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COMMONWEALTH OF AUSTRALIA.

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DEPARTMENT OF NATIONAL DEVELOPMENT.  
BUREAU OF MINERAL RESOURCES  
GEOLOGY AND GEOPHYSICS.

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RECORDS.

1953/105

PRELIMINARY REPORT ON WATERHOUSE URANIUM PROSPECT NO. 2.

by

J.D. Wyatt.

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PRELIMINARY GEOPHYSICAL REPORT ON WATERHOUSE URANIUM PROSPECT  
NO. 2.

by

A. F. Alle.

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## SUMMARY.

The Waterhouse Uranium Prospect No. 2, situated six miles south of Batchelor siding, consists of a series of rock exposures striking approximately 360 degrees and dipping 45 degrees to the East. The three main rock types are shale, hematized and brecciated quartzite and siltstone.

Significant radioactivity is restricted to the shale bed, which also contains copper mineralization in the vicinity of the highest counts. No source of radioactivity has yet been identified. Copper mineralization is present on a small scale 100 feet south and 40 feet east of the 00 peg.

The highest readings recorded by the initial radiometric survey were from 6 x 12 x background over an area of roughly 20 feet by 20 feet, and 4 x - 6 x background in two other areas as shown in plate 1.

Geophysical work consisted of both radiometric and magnetometer surveys. ( Plates 1 and 2).

Geochemical work was carried out and the results shown in Plate 3.

Developmental work in the area is to date restricted to three costeans and the results obtained from these will be discussed in the appropriate section of this report.

Further work by diamond drilling has been recommended on a limited scale to obtain information on the unweathered and perhaps unleached radioactive rock.

## INTRODUCTION.

The Waterhouse Uranium Prospect No. 2 is a radioactive anomaly discovered by the regional section of Waterhouse Geological Party in the course of their mapping programme. No indication of its presence is recorded in the Aerial Scintillometer Report for 1952 (Woods and McCarthy), the nearest anomaly shown on the map accompanying that report is situated  $\frac{1}{2}$  mile due East.

The prospect is situated 3.2 miles on a true bearing of 194 degrees from the south end of Gould Airfield and is 200 yards due west of the North Australian Railway (Darwin - Birdum).

The military co-ordinates are Batchelor sheet 032267, Aerial Photographic coverage is obtained in Aerial Survey 1375, Pine Creek, Run 19, photographs 5145, 5146.

Access is along a track which crosses the railway line at the south end of Batchelor Airfield and thence by way of a telegraph maintenance track which parallels the railway and passes through the prospect. It is passable to vehicles during the wet season up to a distance of  $1\frac{1}{2}$  miles from the prospect.

Detailed geological and radiometric work was commenced in June 1953 and completed in July of that year. Maps were made on scales of both 40 and 100 feet to the inch, by the author and P.B. Rosenhain.

## TOPOGRAPHY.

The area surrounding the prospect consists generally of undulating country bounded on the west, at a distance of one mile, by the Waterhouse Granite and a quarter of a mile to the east, by folded sediments which have been actively eroded to give a rugged terrain.

Cutting across the area in an easterly direction are large alluvial flats. Drainage is to the west by streams flowing only in the wet season.

The prospect itself is situated on an area of ground rising 15 feet above an adjacent alluvial plain. The general level is broken by small ridges of the more resistant rock types, rising to a height of 15 - 30 feet.

From north to south there is a difference in elevation of 25 feet along an average slope of 2 degrees.

## GEOLOGY.

### REGIONAL GEOLOGY.

The radioactive anomaly occurs in an area of north striking, easterly dipping shales, hematized and brecciated quartzites and siltstones, thought to be members of the Brock's Creek Group (Noakes 1949). This area lies approximately one mile east of the Waterhouse Granite.

The regional picture is not completely clarified to date but the prospect is thought to lie on the western flank of a south plunging syncline. The quartzite breccia in the area may therefore be identified with the folded hematized quartzite breccia which passes through Mt. Minza and then northwards through Waterhouse Prospect No. 1.

If this is the case then a relationship could be found between the occurrence of radioactive anomalies and the sedimentary sequence containing the hematized quartzite breccia.

The southern extension of this sequence strikes approximately 350 degrees for a distance of  $1\frac{1}{4}$  miles where further regional interpretation is still to be made.

### DETAILED GEOLOGY.

#### Lithology.

The largest radiometric anomaly is in black shales which are the youngest beds of the sequence mapped in detail. It is underlain to the west by hematized quartzite breccia, hematized quartzite (unbrecciated) and siltstone. The average strike of the beds is 345 degrees average dip 45 degrees E.

Variations in strike and dip occur in the shales due to local folding, the variation of dip being from 30 degrees - 65 degrees and strike from 330 degrees - 360 degrees. bedding is well defined in most outcrops of shale.



The shales vary in silicification and in some cases have a strong augen structure. In several places brecciation of the shale can be seen where it abuts against the hematized quartzite breccia.

The quartzite which underlies the shale is hematized and brecciated. The quartzite fragments in the quartzite breccia are fine-grained and white in colour. Throughout the hematized quartzite breccia small areas of hematized and brecciated vein quartz may be found.

Towards the west the brecciation gives way to hematized "quartzite", in some places well bedded. There is some doubt as to the origin of this hematized "quartzite", which may originally have been a shale which is now so strongly silicified and hematized as to be unrecognisable.

Due to lack of evidence the above bed is tentatively classed as a quartzite in Plate 1 accompanying this report.

Underlying the hematized "quartzite" in the south west corner of the area mapped, is a slightly sheared siltstone, in places silicified and well bedded. The strike is fairly constant at 330 degrees with an average dip of 30 degrees to the East.

It was noticed that the sequence mapped was similar in many respects to that of Waterhouse Uranium Prospect No.1

#### MINERALIZATION.

No visible uranium minerals have been found to date at this deposit and an examination of the high count area with a "Mineral-light" failed to reveal any fluorescent minerals.

Samples of radioactive material taken from the sample trench will be submitted for radioactive analysis.

Copper mineralization on a small scale was observed in the area of greatest radioactivity.

#### THE ANOMALY.

Although the anomaly is not recorded by the Aerial Scintillometer Survey (Woods and McCarthy, 1952), its position in the sequence of shales, quartzites and siltstones is probably related to a series of second order anomalies which extend southwards from Waterhouse Prospect No. 1.

The maximum radioactivity found on the undisturbed surface within the anomalous zone, is in a small area where counts of 12 times background have been obtained with the "carpet sweeper" type detector. Located position is 30' E and 70' W of peg 00.

This high count area is restricted to a small zone of what is apparently bleached shale, three feet wide and eight feet long.

Three costeans, and one sample trench have been cut in the area and it is important to note that in costean No. 1, put down over the high count area at position 30'E and 70'S of peg 00, counts were reduced from 12 times background to 7 times background whilst in costean No. 2 a rise in counts was recorded.

In the sample trench, a series of readings indicated at first a rise in counts then a fall as depth increased.

The 2 times background contour encompasses an area roughly 600 feet long by 240 feet wide and within this area several smaller anomalies of 4 x - 6 x background exist, namely 80 feet west and 200 feet south of 00 peg. in a shale breccia and 100 feet west and 600 feet south of 00 peg in unbrecciated black shales.

In costean No. 1 the water table was encountered eight feet below the ground surface.

The hematized quartzite is almost completely lacking in radioactivity, only one area towards the south showing counts of 2 times background. Similarly only one small area of 2 times background was recorded in the silt-stone.

#### SAMPLING.

A sampling trench was dug through part of the shales giving counts of 4 x - 6 x background. This trench was commenced at 600 feet south and 100 feet west of the 00 peg and continued west for 20 feet.

Samples were taken and have been submitted for radioactive determination.

#### GEOPHYSICAL RESULTS.

##### RADIOMETRIC SURVEY (PLATES I AND II)

The radiometric survey shows a large area of 2 x background almost completely restricted to the shale bed and elongated in a general way along its strike. Within this area three high spots have been detected, the highest reading being 12 times background at a point indicated on Plate 1.

From the general elongation of these high spots along the strike a bedding control is indicated.

##### MAGNETOMETER SURVEY (PLATE III)

This survey shows the highest anomalies exist in the hematized quartzite. These high spots occur at two points, one 300 feet west of the 00 peg where a reading of 2770 gamma was obtained and secondly at a point 200 feet west and 600 feet south of the 00 peg where an anomaly of 2340 gamma was recorded.

In the shales a series of highs and lows was recorded varying from 1720 gamma to 50 gamma.

All anomalies have a north-south extension roughly along the strike of the sequence. This may be related to

injection of material along the bedding or parallel to the axis of the major fold in the area.

SELF POTENTIAL WORK (PLATE 4).

Self potential work shows anomalies in the shale beds approximately in the same position as the radioactive highs and high copper readings obtained by the geochemists.

These results could indicate a zone of sulphide mineralization beneath these anomalies.

CONCLUSIONS.

The following conclusions have been drawn from the geological investigation of the prospect.

Firstly, significant radioactivity is restricted to the shales and secondly that mineralization may have been introduced by way of the brecciated shale zone. In costean No. 2., higher counts are recorded in an area of shale brecciation and it is therefore possible that mineralization occurred along this zone of weakness.

No source of radioactivity has been identified to date but copper mineralization which is in the form of malachite is indicative of an oxidised zone which suggests a leaching of the uranium from the surface.

The close proximity of the water table in the area of high counts may result in secondary enrichment with the possibility of primary ore at no great depth below the surface. Therefore, drilling on a limited scale is recommended both to test the prospect and obtain further information which would prove useful when dealing with anomalies of a similar type.

REFERENCES.

- |                            |       |   |
|----------------------------|-------|---|
| Wood F.W. &<br>McCarthy E. | 1952: | Airborne Surveys over Rum Jungle and other portions of the Northern Territory. Bur. Min. Res. Geophys. Records Rept. 79/1952. |
| Matheson R.S.              | 1953. | Rum Jungle Investigations 1951,1952. Progress Rept. Bur. Min. Res. Geol. Records Rept. 24/1953.                               |
| Noakes L.                  | 1949  | A Geological Reconnaissance of the Katherine-Darwin Region Northern Territory. Bur. Min. Res. Bul No. 16.                     |
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PRELIMINARY GEOPHYSICAL REPORT ON WATERHOUSE URANIUM

PROSPECT NO. 2.

by A.F. Alle.

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PLANS AND SECTIONS.

<u>Plate No.</u>		<u>Scale.</u>
2	Radiometric contour Plan.	40 feet - 1 inch.
3	Magnetic Countour Plan	40 feet - 1 inch.
4	Self-Potential Profiles.	100 feet - 1 inch.

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## SUMMARY.

The Waterhouse Uranium Prospect No. 2 occurs in an area of shale, hematized and brecciated quartzite and siltstone.

A radiometric survey indicates one large area of two times background confined almost wholly to the darker shale beds. Three high spots were detected the highest being eleven times background the others six and eight times. These are located approximately along the bedding of the shales and are spread over a length of 500 feet.

A magnetometer survey over the same area shows a general rise in magnetic intensity from east to west over the area. However a series of magnetic lows and highs varying from 50 gamma to 3100 gamma runs across the area from east to west and is most pronounced in the southern portion. These do not seem to be directly connected with the radioactive anomaly.

The self-potential work although not conclusive, shows a continuous region of negative anomalies occurring roughly along the same shale beds in which the radioactive highs occur.

Geochemical work also shows "medium and high" copper traces in these same beds. The factors which have given rise to secondary copper enrichment in these beds could also have helped to enrich the uranium content in the same area.

Further testing of the anomaly by drilling is recommended.

## INTRODUCTION.

The Prospect was discovered by the Regional Geological Survey at Waterhouse in June, 1953.

It is situated 3.2 miles on a true bearing of 194 degrees from the south end of Gould airfield and is 600 feet west of the Darwin-Birdum railway.

The Military co-ordinates on Batchelor sheet are 032267.

A survey grid was previously laid down over the area to serve both the Geological and Geophysical work. The traverse lines are spaced 100 feet apart and extend 400 feet on each side of a base line running north-south.

The detailed radioactive coverage constituted the main survey. This was supplemented with a detailed magnetic survey and several selfpotential traverses over the main areas of interest.

The work commenced in June and was completed in August, 1953.

### TOPOGRAPHY.

The anomaly is situated in country of low relief. A small alluvial flat occurs on the eastern side and further east gives way to steeply eroded country. One mile west is the outcrop of the Waterhouse granite.

### GEOLOGY.

This is fully described in the geological report.

### GEOPHYSICAL RESULTS.

#### RADIOMETRIC SURVEY.

The traverse lines were read at 25 foot intervals and closer where necessary using a Ratemeter, type 1011-C. Further readings were taken over selected areas to detail clearly the surface extent of the radioactive highs.

One major area of twice background exists situated almost completely over the shale beds. Three high spots each several square feet in extent have been located in this area and occur along a line roughly parallel to the bedding of the shales. The northernmost high originally read twelve times background the centre high four times and the southern one six times background.

Further testing by costeaning was carried out. This resulted in the northern high being reduced from twelve to seven times background indicating that the radioactive material was probably only concentrated in the soil cover.

The second costean was cut in an area of twice background, 100 feet west of the four times area. This revealed a narrow shale band which gave readings of six times background.

The third costean, cut north of the southern high spot, did not reveal anything.

A short trench cut at this southern high raised the count from six to eleven times background but deeper in the trench the reading fell to six again indicating concentration at or near the surface.

The area of twice background is approximately 175,000 square feet.

A radiometric contour plan (Plate II) has been drawn showing the isorads over the area and is attached to the report.

#### MAGNETOMETER SURVEY.

The variations in vertical magnetic intensity over the selected area are shown on the accompanying plan (Plate III).

There is a regional rise in the order of 300 gamma from east to west over the area.

There are also over a dozen sharp magnetic highs and lows over the area, especially along an east-west line at the southern end. The low areas have a minimum reading of 50 gamma and the highest has a maximum of 3100 gamma.

At present these do not seem to be connected with the radioactive highs but they occur generally over the shale beds. However a larger high 3000 gamma exists over alluvium in the north-west portion which is probably underlain by siltstone beds similar to, if not the same as those over which the high magnetic readings occur in the area of Waterhouse Uranium Prospect No. 1.

#### SELF-POTENTIAL SURVEY.

Several self-potential traverses across the area indicated a negative anomaly occurring in approximately the same shale beds where the radioactive highs are located. They are also in general agreement with the results of the Geochemical Survey which shows a high concentration of copper in the northern, central section of the area. This diminishes towards the centre of the area but is more prominent again at the southern end where both a radioactive high and a self-potential low also occur.

Self-potential profiles of these traverses are shown on the accompanying plate (Plate IV).

#### CONCLUSION.

The radioactive, geochemical and self-potential results are related and occur in the darker shale bands.

Extension of the magnetic profiles would be useful to delineate more clearly the nature and extent of the magnetic variations over the area. There does not however, appear to be any connection between the magnetic and radioactive results at present.

As suggested also from the geological evidence and report the area should be further tested by drilling to determine the nature and extent of the radioactive zone at depth.

#### REFERENCES.

- |                            |   |
|----------------------------|---|
| Wood F.W. &<br>McCarthy E. | 1952: Airborne Surveys over the Rum<br>Jungle area and other portions<br>of the Northern Territory.<br>Bur. Min. Res. Geophys. Records<br>Report 79/1952. |
|----------------------------|---|

#### APPENDIX.

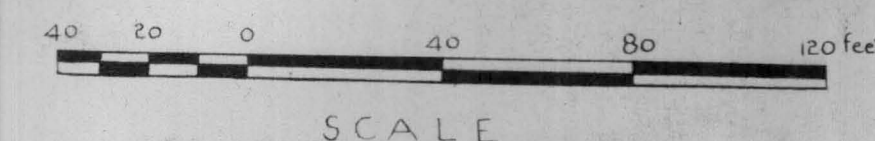
Assay results not yet to hand.

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Plate I.

# GEOLOGICAL PLAN WATERHOUSE URANIUM PROSPECT N°2 RUM JUNGLE AREA NORTHERN TERRITORY, AUST.



## Reference

### QUATERNARY

Alluvium

### PRE-CAMBRIAN

**BROOKS CREEK GROUP**

- Shales
- Brecciated shale
- Hematized Quartzite breccia
- Hematized "Quartzite"
- Siltstone

### INTRUSIVE

Quartz

Geological boundaries [approx.]

Contours

Radiometric contours

Dip, strike and cleavage.

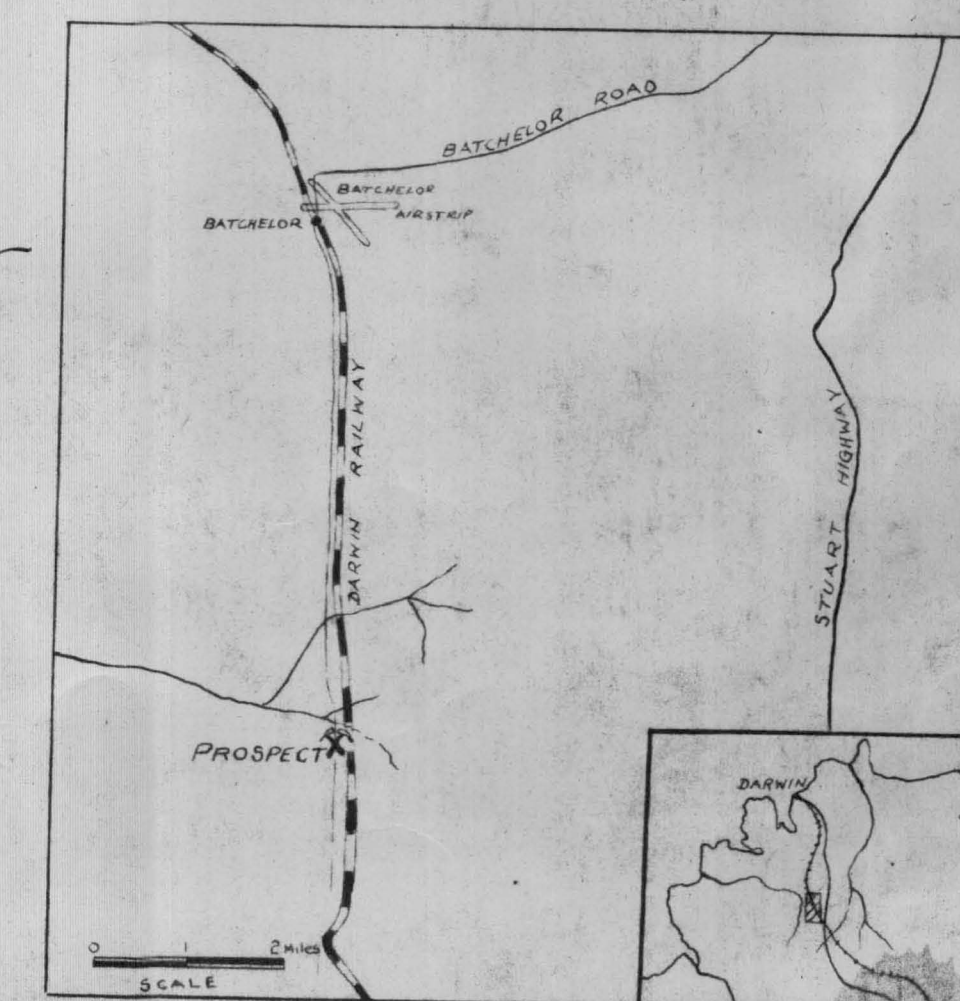
Fault

Plunge of minor anticline

Track

Copper anomaly (M. to V.H.)

### LOCALITY MAP



Plane table and telescopic alidade survey

and geology by:-

P.B. ROSENHAIN and J.D. WYATT.

JUNE-JULY 1953.



RESTRICTED

RADIOMETRIC CONTOUR PLAN  
WATERHOUSE URANIUM PROSPECT NO 2

PLATE 2

RUM JUNGLE AREA  
NORTHERN TERRITORY, AUSTRALIA



REFERENCE

QUATERNARY

PRE-CAMBRIAN

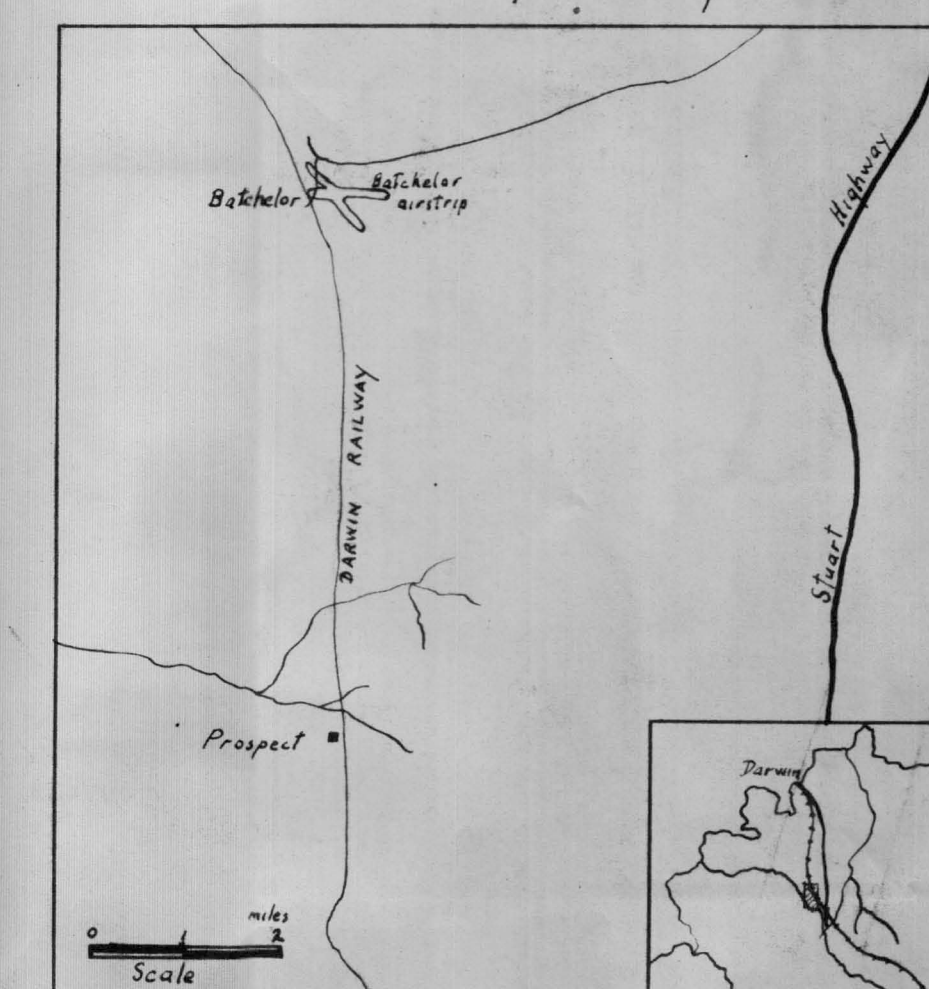
- Shales
- Hematized Quartzite Breccia
- Hematized Quartzite
- Siltstone
- Quartz (Intrusive)
- Geological Boundaries
- Strike and Dip

Contour Interval  $\times 2$

Background = 5.5

Radiometer Type 1011-C

Locality Map



RADIOMETRIC CONTOUR SURVEY

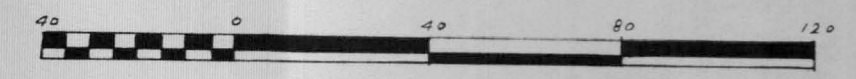
by A F ALLE June-Aug 1953



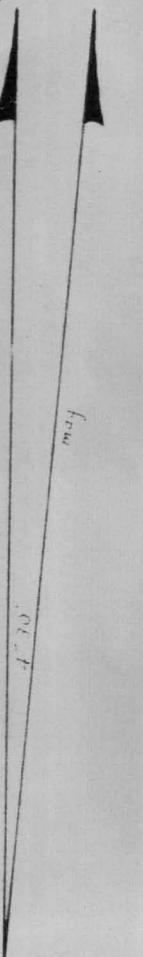
MAGNETIC CONTOUR PLAN

WATERHOUSE URANIUM PROSPECT NO 2

RUM JUNGLE AREA  
NORTHERN TERRITORY, AUST

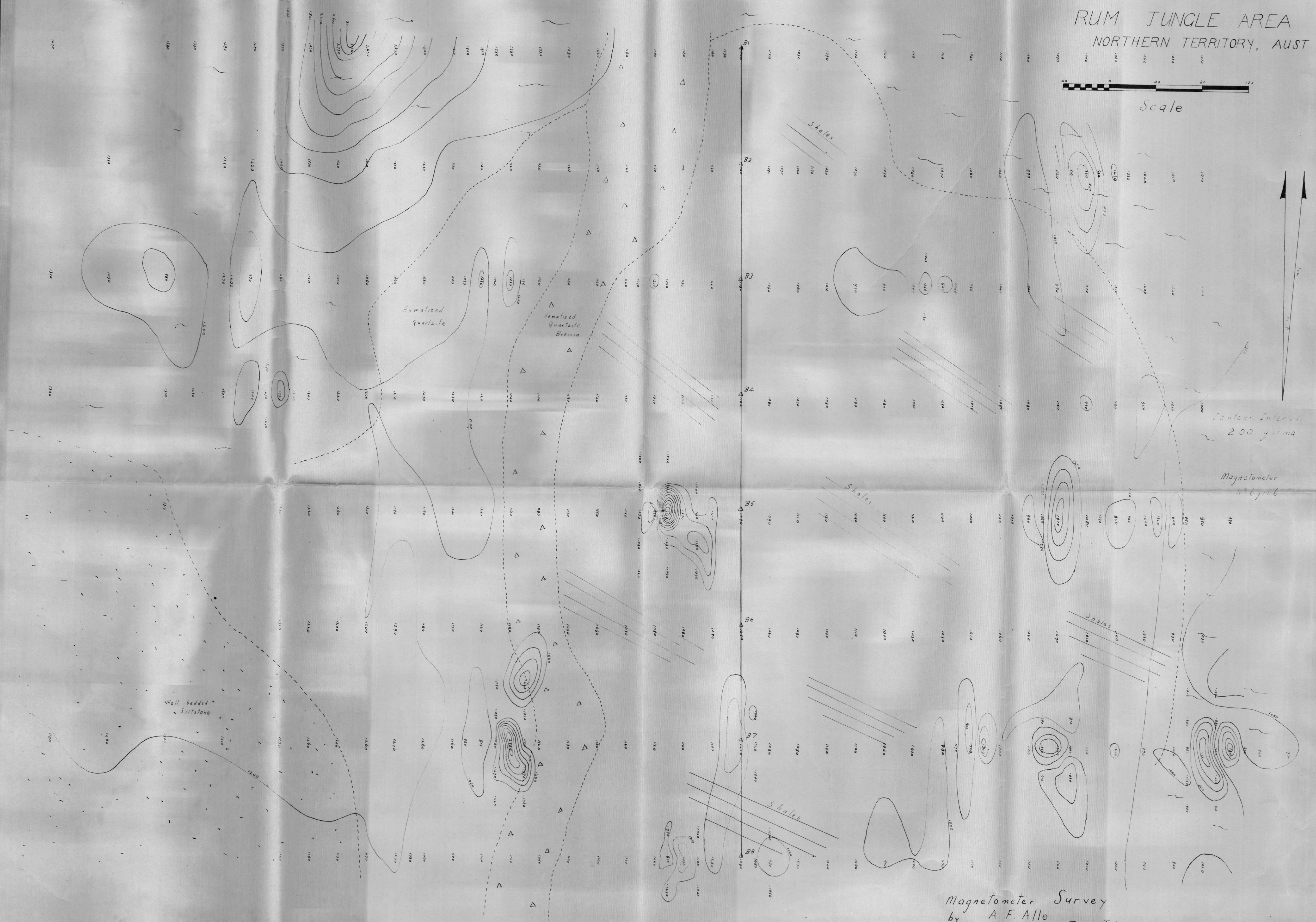


Scale



Contour Interval  
200 gamma

Magnetometer  
567106



Magnetometer Survey  
by A. F. Allen  
June - July 1953



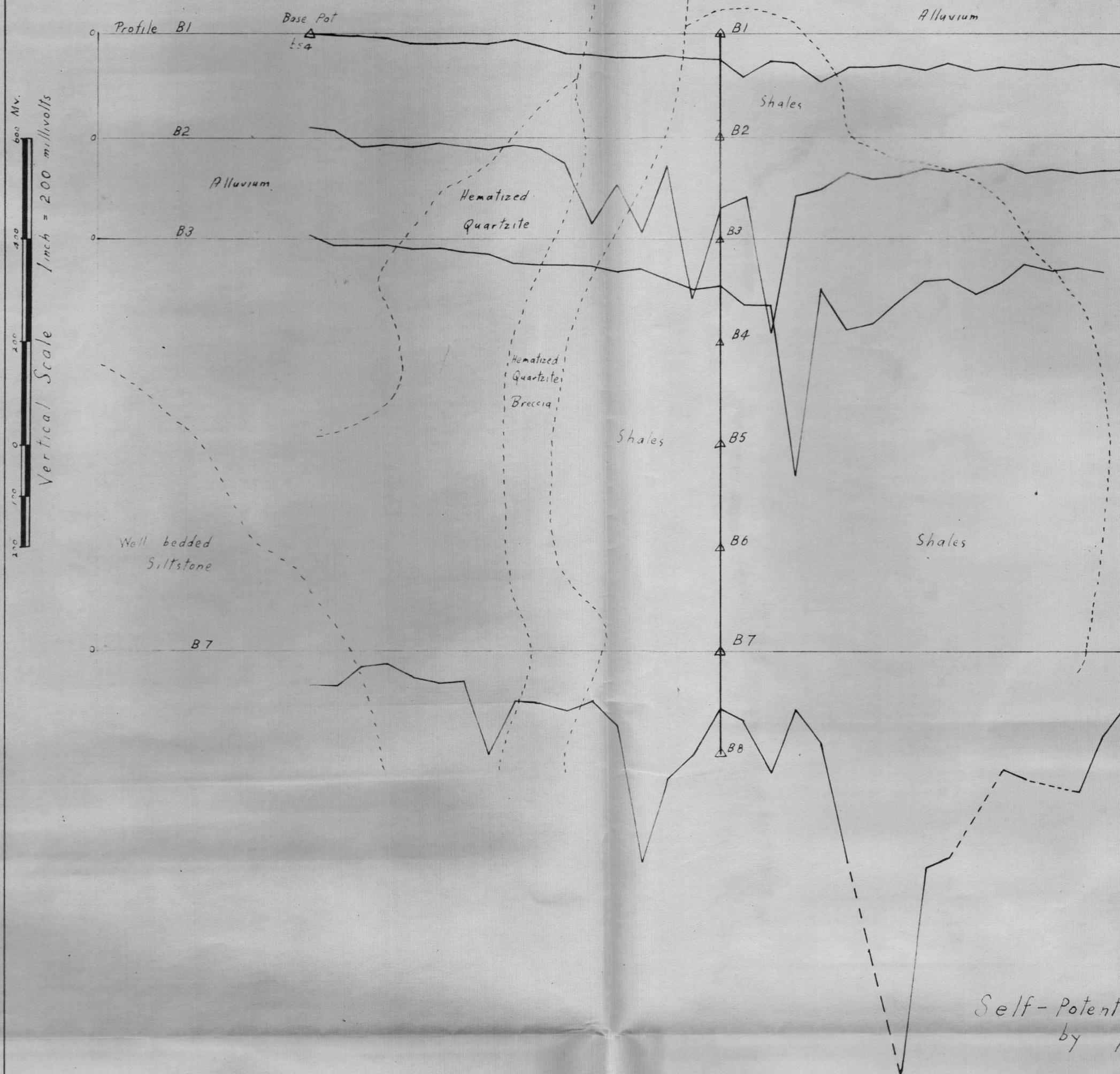
SELF POTENTIAL PROFILES

WATERHOUSE URANIUM PROSPECT

NO 2

RUM JUNGLE AREA

NORTHERN TERRITORY, AUSTRALIA



Self-Potential Survey  
by A. F. ALLE

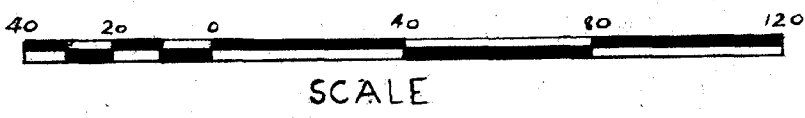
June - July 1953



WATERHOUSE URANIUM PROSPECT  
N° 2

Geochemical Survey

A. Debnam and D. White



Reference

- |   |    |           |          |
|---|----|-----------|----------|
| ○ | N  | NEGATIVE  | } Copper |
| • | L  | LOW       |          |
| • | M  | MEDIUM    |          |
| • | H  | HIGH      |          |
| • | VH | VERY HIGH |          |

