COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

# BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

**RECORDS.**

1960/123




## RESULTS OF DIAMOND DRILLING BY BUREAU OF MINERAL RESOURCES, 1959-1960, AT THE CRATER LINE, NEAR BATCHELOR, NORTHERN TERRITORY.

by

J.M. Rhodes.

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## SUMMARY

DDH. No. 1A was drilled to obtain unweathered core for detailed investigation of the source of the radioactivity of conglomerate within the Crater Formation. Mineragraphic, petrographic, and radiometric investigations indicate that the conglomerate contains less than 0.05% $ThO_2$, and that the radioactivity is due to the mineral thorianite, an oxide of thorium. Uranium is present as a trace only.

The present demand for thorium is insufficient to warrant further investigation of these rocks.


## INTRODUCTION

The Bureau of Mineral Resources Diamond Drill Hole 1A is situated about 1.4 miles east-north-east of the northern end of the main runway of Batchelor air-strip, 43 miles south-south-east from Darwin.

Pebble conglomerates of the Crater Formation have been known to be radioactive since 1952. Three previous attempts have been made to obtain information on the source of the radioactivity by diamond drilling.

In 1952, the Bureau of Mineral Resources drilled two holes 110 feet and 154 feet long at the Crater Prospect half a mile west of DDH. No.1A (Matheson, 1952: Dodd, 1953). The core recovery was low and the rock obtained was not fresh. Territory Enterprise Pty. Ltd. drilled three diamond drill holes which ranged from 100-feet to 250-feet vertical depth in the Crater Formation about 1-mile east of Batchelor. Slightly radioactive pebble conglomerate was intersected in two of the holes. No radioactive minerals were identified. In the same area a line of waggon drill holes 25-feet apart and 20-feet deep confirmed that the radioactivity was restricted to the pebble conglomerate beds. In 1955, Rio Tinto Finance and Exploration Limited drilled in the Crater Formation immediately north of Manton Dam, 13 miles north-north-east of DDH. No. 1A. Three holes were drilled all of which intersected radioactive conglomerate. Although the intersections occurred at depths greater than 200 feet, the core was weathered and petrographic examination failed to establish the source of the radioactivity (Rattigan, 1955).

The present hole was drilled to obtain unweathered core from the Crater Formation to ascertain the source of the radioactivity by detailed mineragraphic, petrographic and radiometric examinations.

Within the area selected for drilling, a plane table survey showed three conglomerate bands which occur within a stratigraphic thickness of about 30 feet (Plate 2). (The conglomerate beds correspond to the No. 1 Pebble Bed of Dodds(1953)

The hole was designed with a bearing of 24° north and a depression of 70° to intersect the south-westerly dipping conglomerate beds about 500 feet below the surface.

## DRILLING

DDH. No. 1 was commenced in December, 1959, and abandoned in April, 1960, at a depth of 486 feet because of unstable ground resulting in jammed casing. The three conglomerate beds were not intersected. DDH. No.1A was then commenced and was completed at 666 feet in July, 1960. This hole is collared one and a half feet closer to the conglomerate outcrop than DDH.No.1, and has the same bearing and depression. This hole was cased to 560 feet. The overall core recovery was 83%.

## DRILLING RESULTS

The three conglomerate beds were intersected between 508 feet and 542 feet. The stratigraphic thickness of this interval is about 23 feet (Plate 3) and the core recovery between 508 feet and 543 feet was 51%.

### Radiometric Examinations

Bore hole logging showed radioactivity between 508 feet and 543 feet. The average grade over this interval was 0.012% $eU_3O_8$ with a maximum value of 0.04% $eU_3O_8$. Examinations of the core showed that the high radioactivity is associated with the three conglomerate beds (Plate 4). The small peak of 0.012% $eU_3O_8$ between 520 feet and 523 feet could not be distinguished lithologically.

Radiometric core assays were made from the whole of the interval between 506 feet and 544 feet. Detailed comparison of conglomerate samples with uranium and thorium standards showed that thorium is responsible for the radioactivity. Plate 4 shows assay results which exceed 0.02% $ThO_2$ or 0.01% $eU_3O_8$. The $eU_3O_8$. The $eU_3O_8$ values which represent the amount of radioactivity, not contained uranium, are shown for comparison with logging results. The assay results when weighted for length show that the average grade between 508 feet and 542 feet in DDH.No.1A is about 0.018% $ThO_2$; the average grade of the conglomerate alone is about 0.034% $ThO_2$.

### Mineralogical Investigations

Samples of the core were sent to the Bureau of Mineral Resources Canberra Laboratories for mineralogical examination by W.M.B. Roberts.

Examination with the X-ray spectrograph of crushed samples from the three conglomerate beds, and of the heavy residues of the crushed samples, showed that thorium was the only radioactive element present in any quantity. A slight trace of uranium was detected in the heavy residue of one of the samples (537 feet 6 inches to 541 feet 10 inches).

Microscopic examination of the heavy residues showed that the minerals present were zircon, rutile or anatase, iron ore, and a vitreous black mineral which was identified by X-ray diffraction as thorianite, an oxide of thorium.

A quantitive analysis by X-ray spectrography on one crushed sample (511 feet 6 inches to 514 feet) showed it to contain 0.040% $ThO_2$.

The quantity of uranium present was too small to be determined accurately. It is probably of the order of 0.002% $U_3O_8$.

## CONCLUSIONS AND RECOMMENDATIONS

Radioactivity within the three conglomerate beds intersected in DDH.No.1A is due to the mineral thorianite, an oxide of thorium, which probably occurs in the matrix. It is considered that this feature can be applied to the Crater Formation as a whole. Because thorianite and other "heavy" minerals are associated with the conglomerate beds, it is suggested that these deposits are of detrital origin.

The conglomerate beds of the Crater Formation are extensive but very low-grade thorium deposits. No further investigations are warranted.

## REFERENCES

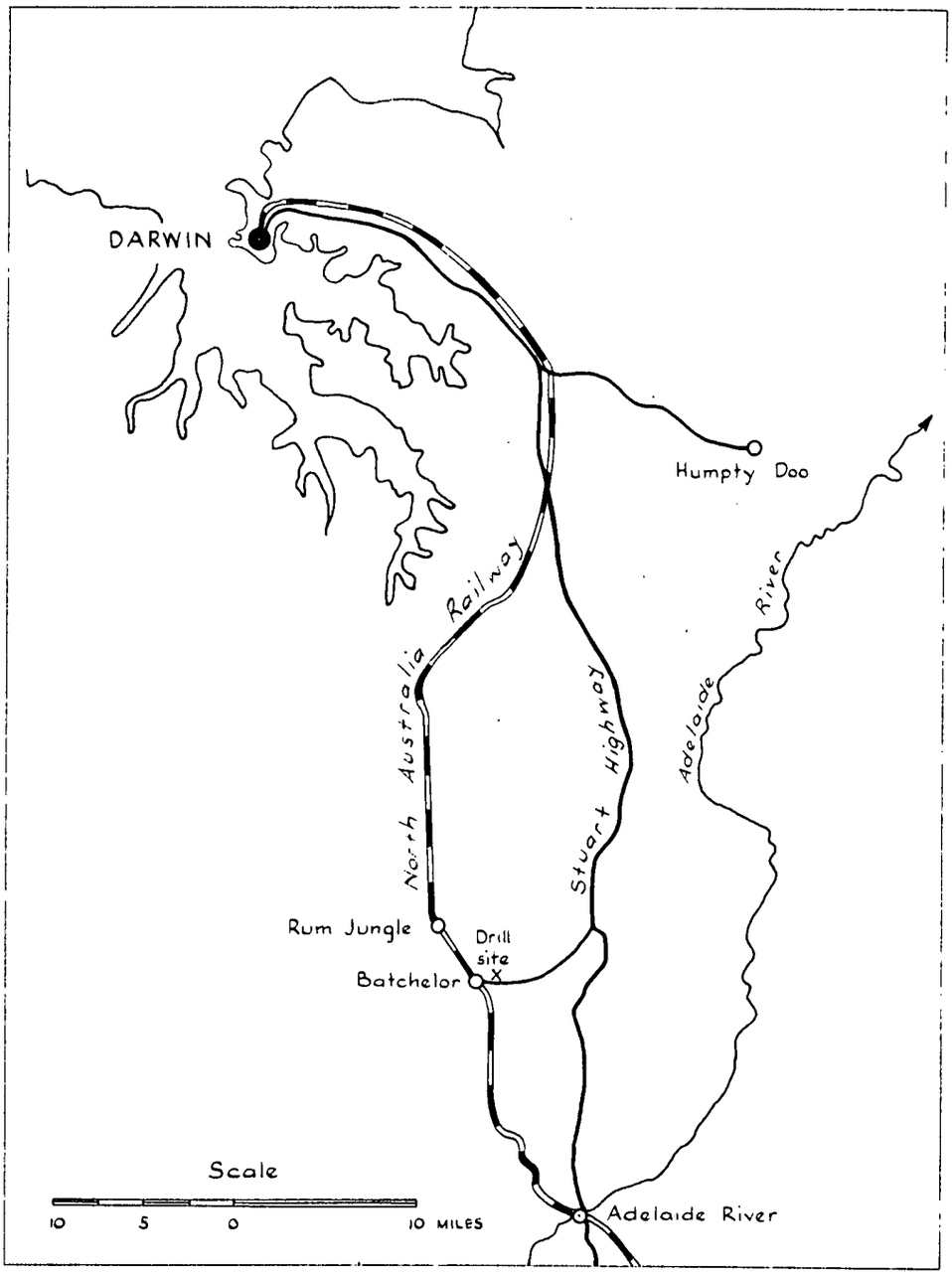
Dodd, P.H., 1953 - Crater Line Investigations, Rum Jungle Northern Territory. Rec.Bur.Min.Resour. Aust. 1953/29

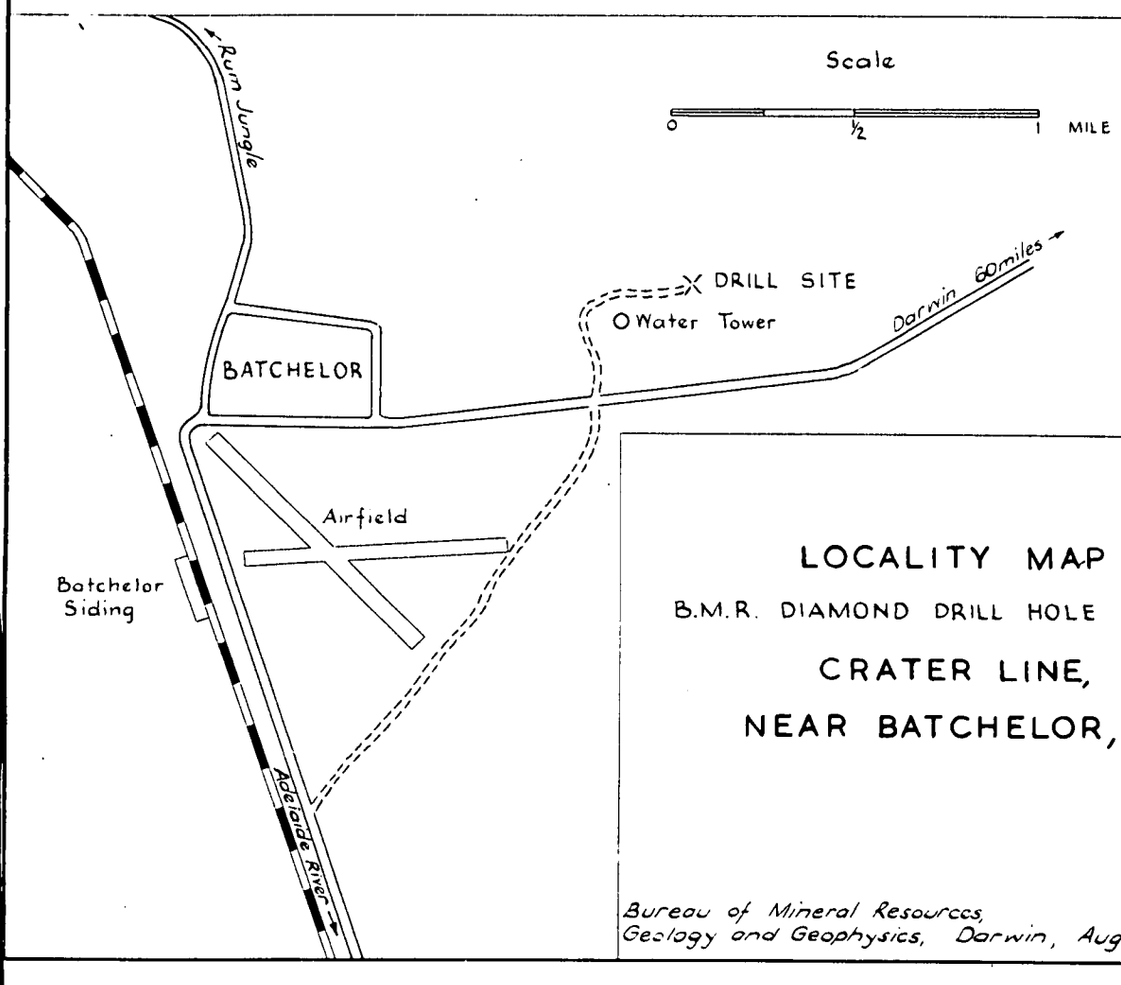
MacKay,N.J.,1953 - Crater Prospect (1951) Rum Jungle, Northern Territory. Rec.Bur.Min.Resour. 1953/28

Matheson, R.S.,1952 - Rum Jungle Progress Report to 30th September,1952. Rec.Bur.Min.Resour.Aust. 1952/-?

Rattigan, J.H.,1955 - Report on Exploration Activities on Radioactive Pebble Conglomerates of the Crater Formation, Manton Area, Northern Territory, during 1955. Rio Tinto Finance and Exploration Limited.

# PLATE 1




## LOCALITY MAP

B.M.R. DIAMOND DRILL HOLE No 1 A

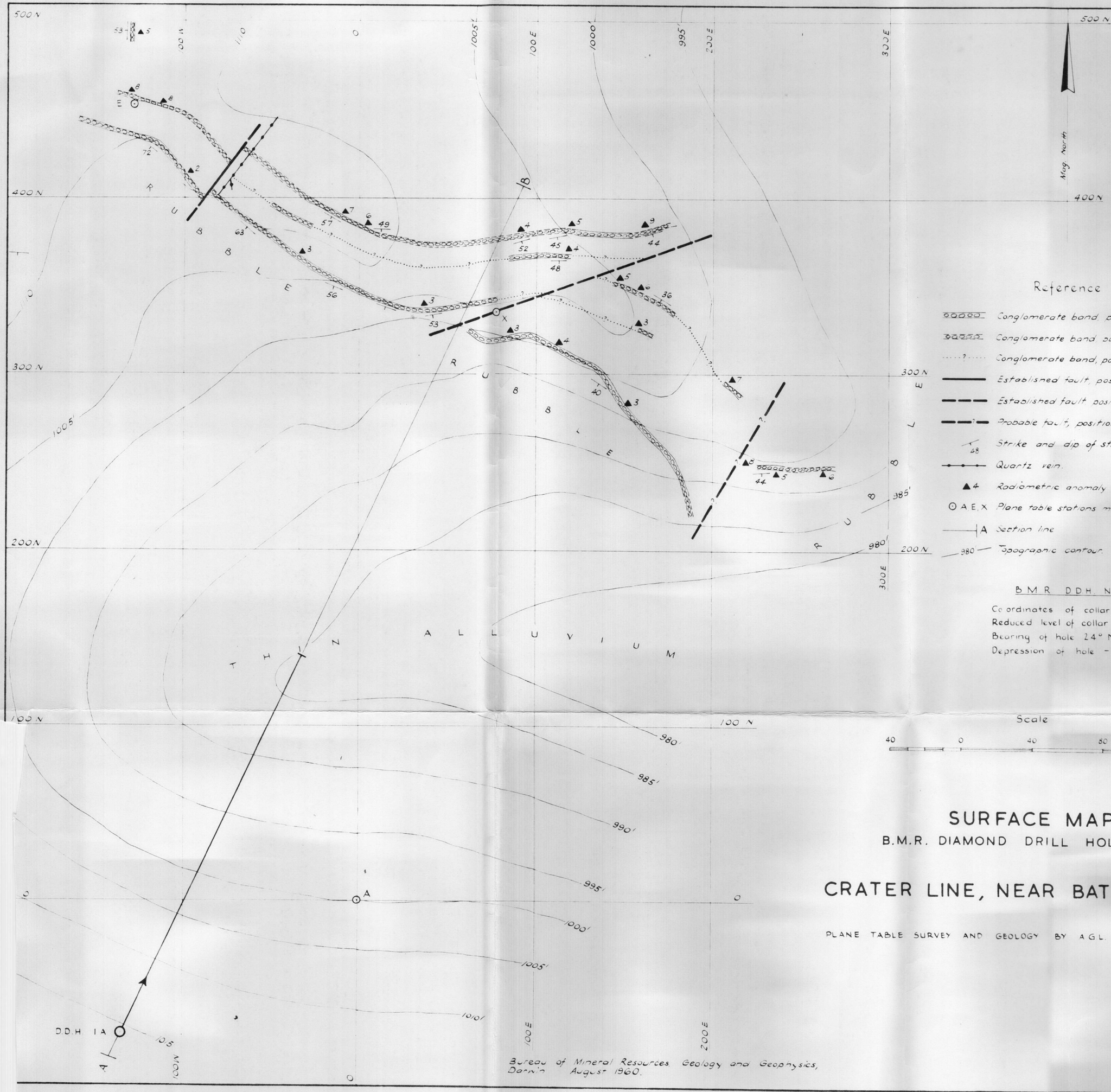
CRATER LINE,

NEAR BATCHELOR, N.T.

NT15-3

Bureau of Mineral Resources, Geology and Geophysics, Darwin, August 1960.

PLATE 2




B.M.R. D.D.H. No. 1A

Co-ordinates of collar 132 W 077 S
Reduced level of collar 1015 ft
Bearing of hole 24° N
Depression of hole -70°

Scale

40 0 40 80 120 FT

# SURFACE MAP

## B.M.R. DIAMOND DRILL HOLE No. 1A

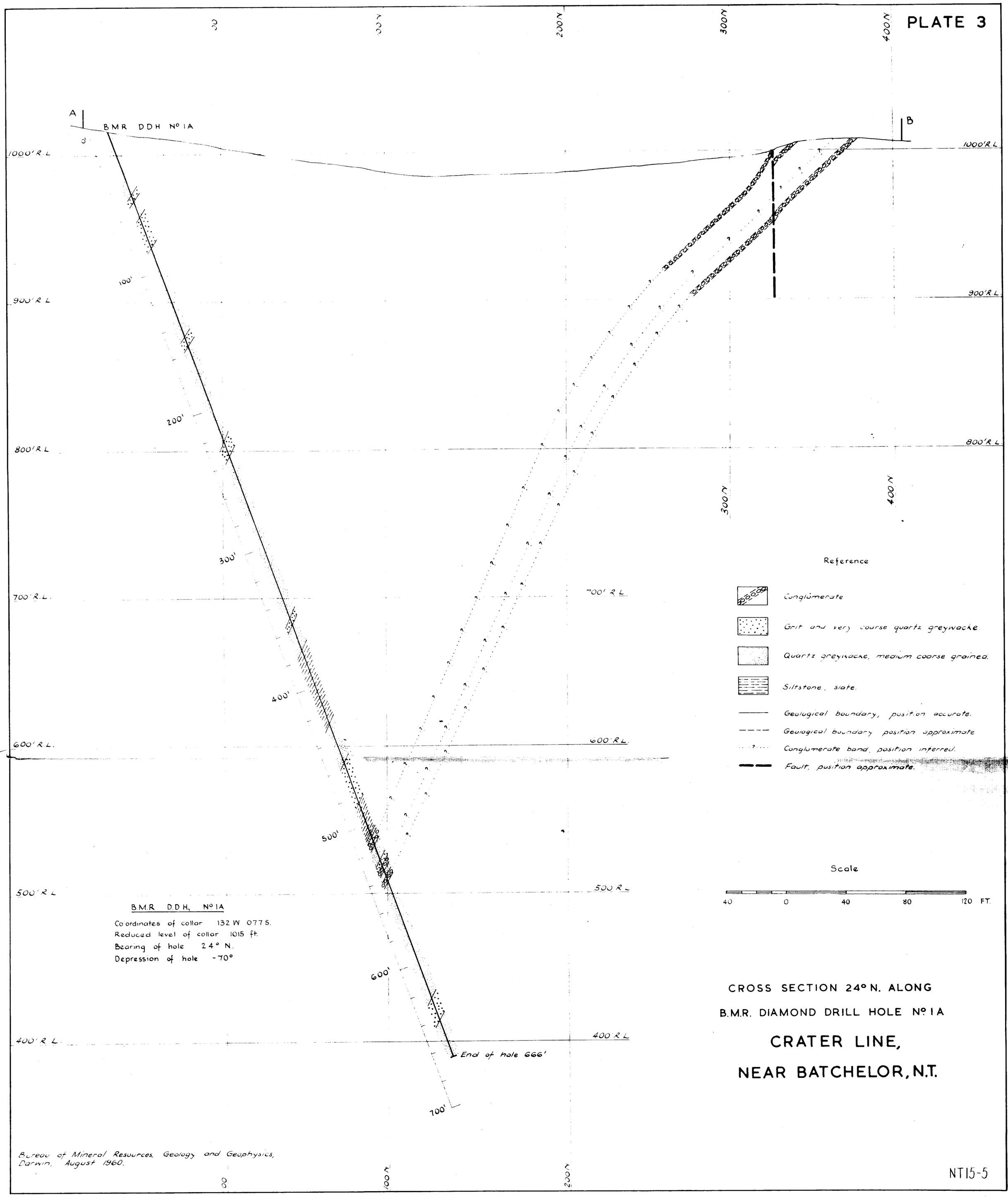
# CRATER LINE, NEAR BATCHELOR, N.T.

PLANE TABLE SURVEY AND GEOLOGY BY A.G.L. PAINE, AUGUST 1959.

Bureau of Mineral Resources, Geology and Geophysics, Darwin
August 1960.

NT15-4

PLATE 3




B.M.R D.D.H. Nº 1A

Co ordinates of collar 132 W 077 S.
Reduced level of collar 1015 ft.
Bearing of hole 24° N.
Depression of hole -70°

Reference

- Conglomerate
- Grit and very coarse quartz greywacke.
- Quartz greywacke, medium coarse grained.
- Siltstone, slate.
- Geological boundary, position accurate.
- Geological boundary position approximate
- ...?... Conglomerate band, position inferred.
- Fault, position approximate.

Scale

40 0 40 80 120 FT.

# CROSS SECTION 24° N. ALONG B.M.R. DIAMOND DRILL HOLE Nº 1A

# CRATER LINE, NEAR BATCHELOR, N.T.

Bureau of Mineral Resources, Geology and Geophysics, Darwin, August 1960.

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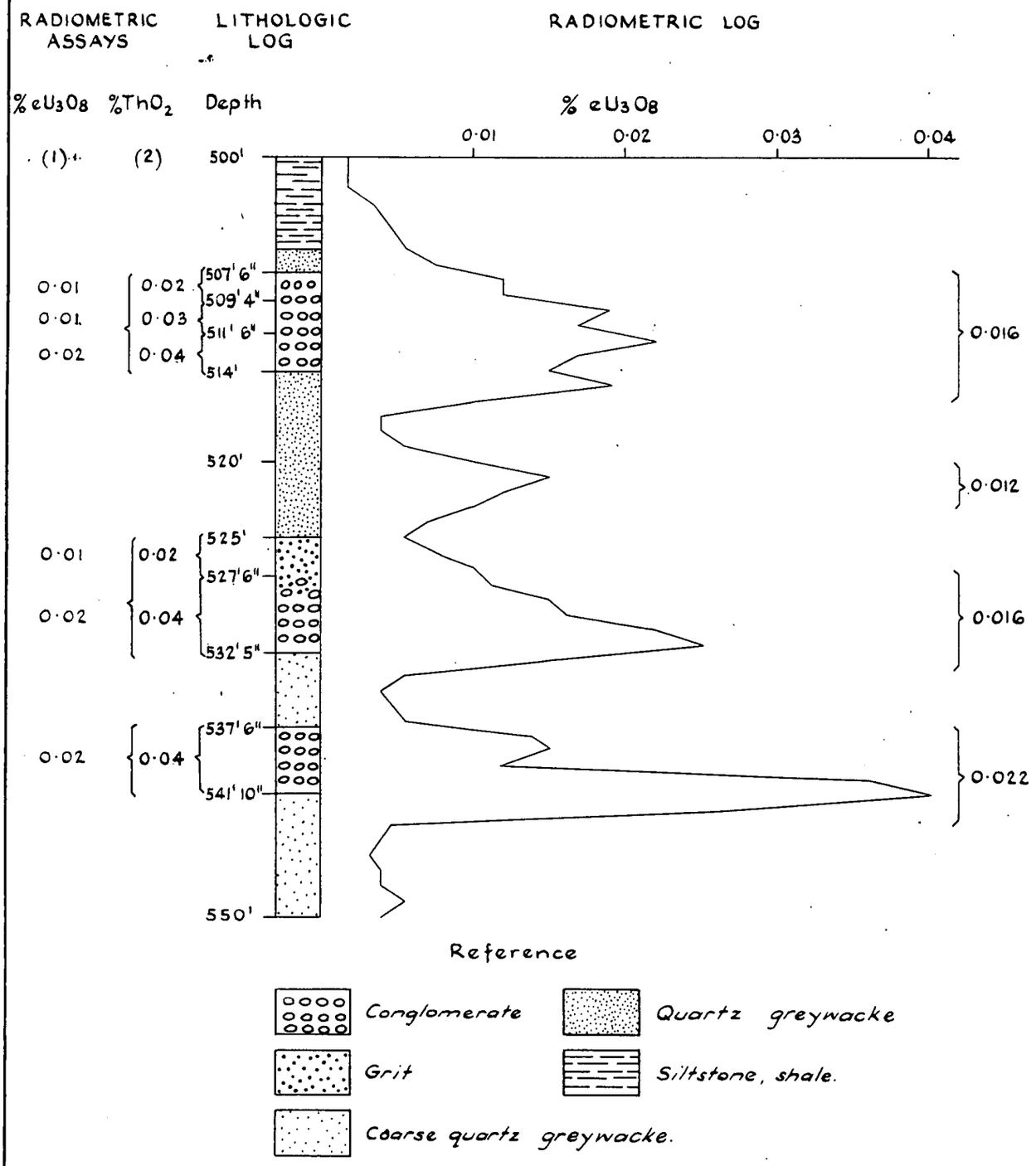
# PLATE 4




(1) Using $U_3O_8$ (pitchblende) standard.
(2) Using $ThO_2$ standard.
Thorium responsible for radioactivity measured.

Scale

10 5 0 10 20 FT.

## RADIOMETRIC ASSAYS, LITHOLOGIC AND RADIOMETRIC LOGS

B.M.R. DIAMOND DRILL HOLE Nº 1A

CRATER LINE, NEAR BATCHELOR, N.T.

*Bureau of Mineral Resources, Geology and Geophysics, Darwin, August 1960.*

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