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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS.

RECORDS
1955, NO. 102

**PRELIMINARY REPORT ON
AIRBORNE RECONNAISSANCE
SCINTILLOGRAPH SURVEY
IN W. A. (1955)**

OVER

- (a) Wodgina - Marble Bar District (Pilbara)*
- (b) Wilgie Mia (Murchison)*
- (c) Lake Dundas (Norseman)*

by
W. D. PARKINSON
and
J. DALY

AIRBORNE RECONNAISSANCE SCINTILLOGRAPH SURVEYS IN W.A. (1955)

- OVER - (a) WODGINA - MARBLE BAR DISTRICT (PILBARA)
(b) WILGIE MIA (MURCHISON)
(c) LAKE DUNDAS (NORSEMAN)

PRELIMINARY REPORT

General

Airborne scintillograph reconnaissance surveys have been carried out over four areas in Western Australia selected in consultation with the State Department of Mines. The areas are:-

1. Wodgina-Marble Bar (Pilbara Goldfield)
2. Ragged Hills (Pilbara)
3. Wilgie Mia (Murchison)
4. Lake Dundas (Norseman)

All four areas were flown by officers of the Bureau of Mineral Resources in D.C.3 Aircraft VH-MIN between the end of April and the beginning of August, 1955. Subsequently, in the latter part of August, a ground reconnaissance was made by a party, including a geophysicist of the Bureau and a geologist of the W.A. Department of Mines, over a small area of interest near Bamboo Creek, to the north east of Marble Bar.

Some details of the areas flown and the results obtained are given below. The total area covered by airborne scintillograph reconnaissance over these four areas was about 13,400 square miles, the flight lines being one mile apart. In addition, detailed surveys were made over twelve selected small areas, totalling 350 square miles, where anomalies were recorded during the reconnaissance flying. Flights were made at a height of both 500 feet and 200 feet along traverses only half a mile apart over these small areas. About 13,400 traverse miles were flown on the reconnaissance surveys and an additional 1,000 miles on the more detailed surveys.

There were no aerial photographs available, before the survey commenced, for three of the areas covered, namely :-

- (1) Nullagine (a portion of Pilbara), 2100 square miles;
- (2) Wilgie Mia, 260 square miles;
- (3) Lake Dundas, 80 square miles.

It was therefore necessary for the D.C.3 aircraft to take high-level photographs from which an appropriate sketch map could be compiled to show the results of the scintillograph surveys. This aerial photography involved an additional 2400 miles of traverse flying.

The party engaged in surveys in the D.C.3 aircraft VH-MIN comprised Captain Duffield and F/O Purnell of T.A.A. and Messrs. Merrick, Irving, Kern and Jackson and Miss Cullen of B.M.R., with Dr. Parkinson, Senior Geophysicist in charge of the party.

Operations

Navigation was by reference to photo-mosaics and aerial photographs, some of which had first to be taken by the airborne party as explained above. These latter photographs were returned

by air to Melbourne for processing and prints were returned to the survey party in time for use in the later stages of the work.

The position of the aircraft was recorded continuously throughout the survey by the operation of a vertical strip camera which photographed the ground directly below the aircraft. The aircraft was flown at a nominal height of 500 feet above the ground throughout the reconnaissance survey and traverses were one mile apart. During the semi-detailed follow-up over small areas of interest in the Pilbara District, where traverses were flown at half-mile spacing, the aircraft was flown at both 500 feet and 200 feet above ground on each traverse. The actual height of the aircraft was recorded continuously by a recording radio altimeter.

Instruments

Two M.E.L. Chalk River scintillation counters were used in the aircraft, each coupled to its own continuous recorder. The two instruments were of about equal sensitivity but were connected to separate ratemeters having time constants of one and two seconds respectively. The two records obtained were generally similar. This preliminary assessment is based on the records from the instrument with the longer time constant. The scintillograph records have in part been corrected for variations in the height of the aircraft.

Areas and Results

(a) Pilbara District

The airborne survey of this, the principal area surveyed in the present series, falls naturally into three phases which are described separately below. The ground follow-up of the Bamboo Creek area is dealt with separately at the end of the report.

(i) Main reconnaissance survey.

The area covered by reconnaissance consists of two contiguous rectangles. The first is bounded by parallels of latitude $20^{\circ}22'$ and $21^{\circ}22'$ south, and by meridians $118^{\circ}15'$ and $119^{\circ}10'$ east longitude, and has an area of about 4,400 square miles. The second is bounded by parallels of latitude $20^{\circ}38'$ and $22^{\circ}00'$ south, and by meridians $119^{\circ}10'$ and $120^{\circ}32'$ east longitude, and has an area of about 8,600 square miles. Thus a total area of 13,000 square miles was reconnoitred.

The area comprises a number of granite intrusions separated by metamorphosed pre-Cambrian sediments. The granitic areas are invariably flat plains whereas the metamorphics form somewhat rugged hills. The positions of the granitic areas are shown on the accompanying sketch map of the Pilbara District.

A preliminary inspection of the scintillograph records shows that over 200 well-defined anomalies and a number of lesser ones were recorded. They are concentrated mainly in the one-mile areas of Abydos, North Shaw, Bamboo and Cooglegong and in the western parts of Corunna Downs and Carbana. A few were recorded in the one-mile areas of Marble Bar, Tabba Tabba and Indee, although most of the northern section of the area surveyed appears to be comparatively inactive. Scattered anomalies were recorded in the one-mile areas of Tambourah, No. 129 and Nullagine.

The central portion of the one-mile area of Bamboo, just north east of the Bamboo Creek mining centre, was found to have many particularly large anomalies. Two bands of high

activity were found there, both trending north-west south-east. The one on the western side of the area is wide and moderately active, whereas the one on the eastern side is narrow and highly active.

(ii) Semi-detailed survey of special regions.

The Bamboo Creek area and eleven other smaller areas were selected for re-flying. Traverses were spaced half a mile or less apart and flights were made at heights of both 500 feet and 200 feet. The twelve special areas are shown on the accompanying map.

It is theoretically possible to obtain some indication of the dimensions of a radioactive area by comparing the magnitude of the anomaly recorded at 500 feet over it with the magnitude of the anomaly recorded at 200 feet. In other words, the technique should make it possible to distinguish between concentrated sources of high activity and broad sources of low activity. These flights were made partly to test the technique with a view to making use of the principle in future surveys.

A preliminary analysis of the results obtained, using this technique over the areas in the Pilbara District, showed that all of them appear to be large sources of low activity.

(iii) Ragged Hills Area.

This area of about 60 square miles was included in the reconnaissance survey because its geological environment appears suitable for radioactive mineralisation. Much manganese ore has been won from the area, which lies about 24 miles south of the Ragged Hills Airstrip.

No significant scintillograph anomalies were recorded over this area.

(b) Wilgie Mia (Murchison District)

The reconnaissance survey at Wilgie Mia covered an area of 256 square miles centred at a point 35 miles north of Cue. Only two scintillograph anomalies were recorded, one near the northern corner of the area and the other near the south.

The anomaly in the north was re-flown at heights of 400 feet and 200 feet. A comparison of the results obtained at these two heights indicates that the source of the anomaly is small in area but not of very high activity.

(c) Lake Dundas (Norseman District)

The reconnaissance survey near Lake Dundas covered an area of 72 square miles with its centre 20 miles south of Norseman. Three well-defined anomalies were recorded at corresponding points on three adjacent flight lines. The source of the anomalies is situated almost in the centre of the area flown and the results indicate that it is a linear source extending across three flight lines, or over a distance of two miles.

Positions of Anomalies.

The positions of the anomalies described above are as yet known only approximately. Their exact positions will not be known until the photographic record has been examined in detail and the position of flight lines determined.

When that has been done the positions of all the anomalies will be marked on appropriate maps of photo-mosaics and will be published for general use in carrying out ground investigations.

Ground Investigation in Bamboo Creek Area.

The concentration of large anomalies recorded in the Bamboo Creek area, already referred to above, was considered sufficiently interesting to warrant immediate investigation on the ground. A B.M.R. party comprising Mr. J. Daly, Supervising Geophysicist and Mr. K. Kern carried out the radioactive survey. They were assisted by Mr. J. Sophoulis, geologist of the W.A. Department of Mines.

Examination was made, using portable Geiger and scintillation counters. It was found that all anomalies in the area occur on acid volcanic rocks of the Nullagine Series which contain slight disseminated radioactivity. These rocks give readings of three to five times normal background on a portable Geiger counter.

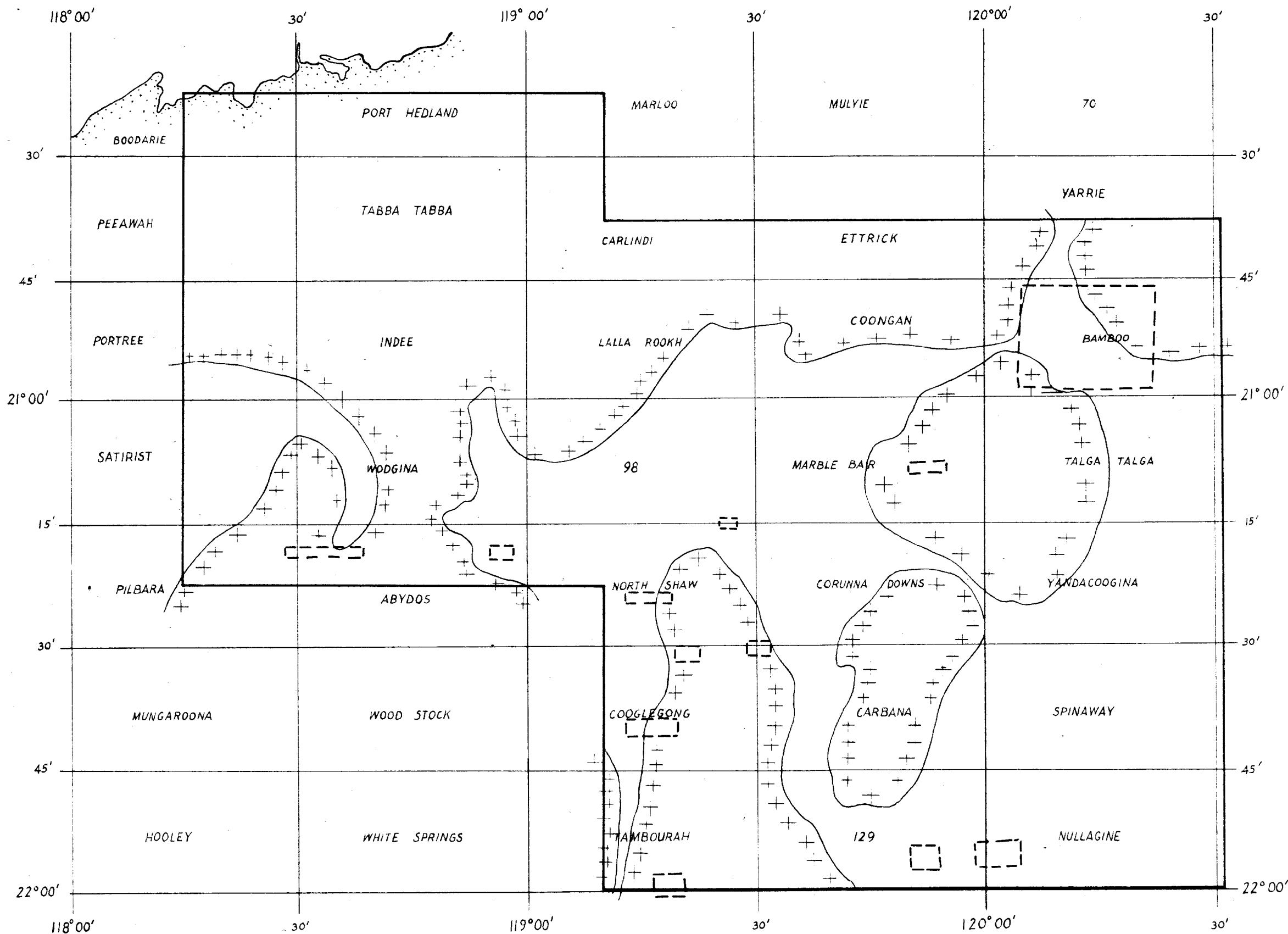
Although the intensity of radioactivity, as observed on the ground in these investigations, is uniform over all rocks of this type in the Bamboo Creek area, the response of the airborne scintillograph appears to be different over different areas of the volcanics. The reason is not clear, but it may be due to the uneven topography, in which case the differences may disappear when complete altitude corrections have been made to the airborne scintillograph records.

About two miles north of the Bamboo Creek battery, the aircraft recorded a plateau of high radioactivity over rocks of this type. Further to the north and north-east, where the volcanics are rather more deeply dissected, the aircraft scintillograph response appears as a number of isolated large anomalies. It was not found possible on the ground to trace specific areas of high radioactivity which could definitely be correlated with the large anomalies.



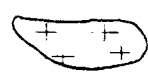
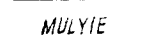
Rocks of the Nullagine Series are characteristically free from folding, fracturing and mineralisation. It is considered that any airborne scintillograph anomalies recorded over rocks of the Nullagine Series will be due to slightly radioactive volcanics. The only anomalies which are likely to have any connection with useful mineralisation are those which arise from rocks of the Mosquito Creek or Warrawoona Series or from the granite.

Melbourne,
October, 1955.

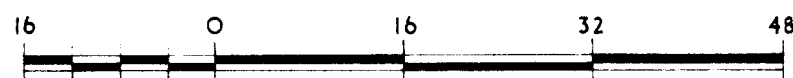
W.D. Parkinson.
J. Daly.



LEGEND

-  Limit of survey
-  Areas of detail refly
-  Granitic Areas
-  One-mile military map

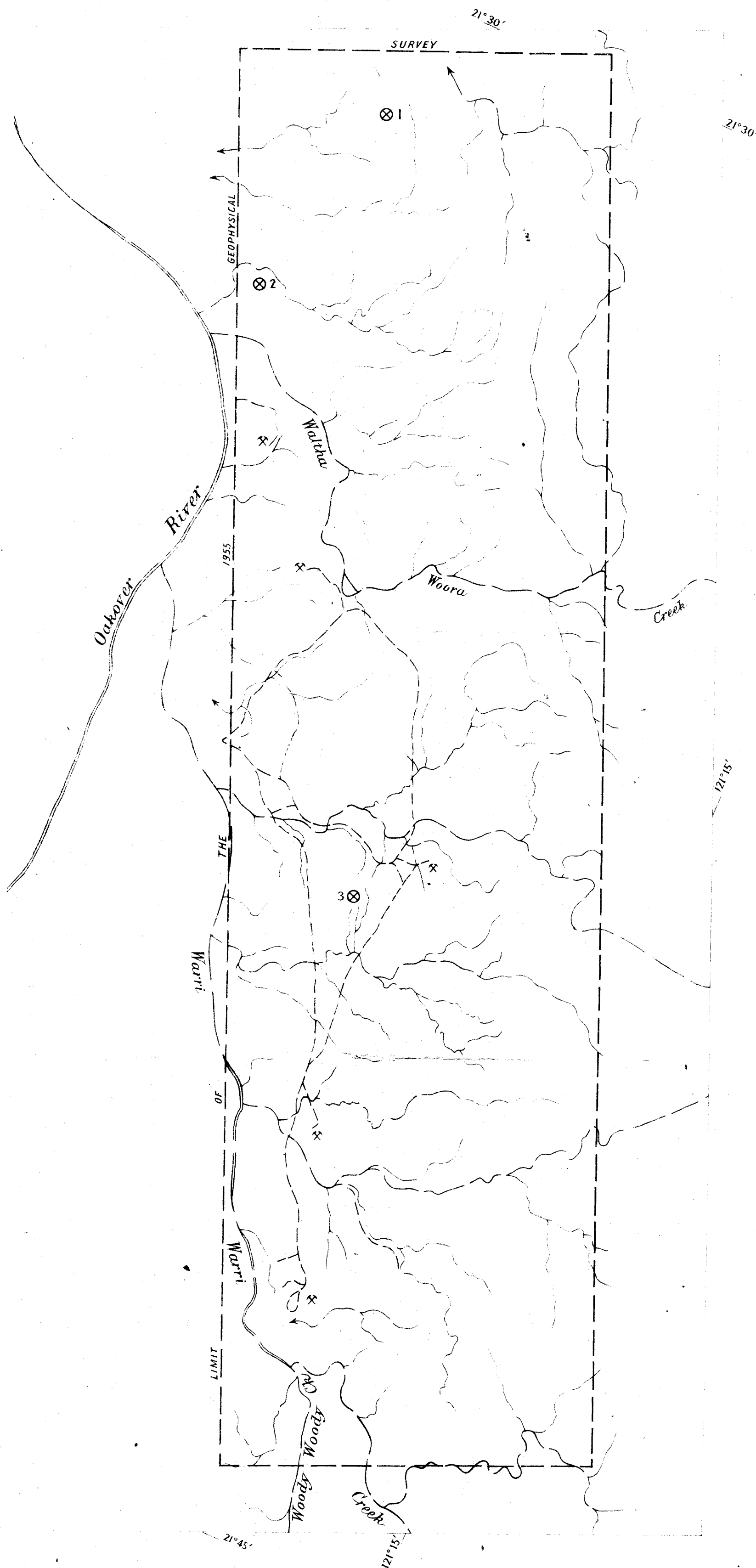
SCALE IN MILES



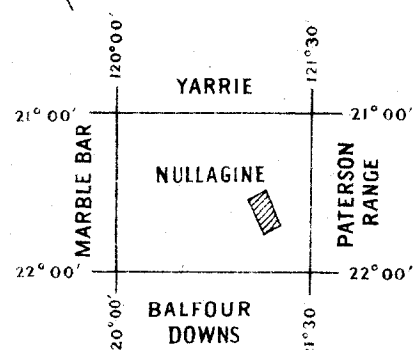
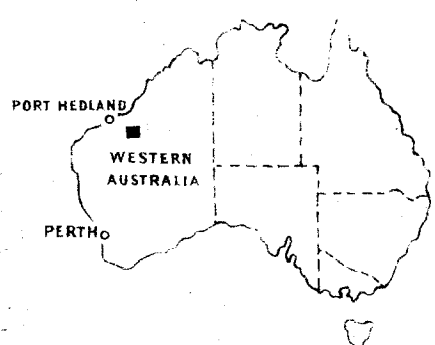
SKETCH MAP OF PILBARA AREA

AIRBORNE RECONNAISSANCE SCINTILLOGRAPH SURVEY (1955)
WODGINA-MARBLE BAR DISTRICT (PILBARA) W.A.

WESTERN AUSTRALIA GREGORY RANGE WOODY WOODY CREEK AREA



LOCATION DIAGRAM



With reference to Australian National 4 Mile Map Series

LEGEND

TOPOGRAPHICAL

- River or Creek
- Creek or Watercourse
- Track
- Mine

RADIOACTIVE

- Radioactive Anomaly:
A place at which
the recorded radio-
activity is substantially
greater than average.

The base map is compiled from sketch maps and uncontrolled photo mosaics. The plotted position of an anomaly lies within a radius of 300 yards of its source.

SCALE IN MILES



MAP SHOWING

RADIOACTIVE ANOMALIES

DETECTED BY AIRBORNE SCINTILLOGRAPH

EXPLANATORY NOTES

This map shows the result of a reconnaissance survey with an airborne scintillograph and serves only as an initial guide to prospecting.

The scintillograph records continuously the intensity of gamma radiation from the ground over which the aircraft flies. The intensity over any area is generally uniform but shows random variations above and below an average value. Anomalies are marked where the intensity is substantially greater than this average value.

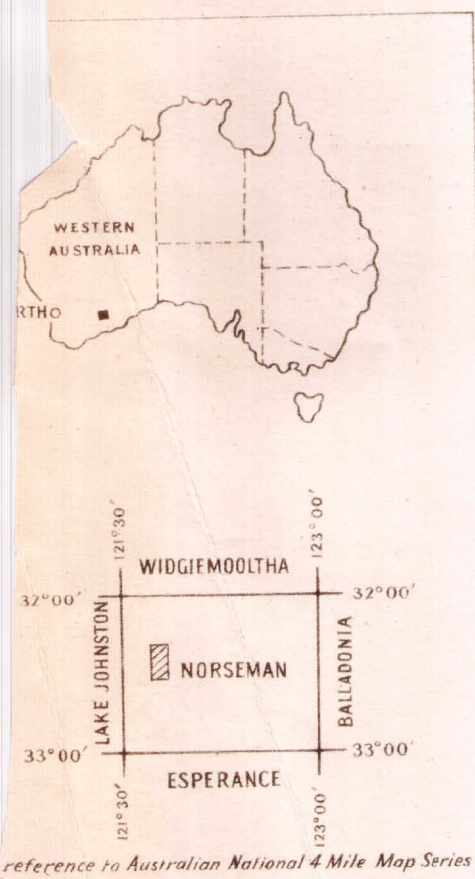
The scintillograph was flown where practicable, at a constant height of 500 feet above the ground. At this height the width of the zone from which radioactivity is recorded is effectively 200 to 250 yards wide. With a flight-line spacing of one mile, therefore, only about ten per cent of the ground has been covered. The height of the aircraft was recorded continuously by a radio altimeter which enabled corrections to be made for variations in the aircraft's height above the ground. Aerial photographs were used for navigation and a continuously operated vertical camera recorded each flight-line.

An anomaly is considered to indicate an area in which uranium minerals may occur. No claim is made that all or even any of the anomalies correspond to uranium deposits of economic importance but it is possible that some do. Subsequent investigation on the ground is necessary to determine their significance and possible economic importance.

WESTERN AUSTRALIA LAKE DUNDAS



LOCATION DIAGRAM



LEGEND

TOPOGRAPHICAL	RADIOACTIVE
High Water Level	Radioactive Anomaly: A place at which the recorded radio- activity is substantially greater than average.
Low Water Level	
Main Route	
Track	
Track with Telegraph Line	
Mine	

The base map is compiled from a two inches to one mile plan of leases and uncontrolled photo-mosaics. The plotted position of an anomaly lies within a radius of 300 yards of its source.

SCALE IN MILES



MAP SHOWING

RADIOACTIVE ANOMALIES

DETECTED BY AIRBORNE SCINTILLOGRAPH

EXPLANATORY NOTES

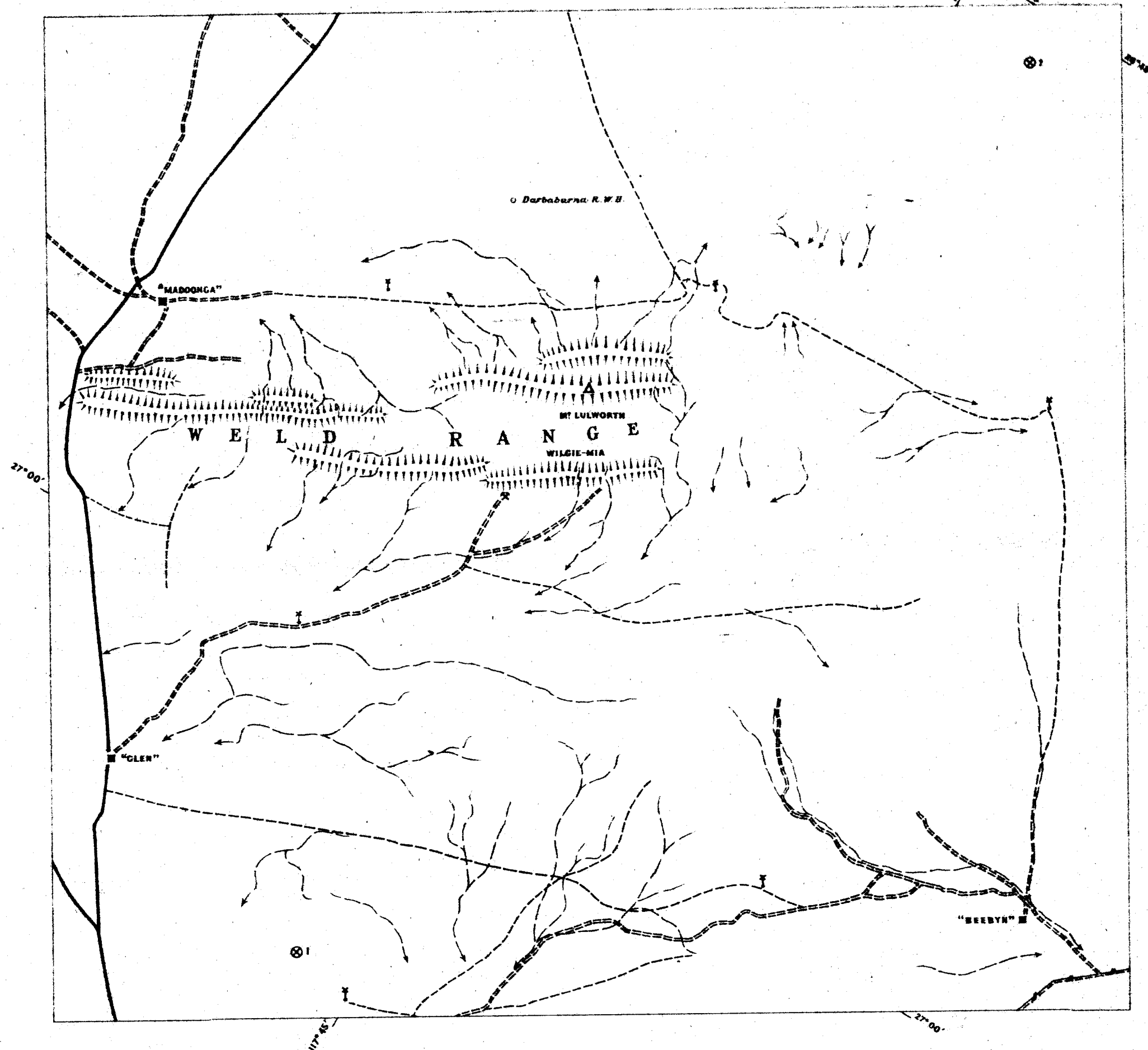
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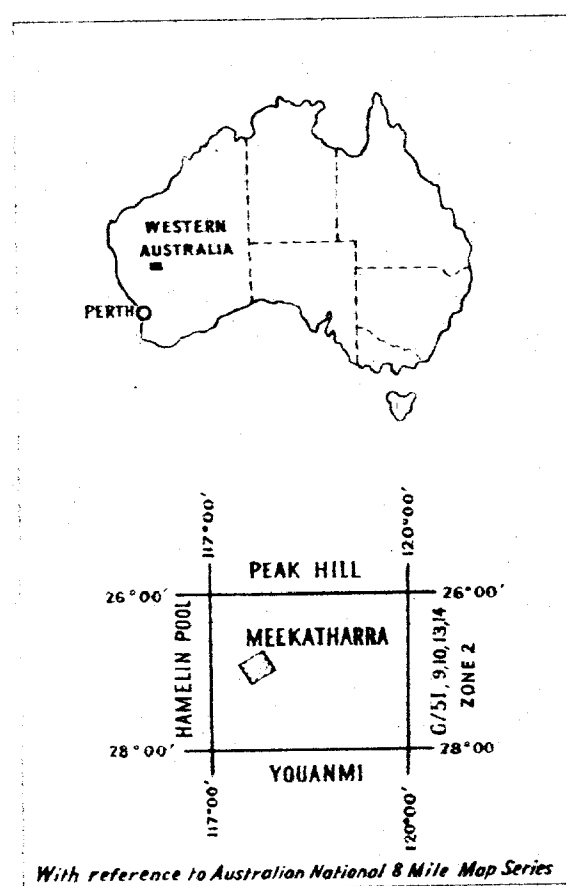
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WESTERN AUSTRALIA WILGIE-MIA AREA



LOCATION DIAGRAM



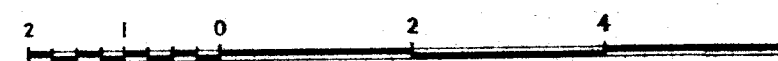
LEGEND

TOPOGRAPHICAL	RADIOACTIVE
<ul style="list-style-type: none"> Watercourse Main Route Track Vehicular Identified* Track Vehicular Unidentified* Homestead Mine Well or Waterhole Well with Windpump 	<ul style="list-style-type: none"> Radioactive Anomaly: A place at which the recorded radioactivity is substantially greater than average.

The base map is compiled from sketch maps and uncontrolled photo-mosaics. The plotted position of an anomaly lies within a radius of 3/4 mile of its source.

* identified on airphotos taken August 1955, --- unidentified but shown on existing sketch maps.

SCALE IN MILES



MAP SHOWING

RADIOACTIVE ANOMALIES

DETECTED BY AIRBORNE SCINTILLOGRAPH

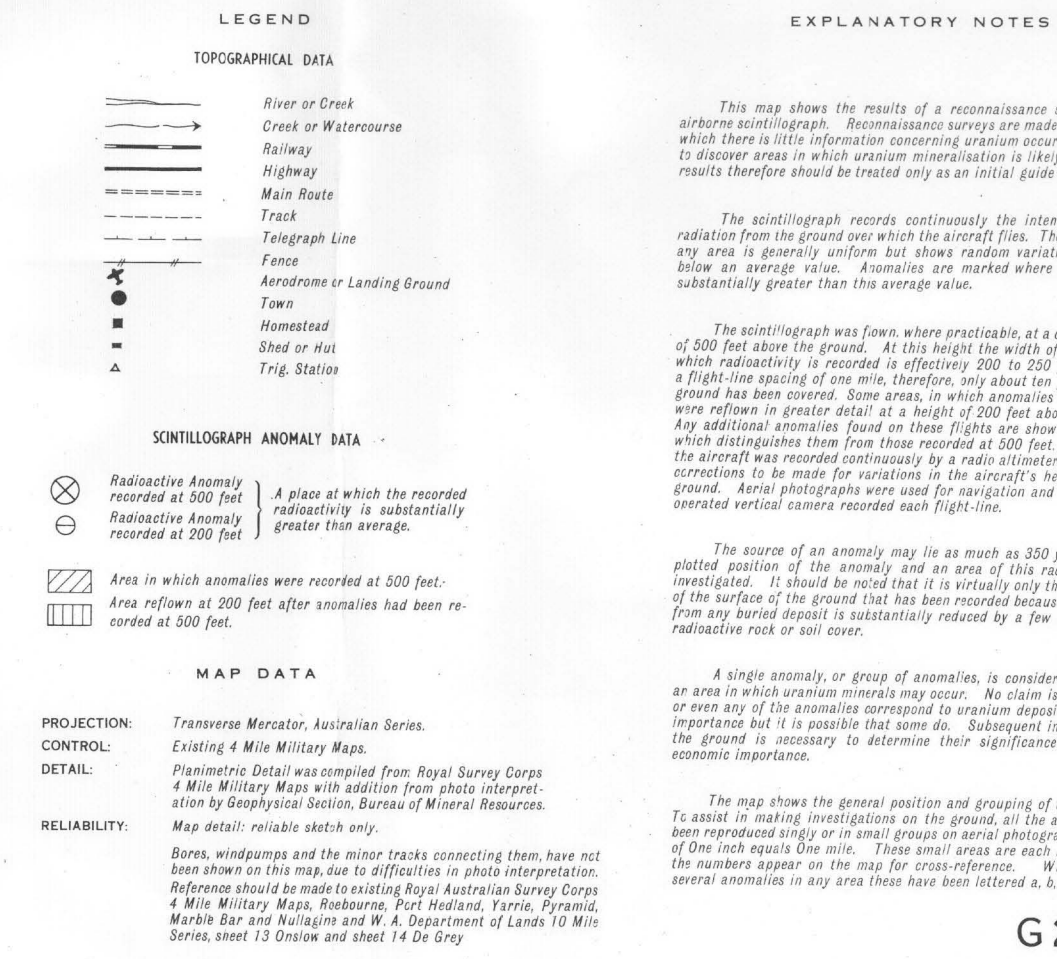
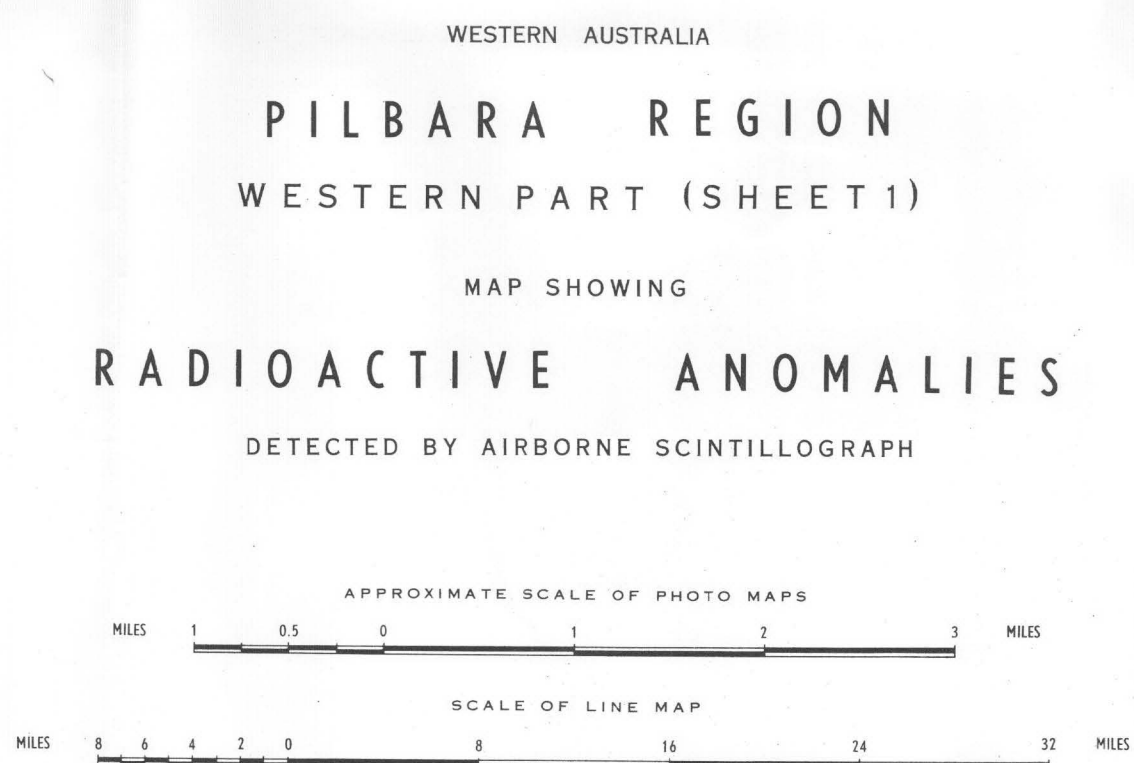
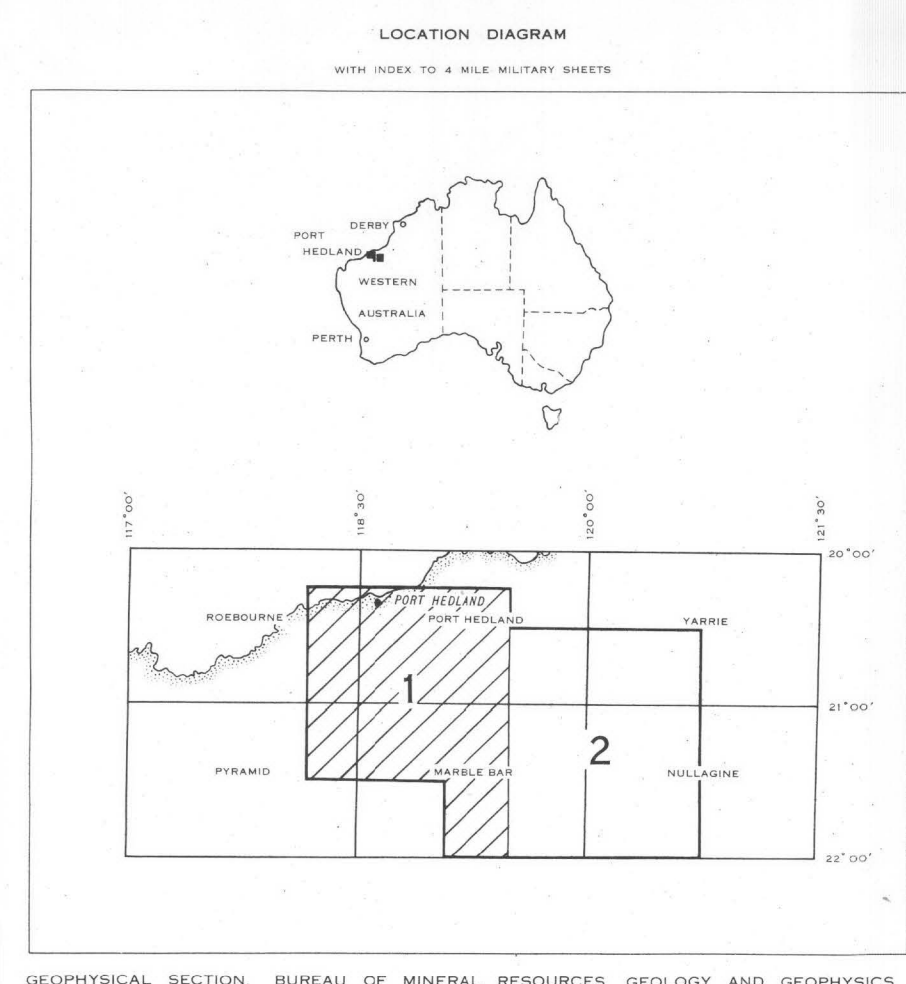
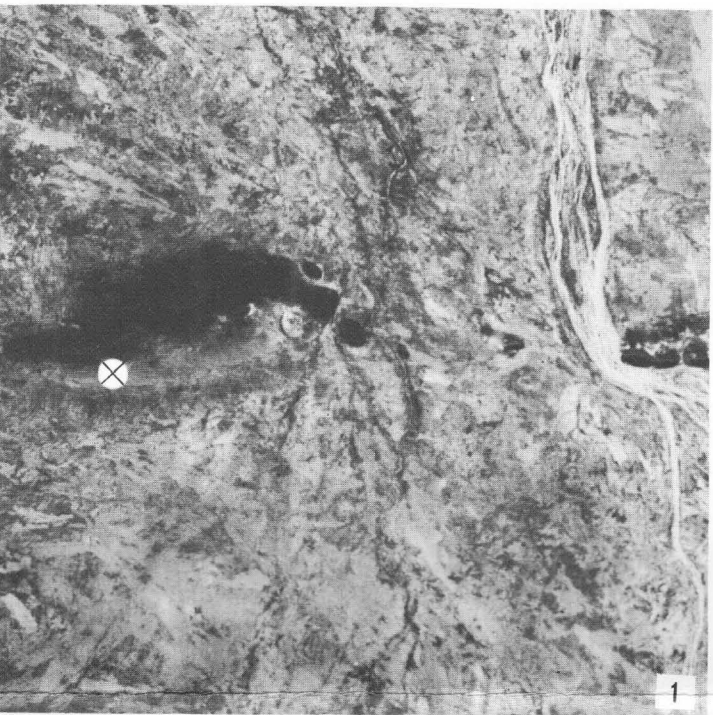
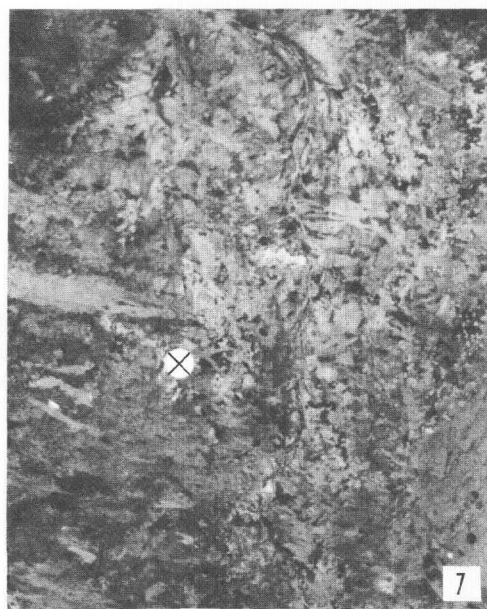
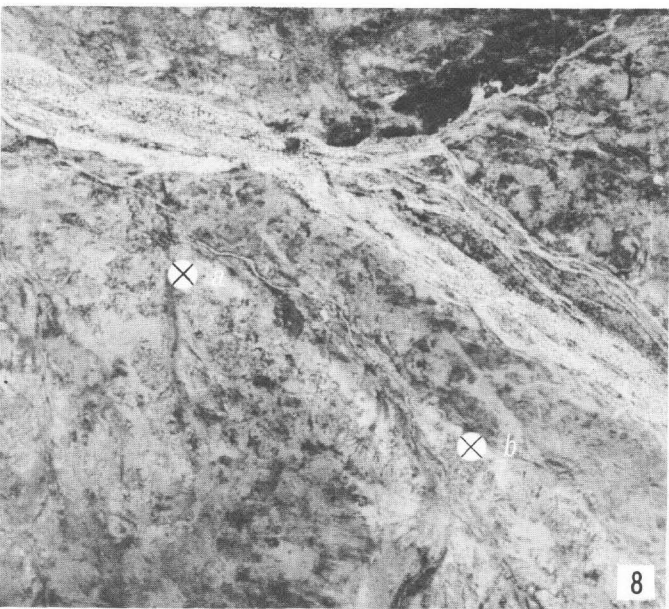
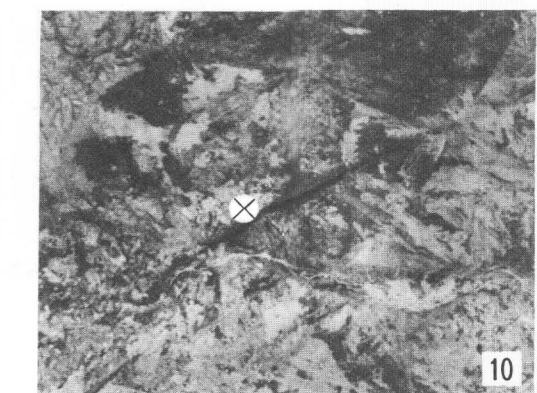
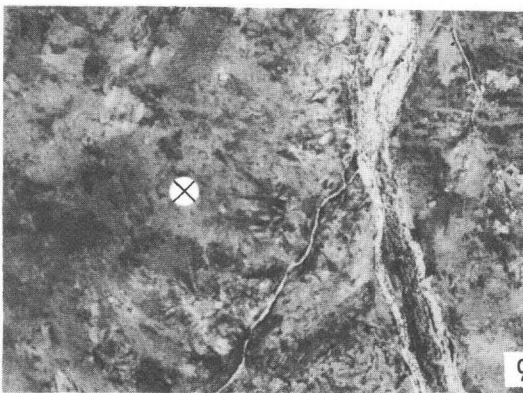
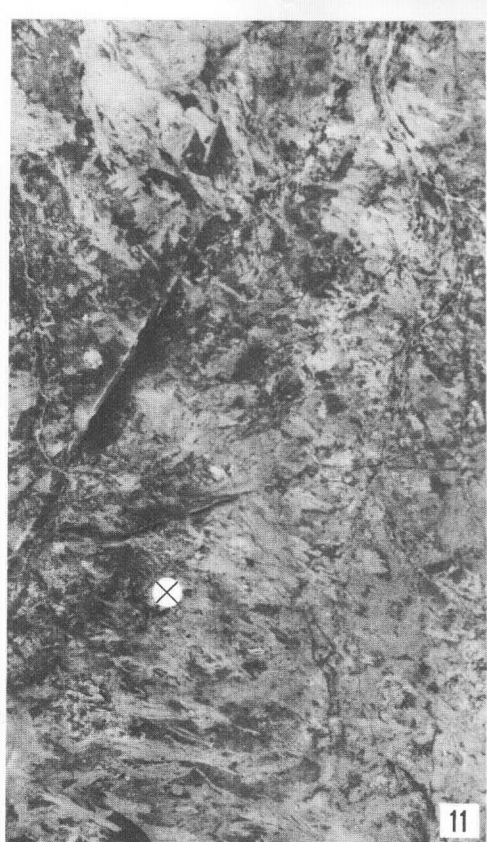
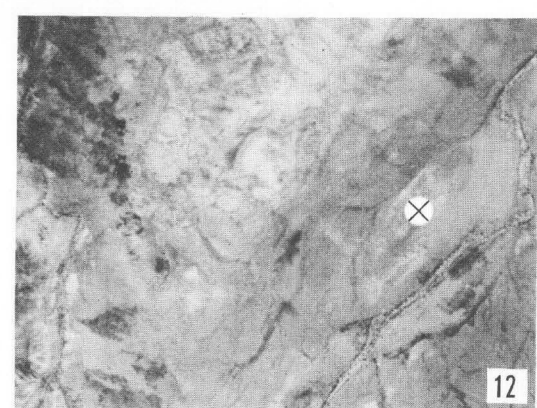
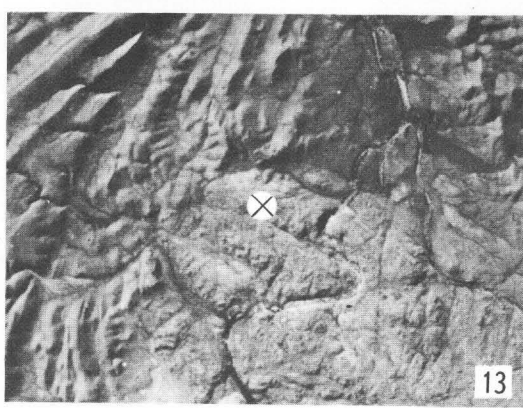
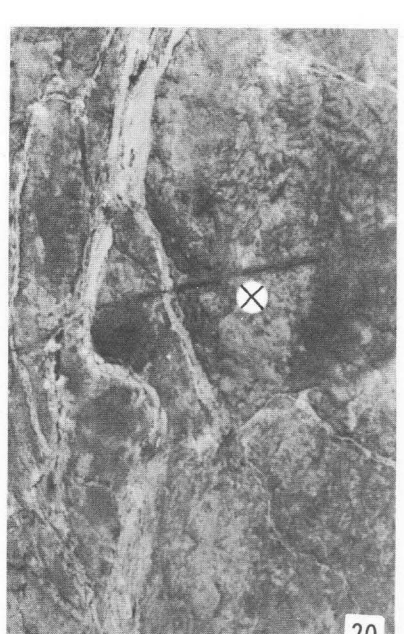
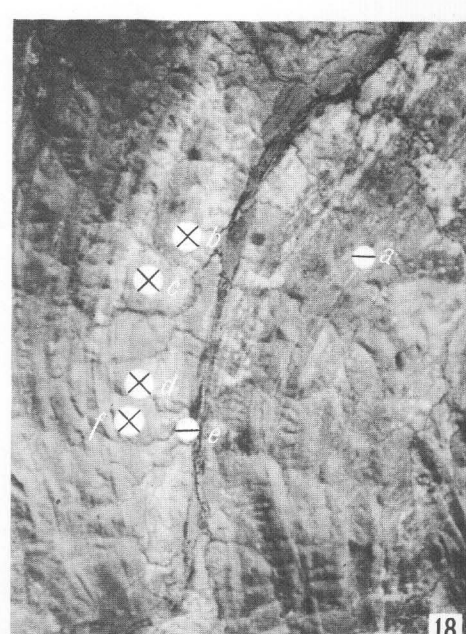
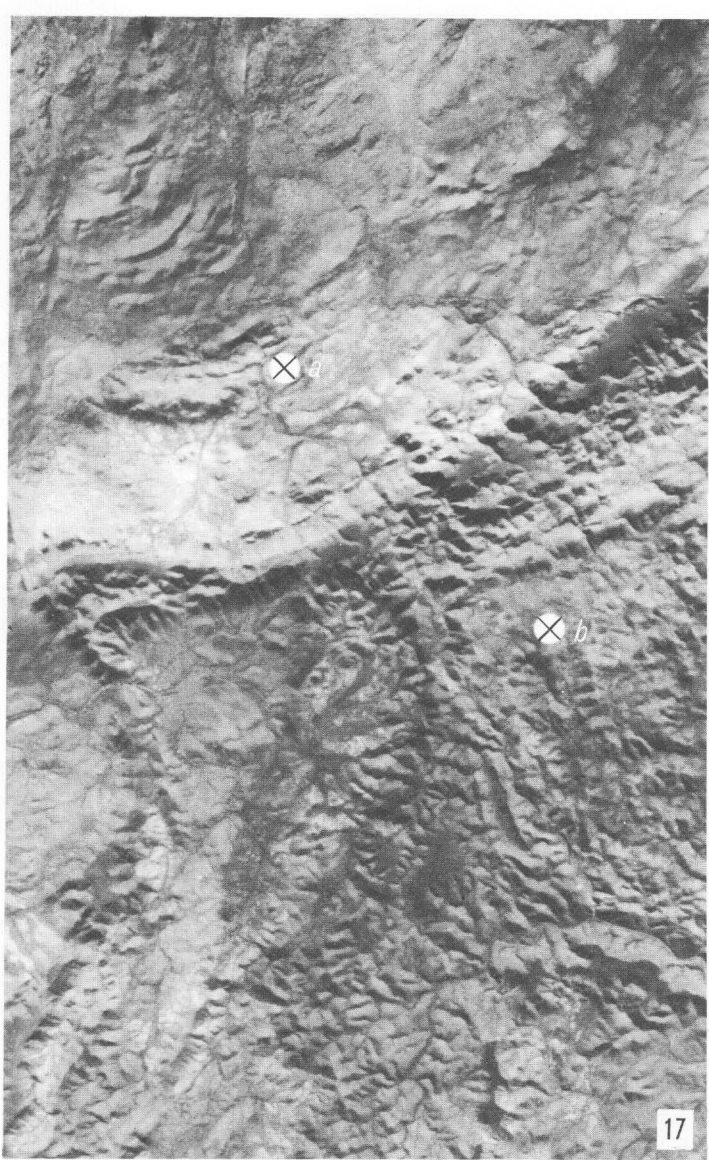
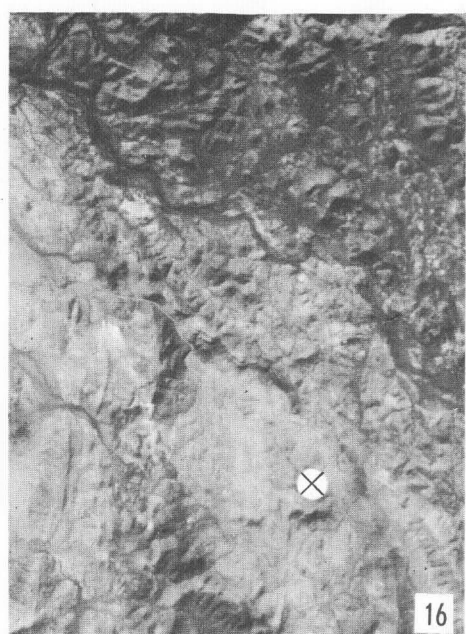
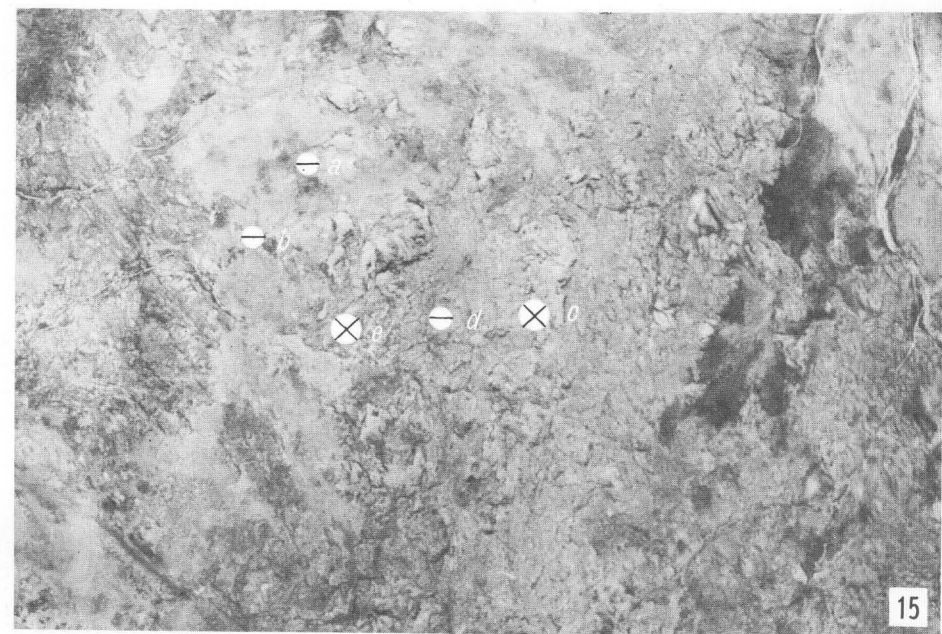
EXPLANATORY NOTES

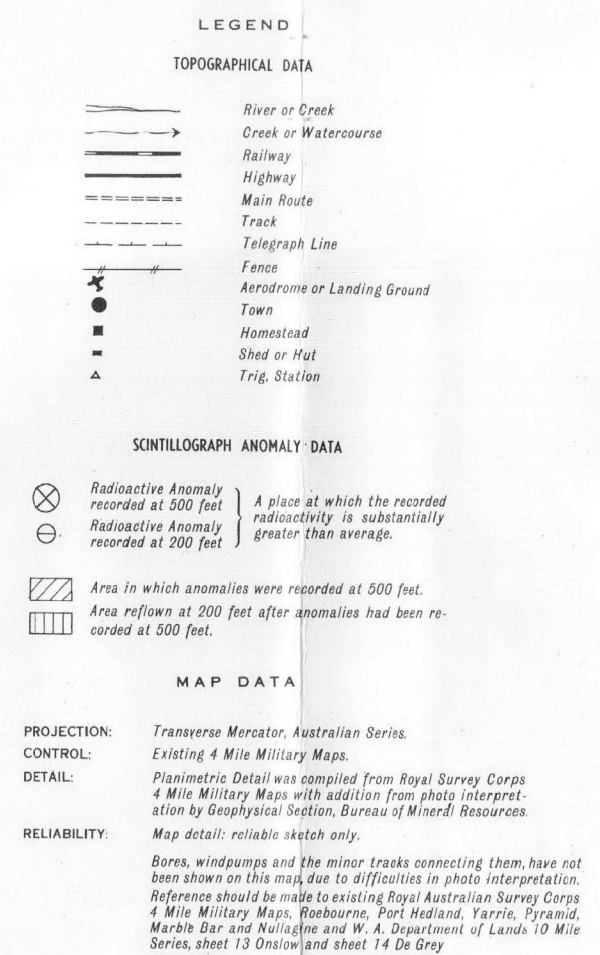
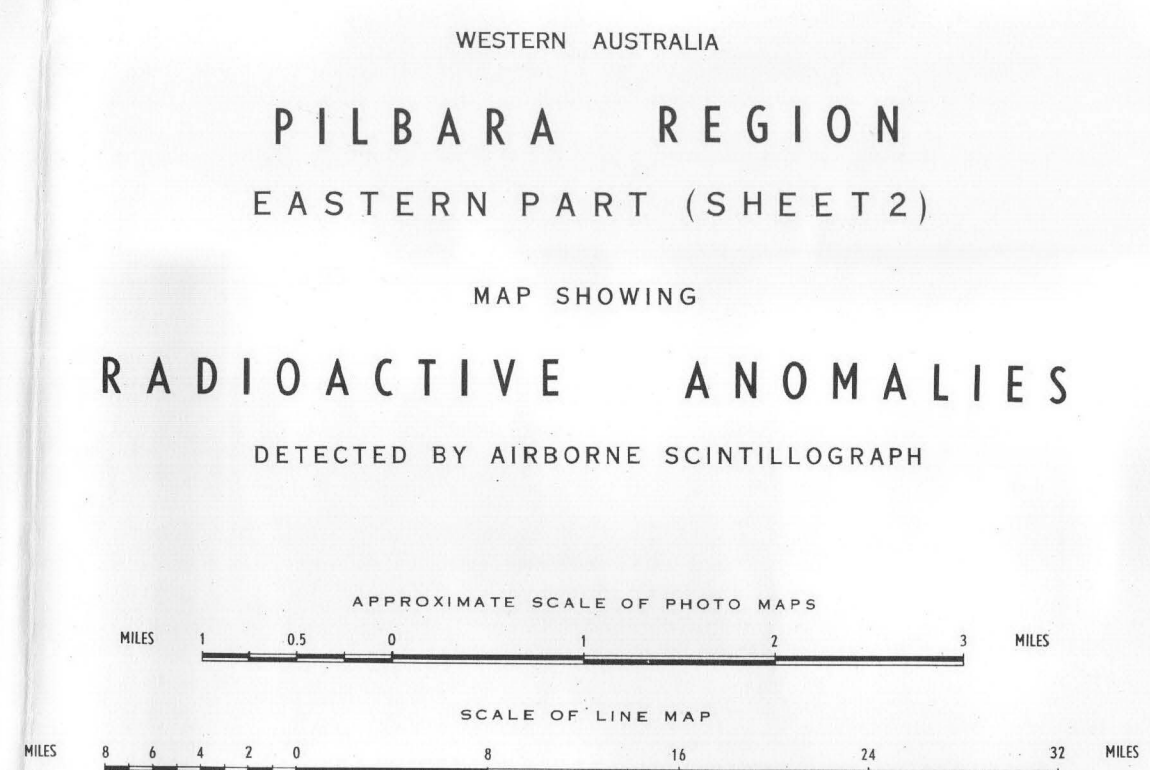
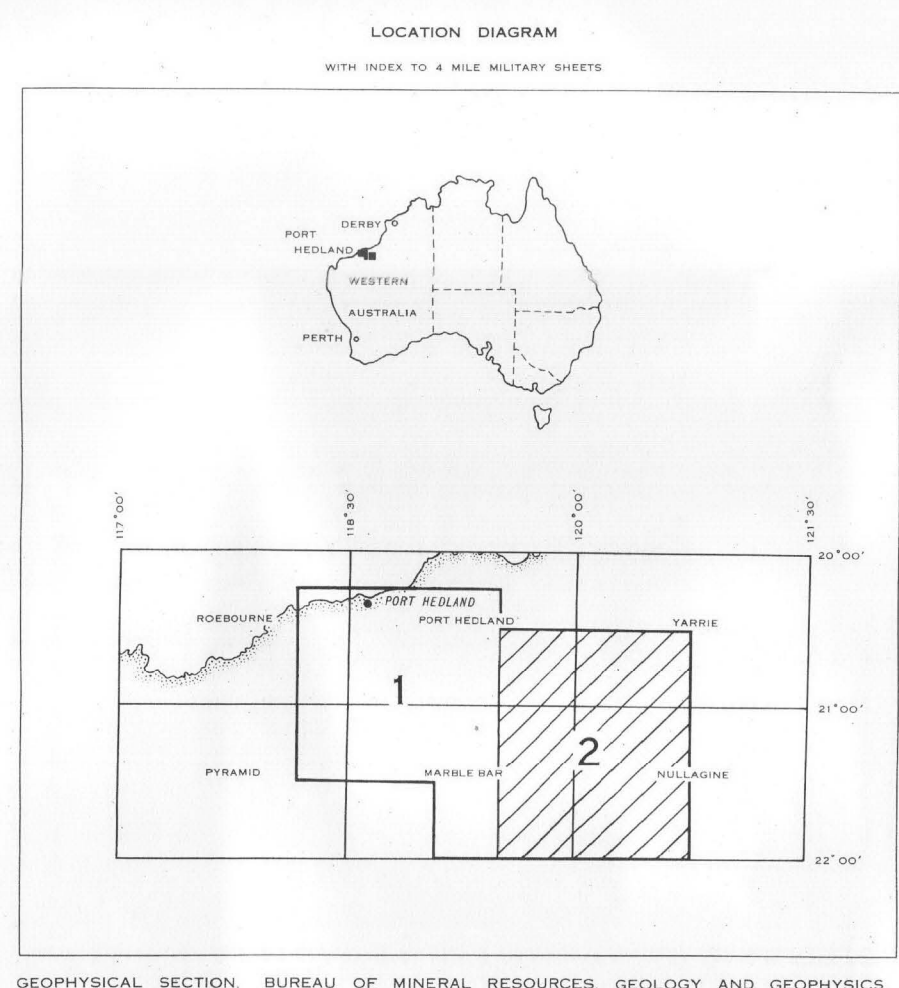
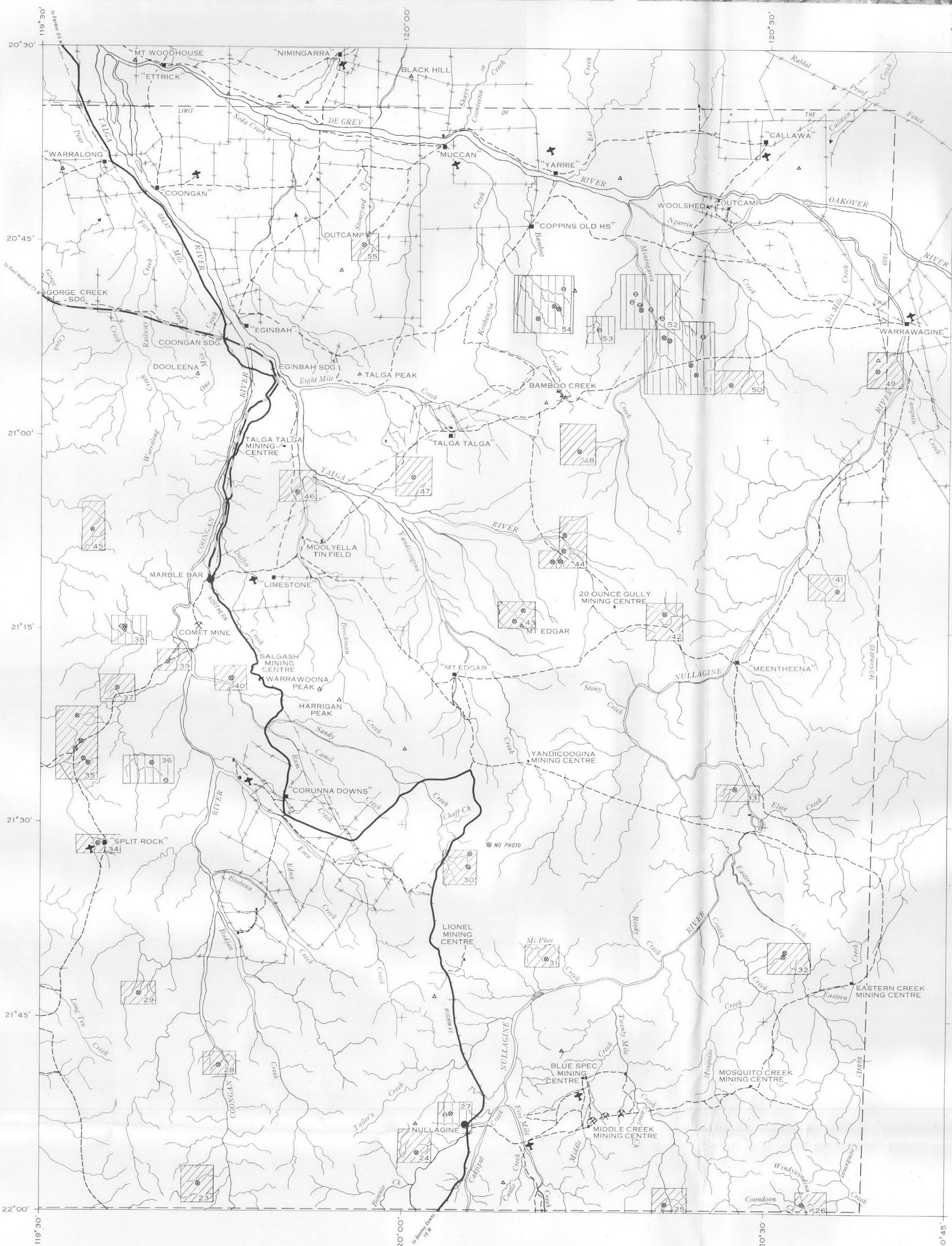
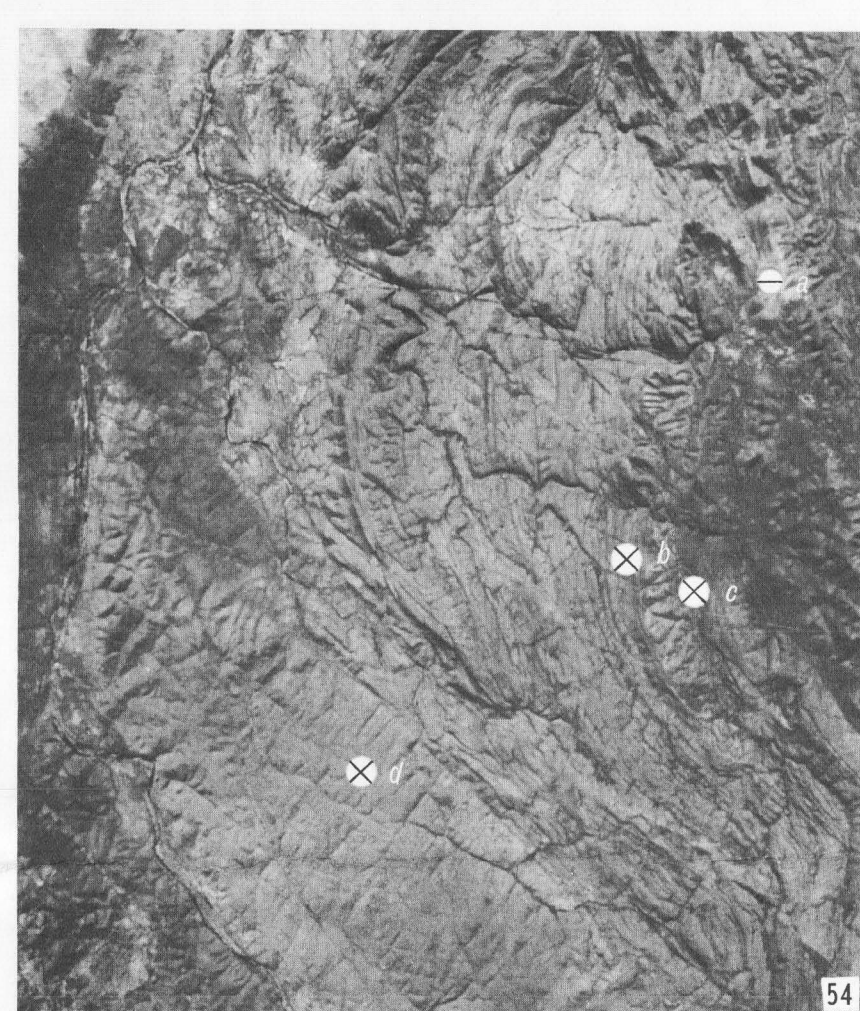
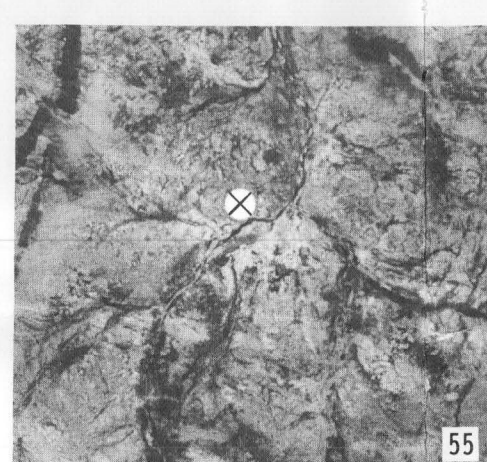
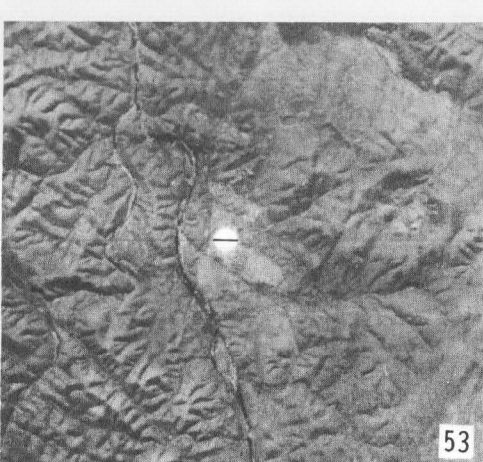
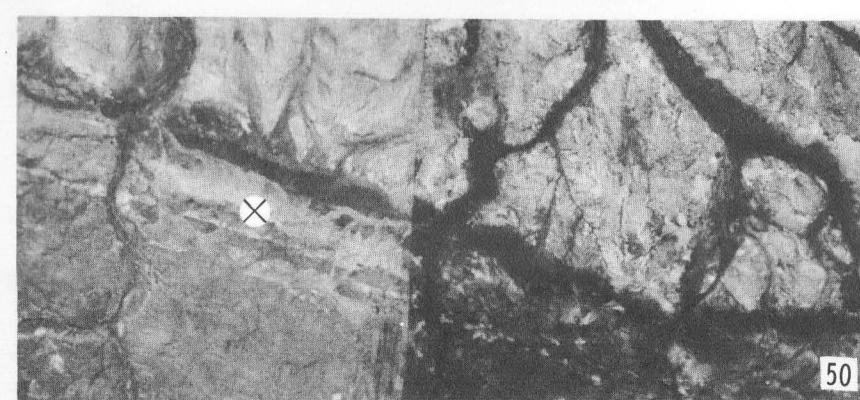
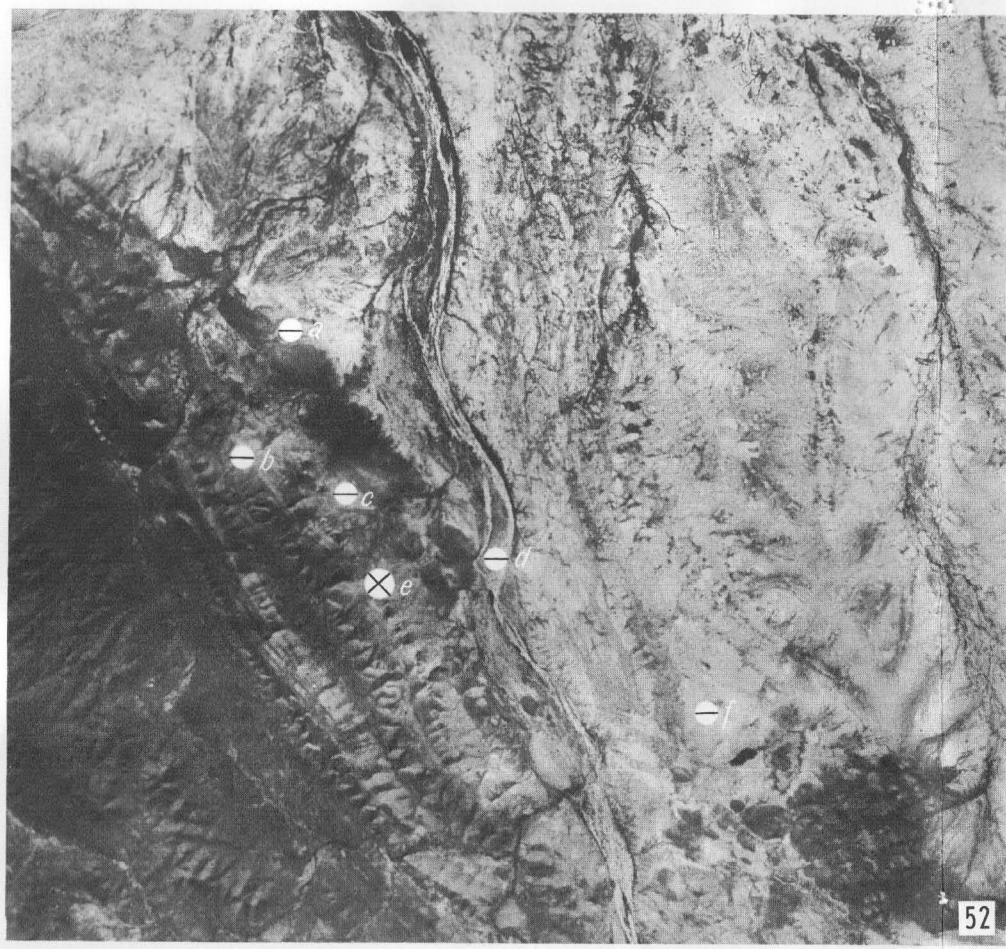
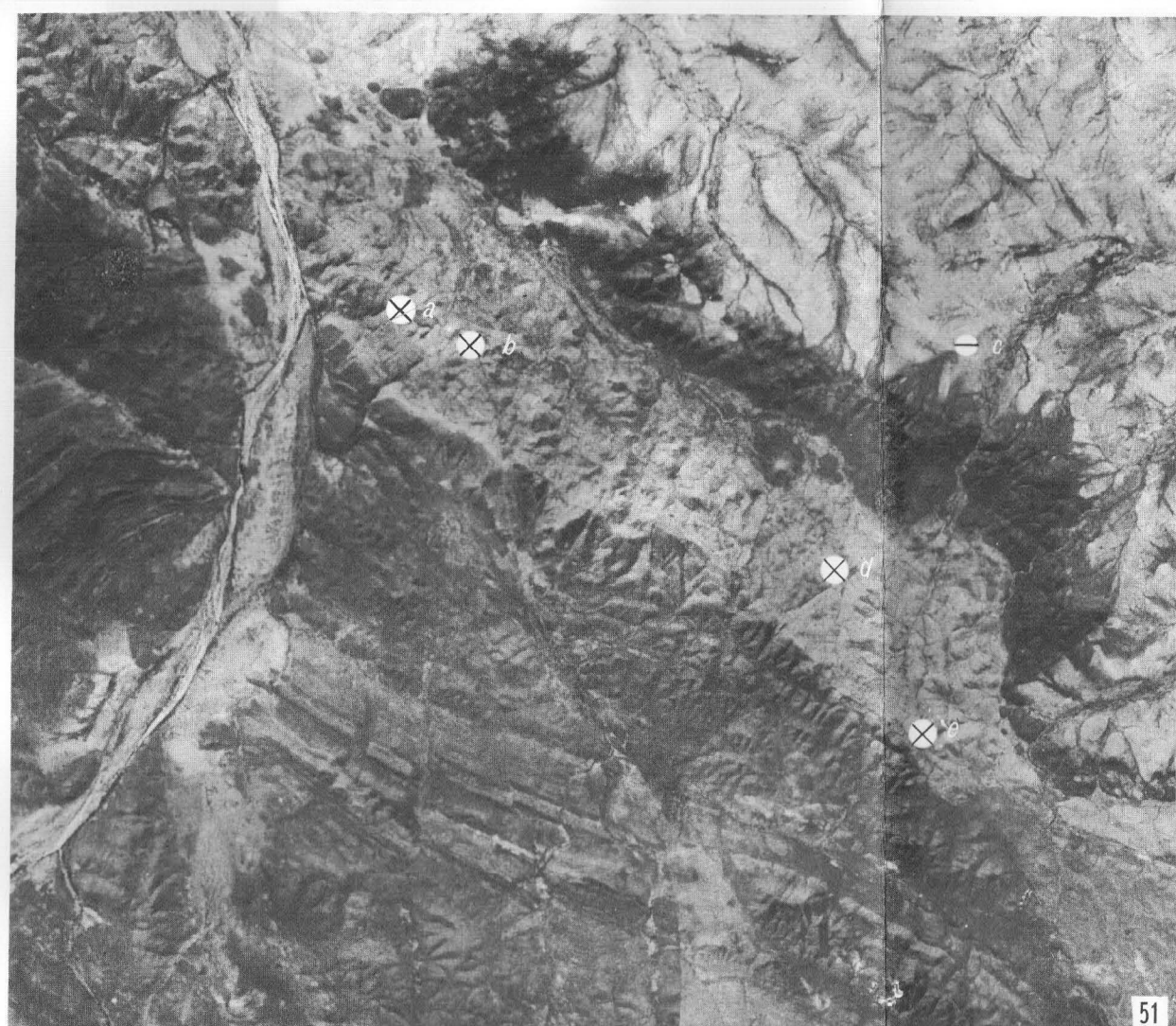
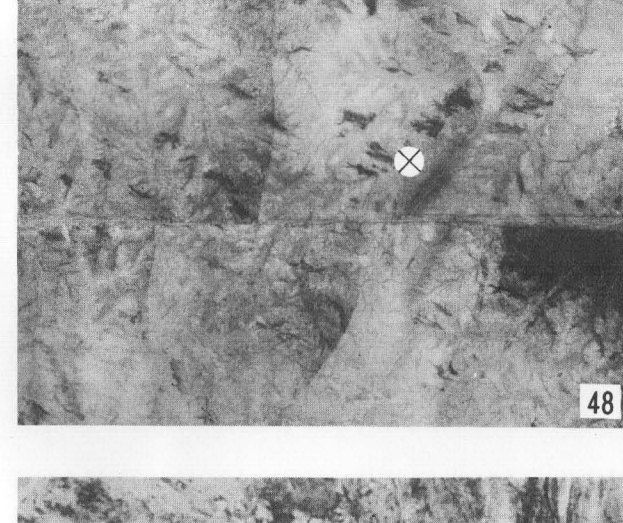
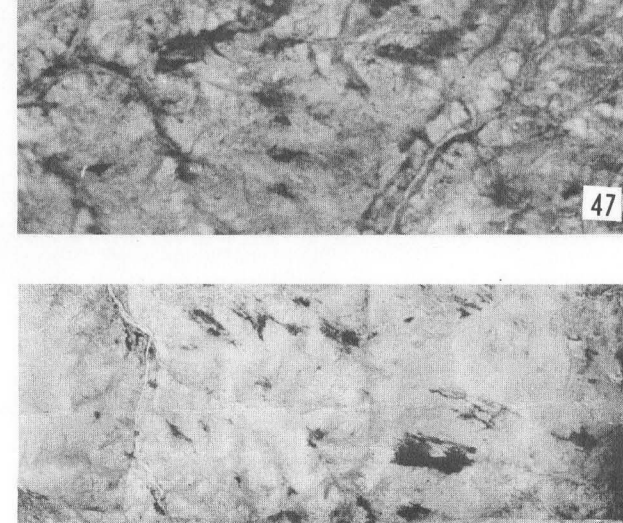
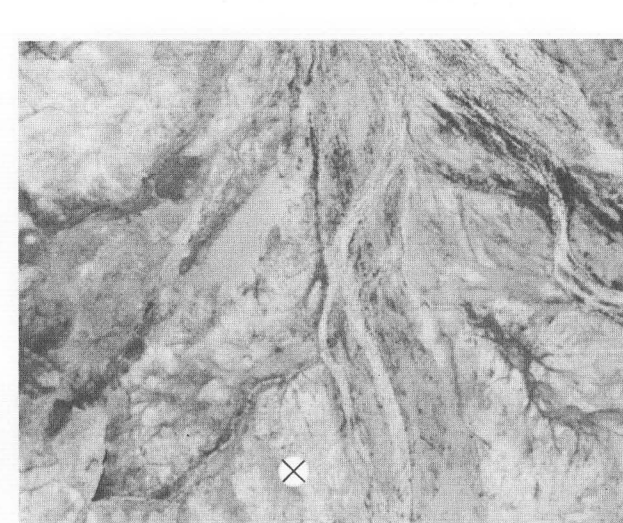
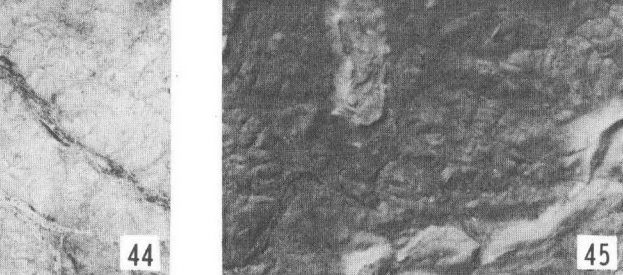
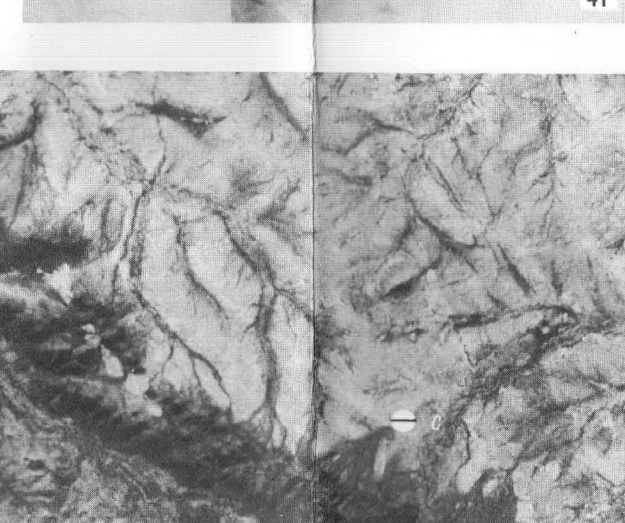
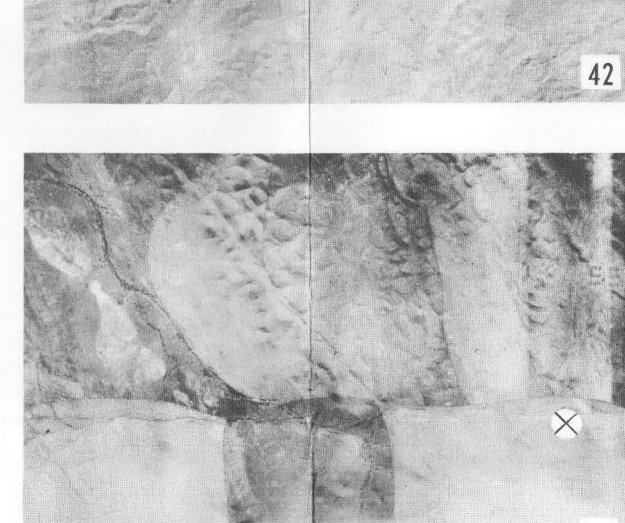
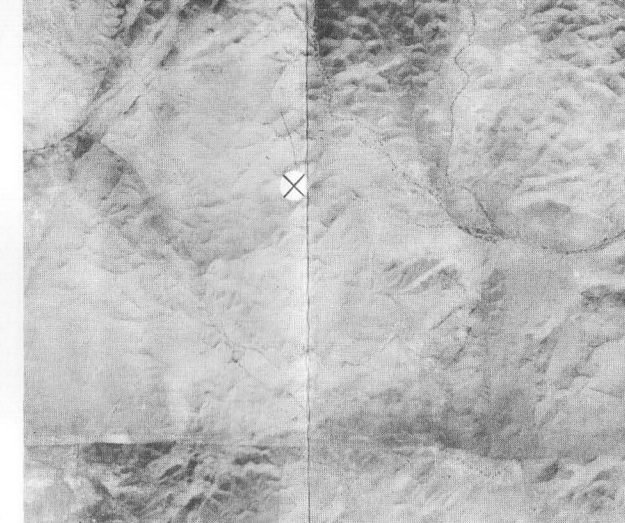
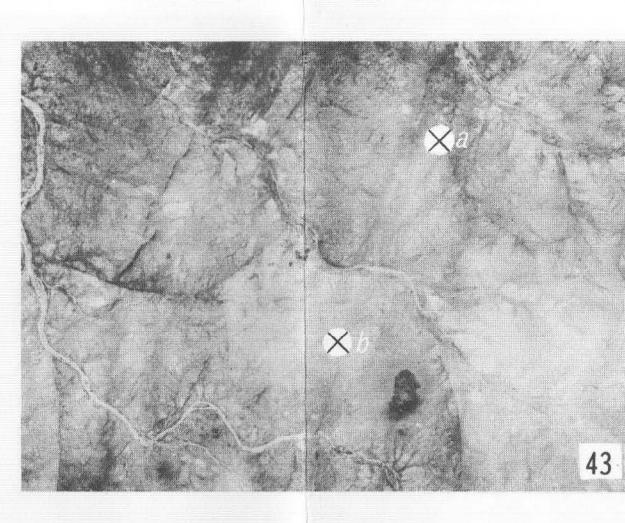
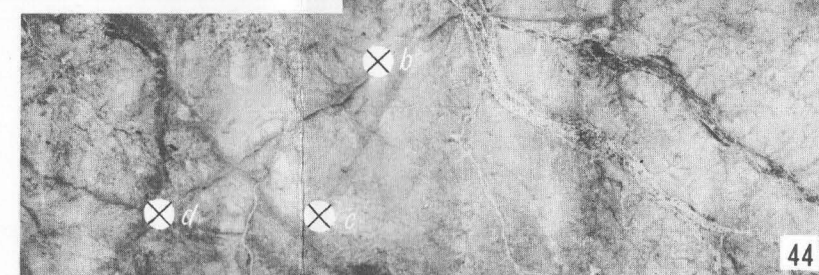
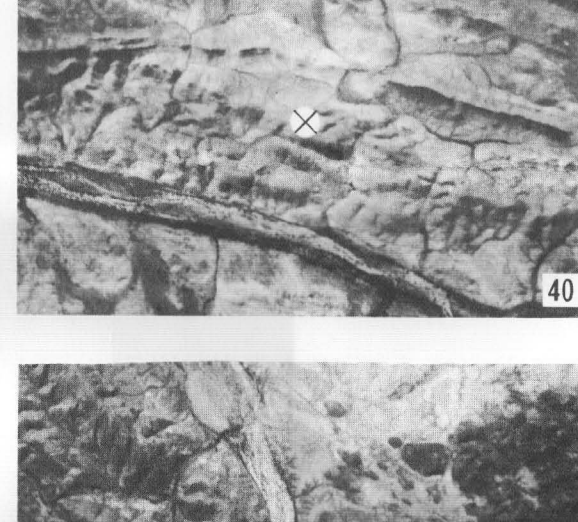
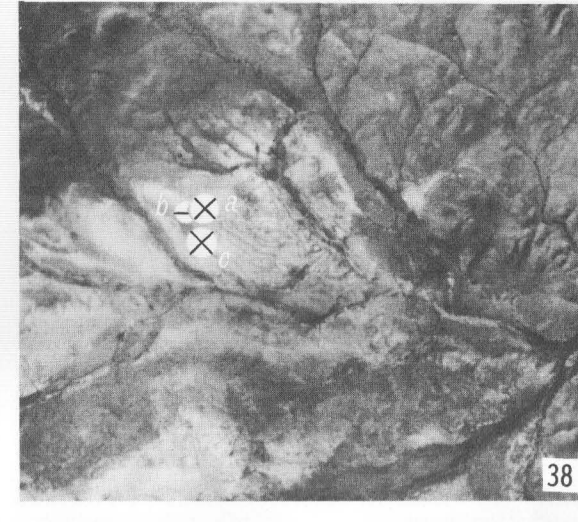
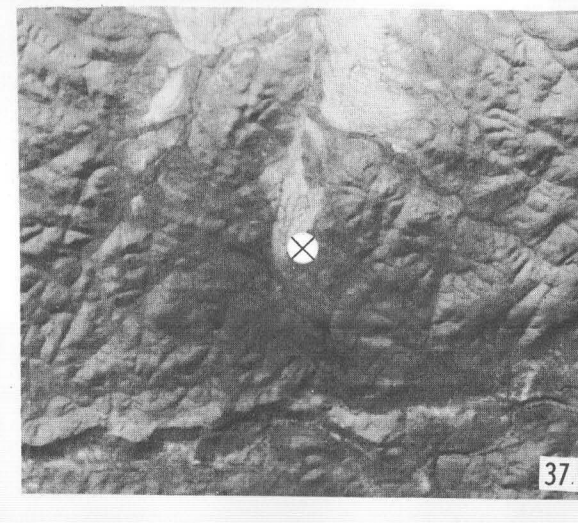
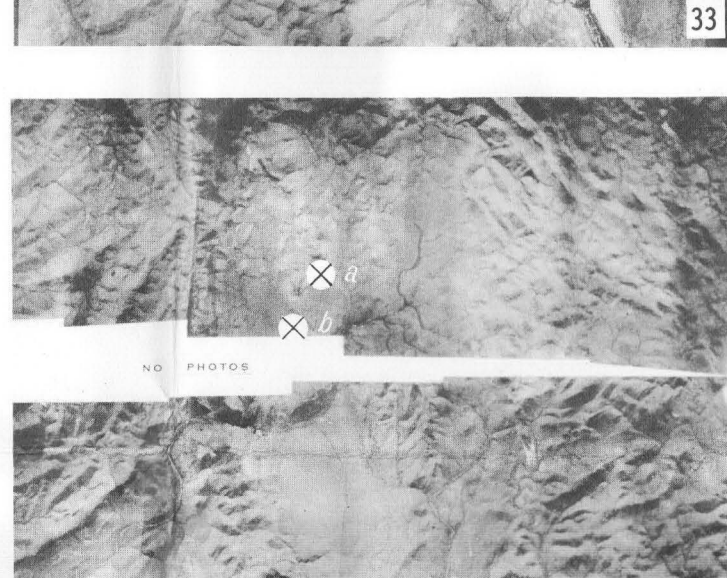
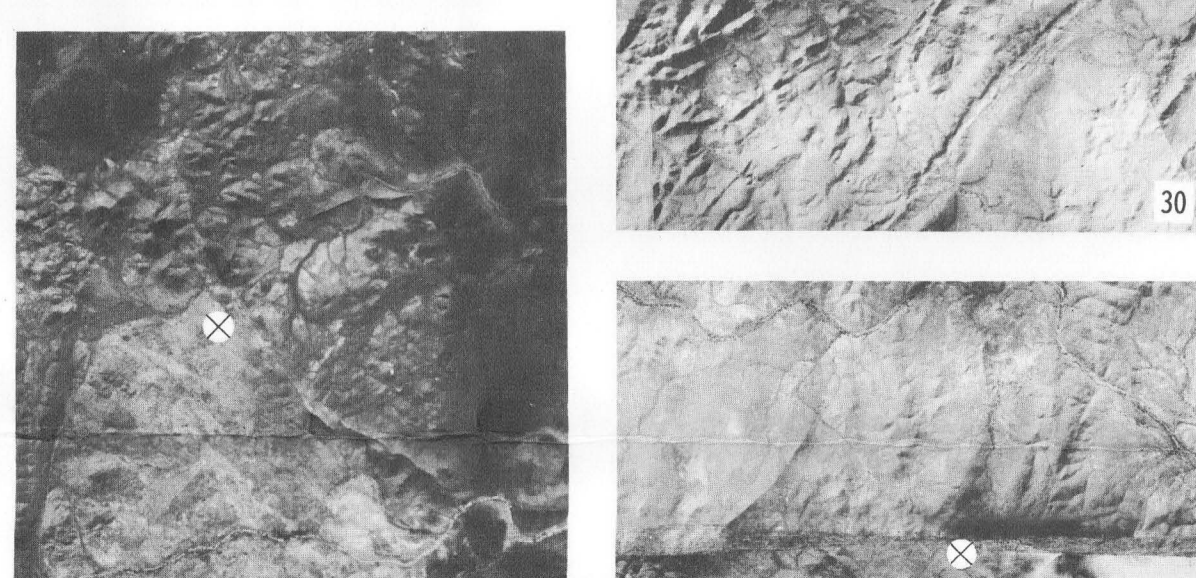
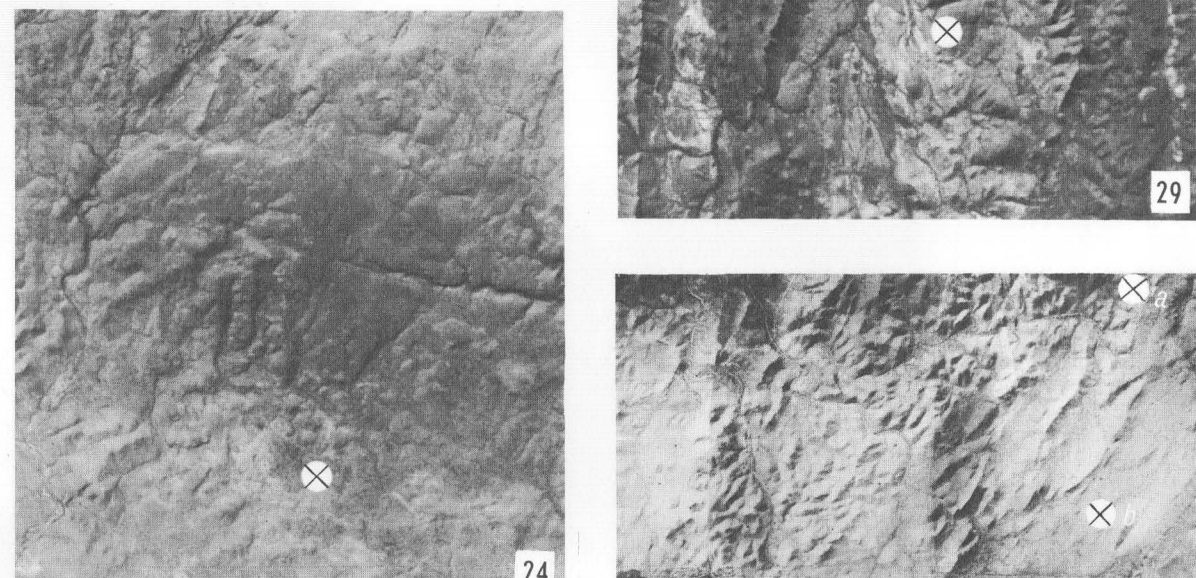
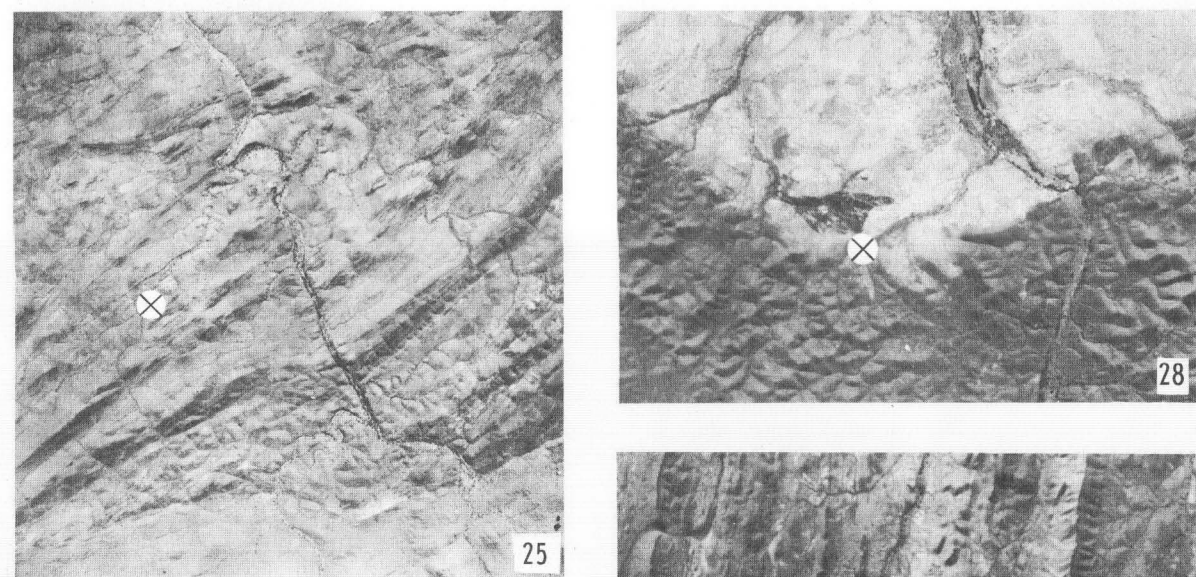
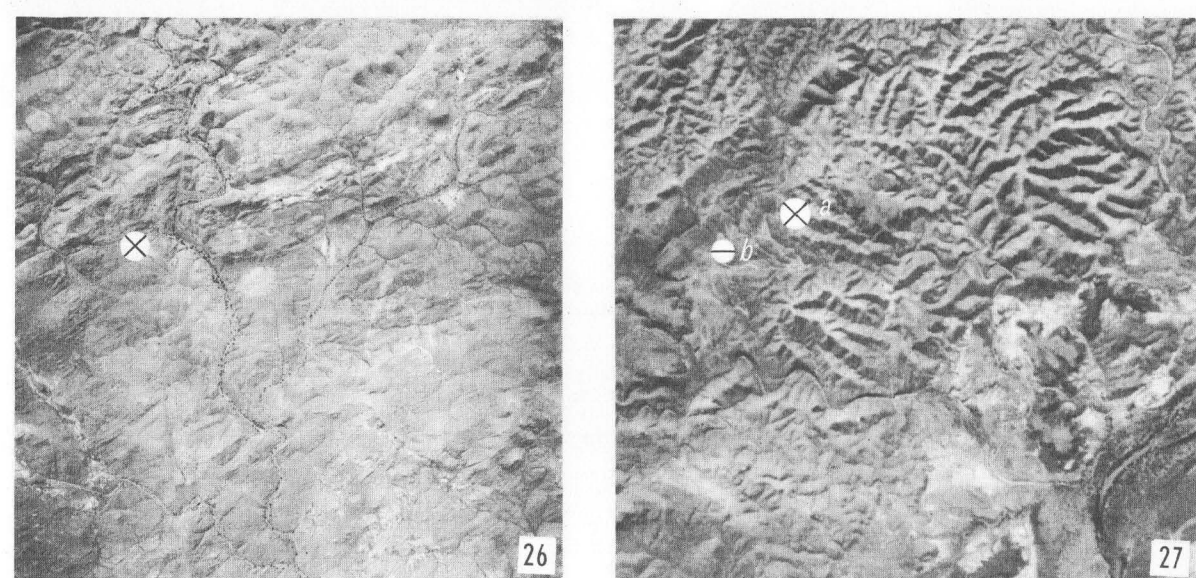
This map shows the result of a reconnaissance survey with an airborne scintillograph and serves only as an initial guide to prospecting.

The scintillograph records continuously the intensity of gamma radiation from the ground over which the aircraft flies. The intensity over any area is generally uniform but shows random variations above and below an average value. Anomalies are marked where the intensity is substantially greater than this average value.

The scintillograph was flown, where practicable, at a constant height of 500 feet above the ground. At this height the width of the zone from which radioactivity is recorded is effectively 200 to 250 yards wide. With a flight-line spacing of one mile, therefore only about ten per cent of the ground has been covered. The height of the aircraft was recorded continuously by a radio altimeter which enabled corrections to be made for variations in the aircraft's height above the ground. Aerial photographs were used for navigation and a continuously operated vertical camera recorded each flight-line.

An anomaly is considered to indicate an area in which uranium minerals may occur. No claim is made that all or even any of the anomalies correspond to uranium deposits of economic importance but it is possible that some do. Subsequent investigation on the ground is necessary to determine their significance and possible economic importance.





EXPLANATORY NOTES

This map shows the results of a reconnaissance survey with an airborne scintilligraph. Reconnaissance surveys are made over regions in which there is little information concerning uranium occurrences, in order to discover areas in which uranium mineralisation is likely to occur. The results therefore should be treated only as an initial guide to prospecting.

The scintilligraph records continuously the intensity of gamma radiation from the ground over which the aircraft flies. The intensity over any area is generally uniform but shows random variations above and below an average value. Anomalies are marked where the intensity is substantially greater than this average value.

The acinillograph was flown, where practicable, at a constant height of 500 feet above the ground. At this height the width of the zone from which radiolatically is recorded is effectively 200 to 250 yards. With a flight-line spacing of one mile, therefore, only about ten per cent of the ground has been covered. Some areas, in which anomalies were recorded, were re-flown in greater detail at a height of 200 feet above the ground. Any additional anomalies found on these flights are shown by a symbol which distinguishes them from those recorded at 500 feet. The height of the aircraft was recorded continuously by a radio altimeter which enabled corrections to be made for variations in the aircraft's height above the ground. Aerial photographs were used for navigation and a continuously operated vertical camera recorded each flight-line.

The source of an anomaly may lie as much as 350 yards from the pitted position of the anomaly and an area of this radius should be investigated. It should be noted that it is virtually only the radioactivity of the surface of the ground that has been recorded because the radiation from any buried deposit is substantially reduced by a few inches of non-radioactive rock or soil cover.

A single anomaly, or group of anomalies, is considered to indicate an area in which uranium minerals may occur. No claim is made that all or even any of the anomalies correspond to uranium deposits of economic importance, but it is possible that some do. Subsequent investigation on the ground is necessary to determine their significance and possible economic importance.

The map shows the general position and grouping of the anomalies. To assist in making investigations on the ground, all the anomalies have been reproduced singly or in small groups on aerial photographs on a scale of one inch equals one mile. These small areas are each numbered and the numbers appear on the map for cross-reference. Where there are several anomalies in any area these have been lettered a, b, c, etc.