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REPORT ON RADIOMETRIC INVESTIGATIONS AT CARCOAR, N.S.W.

by

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REPORT ON RADIOMETRIC INVESTIGATIONS AT CARCOAR, NEW SOUTH WALES.

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INTRODUCTION

Attention has been directed to the cobalt workings at Carcoar as a possible source of radioactive minerals in two ways. During the testing of museum specimens for radioactivity, it was found that cobalt ore from Carcoar was strongly radioactive. Also, the occurrence of uranium in the cobalt ores was reported by Mr. McKillop, formerly a land holder in the area, who submitted a copy of a report signed by Professor T. H. Laby, certifying the presence of uranium in samples examined by him, and at a later date, a sample containing an uranium mineral. A brief visit was paid to the area in 1948, and the presence of strong radioactivity on dumps was confirmed. A more extensive survey of the area was therefore undertaken. The work was performed by geophysicists, assisted by students and cadets, during the interfield seasons of 1949-50 and 1950-51.

THE CARCOAR COBALT WORKINGS

The workings lie in portions 1, 2, 7, 8 and 25, Parish of Shaw, County of Bathurst, about 1 mile south of the township of Carcoar. The layout of the workings, and the areas covered by the survey are shown on Plate 1 attached (G41-3). The cobalt workings indicated by letters "A" to "H", are pits or trenches, generally about 5 feet deep. The copper workings are shafts estimated to be 20-30 feet deep.

The district is hilly, but carries very little timber. The area around the workings is mostly covered with a few feet of soil. Outcrops are few and inconspicuous.

A summary geological examination of the deposits was made by David (1888), shortly after the opening of the field. He describes the ore as occurring in small lenses along a fissure in Silurian slates, close to the contact of the slates with intrusive diorite. At the time of David's visit, only three workings existed (probably those shown as B, D & G on Plate 1). No reference is made by him to the presence of molybdenite, which occurs in working H.

The extent of the ore lenses was very small, total production from all deposits having amounted to only 160 tons of cobalt ore.

TECHNICAL DETAILS

It was thought that a systematic coverage of the area surrounding the workings might lead to the discovery of further small lenses of ore under light soil cover. A base line was laid down roughly parallel to the line of the workings, and traverses pegged at 25 foot intervals (except for the portion between 100 N and 1000 N on the 1951 layout where the traverses were 100 feet apart). Readings were taken every 25 feet along the traverses, using Geiger Muller ratemeters type 1011. The layouts and position of workings are shown on Plate 2.

RESULTS

Definite indications of activity were observed over the dumps around all old cobalt workings, with the exception of working F, which is a very shallow pit, and may not have had any connection with mining operations. Over the area covered

by the 1950 layout, no variation in reading could be detected away from the dumps, except at the extreme north-eastern corner. This area was again covered by the 1951 layout. Over the area traversed in 1951 (apart from dumps) profiles showed numerous small variations in activity, in general not much greater than the accuracy of reading of the instruments used. Such variations were observed over the whole area, but bigger variations were observed in the north-eastern portion. Three anomalous areas were picked out, over which readings significantly greater than background were consistently found, and which were so situated with regard to the old workings that it was considered unlikely that the high readings were due to material from dumps. The positions of these areas are shown at III, IV & V on Plate 2.

Selected profiles are shown on Plate 3. These include :-

(I) Three typical profiles over the area of low activity near the southern end of the 1951 layout.

(2) Profiles over the three anomalous areas.

(3) Profiles over old workings G and H.

A reconnaissance was made across the creek to the north-east of the area traversed. Conditions observed here were similar to those in the areas of low activity on the 1951 layout (i.e., small variations in reading were observed, but none that could be considered significant, having regard to the sensitivity of the instruments used.)

Detailed examinations of the workings were made, particularly of workings G and H, and samples taken from the portions of the dumps giving high readings. During mining operations, the ore was apparently cleaned out very thoroughly, and no mineralised stone was visible in situ, the walls of the workings showing only unmineralised slates.

No evidence of activity was observed around the copper workings at the north-eastern end of the layout.

TESTING

Samples were taken from workings G and H, and tested for radioactivity in the Geophysical Laboratory. The results are shown below :-

Working G.

Sample		Nature of Sample	% U_3O_8 by Radiometric Assay
Designation	Location		
CTG	Collected from various parts of dump	Weathered slate with secondary uranium minerals	0.17
CT1/1	1479N100W	Ditto.	0.77
CT2/1	1490N 116W Depth 0-3"	"	0.03
CT2/2	1490N 116W Depth 3"-12"	"	0.04

Working G (Cont'd.)

Sample		Nature of Sample	% U_3O_8 by Radiometric Assay
Designation	Location		
CT3/1	1490N 128W Depth 0-3"	Weathered slate with secondary uranium minerals	1.35
CT4/1	1512N 109W	Ditto.	0.82

Working H.

Sample		Nature of Sample	% U_3O_8 by Radiometric Assay
Designation	Location		
CW1/1	1025N 766W Depth 0-9"	Weathered slate with molybdenite	1.13
CW1/2	1025N 766W Depth 9"-18"	Ditto	1.30
CW2/1	1045N 759W	"	0.48
CW3/1	1031N 725"	"	0.06

From visual examination of samples collected in 1950, it appears that the molybdenite occurs in two forms. One type is only weakly radioactive. The other type is strongly active. A small sample of the second type, estimated by eye as containing about 30% molybdenite, showed radioactivity consistent with an uranium content of about 4%.

ANOMALIES IV & V

Shallow holes were dug with pick and shovel on anomalies IV and V, in order to test whether these anomalies are due to bodies of radioactive material at shallow depth.

On anomaly IV, the hole was about 4 feet square centred at 1412 N 675 W, and was carried to a depth of 3 feet 4 inches. At the surface, a reading of twice background was obtained, and at the bottom of the hole a reading of 2½ times background. Material removed from the hole showed only slight radioactivity. Further sinking was impracticable without proper equipment. The activity of the material removed from the hole would probably be sufficient to account for the observed anomaly; it remains uncertain whether or not further sinking would disclose more strongly radioactive stone.

Two small holes were dug on anomaly V and samples taken at various depths. The results of tests on these samples are shown in the following table :-

Hole	Depth	Reading as multiple of background count	Sample No.	% U_3O_8 by Radiometric Assay
No.1	0	10	CB1/0-3"	0.33
1475N	3"	101	CB1/3-6"	0.67
375W	6"	116	CB1/6"-12"	0.83

Hole	Depth	Reading as multiple of background count	Sample No.	% U_3O_8 by Radiometric Assay
	12"	64	CB1/12"-16"	0.04
	16"	30		
No.2	0	6		
1514N	3"	41	CB2/3"-9"	0.41
410W	9"	66	CB2/9"-12"	0.37
	12"	56	CB2/12"-16"	0.07
	16"	49		

Although it would be desirable to have one at least of these holes sunk to bedrock, the radioactivity of the samples is sufficient to account for the observed anomaly. The anomaly may be taken as being due to a layer of weathered rock about 6" thick carrying about 0.5% U_3O_8. This layer probably extends over the whole of the anomalous area. From visual examination of the samples, the radioactivity appears to be due to secondary uranium minerals.

VISITS TO OTHER MINES, ETC.

Tests were made over the following mines, etc. in the neighbourhood of Carcoar (see Plate 4) :-

(1) Copper workings on Stoke Hill.

(2) Coombing iron quarries.

(3) Burley Jacky, Belmore, Waugoola and Milburn Creek copper mines near Woodstock.

(4) Copper workings at Mountain Run Creek, and a barytes mine near Trunkey.

The mines mentioned under (3) were of fair size, and are described in some detail by Carne (1908). The same work contains brief references to the copper workings at Stoke Hill and Mountain Run Creek.

Tests were made over dumps and workings generally, but no evidence of radioactivity was observed.

CONCLUSIONS AND RECOMMENDATIONS

(1) No evidence of the presence of lenses of ore similar to those already mined was obtained.

(2) The radiometric survey indicates the possibility of the occurrence of isolated subsurface deposits of radioactive material, roughly over the area covered by the 1951 layout.

(3) Over most of this area, the Geiger counter is not sufficiently sensitive to enable anomalies to be located with sufficient certainty for the location of test sites.

(4) Three anomalous areas were outlined in the northern portion of the area. Two of these were partially tested, one with inconclusive results, the other indicating the presence of a small body of weathered material containing about 0.5% U_3O_8.

(5) Readings over dumps and laboratory tests of samples show that material mined from all cobalt and molybdenite workings was radioactive. No samples representative of original ore were obtained, but tests of samples collected indicate that the uranium content of the ore may have been 1% or higher.

(6) In order to guide any further prospecting, the first essential is a detailed geological examination of the area. In connection with this, it would be desirable to clean out the old molybdenite and cobalt workings.

(7) The testing of the geophysical anomalies should be completed by sinking shafts to bedrock.

(8) It seems probable that radiometric traversing using an instrument more sensitive than a Geiger counter (such as a scintillometer) would enable the location of other anomalies. The advantage to be obtained by the use of such an instrument could only be estimated by actual tests. However, as it appears from testing already performed that some at least of such anomalies would be due to weathered material, gravel, etc., it is considered that a more satisfactory method of testing the area would be by systematic sampling of overburden, using a post hole digger.

(9) As the possibility of locating other lenses of ore by radioactive methods appears doubtful, it is recommended that the use of other geophysical methods be considered. As the lenses are small and at shallow depth, only magnetic or electrical methods appear to offer any prospect of success. As a preliminary to any such work, it is recommended that tests be made of the electrical and magnetic properties of the ore. The only representative samples known are those held in the Mining Museum, Sydney.

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David, 1888. The Carcoar Cobalt Deposits. N.S.W. Department of Mines Annual Report 1888, p. 175.

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Distribution :

(1) File 84N/2.
(2) Under Secretary, Department of Mines, Sydney.
(3) Chief Geologist.
(4) Geophysical Library.
(5)
(6)

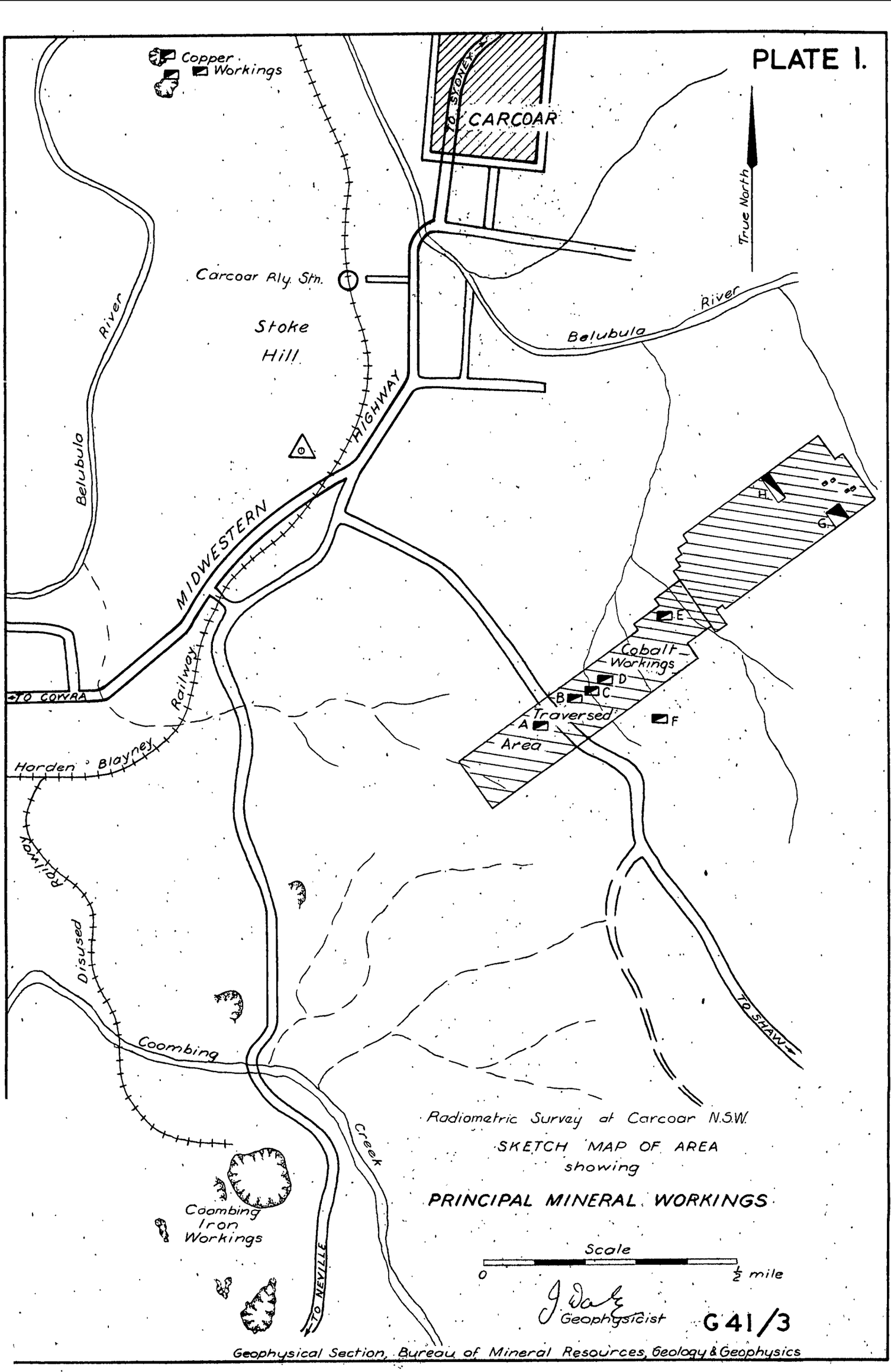
PLATE I.
Copper Workings
TO SYDNEY
TO CARCOAR
True North
Carcoar Rly. Stn.
Stoke Hill
Belubula River
Belubula River
HIGHWAY
MIDWESTERN
Railway
TO COWRA
Harden - Blayney
Railway
Disused
Coombing
Coombing Iron Workings
TO NEVILLE
Creek
H
G
E
Cobalt Workings
D
C
B
A
Traversed Area
F
TO SHAW
Radiometric Survey at Carcoar N.S.W.
SKETCH MAP OF AREA
showing
PRINCIPAL MINERAL WORKINGS
Scale
0
½ mile
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G 41/3
Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics

PLATE 2.

N

800 W
600 W
400 W
200 W
0
200
1800
1600
1400
1200
1000
800
600
400
200
00
1400+2
1200+2
1000+2
800+2
600+2
400+2
200+2
000+2
200-2
400-2
600-2
800-2
1000-2
1200-2

III
IV
V
VI
II
I

Test hole
Copper Workings
Test hole 2
Test hole 1
WORKINGS H G41-3 (SEE INSET A)
WORKINGS G G41-3 (SEE INSET B)

AREA TRAVERSED 1951

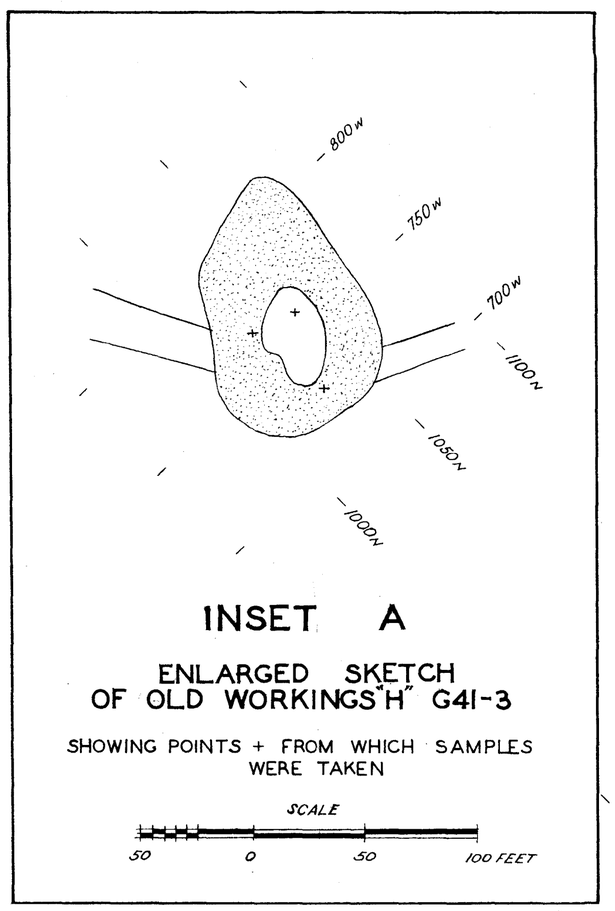
E.

B. C. D. 1950

A.

AREA TRAVERSED

300 W
200 W
100 W
0
100 W
200 E
300 W

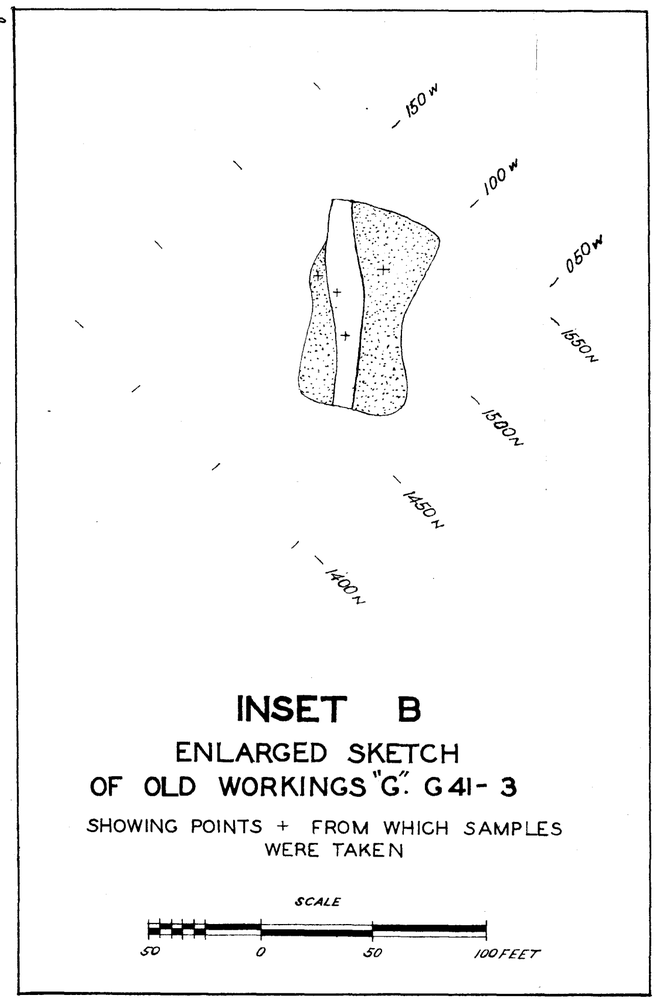


INSET A

ENLARGED SKETCH
OF OLD WORKINGS "H" G41-3

SHOWING POINTS + FROM WHICH SAMPLES WERE TAKEN

SCALE
50 0 50 100 FEET



INSET B

ENLARGED SKETCH
OF OLD WORKINGS "G". G41-3

SHOWING POINTS + FROM WHICH SAMPLES WERE TAKEN

SCALE
50 0 50 100 FEET

LEGEND

- Boundaries of Areas Traversed
- Boundaries of Areas for which Profiles are shown on G41-6 Fig 1 etc.
- Pits at old workings
- Trenches at old workings
- Old Shafts
- Test Holes
- Dump
- Scroll
- Fence
- Watercourse
- Anomalous Area Surrounding Old Workings

SCALE
200 0 200 400 600 Feet

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RADIOMETRIC SURVEY AT CARCOAR N.S.W.

SKETCH MAP SHOWING AREAS TRAVERSED IN 1950 & 51

WITH DETAILS OF OLD WORKINGS COVERED DURING 1951

G 41-5

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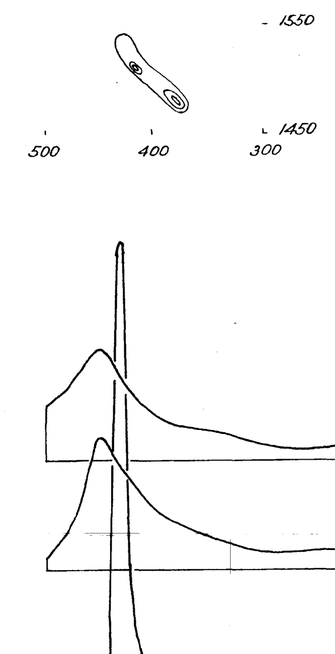
FIGURE Va

ISOCOUNT CONTOURS
DRAWN FROM PROFILES FIG V
2 3 & 4 TIMES BACKGROUND.



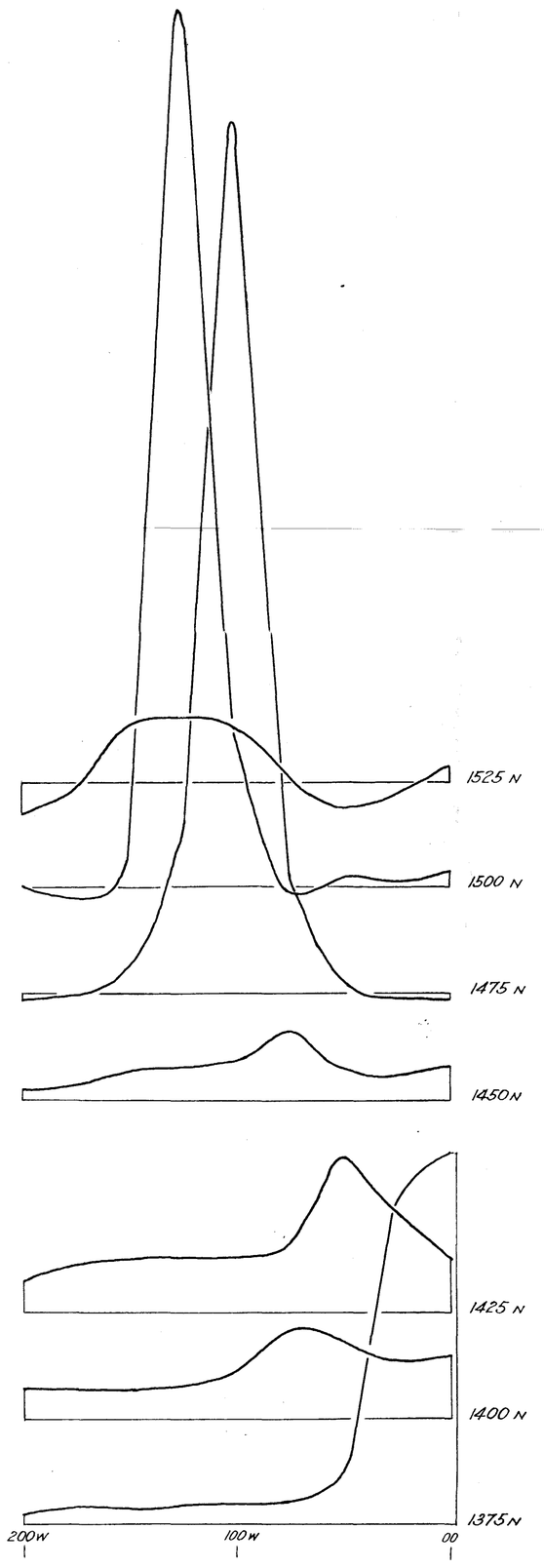


FIGURE VI

PROFILES OVER OLD COBALT WORKINGS "G"
G41-6-VI

FIGURE V

PROFILES SHOWING SMALL ANOMALY

Test holes sunk here

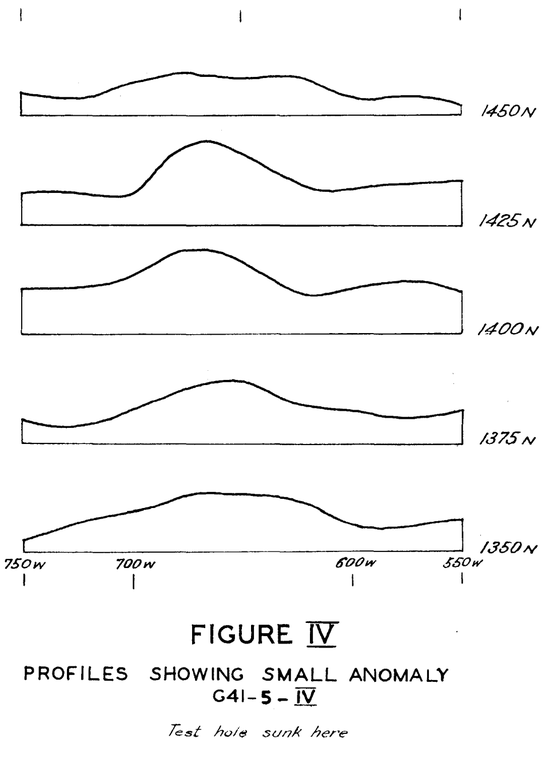
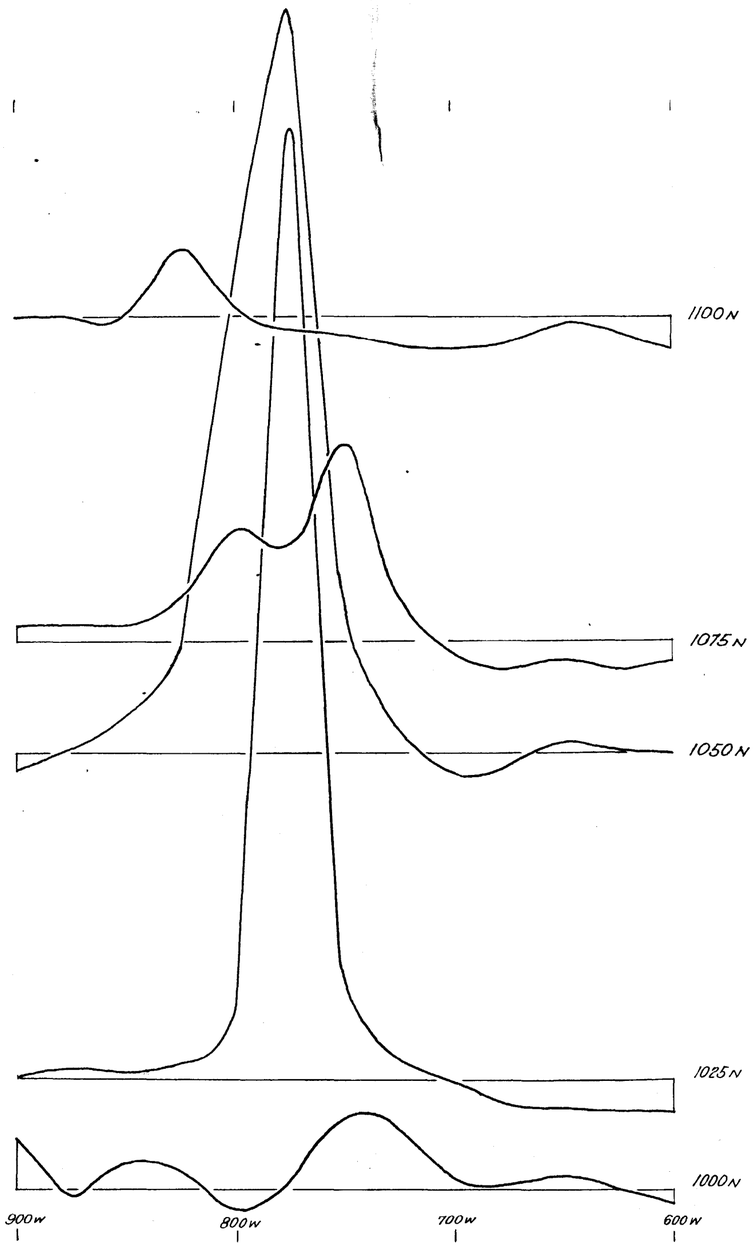


FIGURE IV

PROFILES SHOWING SMALL ANOMALY
G41-5-IV

Test hole sunk here



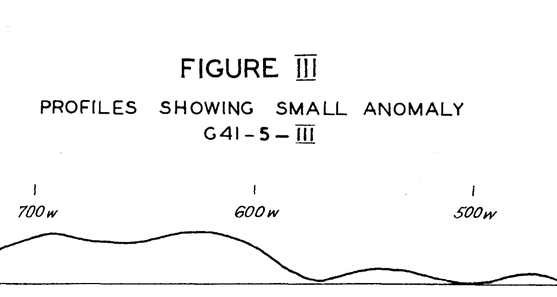


FIGURE III

PROFILES SHOWING SMALL ANOMALY
G41-5-III

FIGURE II

PROFILES OVER OLD COBALT WORKINGS H
G41-5-II

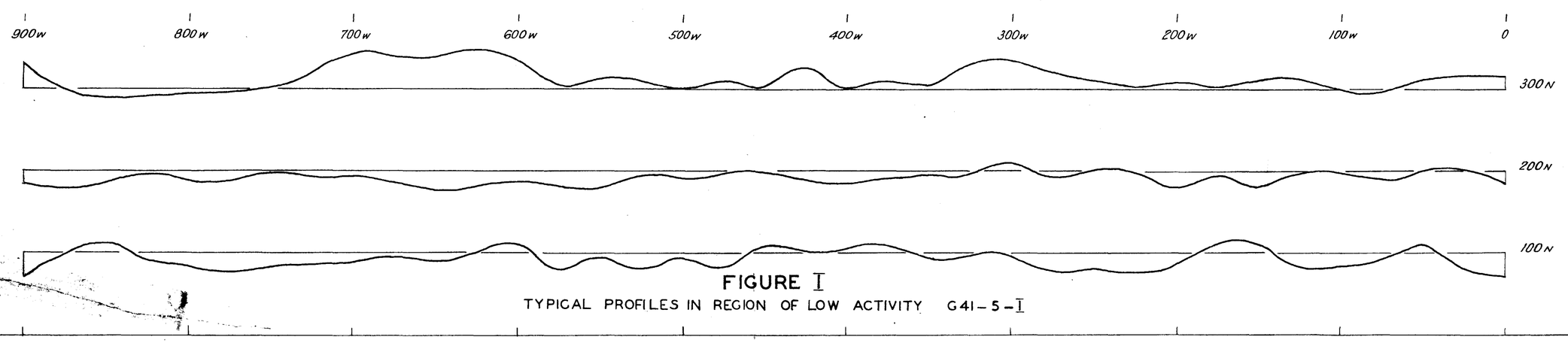


FIGURE I

TYPICAL PROFILES IN REGION OF LOW ACTIVITY G41-5-I

SCALE

500 0 500 1000 1500 2000 Counts/Minute

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RADIOMETRIC SURVEY AT CARCOAR N.S.W.

PROFILES SHOWING RELATIVE GAMMA-RAY INTENSITY

(FOR LOCATIONS OF AREAS FOR WHICH PROFILES ARE DRAWN, SEE PLATE 2)

G41-6

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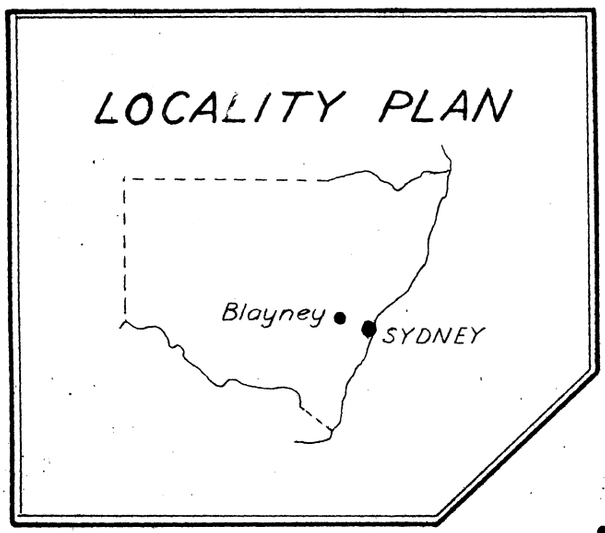
PLATE 4.



To Bathurst

Blayney

Newbridge

Carcoar
(see Plate 1 G41/3)

Barry

Mandurama

Shaw

Lyndhurst

To Cowra

Burley Jacky Mine

Neville

Belmore Mine

Woodstock

Barytes Mine (approx)

Waugoola Mine

Mountain Run Creek Copper Working

Trunkey

Milburn Creek Mine

Mt. Mc Donald

RADIOMETRIC SURVEY AT CARCOAR N.S.W.

POSITIONS OF MINES VISITED

Scale

4 0 4 8 miles

True North

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Geophysicist

G41/4

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.