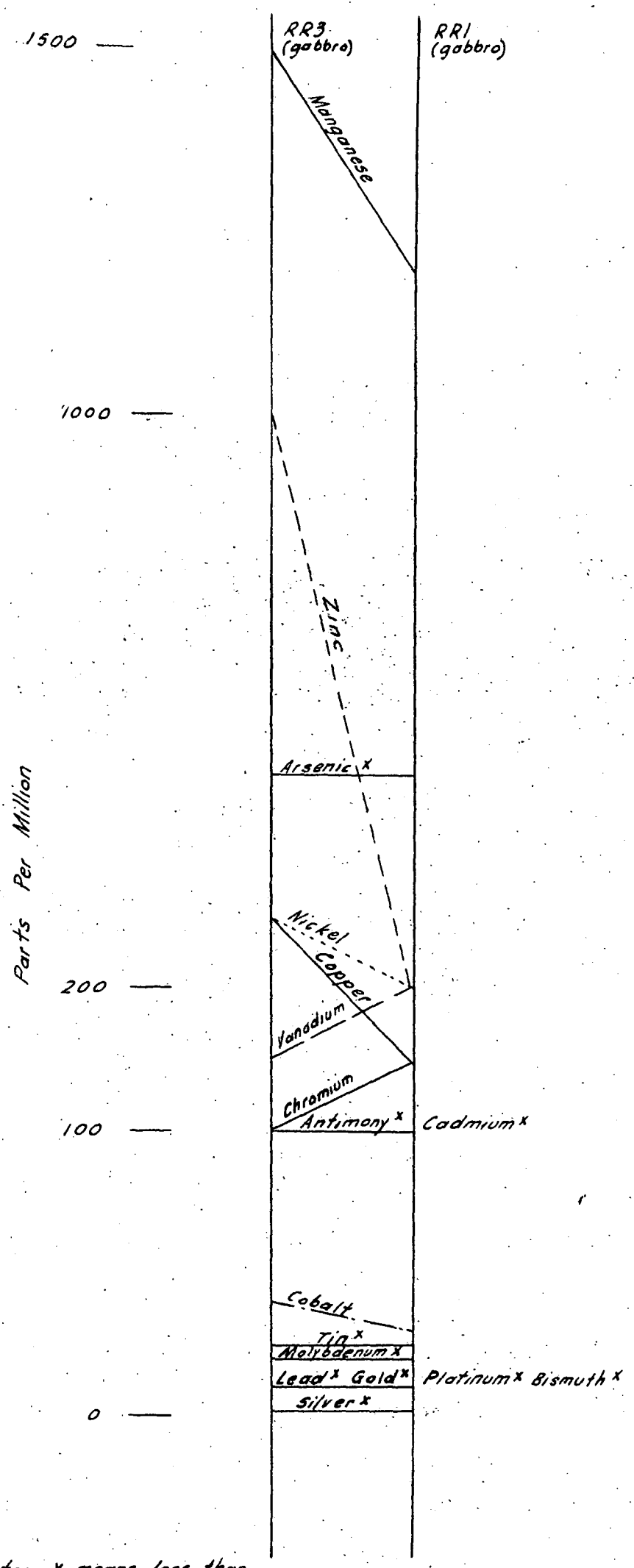
Note:- X means "less than"

SHEET 2.

To accompany report by G.F. Whitten.

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	SPECTROGRAPHIC ANALYSES BORES CR 1/3 SECS. 10 & 15 HD. CHANDADA	D.M.	Scale —
		Tcd. A.W.		Req.	52955 ·
		Ckd.			Dg 7.
Director		Exd.			Date 27-11-61

300 - 6 60 6040



Note:- X means less than.

To accompany report by G.F. Whitten

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	SPECTROGRAPHIC ANALYSES BORES RR1 & RR3 SECS. 148 & 151 Hd. RIPON	D.M.	Scale /
		Tcd. A.W.		Req.	5295G
		Ckd.			Dg 10.
Director		Exd.			Date 27-11-61

200 - 0.60 7701

1 Mason, Brian - Principles of geochemistry.

2 Rankama, K. & Sahama, T.G. - Geochemistry.

3 Polanski, A. - A new essay of evaluation of the chemical composition of the earth.

4 Anderson, J.S. - Chemistry of the earth.

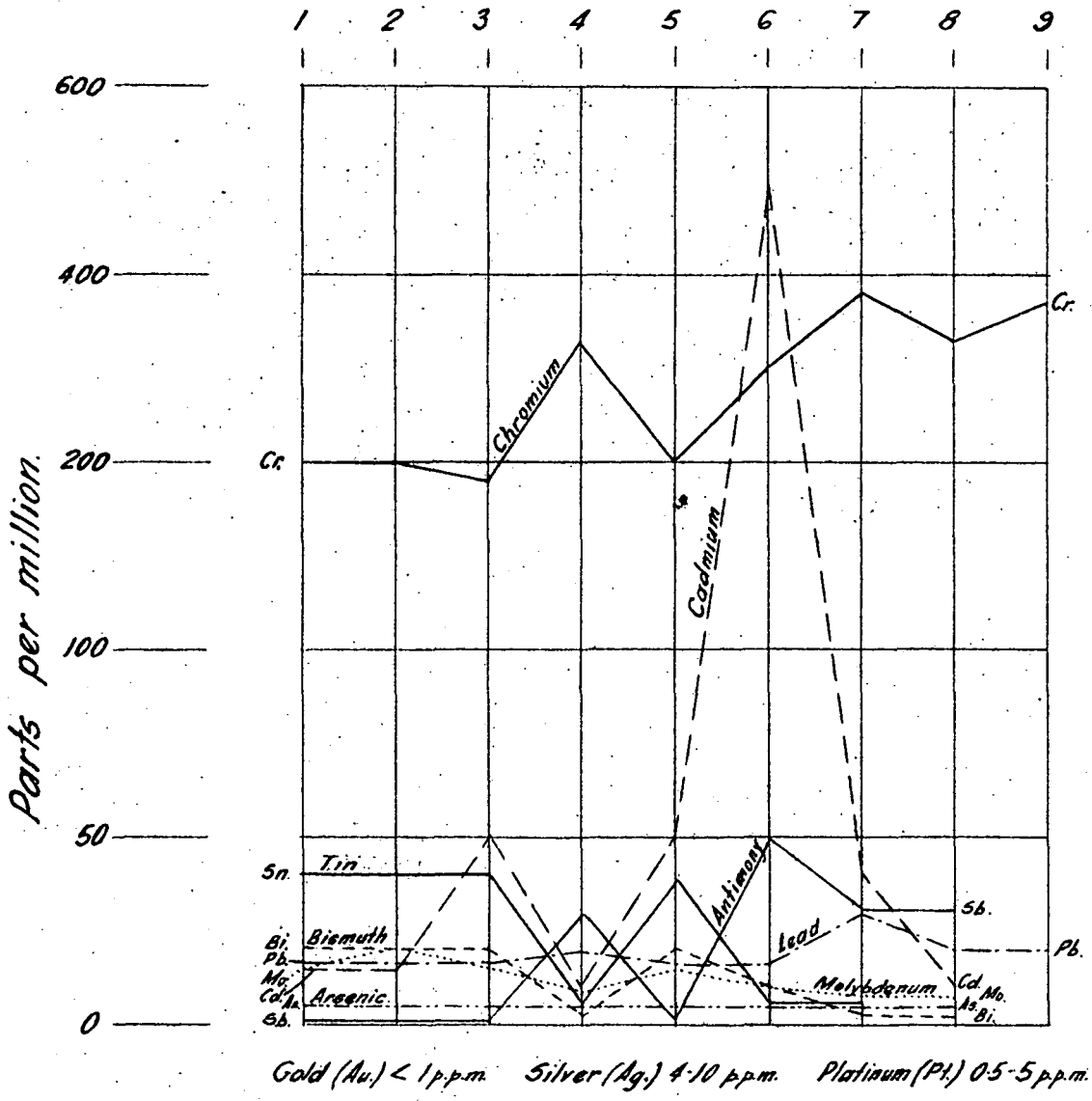
5 Goldschmit, V.M. - The laws of the geochemical distribution of the elements.

6 Fersman, A.E. - Geokhimia, Leningrad.

7 Schneiderhöln. - Die Ausnutzungsmörglichkeiten der deutchen Erzlagerstatten.

8 Berg, G. - Vorkommen und Geochemie der Mineralischen Rohstoffe.

9 Clarke, F.W. & Washington, H.S. - The composition of the earth's crust.



Gold (Au.) < 1 p.p.m. Silver (Ag.) 4-10 p.p.m. Platinum (Pt.) 0.5-5 p.p.m.

Taken from: U.S.G.S. Circular 285, M. Fleischer, 1953, reprinted 1959.

Note:- References 2, 5 & 9 relate to igneous rocks only

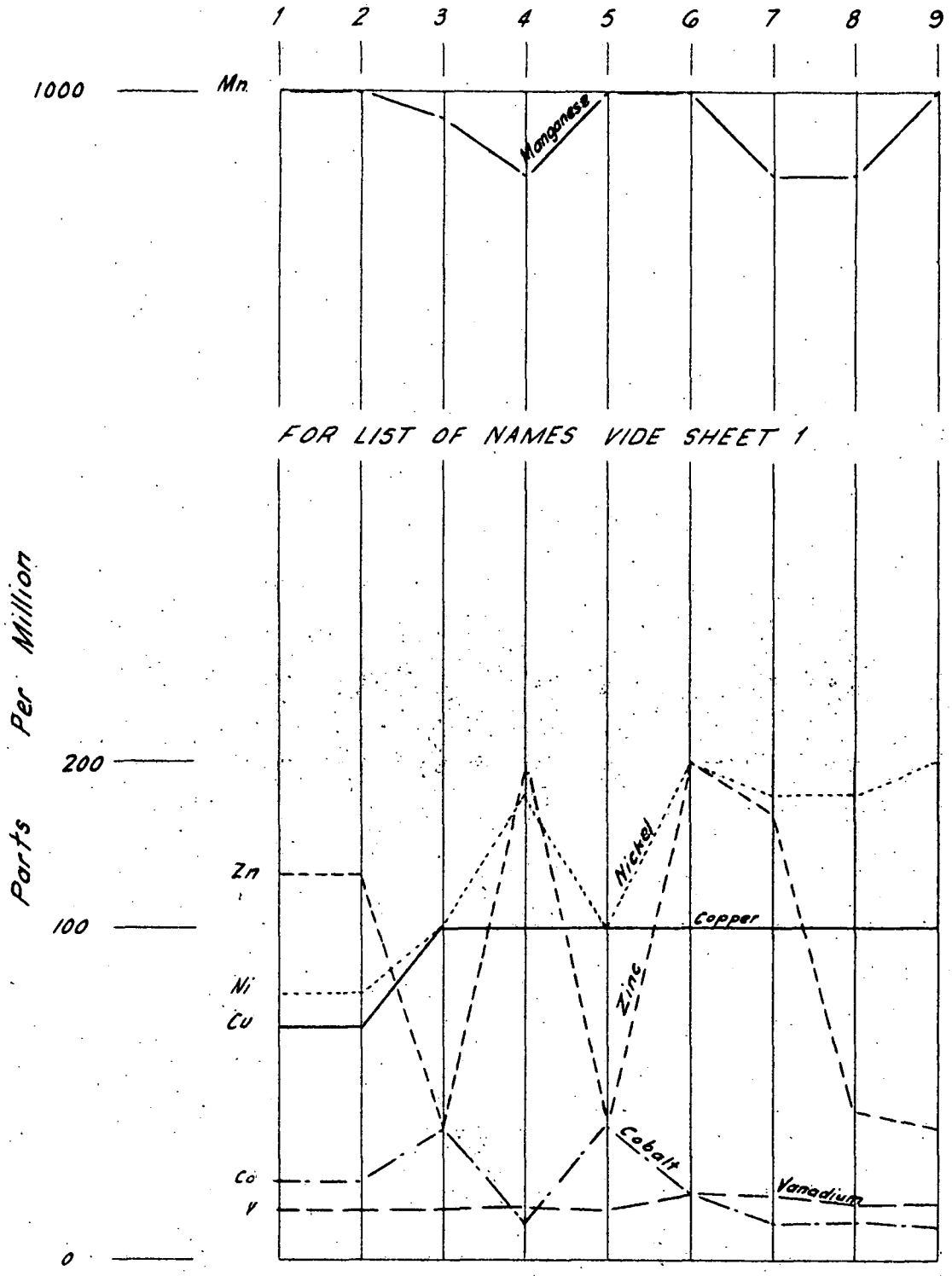
SHEET 1 OF 2

To accompany report by G.F. Whitten.

S.A. DEPARTMENT OF MINES

Approved	Passed	Drn.	ESTIMATES OF THE ABUNDANCE OF SOME METALS IN THE EARTHS CRUST	D.M.	Scale —
		Tcd. M.&L.		Req.	52947 MG.
		Ckd.			
Director		Exd.			Date 13-11-61

300-6 60 6819



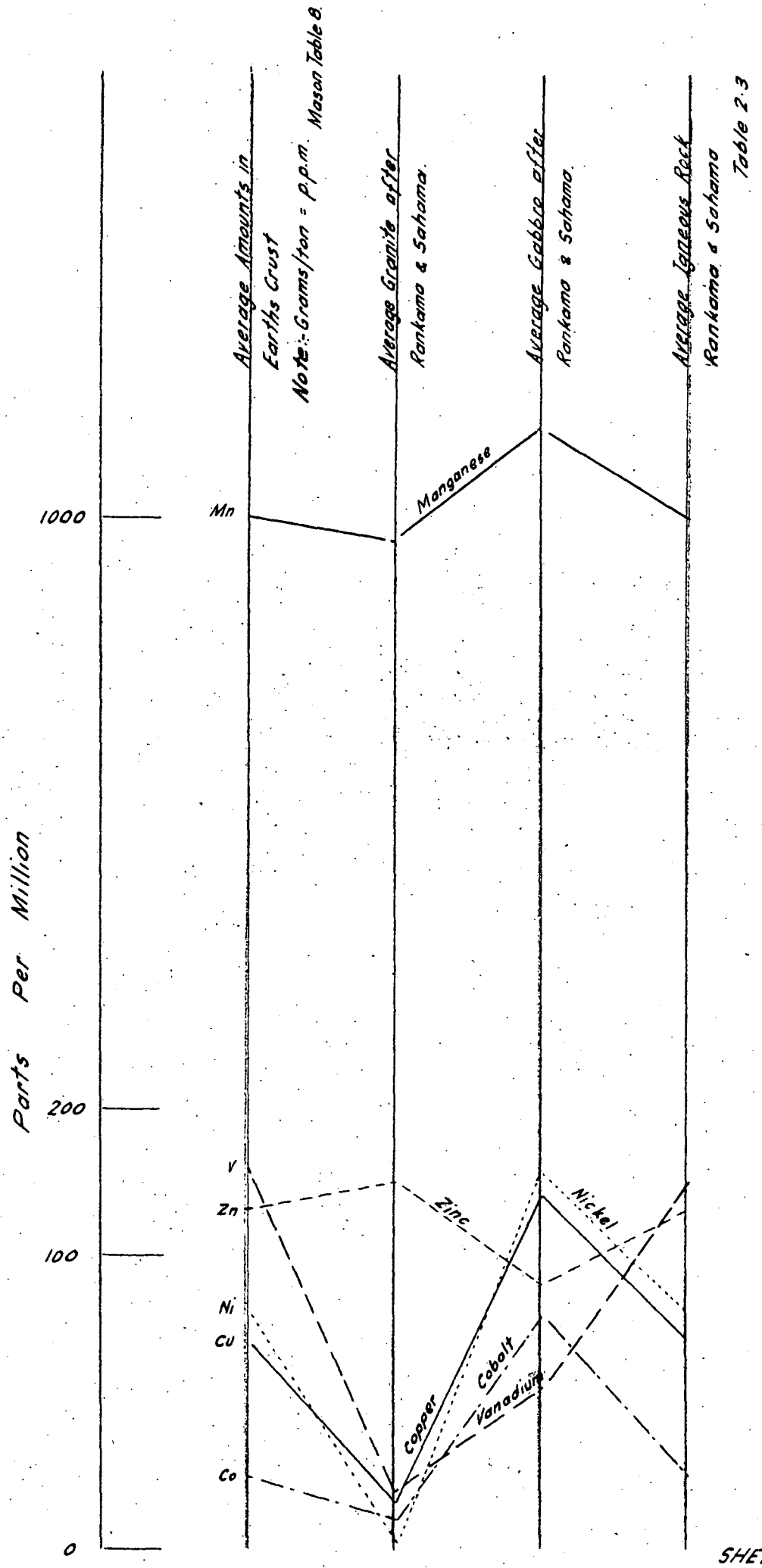
Taken from U.S.G.S. Circular 285, M. Fleischer, 1953, reprinted 1959.

SHEET 2.

To accompany report by G.F. Whitten.

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	ESTIMATES OF THE ABUNDANCE OF SOME METALS IN THE EARTHS CRUST	D.M.	Scale —
		Tcd. A.W.		Req.	S2948 MG.
Director		Exd.			Date 21-11-61

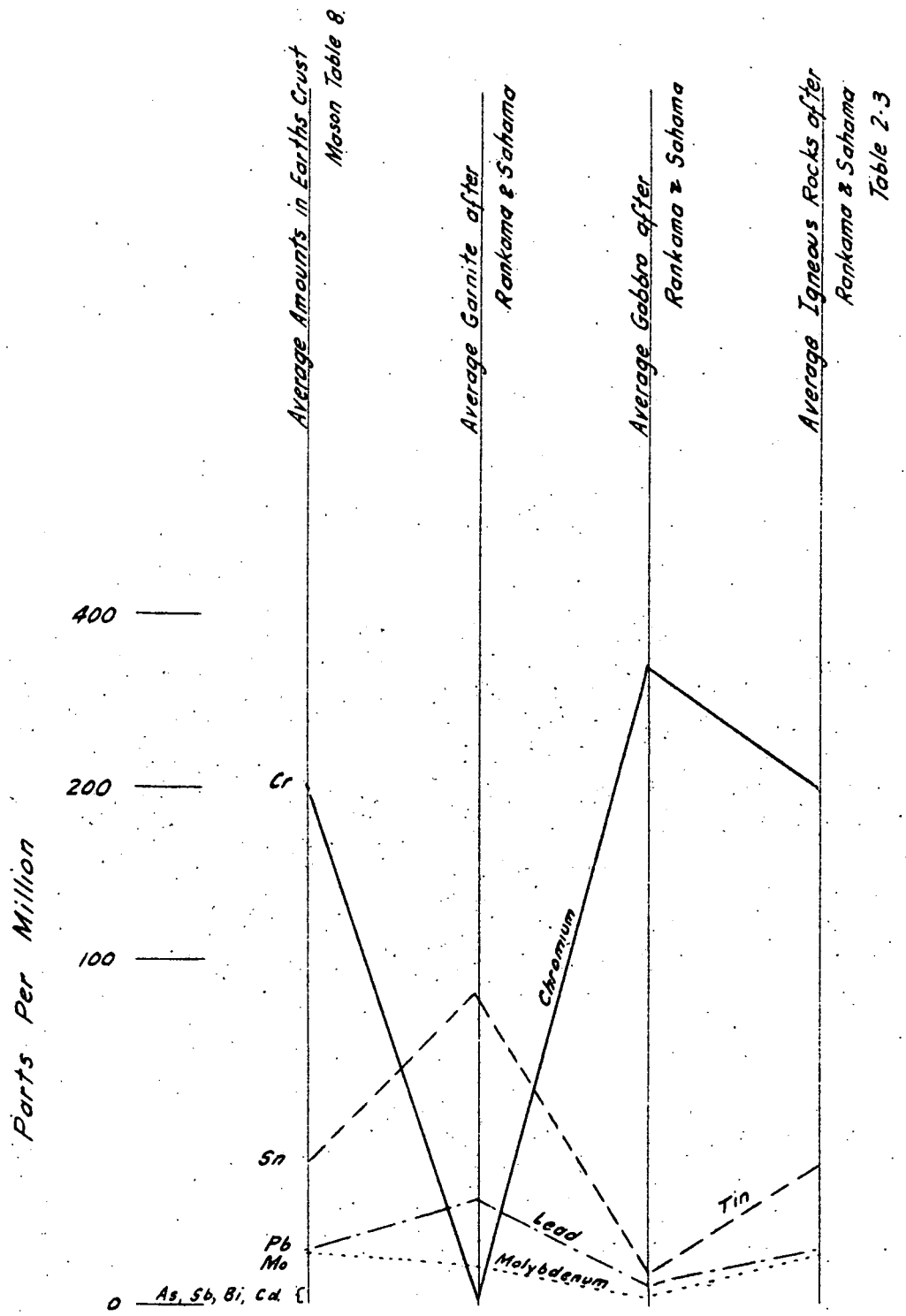
200---6.60 7703



SHEET 1 OF 2.

To accompany report by G.F. Whitten.

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	ESTIMATES OF THE ABUNDANCE OF SOME METALS IN IGNEOUS ROCKS IN THE EARTHS CRUST	D.M.	Scale —
		Tcd. A.W.		Req.	52949 MG
		Ckd.			
Director		Exd.			Date 22-11-61



SHEET 2

To accompany report by G.F. Whitten

S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	ESTIMATES OF THE ABUNDANCE OF SOME METALS IN IGNEOUS ROCKS IN THE EARTHS CRUST	D.M.	Scale /
		Tcd. A.W.		Req.	52950 MG.
		Ckd.			
Director		Exd.			Date 22-11-61

300- -0.60 6049

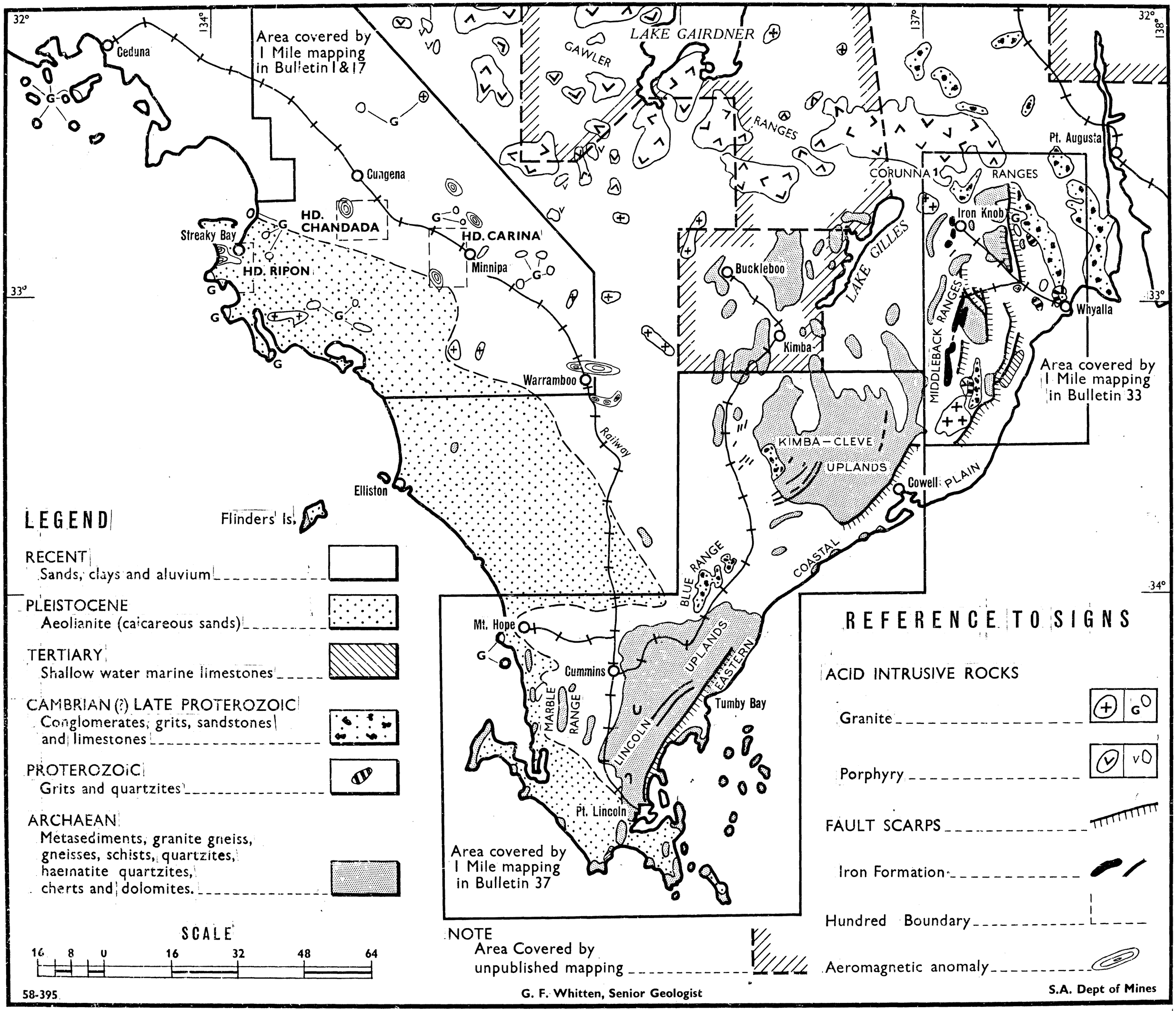
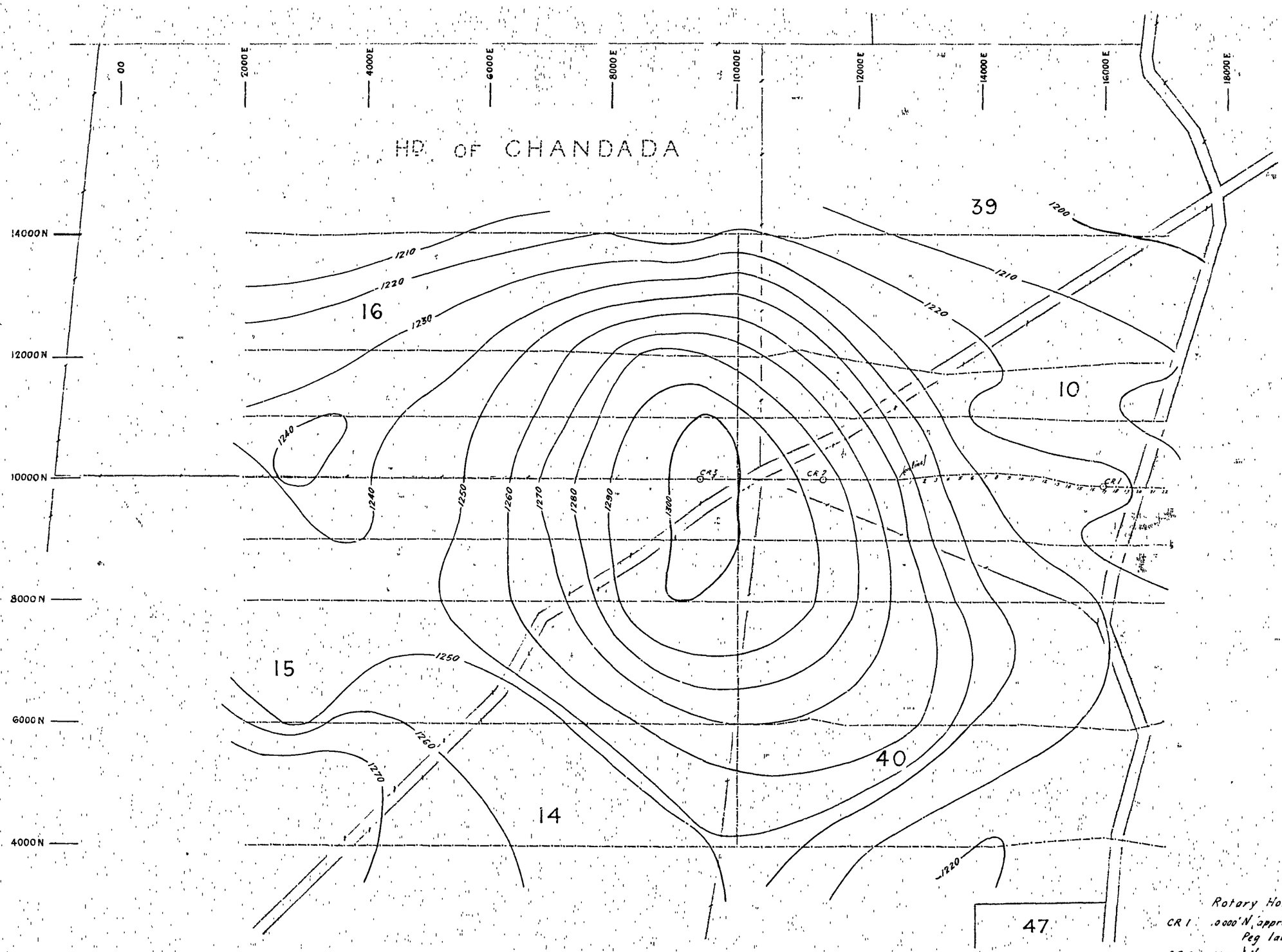


Fig. 1 Geological and locality plan Iron Ore Prospects Eyre Peninsula



Rotary Holes

CR 1 .0000'N (approx.) 16000'E (approx.)
Peg labelled 17

CR 2 10.000'N 11400'E

CR 3 10000'N 9400'E

To accompany report by C.F. Whitten, (after D.R. Dowling)

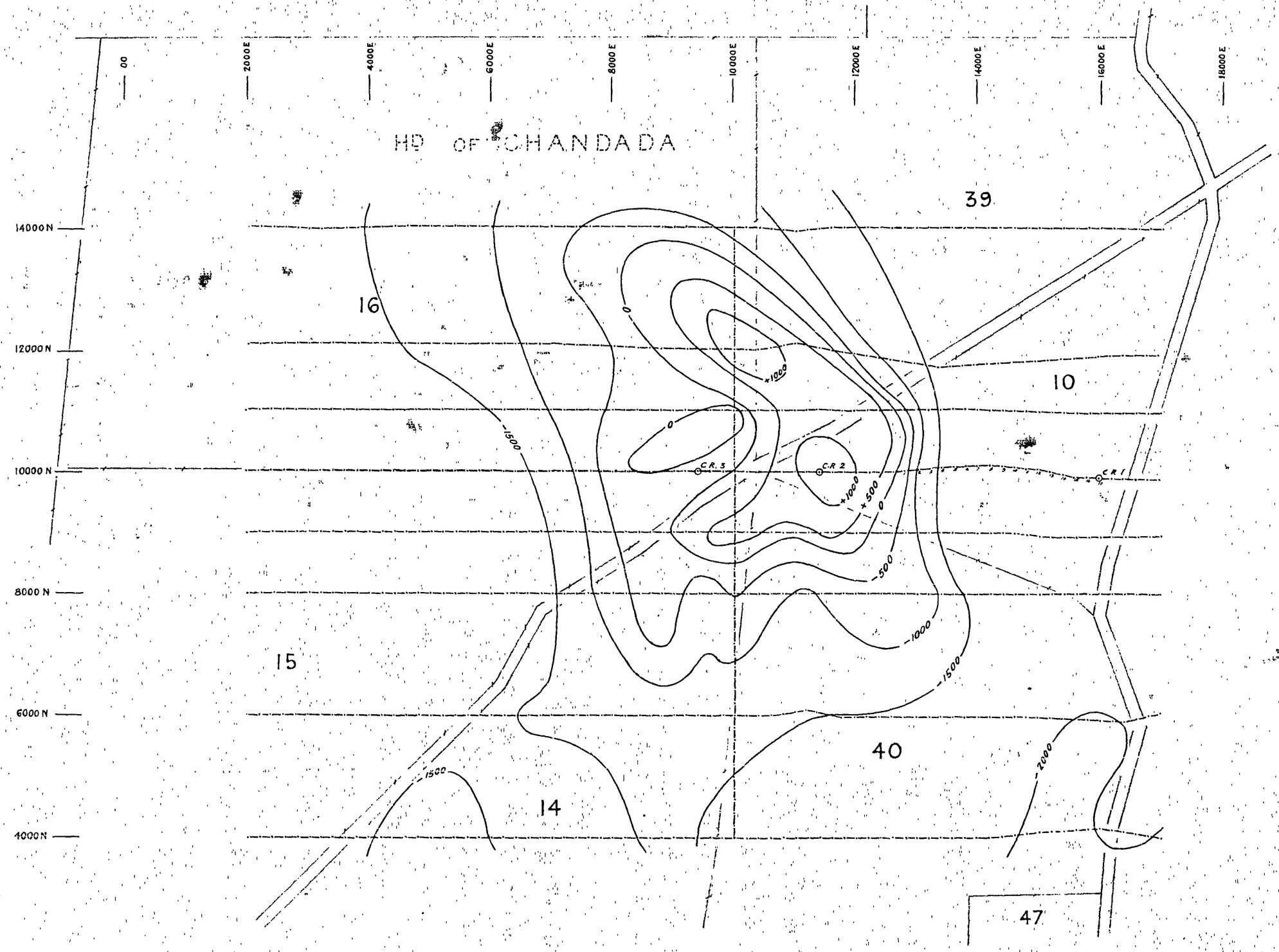
S.A. DEPT. OF MINES

600—7.56 8917

Locality Plan	59-230					Req. No.
Magnetic Contours	59-232					D.M.
						Compiled from
Associated Drawing	No.	No.	Amendment	Exd.	Date	

EYRE PENINSULA
CUNGENA GEOPHYSICAL TRAVERSES. HD CHANDADA
GRAVITY CONTOURS

Approved	Passed		Scale: 1000 Feet to 1 inch.
		Drn.	59 - 231
		Tcd. RR	Dg 7
Director of Mines		Ckd.	
		Exd.	Date 10-7-59



To accompany report by G.F. Whitten
/after D.R. Dowling/

S.A. DEPT. OF MINES

EYRE PENINSULA

GUNGENA GEOPHYSICAL TRAVERSES HD CHANDADA

CONTOURS OF VERTICAL MAGNETIC INTENSITY

Locality Plan	59-230				
Gravity Contours	59-231				
Associated Drawing	No.	No.	Amendment	Exd.	Date

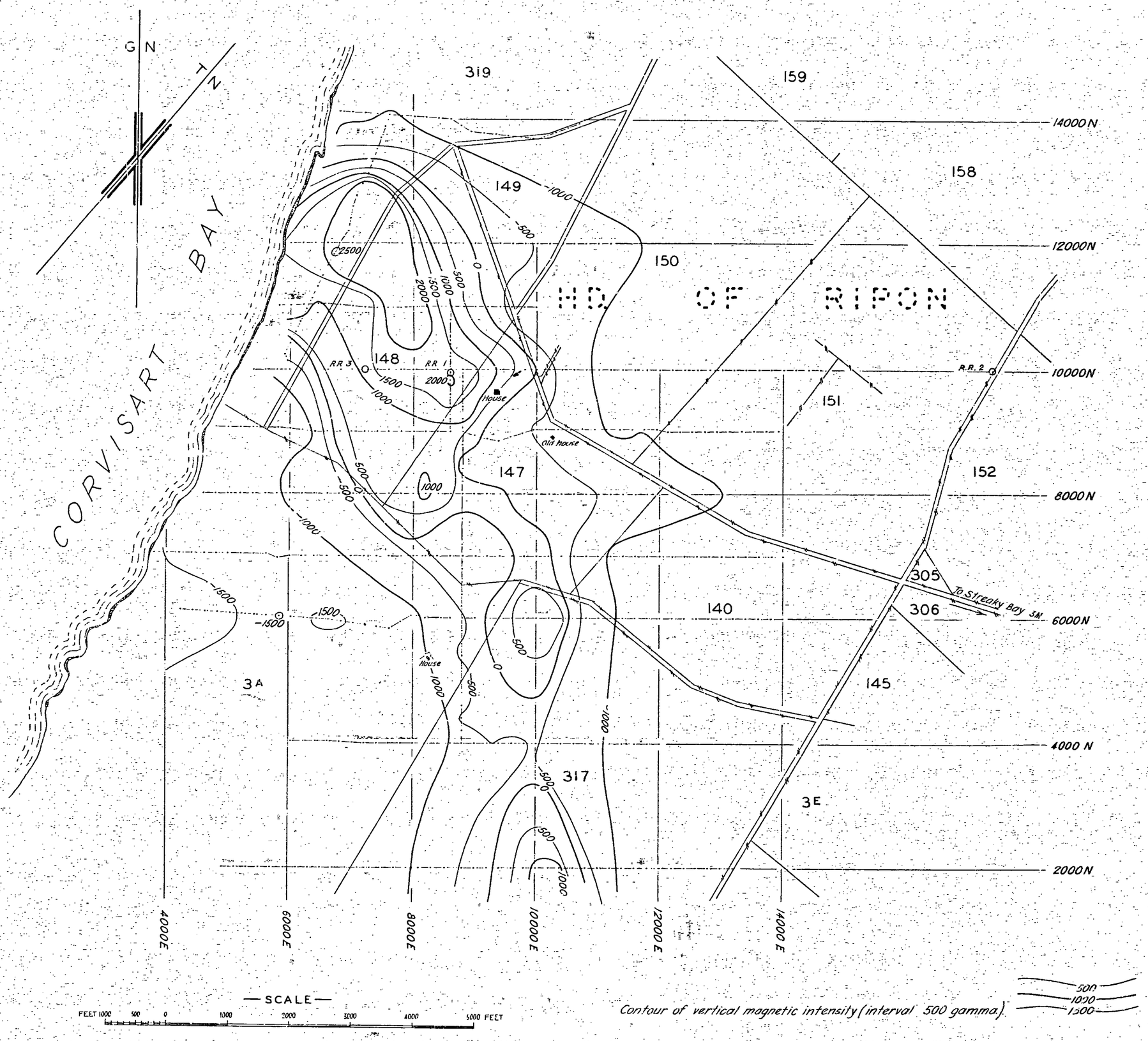
Req. No.
D.M.
Compiled from

Approved	Passed		
Director of Mines		Drn.	
		Tcd. A.R.	
		Ckd.	
		Exd.	

Scale: 1000 feet to 1 inch

59 - 232
Dg 7

Date 10-7-59



To accompany report by G.F. Whitten (after J.E. Webb)

S.A. DEPT. OF MINES

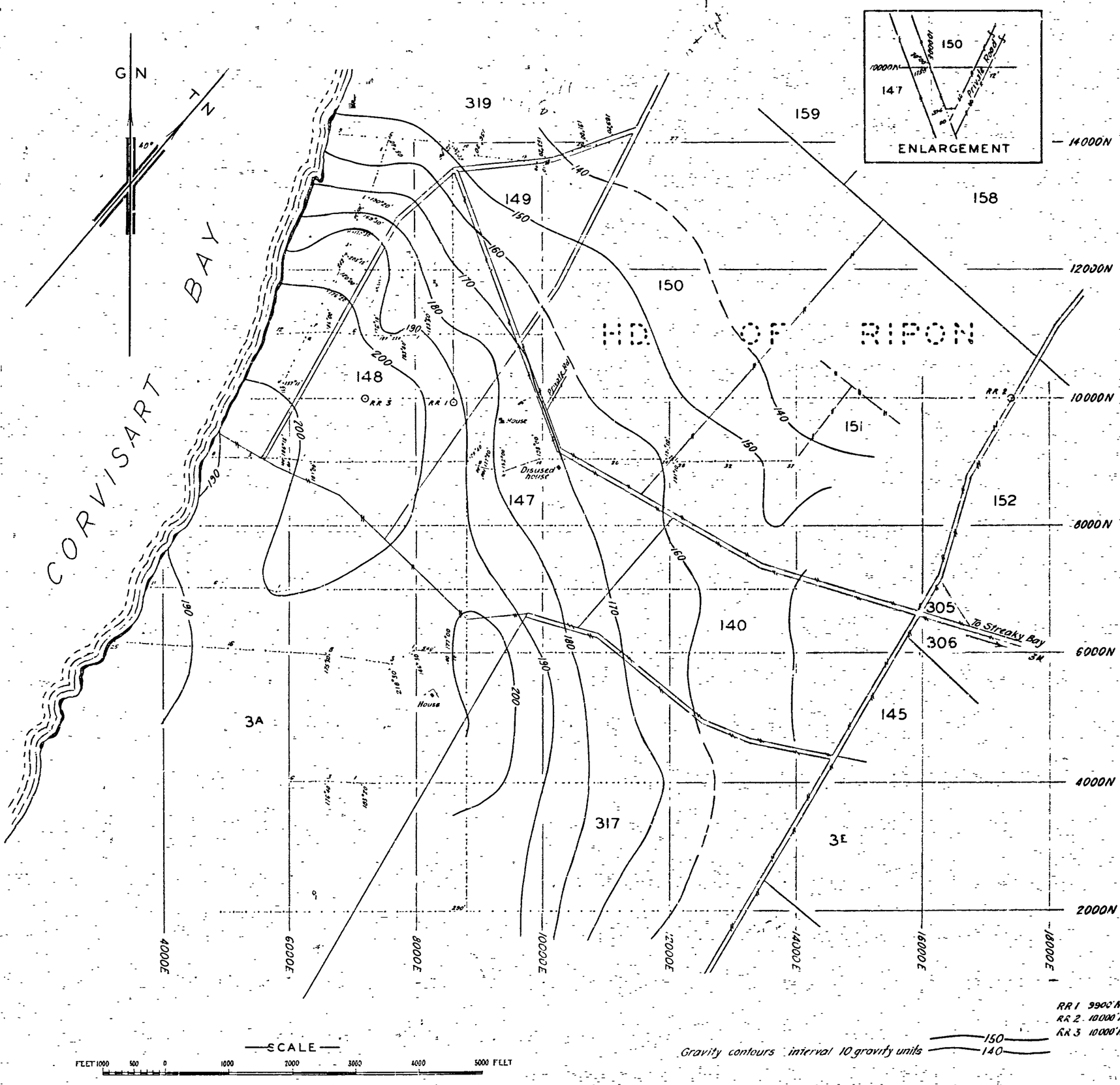
AERO-MAGNETIC ANOMALY - HD. RIPON
PLAN
SHOWING
VERTICAL MAGNETIC INTENSITY CONTOURS

Locality Plan	S 1946
Magnetic Contours	59-275

Associated Drawing	No.	No.	Amendment	Exd.	Date

Req. No.
D.M.
Compiled from

Approved	Passed		
Director of Mines		Drn. / Tcd. M.B. / Ckd. / Exd.	Scale: 1000 ft. to 1 in.
			59—274
			Date 21-7-59 Dg. 10



Rotary Holes

RR 1 9900'N 8600'E Depth 323'
RR 2 10000'N 11400'E " 424'
RR 3 10000'N 7200'E " 211'

Gravity contours interval 10 gravity units — 150 — 140

To accompany report by G F Whitten (after I E Wabb)

S.A. DEPT. OF MINES

AERO-MAGNETIC ANOMALY - HD. RIPON

PLAN SHOWING GRAVITY CONTOURS

Locality Plan	S 1946					Req. No.
Magnetic Contours	59-274					D.M.
Drilling Section						Compiled from
Aeromagnetic Anomaly	51-791					
Associated Drawing	No.	No.	Amendment	Exd.	Date	

Approved	Passed	
		Drn.
		Tcd. MBL.
		Ckd.
Director of Mines		Exd.

Scale: 1000 ft. to 1 in.

59-275

Date 23-7-59 Dg. 10

GRAVITY PROFILE IN MILLIGALS

132
130
128
126
124
122

LINE 10000N

Magnetic

Gravity

Profile

Profile

2000
1000
0
-1000
-2000
-3000

MAGNETIC PROFILE IN GAMMAS

SCALE

1000 0 1000 2000 3000 4000 5000

FEET

C.R. 3

C.R. 2

C.R. 1

Gravity Peak

Magnetic Peak

VERTICAL SCALE IN FEET

500
400
300
200

Surface

55′

120′
130′

No Sample

170′

Contaminated Sample

250′

Inferred Gabbro

Core

284′9″
290′9″

115′

No Sample

Inferred Gabbro

223′
249′
254′8″

Core

Inferred Granite

140′

Core

147′8″
152′8″

Note: Slightly higher bedrock under magnetic peak

500
400
300
200

VERTICAL SCALE IN FEET

Sand

Bore hole

Gabbro

Bore hole

Granite

61-790

G. F. Whitten, Senior Geologist

S.A. Department of Mines

Fig. 7 Cross Section 10000N looking N. Aeromagnetic Anomaly, Hd. Chandada

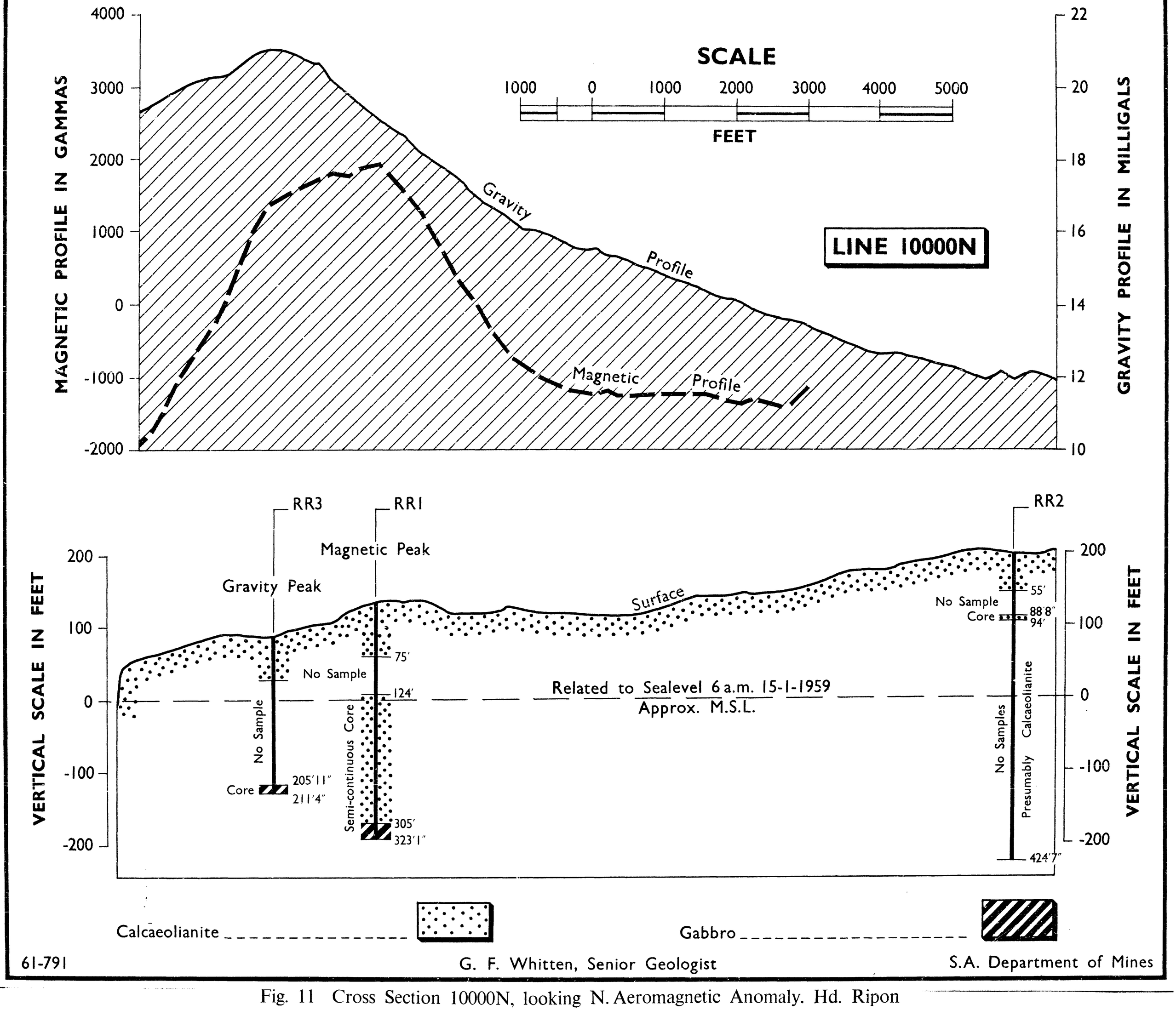


Fig. 11 Cross Section 10000N, looking N. Aeromagnetic Anomaly. Hd. Ripon

BOUGUER ANOMALY IN MILLIGALS

52
50
48
46
44
42
40
38
36
34

LINE 16000N

Gravity Profile

Magnetic Profile

8000
6000
4000
2000
0

VERTICAL MAGNETIC INTENSITY IN GAMMAS

Suggested Rotary Hole

Site For Deep D.D.

I.R.4
I.R.6
I.R.2
I.R.3
I.R.5

VERTICAL SCALE IN FEET

500
400
300
200

150' Core
Lignite Sand
240 251' Core S.G. 2.54

S.G. 2.85 Core 145' 147'6"
Inferred Gabbro
235'

Core 194' 217'6"
S.G. 3.20

Core 180 194

Core 145' 149'
S.G. 2.64

16000N

SCALE

FEET 1000 0 1000 2000 3000 4000 5000 FEET

I.R. 1

14000N

Inferred Gabbro

S.G. 3.16 Core 170' 195' 200'

Sands
Granite
Gabbro
Bore hole

61-792

G. F. Whitten, Senior Geologist

S.A. Department of Mines

Fig. 3 Cross Section 14000N, 16000N, looking N·Aeromagnetic Anomaly Hd. Carina