MINEX SERVICES

TR 6654H - BRAMALL HILLS

ANNUAL REPORT TO 16TH FEBRUARY 1979

URANEX PTY LTD

Project Code: 1242
Report No.: 186
Date: MARCH 1979
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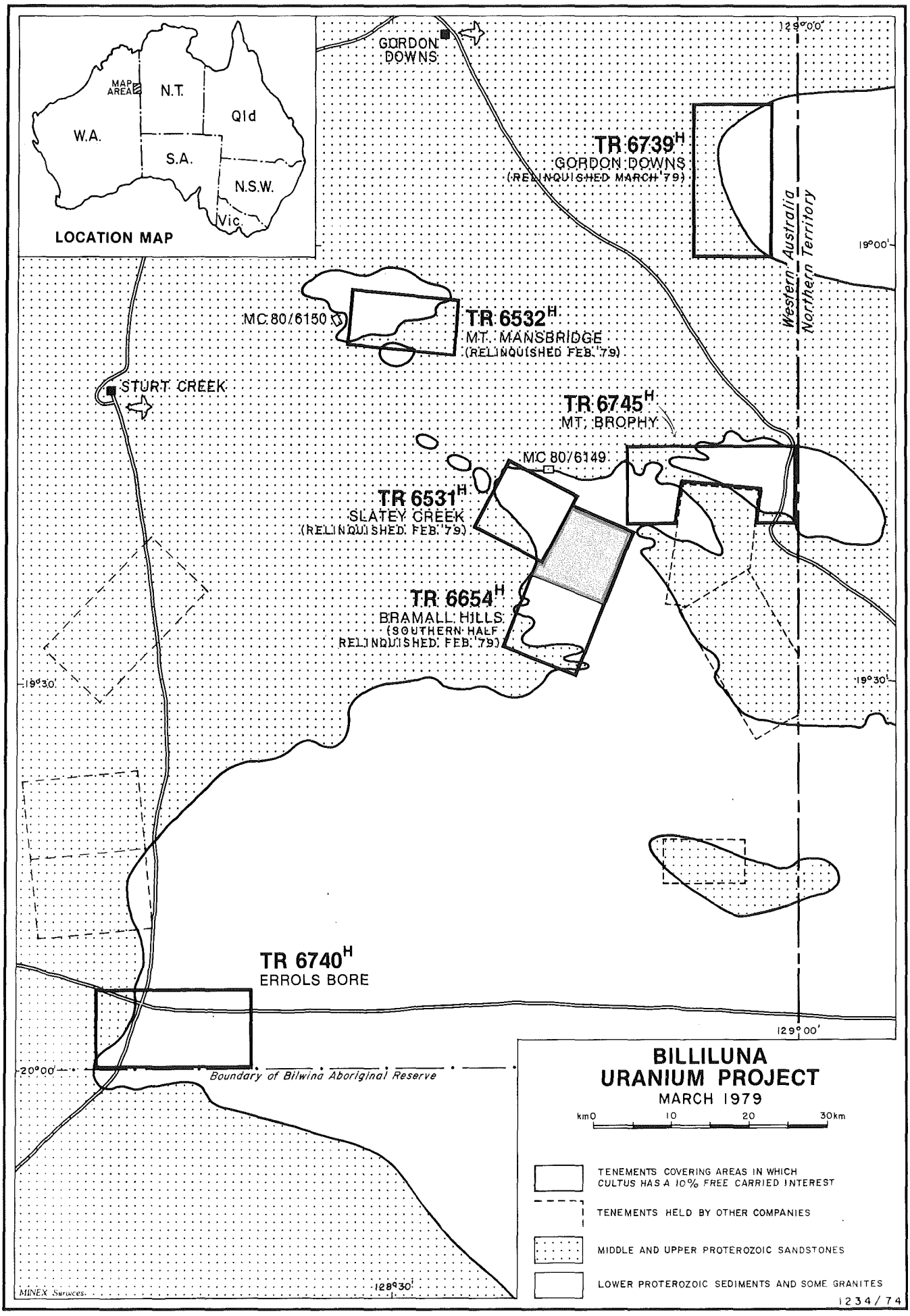
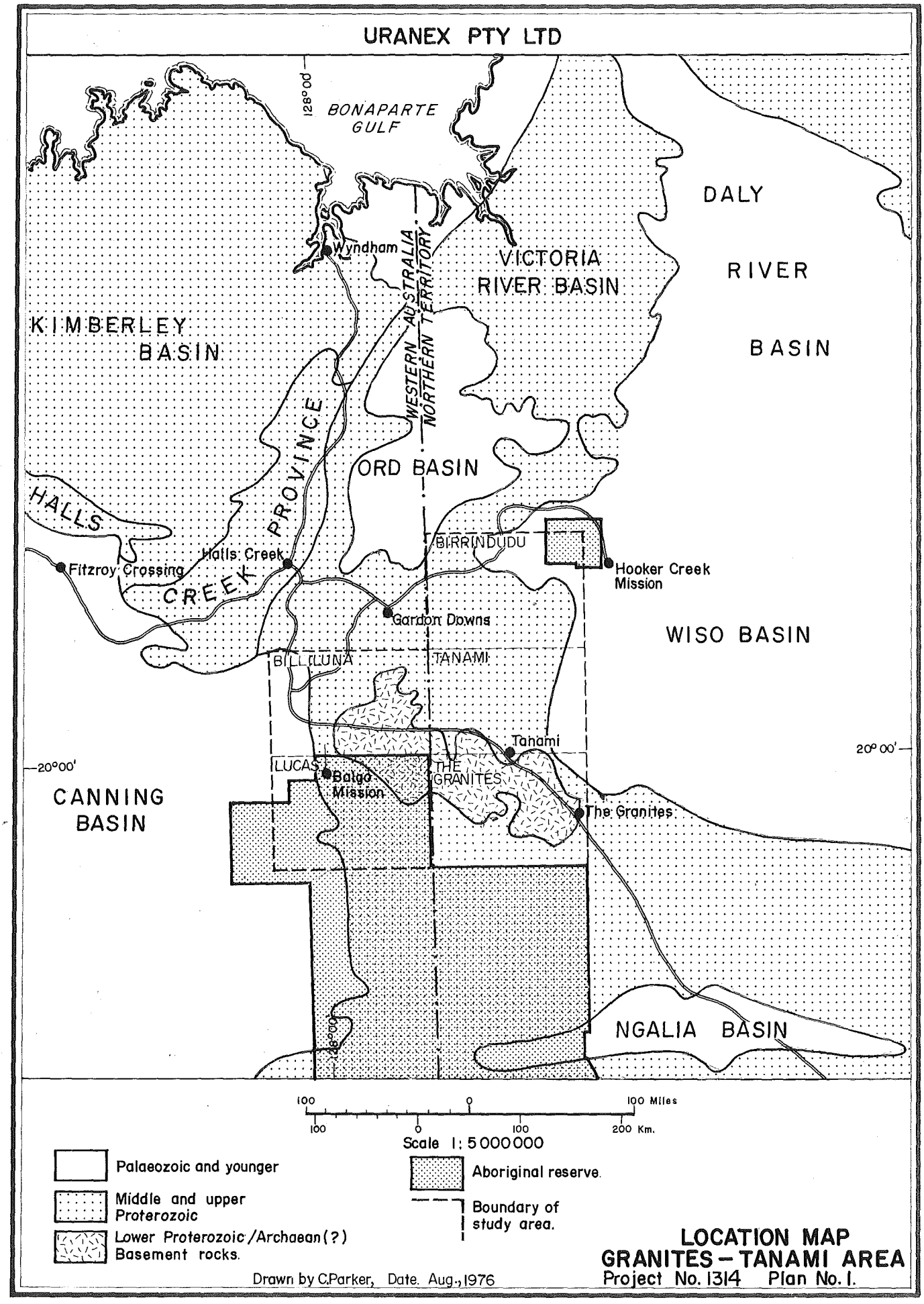

LOCATION MAP
MAP AREA
N.T.
Qld
W.A.
S.A.
N.S.W.
Vic.
GORDON DOWNS
129°00'
TR 6739H
GORDON DOWNS
(RELINQUISHED MARCH '79)
Western Australia
Northern Territory
19°00'
MC 80/6150
TR 6532H
MT. MANSBRIDGE
(RELINQUISHED FEB. '79)
STURT CREEK
TR 6745H
MT. BROPHY
MC 80/6149
TR 6531H
SLATEY CREEK
(RELINQUISHED FEB. '79)
TR 6654H
BRAMALL HILLS
(SOUTHERN HALF
RELINQUISHED FEB. '79)
19°30'
18°30'
TR 6740H
ERROLS BORE
129°00'
20°00'
Boundary of Bilwina Aboriginal Reserve
128°30'
MINEX Services
BILLILUNA
URANIUM PROJECT
MARCH 1979
km 0 10 20 30km
TENEMENTS COVERING AREAS IN WHICH CULTUS HAS A 10% FREE CARRIED INTEREST
TENEMENTS HELD BY OTHER COMPANIES
MIDDLE AND UPPER PROTEROZOIC SANDSTONES
LOWER PROTEROZOIC SEDIMENTS AND SOME GRANITES
1234/74


URANEX PTY LTD
128°00'
BONAPARTE GULF
Wyndham
AUSTRALIA
WESTERN
NORTHERN TERRITORY
VICTORIA RIVER BASIN
DALY RIVER BASIN
KIMBERLEY BASIN
ORD BASIN
HALLS CREEK PROVINCE
Halls Creek
Fitzroy Crossing
BIRRINDUDU
Hooker Creek Mission
Gordon Downs
WISO BASIN
BILLILUNA
TANAMI
Tanami
20°00'
LUCAS
Balgo Mission
THE GRANITES
The Granites
CANNING BASIN
NGALIA BASIN
128°00'
100 0 100 Miles
100 0 100 200 Km.
Scale 1: 5 000 000
Palaeozoic and younger
Middle and upper Proterozoic
Lower Proterozoic/Archaean(?) Basement rocks.
Aboriginal reserve.
Boundary of study area.
LOCATION MAP
GRANITES – TANAMI AREA
Project No. 1314 Plan No. 1.
Drawn by C.Parker, Date. Aug., 1976

SUMMARY

Work carried out on TR 6654H, Bramall Hills, during 1978 has included the following:

1. An airborne radiometric/magnetic survey over TR 6654H and adjacent prospective areas carried out by Geometrics Inc., Sydney. The survey comprised 1152 km of flying and was carried out using a Geometrics Di GRS-3001 differential spectrometer with a GR900 detector interface set on a 1.2 seconds time base. The detector crystal has a volume of 2,000 cu inches. The multi-channel analog recorder was synchronised to a 35mm tracking camera and also recorded altitude and total magnetic intensity in addition to the total count, K, U and Th spectrometer channels. The Britten-Norman Islander aircraft maintained 100 knots at a mean terrain clearance of 80m along traverses at 300m spacing. A photo-mosaic at 1:20,000 constructed from enlargements of the government 1:83,000 air photography were used for visual navigation (and flight line recovery). In addition, some 112 line km of similar radiometric survey over the south-eastern corner of the Slatey Creek TR was carried out as part of the survey over Bramall Hills TR and is included in that section of this report.

2. Helicopter reconnaissance and inspection of 47 airborne anomalies interpreted from the above survey. The area of these anomalies was traversed in a Bell G47 helicopter at a constant terrain clearance of about 10m, a traverse interval of about 50m and a speed of 25 to 40 knots until the anomaly was located or the area extensively traversed. A ground inspection and reconnaissance of the anomalies was then carried out as warranted. A Scintrex GIS-3 spectrometer (with a 6.3 cu inch detector crystal) was used for this work. A total of 13 rock samples were taken during this work and analysed geochemically for U, Th, Cu, Pb, Zn, Ag and Au by Analabs Pty Ltd of Perth.

3. Pegging of 48.7 line km of 50 x 20m grid consisting of 20.5 line km in the BH1 grid, 8.5 line km in the BH2 grid, 8.3 line km in the BH3 grid and 11.4 line km in the BH4 grid.

4. Pegging of 15.4 line km of 25 x 10m grid as detailed fill-in gridding over anomalous parts of the BH1, BH3 and BH4 grids.

5. Multi-channel ground radiometric surveys totalling 44.7 line km at 50 x 20m spacing over the BH1, BH2, BH3 and BH4 grids (19.2, 7.4, 7.5, 10.6 line km respectively). A Geometrics GR410 differential spectromer, with a 21.2 cu inch detector crystal and a 1 minute sample time was used. Uranium readings were adjusted for the effect of thorium before plotting.

6. Multi-channel ground radiometric surveys totalling 15.4 line km at 25 x 5m spacing over the detailed (25 x 10m) grid in-fill on BH1, BH3 and BH4 grids (4.1, 4.1, 7.2 line km respectively). The Geometrics GR-410 differential spectrometer was used as above.

7. Ground magnetic surveys totalling 48.7 line km at 50 x 20m spacing were carried out over the BH1, BH2, BH3 and BH4 grids using a Scintrex MF2 fluxgate magnetometer (20.5, 8.5, 8.3, 11.4 line km respectively).

8. Ground magnetic traverses at 5m station spacing using the Scintrex MF2 magnetometer were carried out along drill sections. These traverses totalled 2.0 line km.

9. Geolocial mapping at 1:1,000 scale of the BH1, BH2, BH3 and BH4 grids with "field assaying" and sampling of anomalous rocks. A total of 154 rock samples were analysed geochemically for U, Th, Cu, Pb, Zn and Ag by Analabs Pty Ltd; 118 samples were from BH1 grid, 8 from BH2, 6 from BH3 and 22 from BH4. Spot "field assays" using the GR-410 spectrometer were made at each of these sample localities.

10. Diamond drilling of 15 holes totalling 1,774m. Five of these holes were drilled on the BH1 grid, 2 on BH2, 3 on BH3 and 5 on BH4. The drilling was carried out by Longyear Australia Pty Ltd, Perth. A total of 404 split core samples was analysed geochemically for U, Th, Cu, Pb, Zn and Ag (325 also for Au)* by Analabs Pty Ltd of Perth and 17 core samples examined in thin section and described by Mintek Services of Perth.

* Not available from the company

11. Geophysical probing of all drill holes was carried out by Geoscience Associates (Australia) Pty Ltd, Adelaide. The probe was a Geoscience instrument and contained a ½" x ½" NaI detector giving a total count (above 0.10 MeV) radiometric reading. It also provided a resistivity and self-potential profile.

12. The results of exploration on the BH3 grid are somewhat encouraging, while results from BH1, BH2 and BH4 grids are somewhat discouraging. The exploration of the latter 3 grid areas was suggestive of a lateritic or other weathering profile, producing a surface enrichment of uranium,however the process and details of such enrichment are not sufficiently clear to be able to reliably recognise similar conditions elsewhere in the project area.

It is therefore recommended that the southern half of the Bramall Hills Temporary Reserve be relinquished while the northern half, containing all present grid areas and all other areas of significant potential, be retained pending exploration results from BH3 grid and other targets within the project area. Alternatively some 12 mineral claims (1,440 hectares) could be pegged to hold the main areas of interest. Further drilling is warranted on the BH3 grid--probably 3 to 5 diamond holes or 8 to 12 percussion holes.

PROGRAMME & PERSONNEL

Airborne radiometric surveys were carried out by Geometrics Inc of Sydney over areas at (see Plan No. 1314/5) Slatey Creek and Mt Mansbridge (in November 1977 - previously reported) and Birrindudu, Bramall Hills, Gordon Downs, Errol's Bore and South Billiluna areas (in the July-October 1978 period). Some minor fill-in flying at Slatey Creek and Mt Mansbridge was also carried out in the latter period. Because of the extended delays involved in the carrying out of these surveys the airborne survey of the Mt Brophy area was carried out in October-November 1978 by Minex Services field crew. Interpretation of analog records of the surveys was carried out by Minex Services in consultation with Mr Dockery, geophysical consultant of Perth.

Other field work consisted of an intergrated programme of anomaly inspection and reconnaissance, detailed grid surveys of selected anomalies and diamond drilling (Bramall Hills only). This was carried out in the August-November 1978 period by a field crew of 7 to 8 including geologists V T Roberts (Senior Project Geologist), N K Pratt (Project Geologist) and B D Armstrong; overall supervision was provided by R P Hewitt and C J Flesher.

Diamond drilling was carried out by Longyear Australia Pty Ltd, Perth, geophysical probing of drill holes by Geoscience Associates (Australia) Pty Ltd, Adelaide and laboratory analyses carried out by Analabs Pty Ltd of Perth.

BRAMALL HILLS

Geology

The northern part of the Bramall Hills area covers a large area of "exposed" basement schists (Killi Killi Beds) adjacent to overlying unconformities of the Gardiner Sandstone (Middle-Lower Proterozoic) and Lewis Range Sandstone (Upper-Middle Proterozoic). The Killi Killi Beds are thought to be Lower Proterozoic in age and are intruded by the Middle-Lower Proterozoic Slatey Creek granite in this area (see Plan No. 1234/21). The exposure of the basement is quite poor in that it consists of small areas of moderate-strongly weathered outcrops, somewhat larger areas of strongly weathered sub-outcrop, but mostly areas of residual soil which show a distinct pattern of banding and fold structures on aerial photographs, but do not show the character of the underlying rock on the ground. The limited outcrops suggest that most of the basement rocks in this area are meta-sandstones containing shaley zones (as at BH3 grid) towards the north and relatively uniform metasiltstones with included basic amphibolite (basic metalava) to the south, as at BH1 and BH4 grids. There is also a suggestion of greater development of coarse sericite in the rocks to the south; this may be due to their proximity to Slatey Creek Granite.

Some lateritic alluvial sediments of probable Tertiary-Cretaceous age occur, mostly on the margins of areas of exposed basement rocks. These appear to be minor in the present area of interest, but may have significant extent in the paleo-drainage system to the east of the Bramall Hills survey area.

In the southern half of the Bramall Hills area, the main outcrop is Lewis Creek Sandstone, with minor outcrop of Slatey Creek Granite and associated pegmatities exposed against the excarpment formed by the Lewis Range Sandstone. Minor outcrop of Killi Killi Beds in the area of anomaly C765 (see Plan No. 1234/21) is essentially weathered, fine grained granitic gneiss; this is thought to be due to metamorphism by the nearby granite. The large area of no outcrop in the central-southern part of the Bramall Hills area is largely sand covered.

Airborne Survey

A total of 47 anomalous responses was interpreted from the analog records and are shown on Plan No. 1234/21 in A8797 and detailed in Table 8. These include 7 anomalies within the area of the Slatey Creek Temporary Reserve which was omitted from the earlier Slatey Creek survey, but included in the Bramall Hills survey (details of these anomalies are included under Bramall Hills).

It is noted that anomalies A353 (BH1 grid) and B013 (BH3 grid) shown on Plan No. 1234/21 were located in the earlier Slatey Creek survey and described in the earlier Report 1236/167. As a result of the earlier work, detailed grid surveys had commenced at the BH1, BH2 and BH3 grids before results of the Bramall Hills airborne survey were available. The B013 airborne anomaly was not pinpointed as an anomaly worthy of investigation by the Bramall Hills survey. This is due partly to the small size and intensity of the anomaly, its overlap with the adjacent "outcrop" anomaly and the east-west orientation of traverse lines - being essentially along strike at this point.

In general, the Bramall Hills survey showed low thorium channel values, and moderate to high backgrounds for uranium and total count channels, taking into account the poor exposure of basement rocks.

Helicopter Reconnaissance

Anomalies A520, A542 and A637 were found to be located over already established grid areas and anomalies B595 and A615 found to compare favourably with the gridded areas. They were associated with gossans of significant size giving greater than 100 ppm U at the reconnaissance stage; gridding (BH4 grid) and detailed surveys were therefore carried out over them. Details of the detailed surveys and consequent drilling of all grid areas is given below.

BRAMALL HILLS

TABLE OF AIRBORNE RADIOMETRIC ANOMALIES

ANOMALY NUMBER* AND GRADE	TRAVERSE LINE	FIDUCIAL	TOTAL COUNT (cps)		K-CHANNEL (cps)		U-CHANNEL (cps)		TH-CHANNEL (cps)		COMMENTS
			Peak	B'ground	Peak	B'ground	Peak	B'ground	Peak	B'ground	
D055	T401W	00550	740	460	64	34	55	28	36	28	
D057	T401W	00570	610	440	52	26	52	28	28	28	
D091	T39E	10910	700	550	48	40	55	32	43	30	
D100	T441E	01000	530	450	36	32	48	28	36	28	
D127	T40W	11270	880	440	90	27	54	30	58	26	
E160	T4W	41602	660	610	53	53	44	35	26	26	
D172	T4W	41729	680	620	49	49	50	30	27	27	
E205	T5E	42054	790	700	53	53	48	40	29	29	
E218	T6W	42189	780	720	51	51	50	38	25	25	
E225	T44W	12250	630	490	65	43	60	37	46	30	
C232	T7E	42322	730	660	60	60	48	34	29	29	
C234	T7E	42341	750	640	53	48	48	39	33	30	
C245	T7E	42455	680	640	29	29	42	30	28	22	
D319	T48W	13190	540	440	30	30	50	28	24	25	
C368	T50W	13680	730	500	110	43	54	32	36	30	
D384	T51E	13840	1280	500	110	25	87	32	68	32	
E415	T52W	14150	760	500	72	35	56	34	38	25	
C431	T15E	44312	660	490	28	31	40	28	28	24	
C438	T15E	44381	730	580	58	58	40	33	30	22	
C447	T15E	44474	680	620	45	45	43	33	27	27	
D470	T16W	44700	820	620	49	49	54	37	28	23	
D473	T16W	44734	750	610	46	66	50	36	29	23	
D517	T18W	45171	660	605	47	47	50	38	20	20	
A520	T18W	45210	1000	620	56	56	70	35	27	22	BH1 Grid
A542	T19E	45424	1205	580	80	49	78	35	34	23	BH1 Grid
C544	T19E	45448	735	600	44	44	54	34	32	24	
C546	T19E	45464	720	620	47	47	47	32	31	24	
D559	T20W	45590	970	550	31	31	58	36	44	21	
B593	T21E	45938	1150	640	80	48	74	42	37	25	BH4 Grid
A615	T22W	46154	1250	610	90	59	75	39	35	21	BH4 Grid
C617	T22W	46170	695	600	70	60	42	31	26	23	
A637	T23E	46379	1300	640	108	74	94	38	34	20	BH2 Grid

Continued

BRAMALL HILLS (continued)

C649	T23E	46495	660	580	50	44	45	33	18	22	
B660	T24W	46600	1020	595	66	66	65	32	25	21	Similar to and south of BH4 Grid
C699	T26W	46990	730	505	26	37	52	28	28	21	
C707	T26W	47070	675	540	49	49	50	32	20	20	
D725	T66W	17250	1040	710	108	59	72	46	60	35	
B730	T27E	47303	870	600	46	46	64	34	28	23	Mainly sand co east of C707
C733	T27E	47334	585	530	33	33	44	30	24	22	
D744	T67E	17440	610	520	47	34	38	32	38	32	
D747	T28W	47470	670	520	30	36	40	28	26	20	
D757	T67E	17570	780	550	60	44	54	38	52	30	
D751	T28W	47532	615	465	37	37	40	30	24	16	
D755	T67E	17550	960	590	100	47	56	38	43	28	
C765	T29E	47653	640	430	70	33	42	28	23	20	Immediately west of BH4 Grid
D782	T68W	17820	780	470	63	32	56	33	50	34	
D825	T31E	48254	640	480	29	29	40	31	28	23	

BRAMALL HILLS

SUMMARY OF HELICOPTER RECONNAISSANCE

ANOMALIES LOCATED	ANOMALIES EXPLAINED BY EFFECT OF TOPOGRAPHY, OUTCROP CONTRAST, STATISTICAL VARIATION ETC	ANOMALIES NOT LOCATED
Significant Anomalies	D055 Topography, granite outcrop; some granite weakly anomalous (to 45 cps on GlS-3)	E160 Due to statistical variation in alluvial soil (?) Further reconnaissance suggested
A520) A542) Limonite veins in amphibolite schist; greater than 100 ppm U at reconn stage	D057 Topography	D172 Over soil cover, statistical variation?
- BH1 Grid	D100 Weak anomaly over sandy soil (reflects sub-surface granite?)	E205 Past end of line; due to altitude/ orientation change of aircraft?
B593) A615) Limonite veins in amphibolite schist; greater than 100 ppm U at reconn stage	D127 Topography, minor outcrop of granite	E218 Over soil cover, statistical variation?
- BH4 grid	D319 Topography	D245 " "
A637 As above - BH2 grid	D384 Topography, outcrop of granite(?)	C368 " "
B660 Similar to above, less extensive veins, maximum assay 50 ppm U.	E415 " "	D747 " "
C707 Minor anomalous limonite vein up to 100 ppm U. Extensive non-anomalous limonite veining.	C431 Topography	
Anomalies Without Significant Potential	C438 Outcrop of granite	
D091 Edge of clay pan - due to concentration of salts (?)	C447 " "	
E225 " "	D473 " "	
C232 Alluvial soil - related to old (Tertiary?) river channel	D517 Sub-outcrop of basement schists	
C234 Weakly anomalous clay pan (part of Tertiary river channel?)	C546 " "	
D470 Lateritic alluvial sediments	D559 Coincides with Mt Brophy anomalies D167-D169 (reported under Mt Brophy)	
C544 Very weak anomaly over shallow residual soil	C617 Outcrop of basement schists (covered by BH2 grid)	
C649 Weak anomaly over sub-outcrop of basements schists	D725 Topography and outcrop of granite	
C699 Lateritic alluvial sediments	B730 Sub-outcrop of basement schist	
C733 " "	D744 Topography	
D825 " "	D751 Outcrop of granite and basement schist	
	D755 Topography and outcrop of granite	
	D757 " " some granite weakly anomalous (to 40 cps on GlS-3)	
	C765 Topography (and outcrop of basement schist?)	
	D782 Topography and outcrop of granite and basement schist	

Helicopter reconnaissance was carried out over the remaining 42 anomalies, with 2 anomalies (B660, C707) being similar to those gridded but with less anomalous and less extensive gossans; these are considered to be of moderate interest, but are not recommended for immediate exploration. As the results of exploration on the other anomalies will have a bearing on the assessment of these, their potential should be reviewed in the light of such results before detailed exploration is carried out on them.

A further 10 anomalies (see Table 9) were found to have a specific, though trivial cause, 23 found to be due to the effect of outcrop and/or topography, while 7 were not located in extensive searches and are not considered to have "real" anomalies.

BH1 Grid

The BH1 grid was placed to allow controlled ground surveys of airborne anomaly A353 noted in the flying of the Slatey Creek TR but located within the adjoining Bramall Hills TR. The anomaly was confirmed as anoamlies A520 and A542 in the later airborne survey of the Bramall Hills TR.

Previous investigations have been conducted over the area by Esso Exploration, but a review of these suggested they had been too cursory to fully investigate the potential of the anomaly, or to fully explain its occurrence (see Report 1236/167).

Geology: The gridded area covers a weathered outcrop of metamorphosed Killi Killi Beds. Within the grid area these are intruded by the Slatey Creek Granite of Proterozoic Age. The outcrop area measures approximately 450m x 200m with a larger area of rubble and sub-outcrop through which resistant limonite-haematite veins protrude (see Plan No. 1234/45). Outside this zone, sand cover dominates. Within the sub-outcrop area there are several small areas of Tertiary (?) alluvial laterite, all of which occur at topographically lower levels than the main outcrop, suggesting that the latter were also topographic highs during that period.

The stratified rocks all dip to the north at around 40°. These can be divided into two units; one (presumably the lower) is dominantly mica schist and appears to be a metagreywacke with perhaps some grain size variation and lessening in mica content upwards. The other is a light coloured, bleached, fine grained unit shown by diamond drilling to be basic amphibolite, probably volcanic. Drilling has shown this may be a repeated sequence though it is not evident in the surface exposure.

The granite occurs as small plugs, conformable sills, discordant dykes and with some pegmatitic phases, which have not been differentiated in the mapping; none were found to be radiometrically anomalous. Drilling has shown the granite to be more extensive at depth.

Scattered throughout the sequence, but preferentially concentrated in the amphibolite unit, are limonite-haematite, limonite-haematite-quartz and quartz veins. These veins are radiometrically and geochemically anomalous and clearly represent the source of the airborne response. Their orientation varies considerably, but overall appears to be a steeply dipping anastomosing set with no particular direction being more anomalous than others. They occur as fracture filling within the layered sequence and both at the margins of and within the granitic intrusives.

The sequence may be faulted, as shown on the plan; this being interpreted from shifts in the position of the amphibolite unit with supporting evidence from the radiometric pattern.

Ground Radiometric Surveys: The initial, more widely spaced survey quite clearly outlined the amphibolite zone containing the concentration of limonite veins and also indicated several satellite zones which for the most part were related to more isolated limonite veins. In general the 200 cpm contour (uranium channel) corresponds closely to the outline of the main amphibolite unit and a peak reading of 942 cpm was indicated on line 1400E over this unit. The later, more detailed, survey both confirmed this trend and added a detailed pattern which can be seen to reflect the distribution of the anomalous veins (see Plan No. 1234/47).

A feature of the radiometric survey is the generally low thorium values - a maximum of only 125 cpm.

Ground Magnetic Survey: Although much of the amphibolite rock carries disseminated magnetite along with patchy disseminated sulphides, the ground magnetic survey did not show a discernable pattern or aid in interpretation of structure as hoped.

Rock Chip Sampling: A total of 118 samples was taken from limonite veins exposed over the BH1 grid area;while these showed a wide range of uranium values (10 ppm to 440 ppm) more than half (77) assayed over 100 ppm U and four samples assayed about 300 ppm U (see Plan No. 1234/46 and Appendix 3).

Most samples anomalous in uranium were also anomalous in copper and zinc with peak values of 750 ppm Cu and 285 ppm Zn, but not in the same sample, nor associated with the highest uranium values. Lead values were rarely above the background of 30 to 40 ppm. The majority of the better values come from veins from within the main amphibolite unit and reflect the radiometric pattern previously outlined.

Diamond Drilling: A total of 695m of drilling in five holes was completed on BH1 grid and is summarised in Table 10. This drilling represented testing of three sections of the prospect, line 1400E, 1475E and 1600E.

The best interpretation of the geology from surface exposure suggested that the radiometrically anomalous veins are concentrated in the amphibolite unit and within these, the highest uranium and base metal values were recorded. On the assumption that such distribution would be maintained down dip as well as along strike, hole BHD1 was sited to intersect the amphibolite unit down dip, beneath the oxidised zone (dip being 40^0 north).

Drilling confirmed the 40^0 northerly dip, passing through the main amphibolite unit between 75.2 to 87.4m (see Plan No. 1234/48). This zone contained several 1 to 2cm limonite veins and a 1cm vein of pyrite at a granite dyke contact, apparently substantiating the concept of vein distribution. Assaying of this section gave peak values of 10 ppm U at 84.8 to 85.3m and 86.8 to 87.3m with anomalous copper and zinc values. In a deeper amphibolite unit (112.9 to 116.8m), the section 114.7 to 115.2m assayed 60 ppm U with low base metal values. This zone contains small veins of quartz-felspar with minor pyrite and was shown as a weak peak on the down-hole radiometric log. A similar peak at the contact of another, deeper amphibolite (136.0 to 146.60m), returned 30 ppm U over the section 146.3 to 147.3m which also coincided with the contact of a small granite dyke. The amphibolite here carried an estimated 2% disseminated sulphide.

BRAMALL HILLS
DIAMOND DRILL HOLE SUMMARY

Hole No	Grid	Co-Ords	Azimuth	Depression	Total Depth m	Result
BHD1	BH1	1400E/3700S	Vert	90°	158.8	Best assay 60 ppm U over 0.5m
BHD2	BH2	60E/170S	322°	70°	140.0	Drilled granite throughout
BHD3	BH1	1400E/3580S	Vert	90°	181.8	Best assay 25 ppm U over 2.0m
BHD4	BH2	007E/139S	322°	70°	118.4	No assay over 8 ppm U
BHD5	BH3	5072E/5270S	180°	70°	100.0	Best assay 170 ppm U over 1.2m
BHD6	BH4	5175E/5059S	Vert	90°	64.0	Abandoned
BHD7	BH3	5200E/5220S	180°	70°	140.0	Best assay 417 ppm U over 0.7m
BHD8	BH4	5174E/5059S	Vert	90°	101.0	No assay over 20 ppm U
BHD9	BH3	5450E/5180S	180°	70°	95.8	No assay over 20 ppm U
BHD10	BH4	5215E/5180S	Vert	90°	100.0	Best assay 40 ppm U over 0.8m
BHD11	BH1	1475E/3755S	180°	70°	121.40	Best assay 35 ppm U over 0.85m
BHD12	BH4	5350E/5548S	180°	70°	100.0	No assay over 20 ppm U
BHD13	BH1	1475E/3830S	360°	70°	113.15	Best assay 35 ppm U over 0.5m
BHD14	BH4	5153E/5115S	155°	70°	120.0	Best assay 30 ppm U over 0.5m
BHD15	BH1	1600E/3660S	180°	70°	120.0	Best assay 25 ppm U over 1.0m

Hole BHD3 was sited to test the same target at greater depth to ensure intersecting the main amphibolite where the veins were not oxidised as well as testing another, weak, soil covered radiometric anomaly at shallow depth (see Plan No. 1234/48). Similar lithologies were encountered but in the critical zone it was found that granite had digested the layered sequence. The granite at this position is a chloritic variety and is also weakly radiometrically anomalous with assays of 20 to 25 ppm U for the sections 123.0 to 125.0m. The granite contact is at 122.80m.

In surface rock chip sampling, the peak values (440 ppm and 340 ppm U) were recorded from a vein near line 1475E and hole BHD11 was sited to examine this and other anomalous veins occurring further south near the amphibolite-schist contact (see Plan No. 1234/49). The intersections of amphibolite in this hole suggest that the dip is steeper than the 40^0 observed at surface or that faulting has modified the picture. An intersection of quartz-limonite at 8.40 to 15.20m is considered to represent the peak value, surface vein, but at this depth gives values of only 30 and 35 ppm U with similarly reduced base metal values.

In view of the lack of good correlation between surface and drill hole geology, it was considered the situation had not been fully investigated at this stage, so that BHD13 was drilled in the opposite direction to give full coverage (particularly to cover the possibility of south dipping veins). The only amphibolite intersected in this hole was very near surface and the only anomalous uranium values were from limonite veining in the first 25m of the hole where up to 35 ppm U was recorded (see Plan No.1234/49).

Hole BHD15 was located to test prominent limonite vein outcrops carrying anomalous uranium and base metal values on line 1600E (see Plan No. 1234/50). The hole intersected several amphibolite horizons but the only limonite veining was again in the oxidised zone associated with granite and quartz. A feature of the amphibolite here is that it carries appreciably more sulphide than in other BH1 drill holes and that part of this is pyrrhotite, which has not been positively identified elsewhere. The oxidised veins from 21.2 to 25.4m assayed up to 30 ppm U with weakly anomalous base metal values.

The best correlation of drill hole geology with surface geology indicates that the surface (massive) limonite-haematite veins correspond to weak sulphide disseminations at depth, so that the surface veins may be considered to be gossans. However, they appear to be very considerably enriched in iron as well as uranium and base metals. Alternatively, it is possible that the drilling intersected only the attenuation of more significant sulphide veins.

BH2 Grid

The BH2 grid was positioned to cover an area of discontinuous outcrop which had been found to be strongly anomalous during reconnaissance of the nearby A353 anomaly. Subsequently anomalies A637 and C617 were found to occur over the grid area when results of the Bramall Hills airborne survey became available.

Anomaly C617 probably represents the effect of an isolated outcrop surrounded by sand. However anomaly A637 coincides with a zone of anomalous limonite-haematite veins in Killi Killi Beds with accompanying granitic intrusions. The area had previously been mapped and briefly investigated by Esso Exploration but this work is not considered to have provided a good test of the anomaly (see Report 1236/167).

Geology: Exposure on BH2 grid is sparse, being represented essentially in four restricted outcrops (see Plan No. 1234/51). The two northeasterly outcrops are quite small and represent respectively a roof pendant of Killi Killi schist in Slatey Creek Granite and schist with minor granitic intrusion. Some of the area shown as granitic rocks is pegmatitic but these have not always been differentiated in the mapping; neither granite nor pegmatite is radiometrically anomalous.

Two units of the Killi Killi Beds have been recognised in mapping. These are essentially the same as differentiated on BH1 grid, being a mica schist unit and a poorly foliated to massive, leached, basic amphibolite. Centrally in the main outcrop area, these are folded with a small syncline occurring at the crest of the hill and complementary anticline on the north side. These structures are cut off by faulting immediately to the west. To the southwest there is a suggestion of anticlinal folding, but there is insufficient definitive exposure to be certain of this. The central outcrop roof pendant gives the impression of representing a synclinal remnant.

As with the BH1 grid, limonite-haematite (± quartz) and quartz veins are fairly common and as in that area, they are concentrated (though not restricted) to the amphibolite unit. One quartz vein carries sulphides (? pyrite) and considerable boxwork.

At the eastern end of the grid a small area of metadolerite rubble was located.

Ground Radiometric Survey: The radiometric contour plan (Plan No. 1234/52) apparently reflects the anticlinal fold structure in the area of the main anomaly on the western section of the grid and perhaps again on the main hill outcrop area. This is shown by the 300 cpm contour which approximately outlines the oxidised, leached, amphibolite which carries the limonite veins. The peak value recorded was 778 cpm on the uranium channel.

As on the BH1 grid, thorium values are quite low - a maximum of 118 cpm.

Magnetics: Magnetics showed insufficent contrast to be of use in confirming geological structure interpretations or in siting diamond drill holes.

Rock Chip Sampling: Samples from the limonite veins were taken during a detailed spectrometer reconnaissance of the veins. Samples were taken at the location of the higher readings to obtain maximum values for individual veins, to aid in selection of drill targets. For the most part the samples showed a range of 140 ppm to 160 ppm U and 100 to 150 ppm Cu and Zn.

Diamond Drilling: Two diamond drill holes totalling 258m were completed on BH2 grid. Both holes were designed to examine the presumed southern limb of the anticlinal feature of the main radiometric anomaly. However through lack of exposure the first hole BHD2 was sited too far south and drilled in granite to its total depth of 140m (see Plan No. 1234/53). It established the position of a fault postulated from a quartz breccia zone at surface.

BHD4 was then sited closer to the structure and drilled a sequence of amphibolite and schist before entering granite at 86.4m (see Plan No. 1234/53).

No significant assays apart from some weakly anomalous base metal values, were recorded from sampling of these holes.

BH3 Grid

This grid was positioned to cover the B013 anomaly located during the Slatey Creek airborne survey. It appeared to be centred on a small sub-outcrop of weakly foliated limonite-haematite rock (gossan?) some 30m west of hilly outcrop and sub-outcrop of Killi Killi Beds. The general area had been covered by some previous exploration (see Report 1236/167), but the work was broadly based and did not test anomalies indicated by the present work.

Geology: The outcrop and sub-outcrop of Killi Killi Beds in this area consist of two main units: an upper phyllitic, lithic sandstone (?) with interbedded sericite schist and minor quartzite and a poorly exposed, lower, sericite schist (metasiltstone ?) containing minor black shale lenses; the contact zone between these units is marked by a crenulated, drag folded, sericite schist - black shale band (see Plan No. 1234/54). Development of bedding varies from very poor or non-existent in the coarser grained schists, to moderately developed, thin bedding in the finer schists and shale; it is often obscured by parallel axial plane cleavage. The area contains numerous quartz veins, of the order of 10m x 1m, which are generally conformable with bedding. Limonite-haematite veins are rare on the grid area and almost entirely restricted to the coarser unit; they are more common, though not anomalous, in outcrop east of the grid area. Granite is essentially restricted to two main outcrops 150m x 2m and 15m x 5m in size, respectively.

The sequence strikes eastnortheasterly and dips at about 55^0 north. Drag folds in the crenulated schists plunge west at 4^0 to 47^0.

Ground Radiometric Survey: As with the other grid areas, low thorium readings are a feature of the BH3 grid, so that the uranium channel contours, corrected for thorium, (Plan No. 1234/55) give virtually the same pattern as the total count contours. The peak reading (640 cpm) occurred at 5075E, 5335S, adjacent to the small sub-outcrop of gossan (1 to 2 sq m), located by the original helicopter reconnaissance; although the anomaly is quite small it was considered an important drill target in view of the very limited amount of sub-outcrop and the assay of 180 ppm U obtained from it. The peak occurs at the western end of a broader anomaly some 300m long and outlined by the 200 cpm contour. Although the broad anomaly essentially lies over the upper schist unit, it is slightly discordant to the

trend of that unit. Minor spot highs within the broad anomaly were inspected and found to be real, though quite limited in extent and without a definite geological cause. A small anomaly on line 5450E occurs as the strike extension of the broad zone.

Another prominent anomaly, some 100m x 30m, is centred on 5250E, 5370S, occurs over an area of poor outcrop within the lower, finer grained schist unit and represents an important drill target which has not been tested to date.

Ground Magnetic Survey: This survey showed insufficient magnetic contrast to be useful in geological interpretation.

Diamond Drilling: Drill hole BHD5 was sited to test the anomalous gossan near 5075E, 5335E below the zone of weathering. Drilling encountered a sequence of schists to 60.0m, 5m of shale interbedded with schist (metasiltstones) containing 3 to 5% pyrite,which correlates with the anomalous gossan, then more schists to 90.4m, followed by granite to the end of the hole at 100m (see Plan No. 1242/56). The down-hole gamma log proved the shale-metasiltstone unit and schists immediately below to be anomalous and assays of core samples outlined two anomalous zones of approximately 2m length with peak values of 80 ppm U and 170 ppm U respectively, at 62.4 and 67.4m.

Drill hole BHD7 was designed to test the strike extension of the anomalous zone of BHD5 as well as generally investigate the central part of the broad 300m anomaly and to specifically test the small radiometric peak at 5200E, 5270S. Surface sampling in the latter area had given 30 ppm U. The drilling encountered two shale units within sericite schists to 129m, followed by basic amphibolite to the end of the hole at 140m (see Plan No. 1234/57). The first shale unit, intersected from 81.6 to 89.9m, probably correlates with the anomalous unit in BHD5 and was found slightly anomalous by the down-hole gamma log. Schists immediately above the shale gave the best assay values of 15 to 20 ppm U.

The second shale unit, intersected from 112.7 to 119.8m,is not exposed on the surface. Down-hole probing showed a 2m, anomalous zone associated with this shale. The best assay from this zone is 417 ppm U from 115.1 to 115.8 with an average value of 247 ppm U over a 1.5m interval from 115.1 to 116.6 metres.

A minor anomaly in oxidised schists at 34.0 to 38.0m, gave a maximum of 40 ppm U in haematite veins.

Drill hole BHD9 was located to test strike extensions of the anomalous shale units drilled in BHD5 and 7, in addition to specifically testing the small anomaly centred at 5450E, 5250S corresponding with a small ferruginous mudstone band which assayed 45 ppm U. A sequence of schists with two shale units was traversed and the hole terminated in 10m of amphibolite at 96.0m (see Plan No. 1234/58). The first shale from 64.5 to 69.9m probably correlates with the outcropping mudstone unit and was found to be slightly anomalous by the down-hole gamma probe giving maximum assay values of 15 ppm U. The second shale zone from 75.8 to 85.5m, which may correlate with the anomalous shale unit found in BHD5, was not found to be anomalous by the down-hole gamma probe and gave a maximum assay of 8 ppm U.

BH4 Grid

The BH4 grid was positioned to cover the source of airborne anomalies B593 and A615, which proved to be gossanous veins in similar rocks to those at BH1 and BH2 grids. The poor exposure in the area did not allow a direct comparison of the size of gossan veins in this area with those at BH1 and BH2 grids, however rock sampling gave assays of greater than 100 ppm U at the reconnaissance stage which compares favourably with those at BH1 and BH2 at a similar stage.

Geology (see Plan No. 1234/59): The rocks exposed on the grid area are interbedded medium to coarse grained quartz felspar (?) sericite schists and a fine grained massive, kaolin haematite rock which drilling showed to be the surface representation of an intermediate to basic amphibolite (meta lava ?). Minor granite dykes intrude the layered sequence. Exposure of quartz, limonite-haematite and quartz-limonite-haematite veins, up to 10m x 2m in size, are common on the grid area and vary from strongly anomalous (radiometrically) to almost non-anomalous. The veins appear to be mainly conformable, helping to outline structure, but "axial plane veins" also occur and appear to be stratabound and predominantly associated with the amphibolite unit.

While exposure of rocks is somewhat limited over the grid area, residual soils are extensive and generally give a strong air-photo pattern which reliably indicates the structural trends. A series of shallow plunging folds with a "wavelength" of 300 to 400m is the dominant structural feature in this area. This gives an overall

trend of approximately 150° (see Plan No. 1234/59), though strikes are generally easterly or eastnorth-easterly. Fold plunges are 18° to 45° in an east-northeasterly direction. The folding is asymmetric with the axial plane dipping approximately 70° north (axial plane cleavage is well developed), north limbs of anticlines having moderate north dips (mostly 40° to 50°) and most south limbs probably near vertical and "sheared out" by vertical or axial plane shearing. The scale of folding and the moderate to shallow fold plunges have necessarily had a major influence on the siting of drill holes.

Ground Radiometric Survey (see Plan No. 1234/60): An apparently complex pattern of small radiometric anomalies corresponds well with exposure of anomalous limonite-haematite veins (which give up to 240 ppm U) but is seen as a reasonably simple pattern when compared to the geological structure (see Plan No. 1234/59). However, it is uncertain whether the anomalies are occurring at a single stratigraphic horizon or two adjacent horizons, as present structural data does not give sufficient details of drag-folding and faulting.

Ground Magnetic Survey: This survey showed too little magnetic contrast to be a useful aid for either structural interpretation or drill hole siting.

Diamond Drilling: The four best drill targets were selected by an assessment of all ground radiometric anomalies, taking into account rock assays from associated limonite-haematite veins, and structural location. These were tested by drilling down dip or down plunge depending on the structural information available. Amphibolite was found to correlate with the surface anomalies but, although it contained small carbonate and pegmatite veinlets and minor sulphides, no significant radiometric anomalies were found by the down-hole probe. Schists drilled were predominately quartz sericite schists in the oxidised zone and quartz/biotite felspar/sericite schists in the unoxidised zone.

Drill hole BHD6 was located to test, down plunge, an anomalous fold nose which gave surface assay values up to 160 ppm U. The anomaly was caused by a concordant limonite-haematite vein following the drag-folded upper contact of amphibolite with schist and by discordant veins of limonite-haematite which probably follow axial plane fractures. Drilling problems culminated in abandoning BHD6 at a depth of 64.0m and drilling BHD8 1m away (see Plan No. 1234/61).

The sequence drilled was schist, amphibolite and schist. The amphibolite was intersected at a depth of 55.6 to 71.2m and correlates with the surface anomalous rocks; it contained disseminated pyrite throughout but only occassional limonite veins, less than 2 cm thick. The down-hole gamma log gave very weak anomalies which correspond to weathered zones in the core. Assay values were a maximum of 10 ppm U. Drilling confirmed the plunge angle of the folding.

Drill hole BHD10 was designed to test down plunge from a broad anomaly occurring on the right hand limb of a syncline near the fold nose. The anomaly occurred over soil and haematite-limonite rubble and gave assay values up to 200 ppm U. Minor weathered amphibolite rubble was found in the same area.

Drilling encountered two minor amphibolite bands within sericite schists, in addition to the main amphibolite (at 45.5 to 68.1m), which is correlated with the anomalous unit at surface (see Plan No. 1234/62). This unit contained numerous carbonate-limonite veins (3 mm scale) at the lower contact and over a 2m interval below 50.2m, but gave no anomalous uranium assays. It is considered, that the target was intersected, but was not anomalous at that location.

Drill hole BHD12 was sited to test down dip from a broad, strong anomaly apparently located on the south limb of an anticline, though shallow northerly dips are thought to occur in this area. Due to poor exposure, little structural data is available; however drill hole geology appears to correlate with the surface geology, supporting the shallow northerly dip (see Plan No. 1242/62). Surface samples of limonite-haematite veins in the anomalous area gave assays up to 160 ppm U. A limonite stained, kaolinised amphibolite some 17m thick, was intersected in the oxidised zone, within a sericite schist sequence; it contained limonite veins 2 to 5cm thick, but the maximum assay value was only 15 ppm U.

Drill hole BHD14 was planned to test down dip from a strong anomaly centred on limonite-haematite veins which gave a best assay of 240 ppm U with 340 ppm Cu and 225 ppm Zn. The target occurs on the overturned left limb of a syncline near the fold nose. Structural data available showed the overturned limb to be near vertical and drilling proved this to be the case.

A minor amphibolite band was encountered at 103m, in addition to the main amphibolite at 45.5 to 75.6m, which is correslated with the surface anomaly (see Plan No. 1234/64). The amphibolites occurred within sericite schist country rock. Three narrow zones within the main amphibolite had common limonite fractures 1 to 5mm in thickness, while fine grained pyrite was disseminated throughout the amphibolite; however the maximum assay from this section was only 10 ppm U. The down-hole gamma log showed a 3 times background anomaly associated with quartz and quartz pegmatite veins in sericite schist at 93.5m. The best assay from this section was 30 ppm U over 0.5m. A feature of the schists in this hole is the development of some garnet.

APPENDIX III

BRAMALL HILLS ROCK ASSAYS

(Results in ppm unless otherwise shown)

SAMPLE NO	LOCATION/ANOMALY	U	Th	Cu	Pb	Zn	Ag
ANOMALY SAMPLING (HELICOPTER RECONN)							
46495/1	T649	5	30	60	15	110	X
46495/2	C649	X	10	35	10	180	X
46495/3	C649	9	X	95	25	105	X
46495/4	C649	30	15	155	10	180	X
46495/5	C649	7	10	50	10	45	X
46609/1	B660	20	4	105	15	205	X
46609/2	B660	50	4	170	5	270	X
46609/3	B660	X	20	35	X	115	X
46990/1	C699	6	40	85	25	30	X
46990/2	C699	X	30	110	20	30	X
47070/1	C707	100	X	220	30	120	X
47070/2	C707	50	X	175	15	105	X
47070/3	C707	40	15	215	5	225	X
BH1 GRID							
001	1359E/3955S	120	X	185	85	125	0.5
002	1356E/3939S	30	X	55	20	40	X
003	1363E/3931S	110	X	200	20	110	X
004	1367E/3926S	50	X	170	90	70	X
005	1370E/3916S	50	X	175	25	70	0.5
006	1382E/3920S	170	X	320	85	120	0.5
007	1384E/3921S	110	X	175	30	90	0.5
008	1370E/3914S	220	X	360	40	160	X
009	1361E/3917S	180	X	230	25	120	X
010	1392E/3902S	45	X	165	20	60	X
011	1373E/3886S	85	X	620	5	95	X
012	1366E/3885S	110	10	620	30	100	0.5
013	1359E/3854S	160	X	305	25	135	1.0
014	1362E/3818S	170	10	380	15	105	0.5
015	1384E/3789S	160	X	325	30	170	0.5
016	1384E/3799S	60	X	325	45	215	0.5
017	1372E/3792S	180	15	435	30	125	1.0
018	1374E/3789S	75	15	180	35	230	0.5
019	1374E/3789S	150	X	350	25	110	0.5
020	1375E/3787S	180	15	370	30	140	1.0
021	1374E/3786S	170	X	330	25	155	0.5

BRAMALL HILLS ROCK ASSAYS (continued)

022	1378E/3790S	220	X	455	30	190	X
023	1385E/3784S	250	X	405	40	455	1.0
024	1367E/3786S	150	X	390	35	75	1.0
025	1356E/3784S	120	10	325	25	120	1.0
026	1332E/3794S	250	X	540	25	145	0.5
027	1340E/3873S	150	X	295	25	100	1.0
028	1339E/3874S	140	X	260	30	100	X
029	1341E/3871S	95	X	320	25	80	X
030	1334E/3860S	210	25	450	25	140	X
031	1330E/3858S	200	X	555	40	150	1.5
032	1315E/3862S	150	X	750	45	150	1.0
033	1421E/3811S	140	X	430	35	135	1.0
034	1416E/3810S	150	X	355	40	190	1.0
035	1411E/3809S	100	X	300	60	230	1.5
036	1416E/3812S	80	20	240	65	165	0.5
037	1405E/3817S	120	X	250	35	75	1.0
038	1408E/3817S	120	X	465	40	115	1.5
039	1403E/3810S	310	X	315	50	110	1.0
040	1419E/3822S	45	X	265	40	130	1.5
041	1406E/3778S	140	X	360	15	110	X
042	1425E/3774S	190	X	315	20	105	X
043	1440E/3772S	200	X	360	55	125	X
044	1410E/3781S	85	X	540	75	135	X
045	1422E/3780S	360	X	720	135	220	X
046	1437E/3759S	45	X	260	45	110	X
047	1427E/3747S	150	X	305	35	90	X
048	1442E/3735S	150	25	360	25	110	X
049	1451E/3738S	160	15	510	25	185	X
050	1453E/3726S	55	X	295	5	130	0.5
051	1469E/3729S	100	X	270	25	170	X
052	1472E/3732S	240	X	550	30	120	X
053	1477E/3133S	150	X	645	25	130	0.5
054	1477E/3733S	200	X	495	35	135	X
055	1503E/3753S	160	X	485	40	165	1.0
056	1506E/3748S	170	X	675	95	120	0.5
057	1523E/3758S	50	X	500	90	165	1.0
058	1535E/3762S	60	X	315	20	100	0.5
059	1544E/3762S	90	X	715	25	120	X
060	1530E/3747S	200	10	425	30	100	X
061	1539E/3717S	170	X	580	125	145	X

BRAMALL HILLS ROCK ASSAYS (continued)

102	1630E/3702S	110	20	240	40	120	X
103	1620E/3682S	65	X	340	40	150	X
104	1630E/3677S	65	30	360	95	190	X
105	1639E/3677S	50	X	385	100	150	X
106	1643E/3674S	130	X	500	115	170	X
107	1644E/3686S	65	20	310	60	125	X
108	1643E/3699S	95	50	305	35	90	X
109	1647E/3698S	60	35	345	40	90	X
110	1654E/3691S	95	15	440	30	110	X
111	1652E/3690S	90	60	400	40	100	0.5
112	1659E/3695S	45	I5	620	40	120	X
113	1660E/3693S	10	10	190	5	55	X
114	1660E/3690S	50	X	390	20	150	X
115	1681E/3689S	95	20	440	40	170	X
116	1690E/3660S	160	X	400	70	120	X
117	1700E/3660S	110	X	300	40	100	X
118	1701E/3664S	100	35	470	75	110	X
BH2 GRID							
147	46E/128S	140	15	115	20	80	X
148	35E/122S	140	7	130	15	125	X
149	25E/117S	150	X	140	20	120	X
150	17E/119S	110	15	150	20	100	X
151	10E/94S	30	20	60	25	95	X
152	10E/80S	160	X	190	20	165	X
153	5W/78S	130	4	160	30	120	X
154	127E/47S	140	15	205	25	150	X
BH3 GRID							
141	5108E/5318S	65	25	155	20	55	X
142	5070E/5336S	180	20	60	20	90	X
143	5213E/5272S	30	30	60	15	50	X
144	5401E/5216S	20	20	60	15	135	X
145	5450E/5251S	45	35	370	35	145	X
146	5300E/5360S	20	20	60	20	45	X
BH4 GRID							
119	5046E/5064S	110	20	270	40	140	X
120	5048E/5064S	130	X	230	50	190	X
121	5078E/5076S	50	8	130	40	150	X
122	5082E/5098S	85	60	285	60	230	X
123	5095E/5095S	65	6	265	70	155	X
124	5o90E/5106S	160	25	340	110	240	X

BRAMALL HILLS ROCK ASSAYS (continued)

062	1534E/3714S	230	X	530	60	95	0.5
063	1538E/3711S	220	X	530	65	125	0.5
064	1498E/3722S	160	15	335	15	120	X
065	1514E/3723S	95	X	330	25	120	X
066	1442E/3816S	30	15	230	25	80	X
067	1456E/3807S	85	15	305	55	85	X
068	1462E/3804S	110	X	305	35	90	X
069	1461E/3802S	180	X	375	45	140	X
070	1453E/3774S	190	X	450	80	90	X
071	1459E/3770S	290	X	560	100	130	0.5
072	1457E/3771S	190	X	460	75	110	0.5
073	1481E/3766S	440	X	435	80	125	0.5
074	1480E/3765S	340	20	415	75	115	X
075	1476E/3763S	230	X	405	75	95	X
076	1472E/3797S	170	X	365	60	145	0.5
077	1473E/3795S	100	X	460	45	110	X
078	1474E/3794S	110	X	315	30	80	X
079	1494E/3784S	150	X	445	55	130	X
080	1502E/3794S	220	X	550	55	160	X
081	1503E/3800S	90	20	375	70	115	X
082	1488E/3800S	85	X	280	55	85	X
083	1485E/3802S	45	X	175	25	90	0.5
084	1480E/3803S	55	X	285	55	90	X
085	1572E/3722S	170	X	510	30	285	X
086	1591E/3713S	200	X	300	30	140	X
087	1595E/3714S	160	25	485	30	170	X
088	1600E/3715S	100	25	450	30	140	X
089	1600E/3717S	120	25	680	40	125	X
090	1600E/3714S	150	X	520	25	140	X
091	1598E/3704S	90	X	590	40	185	X
092	1583E/3695S	100	X	465	55	150	X
093	1578E/3698S	140	X	575	40	185	X
094	1596E/3695S	120	X	550	40	140	X
095	1602E/3692S	100	20	400	50	105	X
096	1609E/3690S	90	X	375	25	125	X
097	1609E/3702S	45	X	425	60	170	X
098	1618E/3708S	35	X	290	50	80	X
099	1618E/3717S	45	15	330	55	165	X
100	1625E/3715S	140	35	370	105	225	X
101	1627E/3707S	85	15	390	80	120	X

BRAMALL HILLS ROCK ASSAYS (continued)

125	5090E/5115S	135	X	270	80	190	X
126	5135E/5143S	140	15	155	45	320	X
127	5157E/5138S	240	X	340	55	225	X
128	5166E/5141S	115	X	180	30	195	X
129	5160E/5143S	75	10	165	20	145	X
130	5201E/5238S	200	X	270	25	160	X
131	5168E/5225S	140	X	195	20	160	X
132	5353E/5308S	130	X	185	30	235	X
133	5388E/5281S	160	X	330	200	160	X
134	5377E/5354S	80	X	200	35	220	X
135	5420E/5480S	90	15	210	50	265	X
136	5387E/5487S	55	6	150	140	195	X
137	5385E/5629S	125	20	135	30	170	X
138	5342E/5628S	160	6	180	40	210	X
139	5293E/5704S	95	7	95	25	110	X
140	5306E/5696S	70	9	160	30	110	X

(Note: X is below limit of detection)

APPENDIX IV

BRAMALL HILLS

DIAMOND DRILL HOLE LOGS

(for Diamond Drill Holes BHD1 to BHD15)

DIAMOND DRILL RECORD

Hole No. BHD 1 Page 1 of 6

Project No. 1242 Date Commenced 7.10.78 Date Completed 13.10.78 Total Depth 158.8M

Area BRAMALL HILLS BHI GRID Co-ordinates 37005/1400E Depression 90° Hole size 95mm to 3m

Survey Depth	Declin.	Azimuth
50m	89°	ACID TUBE
100m	82°	"
150m	81°	"

Azimuth

Collar R.L.

Core Recovery 89.7 %

Drilled by Longyear (Aust.)

NQ to 53.7m

BQ to 158.8m

to

Machine Longyear 44

Logged by N.K. PRATT

SUMMARY

Depth as measured by radiometric logger 160M. Core from 73M - 96M confused for unknown reason - in tray wrongly and with confusing marker blocks.

Sequence drilled consisted of ?metagrey wacke with medium and fine grained metabasics (dolerite and/or basalt). Correlation suggests surface mapped "mudstone" (massive unit with most of limonite veins) is metabasalt 75.2M - 87.4M. This unit contains limonite veins but is not radiometrically anomalous.

Weak radiometric anomalies shown on gamma log at 115.6M, 141.4M and 147.8M.

HOLE No. BHD 1 — DIAMOND DRILL RECORD — PAGE 2 of 6

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION	ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
0.0	3.0	0	0	0	3.00	No core - Tricone								
3.0	4.8	1.4	78	3.00	9.50	QUARTZ-SERICITE-SCHIST								
4.8	7.4	2.6	100			Moderately oxidised. In part								
7.4	10.2	2.8	100			well foliated with ∠ on fol-								
10.2	13.6	3.4	100			iation at 45°. Minor limonite								
13.6	16.6	2.8	93			veins at 5.60; 5.80 and 6.5 cm.								
16.6	18.5	1.65	87			QUARTZ AND QUARTZ-LIMONITE								
18.5	19.8	1.1	85	9.50	13.60	BRECCIA	11.6	12.1	45	X	190	15	30	X
19.8	21.9	1.3	62			Oxidised quartz-sericite	12.1	12.5	45	20	230	15	45	X
21.9	23.8	1.5	79			schist 12.60 - 13.00.	13.0	13.5	40	15	175	5	55	X
23.8	25.8	1.5	75			BIOTITE-SERICITE-FELSPAR SCHIST								
25.8	26.8	0.45	45	13.60	22.40	Haematite stained from 16m	13.5	14.0	15	10	45	X	15	X
26.8	28.8	1.25	63			coarse grained well foliated								
28.8	30.6	1.3	72			and moderately oxidised. Minor								
30.6	31.8	0.25	21			granite dyke at 21.90.								
31.8	33.6	0	0			AMPHIBOLITE								
33.6	34.8	0.7	58	22.40	40.50	Mainly medium and coarse								
34.8	36.6	1.5	83			grained ?metabasic, almost								
36.6	37.7	0.9	82			totally oxidised to green clay								
37.7	39.4	1.35	79			(? serpentine) weakly								
39.4	40.8	0.95	68			foliated. Pegmatite at 22.5								
						Granite 29.80 - -3.70.								

HOLE No. BHD 1 — DIAMOND DRILL RECORD — PAGE 3 of 6

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION
40.8	43.8	0.8	27	40.50	75.20	QUARTZ-SERICITE-BIOTITE FELSPAR SCHIST
43.8	44.51	0	0			Some ? chloritic zones after 60m. To 50m is friable non foliated medium grained. Then banded with Δ at 40°. Coarsely spotted with sericite 52.00 - 60.00 . Overall is medium and coarse grained.
44.51	45.7	0.7	59			
45.7	46.8	1.1	100			
46.8	48.55	0	0			
48.55	49.3	0.35	47			
49.3	50.4	0.65	59			
50.4	50.9	0	0			
50.9	51.9	.45	45			
51.9	52.6	0.7	100			Granite 49.70 - 54.40
52.6	53.7	1.0	91			70.00 - 73.80
53.7	55.8	1.95	93			
55.8	71.8	16.0	100	75.20	87.4	AMPHIBOLITE
71.8	73.8	1.85	93			Medium grained ? metabasic with felspar to 83.40 - then fine grained amphibolite. Pegmatic 77.20 - 77.40.
73.8	76.8	3.0	100			
76.8	77.28	2.25	468			
77.28	77.48	0.17	85			
77.48	80.48	3.0	100			MINERALISATION
80.48	81.8	0.47	36			0.5 cm pyrite at 77.40 contact
81.8	84.8	2.7	90			Pyrite in quartz - ?chlorite
84.8	87.8	3.0	100			veins at 80.5 and 80.9. Some disseminated pyrite.
						Limonite veins 81.4 and 83.40 - 87.4

ASSAY RECORD

From	To	U	Th	Cu	Pb	Zn	Ag
77.28	77.48	3	5	80	5	70	0.5
82.1	82.6	X	15	460	10	110	X
82.6	83.1	X	X	200	5	120	X
83.1	83.6	3	X	120	5	140	0.5
83.6	84.1	5	10	180	15	160	1.5
84.1	84.8	X	X	110	15	180	1.0
84.8	85.3	10	X	230	5	150	1.5
85.3	85.8	6	X	185	20	150	1.0
85.8	86.3	6	4	190	30	100	1.0
86.3	86.8	X	X	320	25	125	2.0
86.8	87.3	10	X	275	45	120	1.5

HOLE No. BHD 1 — DIAMOND DRILL RECORD — PAGE 4 of 6

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION	ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
87.8	90.8	3.0	100	87.4	112.0	QUARTZ-BIOTITE-FELSPAR SCHIST								
90.8	93.8	3.0	100			Medium and coarse grained well								
93.8	96.8	3.0	100			banded (but massive to lightly								
96.8	99.8	3.0	100			banded 100.40 - 104.5) Banded								
99.8	102.8	3.0	100			at 40° to core.								
102.8	105.8	3.0	100			Granite 95.8 - 96.80								
105.8	108.8	3.0	100			97.0 - 99,7								
108.8	111.8	3.0	100			100.20-100.40								
111.8	114.8	3.0	100			102.00-102.30								
						104.50-107.80								
						108.30-108.50								
						109.00-109.40								
						109.80-110.20								
114.8	117.8	3.0	100	112.00	116.8	AMPHIBOLITE	113.2	113.5	X	X	180	10	160	X
						Fine grained ? metabasic	113.5	113.7	X	X	120	15	130	X
						Brecciated over first 30cm	113.7	114.3	8	10	110	5	60	X
						with quartz-chlorite-serpent-	114.3	114.7	7	X	65	20	20	X
						ine. 113.8-114.8 Pegmatite	114.7	115.2	60	5	70	5	5	0.5
						veins with Pyrite. Small veins	115.2	115.7	3	X	60	5	65	0.5
						of quartz-pyrite and	115.7	116.2	X	X	40	X	75	0.5
						disseminated pyrite through-	116.2	116.9	X	8	140	X	95	0.5
						out the section.								

HOLE No. BHD 1 | DIAMOND DRILL RECORD | PAGE 5 of 6

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION	ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
117.8	120.8	3.0	100	116.80	136.00	QUARTZ-BIOTITE-FELSPAR SCHIST								
120,8	126.8	6.0	100			Fine grained lightly banded								
126.8	132.8	6.0	100			to 119.1. Then mainly coarse								
132.8	135.8	3.0	100			grained well banded. at								
						124M 65°								
						Amphibolite 120.80 - 121.50								
						Granite 119.10 - 120.80								
						121.50 - 122.80								
						124.90 - 127.90								
						129.90 - 131.80								
						133.50 - 135.90								
						Most granite carried epidote	140.5	141.0	15	20	15	5	30	X
						alteration of felspars.	141.0	141.5	5	20	65	5	65	X
135.8	137.4	1.6	100	136.00	146.60	AMPHIBOLITE	141.5	142.0	3	20	90	5	85	X
137.4	138.8	1.4	100			Fine grained metabasic	142.0	142.7	X	25	105	10	60	X
138.8	141.8	3.0	100			with vein quartz to 139m.	142.7	143.2	X	X	145	5	95	X
141.8	144.8	3.0	100			Quartz biotite schist 138.85	143.2	143.7	3	4	135	10	100	0.5
144.8	147.8	3.0	100			-141.40 In Granite 140.0 -	143.7	144.7	3	X	85	5	100	X
						140.5	144.7	145.2	X	6	155	10	100	X
						MINERALISATION	145.2	145.7	X	4	385	10	80	X
						Pyrite associated with	145.7	146.3	X	8	145	10	90	X
						quartz veins and in dissem-	146.3	146.7	30	30	100	5	55	X
						inations about 2% overall.	146.7	147.3	30	20	20	5	50	X
				146.6	152.90	QUARTZ-BIOTITE-FELSPAR SCHIST								

HOLE No. BHD 1 | DIAMOND DRILL RECORD | PAGE 6 of 6

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION
147.8	150.8	3.0	100	146.60	152.90	Medium grained lightly
150.8	153.8	2.92	97			banded with 75°.
						Granite 147.30 - 147.90
						150.10 - 150.50
						and at 148.30 (20 cm)
153.8	156.8	3.0	100	152.90	158.80	GRANITE
156.8	158.8	2.0	100			Epidote alteration of
						Felspars and some quartz ?
						chlorite veining.
						EOH

ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag

DIAMOND DRILL RECORD

Hole No. BHD 2 — Page 1 of 2.

Project No. 1242 — Date Commenced 9.10.78 — Date Completed 16.10.78 — Total Depth 140.0

Area BRAMALL HILLS GRID BH2 — Co-ordinates 00E/170S — Depression 70° — Hole size 95mm to 3.0m

Survey Depth	Declin.	Azimuth
50m	67°	
100m	60°	
140m	58°	

Azimuth 332°

Collar R.L.

Core Recovery 92.8%

Drilled by Longyear (Aust)

NQ	to 42.10m
BQ	to 140.00m
	to

Machine Longyear 44

Logged by N.K. PRATT

SUMMARY

This hole was sited to drill the southern limb of a small anticline carrying radiometrically anomalous vein material in a leached massive rock unit. Because of faulting and more extensive granite intrusion than initially suspected the hole drilled the full depth in granite - intersecting a major fault zone 133.70 - 136.00. The granite is mostly medium grained quartz- K felspar with plagioclase felspar altering to epidote. There are some pegmatite phases to the granite and some zones of chloritic alteration particularly near the fault zone and these (the chloritic zones) are shown to be very weakly radiometrically anomalous in the Geoscience downhole logging.

HOLE No. BHD 2 | DIAMOND DRILL RECORD | PAGE 2 of 2

Drill Record From	To	Rec	%	From	To	GEOLOGICAL DESCRIPTION
0.0	140	127	92.8	0M	140.0M	GRANITE
						Medium grained quartz-
						K. felspar with plagioclase altering to epidote
						major fault zone 133.70 - 136.00M

ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
79.0	79.5	4	9	15	155	20	X
93.0	93.5	9	5	40	5	30	X
93.5	94.0	X	5	15	5	10	X
123.5	124.0	10	15	20	10	25	X
124.0	124.5	X	4	10	10	5	X
124.5	125	4	10	10	10	25	X
135.8	136.3	X	15	X	5	15	1.5
136.3	136.8	20	15	T	5	20	1.5
136.8	137.3	15	15	X	X	15	1.5
137.3	137.8	6	15	10	5	20	2.0
137.8	138.3	4	15	X	5	10	1.5
138.3	138.8	3	10	5	5	15	1.0

DIAMOND DRILL RECORD

Hole No. BHD 3 — Page 1 of 4.

Project No. 1242 — Date Commenced 14.10.78 Date Completed 19.10.78 Total Depth 181.8m

Area BRAMALL HILLS BH1 GRID — Co-ordinates 1400E/35805 Depression 90° Hole size 95mm to 6.0m

Survey Depth	Declin.	Azimuth
60m	86°	174°
120m	73°	191°
180m	69°	196°

Azimuth

Collar R.L.

Core Recovery 92 %

Drilled by Longyear (Aust.)

NQ to 46.80m
BQ to 181.80m
to

Machine Longyear 44

Logged by N.K. PRATT

SUMMARY

This hole was drilled to examine the down dip extension of the geology encountered in BHD1, and to examine a weaker anomaly under soil cover. It drilled a sequence essentially similar to that in BHD1 but encountered granite at a shallow 122.80m indicating the non outcrop area to be largely granite. The top of the granite is weakly radiometrically anomalous but assays of only 20 ppm U were recorded.

HOLE No. BHD3 — DIAMOND DRILL RECORD — PAGE 2 of 4

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION	ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
0.0	6.0	0		0	6.0	No core - Tricone Drilling								
6.0	10.8	2.28	47.5	6.0	30.70	AMPHIBOLITE								
10.8	14.8	2.60	65			Medium and coarse grained								
14.8	19.8	4.8	96			? metabasic with green clay								
19.8	25.8	3.94	66			and serpentine. Strongly								
25.8	30.7	3.9	80			oxidised 0-15 and 21-26								
30.7	34.8	2.63	61	30.70	45.0	QUARTZ-BIOTITE-FELSPAR SCHIST								
34.8	39.8	2.64	53			Medium grained moderately								
39.8	41.3	0.35	23			banded at 50° to core axis								
41.3	43.8	0.93	37			Granite 30.90-31.70								
43.8	45.4	1.6	100			and at 40.80 and 42.30								
						Quartz-limonite vein at								
						43.80 near parallel to core								
45.4	48.6	2.6	81	45.0	47.55	SERICITE QUARTZITE								
						Fine-medium grained								
						massive to lightly banded								
48.6	52.8	4.55	108	47.55	60.20	AMPHIBOLE-BIOTITE-FELSPAR SCHIST								
52.8	55.7	2.9	100			Medium grained rock with near	51.1	51.6	X	5	485	40	165	1.0
55.7	58.6	2.83	98			gneissic appearance .	55.6	56.1	5	10	550	30	120	X
58.6	60.7	2.1	100			Carbonate and felspar veins	56.1	57.1	X	4	645	25	130	0.5
						throughout. Granite and/or	57.1	57.4	X	X	495	35	135	X
						pegmatite 52.40-52.80;								
						57.30-58.40;								

HOLE No. BHD 3 — DIAMOND DRILL RECORD — PAGE 3 of 4

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION	ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
60.7	68.8	8.1	100	60.20	76.50	QUARTZ-BIOTITE-FELSPAR SCHIST								
68.8	75.9	7.1	100			Mainly medium grained and								
						well banded at 60° to core								
						axis.								
75.9	82.0	6.1	100	76.50	82.30	AMPHIBOLE-BIOTITE-FELSPAR SCHIST								
						Medium and fine grained								
						lightly foliated, with minor								
						quartz - carbonate veins								
82.0	88.8	6.8	100	82.30	92.90	QUARTZ-BIOTITE-FELSPAR SCHIST								
88.8	91.8	3.0	100			Well banded medium grained								
						with banding at 60°. Quartz								
						vein 83.00-83.60 and minor								
						granite at 86.8 and 91.0.								
91.8	97.5	5.7	100	92.90	98.50	AMPHIBOLE-BIOTITE-FELSPAR SCHIST								
						Medium and fine grained								
						moderately foliated with								
						felspar - carbonate veining								
						at 96.20 and 97.20								
97.5	106.8	9.3	100	98.50	106.40	QUARTZ-BIOTITE-FELSPAR SCHIST								
						medium and fine grained								
						banded to near massive								
						Granite 103.5-103.8; 105.30-105.50								
106.8	115.8	9.0	100	106.40	114.20	AMPHIBOLITE								

HOLE No. BHD3 | DIAMOND DRILL RECORD | PAGE 4 of 4

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION	ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
				106.40	114.20	(Cont.) AMPHIBOLITE								
						Mainly fine grained massive								
						? metabasic. Some 1cm felspar								
						veins 113-114m. Minor granite								
						veins at 108.10 (5 cm) and								
						110.0 (20cm).								
115.8	120.1	4.3	100	114.20	122.80	QUARTZ-BIOTITE-FELSPAR SCHIST	120.0	120.5	4	20	15	5	55	X
120.1	120.5	0 .3	3 83			Fine grained massive to	120.5	121.0	3	15	20	5	35	X
120.5	121.8	1.3	100			lightly foliated. Some 5mm	121.0	121.5	X	15	30	10	40	X
						augen at 115.20	121.5	122.0	X	20	35	5	65	X
						Granite at 116.60-118.10	122.0	122.5	6	20	20	5	65	X
						121.10 (20 cm) 121.40 (20cm)	122.5	123.0	X	15	25	5	35	X
						and 122.4 (20 cm)	123.0	123.5	20	20	25	10	35	X
121.8	124.7	2.3	79	122.80	181.80	GRANITE	123.5	124.0	20	25	35	5	30	X
124.7	125.8	1.1	100			Medium and coarse grained	124.0	124.5	20	15	50	5	25	X
125.8	127.8	2.0	100			with extensive epidote alt-	124.5	125.0	25	10	30	10	30	X
127.8	130.8	2.7	90			eration of felspar Chloritic								
130.8	148.8	18.				alteration to 127m	156.4	156.9	15	15	10	5	20	X
148.8	181.8	33	100			Quartz biotite schist	156.9	157.4	7	25	25	5	35	X
						166.30 - 167.0								
							166.2	166.7	7	20	55	10	90	X
							166.7	167.0	6	20	20	10	85	X

DIAMOND DRILL RECORD

Hole No. BHD4 — Page 1 of 3

Project No. 1242 — Date Commenced 16.10.78 Date Completed 19.10.78 Total Depth 118.40m

Area BRAMALL HILLS BH GRID 2 — Co-ordinates 007E/139S — Depression 70° — Hole size 95mm to 2.0m

Survey Depth	Declin.	Azimuth
50m	69°	330°
100m	68°	327°

Azimuth 332°

Collar R.L.

Core Recovery 84.95 %

Drilled by Longyear (Aust) P/L

NQ	to 54.50m
BQ	to 118.40m
	to

Machine Longyear 44

Logged by N K Pratt

SUMMARY

This hole was sited on section with BHD2 after that hole drilled full length in granite. It drilled a sequence of schists and amphibolite bottoming in granite from 86.40m without intersecting significant mineralisation. Caving prevented radiometric logging below 106m and a probe was lost in the hole on getting hung on a short length of unrecovered casing at 54m. The substantially damaged probe was subsequently recovered.

HOLE No. BHD 4 DIAMOND DRILL RECORD PAGE 2 of 3

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION
0.0	2.0	0	0	0	2.0	No core Tricone
2.0	3.0	0.25	25	2.0	4.0	GRANITE
3.0	4.0	0.23	23			Oxidised with limonite very
						little core recovered
4.0	6.5	1.0	40	4.00	19.70	KAOLINISED AMPHIBOLITE
6.5	8.0	1.5	100			Fine and medium grained
8.0	9.7	1.35	79			extremely leached rock massive
9.7	11.0	1.3	100			mostly but some light
11.0	17.0	5.85	97.5			foliation
17.0	20.0	2.6	87	19.70	27.40	QUARTZ-BIOTITE-FELSPAR SCHIST
20.0	23.0	1.6	53			Oxidised medium and coarse
23.0	26.0	2.2	73			grained, well banded with Δ
26.0	27.6	1.0	63			on banding 55°
27.6	28.0	0.25	63	27.40	33.50	GRANITE
28.0	28.7	0.6	86			Oxidised coarse grained
28.7	30.4	1.55	91			muscovite granite. Quartz vein
30.4	33.5	1.9	61			over first 1 m
33.5	35.0	1.5	100	33.50	59.60	AMPHIBOLITE
35.0	37.0	0.8	40			Fine grained massive with some
37.0	37.6	0.5	83			zones of biotite development
37.6	41.0	3.4	100			40.40 - 45.90 Quartz clay
41.0	47.0	2.04	34			breccia fault zone.
47.0	50.0	2.5	84			

ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
47.0	47.5	8	4	75	10	125	X
47.5	48.0	6	X	130	5	135	X
48.0	48.3	7	X	95	5	110	X
50.2	50.6	3	X	65	5	90	0.5
50.6	51.1	X	X	60	X	110	X
51.1	51.7	X	8	50	5	70	X
51.7	52.2	3	7	85	5	100	0.5
52.2	52.7	X	X	140	5	110	X
55.3	55.8	3	X	100	20	100	X
55.8	56.1	3	X	120	5	60	X
56.1	56.7	4	X	105	5	65	X
56.7	57.2	5	X	50	5	120	X
57.2	57.6	X	X	90	5	140	X
57.6	58.1	7	X	55	5	75	X
58.1	59.5	X	4	160	5	100	X
58.6	59.5	X	6	160	10	125	X

HOLE No. BHD 4 | DIAMOND DRILL RECORD | PAGE 3 of 3

Drill Record From	to	Rec	%	From	To	GEOLOGICAL DESCRIPTION	ASSAY RECORD From	To	U	Th	Cu	Pb	Zn	Ag
50.0	60.0	10.0	100	33.50	59.60	(Cont.) Granite 34.95-40.40								
						hegmatite and quartz rich								
						48.70-50.30. Partly Pegmatite								
						Limonite veins occur through-								
						out the section and on the								
						contact at 50.30								
60.0	72.1	12.1	100	59.60	86.40	QUARTZ-BIOTITE-FELSPAR SCHIST								
72.1	74.25	1.7	77			Medium and coarse grained								
74.25	86.0	11.75	100			well banded at 50° to								
						core axis. Spotted with coarse								
						? Felspar at 62.80-63.80								
						50°								
						Granite 61.80-62.80								
						63.80-72.25								
						Quartz veining 73.5 - 74.0								
						Carbonate veining 83.0-83.6								
86.0	118.4	32.4	100	86.40	118.40	GRANITE								
						Medium grained with								
						pegmatitic zones at 91 m,								
						107m, 108.5-110.20 and 117.								
						EOH								

APPENDIX V

BRAMALL HILLS

THIN SECTION DESCRIPTIONS

Order No. 4341

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 1 MINEX Registered No. IL-9233
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-1, 81.6m.
Minerals Visible: Amphibole, quartz, minor biotite, and opaques.
Texture: Indeterminate, probably mainly subidioblastic and idioblastic.
Colour: Dark green, almost black.
Grain Size: Fine-grained.
Other Comments: This non-ferromagnetic, amphibolitic metamorphic rock may have been derived during amphibolite grade burial metamorphic recrystallization processes from a fine-grained basic lava with basaltic norm, rather than from an impure arenaceous sediment. Most relic textures may have been destroyed. The minor biotite present is possibly a product of metasomatism.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 58% Amphibole, variety green metamorphic hornblende, occurs as very fine to fine-grained interlocking acicular and prismatic subidioblasts and idioblasts that do not exhibit any preferred orientation, and as finely crystalline clusters that enclose fine xenoblastic and granoblastic quartz, and minor scattered biotite, and opaques. It is probably pseudomorphous after clinopyroxene. No fresh pyroxene remains.

ACCESSORY & SECONDARY MINERALS

40% Quartz occurs as fine to very fine xenoblasts in amphibole, and as patchy granoblastic mosaics interlocked with dominant amphibole. Trace fine untwinned plagioclase is occasionally associated. There are no relic clasts, or any evidence of sorting (or grading).

1% Biotite occurs as fine scattered, randomly oriented flakes in the green hornblende.

1% Opaques occur as fine scattered anhedra to euhedra, and blebs in hornblende. Iron ore is probably dominant.

Texture: Finely subidioblastic, idioblastic, and granoblastic.
Alteration: None apparent.
Petrogenesis: A fine-grained biotitic orthoamphibolite.
Remarks: Although there are no diagnostic relic igneous textures on which to base identification, the metamorphic silicate mineral assemblage, and absence of relic clastic textures, suggest that the precursor was a fine-grained basic volcanic. Thus there is no textural evidence to suggest that the precursor was an impure arenaceous sediment. The original rock may have been a biotitic basalt.

ROCK NAME: FINE-GRAINED, BIOTITIC ORTHOAMPHIBOLITE.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 2 MINEX Registered No. IL-9234
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-1, 58.9m.
Minerals Visible: Sericite, biotite, quartz, and fine opaques.
Texture: Foliated. (Banded).
Colour: Greyish, with dark brown.
Grain Size: Very fine, to fine-grained.
Other Comments: This non-ferromagnetic, foliated and banded metamorphic rock appears to be a regionally metamorphosed, fine-grained arenaceous sediment. Biotite, and sericite rich bands give the schist a banded appearance. All feldspar clasts originally present, may have been completely sericitized.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 43% Sericite occurs as very fine to fine oriented, and occasionally suboriented flakes, as lepidoblastic aggregates, and as anhedral, subhedral, and lenticular aggregates with matted fabric. Many of the tabular, angular, and subangular aggregates closely resemble sericite pseudomorphs after feldspar clasts. The sericite is dominant in the biotite and quartz poor leucocratic band.

ACCESSORY & SECONDARY MINERALS

30% Biotite occurs as fine suboriented, and oriented flakes, and as flaky aggregates interlocked with varying proportions of quartz and sericite.

25% Quartz occurs abundantly in the biotite rich band as fine scattered xenoblasts that represent recrystallized relic subangular and subrounded clasts. There are no relic volcaniclasts. There is some evidence of grading.

2% Opaques occur as very fine scattered anhedra to euhedra in the silicate mineral assemblage. A proportion may be carbonaceous matter. Precise identification of the dusty opaques is not possible in thin section. Iron ore must be present in places.

Texture: Foliated. (Relic clastic).
Alteration: None apparent.
Petrogenesis: A banded quartz-biotite-sericite schist and quartz-sericite-biotite schist.
Remarks: Biotite is dominant in the darker coloured metasediment exposed in thin section, and sericite is dominant in the lighter coloured band. Relic clastic textures, including sorting, have been preserved in the quartz and biotite rich schist, and thus clearly indicate that the precursors were prior to regional metamorphic recrystallization, fine-grained, banded sedimentary rocks. Some of the sericite may be of metasomatic origin.

ROCK NAME: BANDED QUARTZ-BIOTITE-SERICITE SCHIST & QUARTZ-SERICITE-BIOTITE SCHIST.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 3 MINEX Registered No. IL-9235
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-1, 57.8m
Minerals Visible: Sericite, biotite, quartz, and fine opaques.
Texture: Foliated. (Spotted).
Colour: Grey, white, and brown.
Grain Size: Fine-grained.
Other Comments: This foliated metamorphic rock appears to be a spotted quartz-biotite-sericite of sedimentary origin. It is quite likely that all diagnostic sedimenticlastic textures have been totally destroyed during regional metamorphic recrystallization processes.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 45% Biotite occurs as very fine to fine oriented flakes, and as continuous and discontinuous lepidoblastic aggregates that parallel the foliation planes. The biotite is interlocked with sericite, and subordinate granoblastic, and xenoblastic quartz. Very fine zircon and opaque granules are occasionally enclosed. Chlorite is very rare.

ACCESSORY & SECONDARY MINERALS

44% Sericite occurs as very fine to fine suboriented and oriented flakes, as discontinuous lepidoblastic aggregates, and as lenticular and clotted aggregates with matted fabric devoid of relic textures. It is interlocked, often in optical continuity, with the strongly pleochroic biotite.

10% Quartz occurs as fine scattered xenoblasts, and as patchy mosaics with granoblastic fabric within the dominant biotite-sericite assemblage. Several of the subrounded and subangular xenoblasts closely resemble metamorphically deformed relic clasts.

1% Opaques occur as very fine scattered anhedra in the silicates. Magnetite granules may be dominant.

Texture: Foliated. (Spotted).
Alteration: Not apparent.
Petrogenesis: A spotted quartz-sericite-biotite schist.
Remarks: The few indistinct relic textures left in this foliated, micaceous rock suggest that the precursor was a pelitic sediment. Several of the quartz xenoblasts resemble relic subangular and subrounded clasts. There is no evidence of grading. Relic quartz and feldspar volcaniclasts, and twinned and untwinned feldspar clasts are absent. The sericite and biotite probably replaced pelitic matrix material.

ROCK NAME: SPOTTED QUARTZ-SERICITE-BIOTITE SCHIST.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 4 MINEX Registered No. IL-9236
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-3, 53.8m.
Minerals Visible: Amphibole, quartz, ?feldspar, and fine opaques.
Texture: Mildly foliated, and finely banded (nematoblastic).
Colour: Dark green with grey.
Grain Size: Fine-grained.
Other Comments: This mildly foliated, and finely banded amphibolitic metamorphic rock appears under a hand lens to be a regionally metamorphosed sediment, and not a basic volcanic or tuff. Most relic clastic textures may have been destroyed in this para-amphibolitic rock.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 60% Amphibole, variety green metamorphic hornblende, occurs as very fine to fine suboriented and oriented acicular, and long and short prismatic subidioblasts and idioblasts, and as continuous and discontinuous nematoblastic aggregates interlocked with fine, parallel disposed bands of granoblastic quartz mosaics. The hornblende also encloses fine quartz xenoblasts, and occasionally opaque grains, probably of iron ore. Twinned and untwinned plagioclase xenoblasts are rarely seen. The amphibole did not pseudomorph pyroxene in this case.

ACCESSORY & SECONDARY MINERALS

39% Quartz occurs as fine scattered angular, subangular, and subrounded xenoblasts, and as fine irregular banded aggregates with granoblastic fabric that alternate with the amphibole rich bands. Many of the quartz, and several of the subangular feldspar xenoblasts closely resemble relic clasts. Undulose extinction due to stress was developed in the quartz. There is no evidence of grading.

1% Opaques, probably mainly magnetite, occur as fine scattered anhedra to euhedra, and aggregates.

Texture: Nematoblastic.
Alteration: Not apparent.
Petrogenesis: A fine-grained, finely banded para-amphibolite (ex-sediment).
Remarks: Despite the effects of amphibolite grade regional metamorphic recrystallization processes on the sedimentary precursor, relic quartz clasts can still be recognized. Volcaniclasts are absent. Several relic twinned and untwinned plagioclase clasts are also present. These are now represented by fine plagioclase xenoblasts within the granoblastic quartz bands. Biotite is absent.

ROCK NAME: FINE-GRAINED, FINELY BANDED PARA-AMPHIBOLITE (EX-SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 5 MINEX Registered No. IL-9237
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-3, 113.0m.
Minerals Visible: Chlorite, quartz, ?biotite, carbonate, and fine opaques.
Texture: Indeterminate, probably mainly matted, and xenoblastic.
Colour: Dark green and white.
Grain Size: Fine-grained.
Other Comments: This fine-grained, non-ferromagnetic rock appears under a X20 hand lens to consist mainly of matted aggregates of penninitic chlorite, minor quartz, scattered opaques, and possibly biotite. The chlorite may be a retrograde low greenschist facies recrystallization product of biotite. All diagnostic relic textures may have been destroyed.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 85% Chlorite, variety penninite, occurs as very fine and fine-grained, interlocking matted aggregates, and as several fine scattered flaky porphyroblasts that do not exhibit preferred orientation. The dominant chlorite encloses fine scattered subangular, subrounded, and rounded quartz xenoblasts and patchy granoblastic mosaics, abundant dusty opaques, and remnant biotite. It is possible that the chlorite pseudomorphed pre-existing biotite during retrograde low greenschist facies burial metamorphic processes. Fine carbonate is enclosed in places. The chlorite does not exhibit pseudomorphous shapes after other felsic and mafic silicate minerals. Amphiboles and feldspars are absent.

ACCESSORY & SECONDARY MINERALS

11% Quartz occurs as fine to very fine scattered angular, subangular and subrounded xenoblasts, and as irregular mosaics with granoblastic fabric enclosed by the chlorite. Irregularly banded aggregates are also present in places.

3% Opaques, probably consisting of iron ore and carbonaceous matter, occur as anhedra and granular aggregates in the chlorite.

1% Carbonate occurs as fine scattered aggregates.

Texture: Predominantly matted.
Alteration: None apparent.
Petrogenesis: A weakly carbonatized, quartz-chlorite rock.
Remarks: In the absence of diagnostic relic textures on which to base identification, it can only be assumed that the precursor was a pelitic sediment (carbonaceous shale) with minor fine quartz clasts. There are no chlorite pseudomorphs after devitrified glass, amphibole, or feldspars, or pyroxenes of igneous origin. There is no evidence that it was a basic tuff, or tuffaceous sediment.

ROCK NAME: WEAKLY CARBONATIZED, QUARTZ-CHLORITE ROCK.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 6 MINEX Registered No. IL-9238
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-3, 162.3m.
Minerals Visible: Quartz, sericite, biotite, feldspar, and fine opaques.
Texture: Probably mainly granular, or finely hypidiomorphic granular.
Colour: Greyish, with brown.
Grain Size: Fine-grained.
Other Comments: This non-ferromagnetic, quartzofeldspathic rock appears under a hand lens to be a slightly oxidized, fine-grained two mica (sericite and biotite) granite. It does not appear to be a polymetamorphosed, fine-grained arkosic sandstone. It was probably also burial metamorphosed.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 46% Alkali feldspar, microcline and orthoclase, and minor associated albite-oligoclase, occur as fine anhedral and subhedral grains, and as tabular and lath shaped grains interlocked with quartz, and subordinate sericite and biotite, and dusty opaques. There is no preferred orientation. Most of the feldspar grains have been incipiently stained by very fine Fe-hydroxides, and argillitized and sericitized. Relic clasts and volcaniclasts are absent.

ACCESSORY & SECONDARY MINERALS

40% Quartz occurs as very fine to fine anhedral and subhedral grains that exhibit undulose extinction due to stress, and as patchy mosaics interlocked with the feldspars and micas. Relic clasts are absent. One micrographic intergrowth is also present.

12% Sericite and biotite occur in about equal abundance as very fine to fine, randomly oriented flakes, and occasionally, patchy flaky aggregates locked in the quartz and feldspars.

2% Goethite-limonite occurs as very fine anhedra in the silicate mineral assemblage.

Texture: Finely hypidiomorphic granular.
Alteration: Slight oxidation.
Petrogenesis: A slightly altered, fine-grained two mica granite.
Remarks: The relic textures are so diagnostically igneous, that it would be impossible to optically classify this rick as a recrystallized quartzo-feldspathic sandstone with the composition of an arkose, thus a meta-arkose. This acidic igneous rock with both sericite and biotite, is best classified as a two mica granite. Very fine sericite also partly replaced the feldspars. Clasts are absent.

ROCK NAME: SLIGHTLY ALTERED, FINE-GRAINED TWO MICA GRANITE.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 7 MINEX Registered No. IL-9239
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-2, 139.9m.
Minerals Visible: Quartz, feldspar, biotite, sericite, and fine opaques.
Texture: Mildly porphyritic.
Colour: Greyish, with some brown.
Grain Size: Fine to medium-grained.
Other Comments: This quartzofeldspathic rock appears to differ from the preceding granitic sample only in the grain sizes of the silicate minerals, and the fabric. A feldspar phenocryst can be seen in the core sample. It may have been partly sericitized during K-metasomatic processes. This affected particularly the feldspars.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 40% Quartz occurs as fine to medium-grained anhedral grains of essential origin interlocked with partially to almost completely sericitized alkali feldspars, and albite-oligoclase, which was less affected by the K-metasomatic replacement processes. There are no relic quartz or feldspar clasts, and volcaniclasts. Fine accessory sericite, and minor fine biotite are present.

ACCESSORY & SECONDARY MINERALS

36% Alkali feldspars composed of orthoclase and microcline, and minor albite-oligoclase, occur as partly to almost completely sericitized anhedral, tabular, and lath shaped grains, several of which have phenocrystal dimensions.

20% Sericite occurs as fine to medium-grained, scattered flakes of essential origin, and as finely matted aggregates of metasomatic origin that partially to almost completely replaced the alkali feldspars, at times leaving only pseudomorphous tabular shapes.

2% Biotite occurs only as fine to very fine flakes, and as chloritic pseudomorphs.

2% Goethite-limonite occurs as very fine anhedra.

Texture: Finely porphyritic.
Alteration: Very slight oxidation.
Petrogenesis: A slightly oxidized, partly sericitized, porphyritic two mica granite.
Remarks: This leucocratic granitic rock is best described as a porphyritic two mica granite, rather than as a granite porphyry which has a distinctive finely crystalline groundmass. There are no relic clasts to suggest a recrystallized arkosic sediment. Two types of sericite are represented. The first is of essential origin, and the second is of metasomatic origin.

ROCK NAME: SLIGHTLY OXIDIZED, PARTLY SERICITIZED, PORPHYRITIC TWO MICA GRANITE.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 8 MINEX Registered No. IL-9240
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-5, 62.75m.
Minerals Visible: Quartz, biotite, sericite, and fine opaques.
Texture: Foliated. (Finely banded).
Colour: Greyish, with dark brown.
Grain Size: Fine-grained.
Other Comments: This fine-grained, non-ferromagnetic, foliated (schistose) metamorphic rock appears under a X20 hand lens to be regionally metamorphosed arenaceous sediment. A few fine relic quartz clasts may have survived recrystallization. The pelitic matrix material would now consist of fine sericite and biotite. All the feldspar clasts may have been sericitized.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 36% Biotite occurs abundantly as very fine to fine oriented flakes, and as parallel disposed, discontinuous flaky aggregates with lepidoblastic fabric that parallel the schistosity of the rock. This metamorphic sheet silicate mineral is interlocked with sericite, and is often enclosed by the granoblastic quartz mosaics. Dusty opaques are occasionally enclosed. Chloritized biotite is present in places.

ACCESSORY & SECONDARY MINERALS

32% Sericite occurs as very fine angular, subangular, and tabular aggregates with matted fabric that appear to be sericite pseudomorphs after feldspar clasts, and as coarser grained suboriented and oriented flakes in the finer grained sericite, and granoblastic quartz mosaics.

30% Quartz occurs as very fine to fine scattered angular, subangular, and subrounded xenoblasts, ex-clasts, and as fine lenticular and irregularly banded aggregates that like the sheet silicate minerals, sericite and biotite, parallel the foliation. Relic sedimenticlastic banding has been preserved. Fresh feldspar clasts are absent.

2% Opaques occur as very fine scattered anhedra to euhedra, and blebs in the silicates.

Texture: Foliated. (Relic clastic).
Alteration: None apparent.
Petrogenesis: A fine-grained, quartz-sericite-biotite schist, ex-sediment.
Remarks: The relic textures as expressed by fine quartz clasts suggest that the precursor was a fine-grained sediment, with a pelitic matrix, now sericite and biotite. Fine feldspar clasts may have also been present in places. There is no evidence of grading. Relic volcaniclasts are absent. Some of the biotite flakes exhibit partial retrograde metamorphic chloritization.

ROCK NAME: FINE-GRAINED, QUARTZ-SERICITE-BIOTITE SCHIST (EX-SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 9 MINEX Registered No. IL-9241
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-5, 63.5m.
Minerals Visible: Quartz, sericite, ?biotite, chlorite, and fine opaques.
Texture: Foliated. (Finely banded).
Colour: Dark grey, to almost black.
Grain Size: Fine-grained.
Other Comments: This finely banded, foliated metamorphic rock appears under a hand lens to be a regionally metamorphosed, fine-grained carbonaceous sediment. Chloritized biotite may occur in interstitial sites. Grading may have been preserved.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 40% Quartz occurs as fine, parallel disposed lenticular and banded microcrystalline and macrocrystalline mosaics with granoblastic fabric, and as very fine to fine xenoblasts in the sericite rich bands. The latter exhibit relic angular and subangular clastic textures. There is also evidence of grading. Very fine granules and lenticular to banded aggregates of an opaque mineral, probably carbonaceous matter, are enclosed. There are no quartz volcaniclasts, or feldspar clasts.

ACCESSORY & SECONDARY MINERALS

39% Sericite occurs as very fine to fine oriented flakes and flaky aggregates in the quartz rich bands, and abundantly in the sericite rich bands with lepidoblastic fabric. Very fine carbonaceous matter darkened the sericite, and masked the optical properties. Trace fine chlorite is at times associated.

20% Opaques, probably mainly cryptocrystalline carbonaceous matter occur as very fine anhedra, and as lenticular and irregularly banded aggregates in the quartz and sericite assemblage.

1% Chlorite occurs as very fine oriented flakes, and as optically continuous patches mainly in the granoblastic quartz bands. Biotite is absent.

Texture: Foliated. (Relic clastic).
Alteration: Not apparent.
Petrogenesis: A fine-grained, carbonaceous, chlorite-sericite-quartz schist, ex-finely banded sediment.
Remarks: There can be no doubt when the thin section is examined, that the precursor was a fine-grained, carbonaceous sediment since relic quartz clasts have been well preserved. Relic grading can also be seen in the bands. Pelitic material probably occurred in the matrix, and was intermixed with carbonaceous matter.

ROCK NAME: FINE-GRAINED, CARBONACEOUS, CHLORITE-SERICITE-QUARTZ SCHIST (EX-FINELY BANDED SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 10 MINEX Registered No. IL-9242
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-5, 76.2m.
Minerals Visible: Quartz, sericite, biotite, and fine opaques.
Texture: Foliated. (Finely banded).
Colour: Grey, dark grey, and brown.
Grain Size: Fine-grained.
Other Comments: This non-ferromagnetic, banded siliceous rock appears to be a regionally metamorphosed, poorly sorted sediment. Fine relic quartz clasts can be seen under a X20 hand lens. Quartz and biotite are the dominant silicate minerals present.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 68% Quartz occurs predominantly as very fine to fine-grained xenoblasts that often still exhibit the relic subangular, subrounded, and angular shapes of pre-existing clasts, and as fine irregularly banded granoblastic aggregates that with the associated biotite and sericite parallel the foliation planes, and original bedding planes. Sorting was poor. Relic volcaniclasts and feldspars are absent.

ACCESSORY & SECONDARY MINERALS

22% Biotite occurs as very fine to fine suboriented and oriented flakes, and as discontinuous lepidoblastic aggregates interlocked with sericite. There was no retrograde chloritization.

8% Sericite occurs as fine suboriented and oriented flakes often interlocked with the dominant biotite, or enclosed by it. Sericite pseudomorphs after feldspar clasts are absent. Trace fine zircon and tourmaline occur as several clastic grains.

2% Opaques occur as very fine scattered anhedra, subhedra, and blebs, probably mainly of magnetite and carbonaceous matter, locked in the silicate mineral assemblage.

Texture: Foliated. (Relic clastic, banded).
Alteration: Not apparent.
Petrogenesis: A fine-grained, sericite-biotite-quartz schist, ex-poorly sorted arenaceous sediment.
Remarks: Once again have many clastic textures been well preserved despite the effects of regional metamorphic recrystallization. These relic sedimenti-clastic textures indicate that the precursor was a finely banded, poorly sorted, arenaceous sediment. The original matrix was completely obliterated. Trace fine tourmaline and zircon occur as several clastic grains. Twinned and untwinned feldspars are absent.

ROCK NAME: FINE-GRAINED, SERICITE-BIOTITE-QUARTZ SCHIST (EX-POORLY SORTED ARENACEOUS SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 11 MINEX Registered No. IL-9243
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-6, 55.33m.
Minerals Visible: Biotite, quartz, and fine opaques.
Texture: Foliated (spotted).
Colour: Dark brown to brown.
Grain Size: Fine-grained.
Other Comments: This fine-grained metamorphic rock appears under a hand lens to consist mainly of granoblastic and xenoblastic quartz, and oriented biotite. The precursor may have been an impure pelitic, or arenaceous sediment. It is non-ferromagnetic.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 50% Biotite occurs as very fine to fine-grained oriented flakes interlocked with granoblastic quartz, as discontinuous lepidoblastic and lenticular aggregates, and as oriented flaky porphyroblasts that parallel the foliation planes. It is a strongly pleochroic metamorphic variety, and is free from retrograde chlorite. Muscovite is also present in places.

ACCESSORY & SECONDARY MINERALS

49% Quartz occurs as very fine to fine interlocking xenoblasts that often exhibit relic clastic textures. The interlocking mosaics have a granoblastic fabric, again a metamorphic textural feature. Twinned and untwinned feldspars, and amphibole, are absent from interstitial and intergranular sites.

1% Muscovite (sericite), occurs as several very fine, parallel disposed, shear fillings.

Trace opaques occur as very fine scattered anhedra in the silicate mineral assemblage. It is probably mainly dusty magnetite.

Texture: Foliated and granoblastic.
Alteration: None apparent.
Petrogenesis: A fine-grained, spotted quartz-biotite schist, ex-sediment.
Remarks: The relic textures suggest that the precursor was a fine-grained, well sorted arenaceous sediment as indicated by the fine relic angular, subangular, and subrounded relic quartz clasts, now xenoblasts. There is no relic grading. Relic volcaniclasts are absent. There was no development of brown or green metamorphic hornblende. Feldspar clasts are absent.

ROCK NAME: FINE-GRAINED, SPOTTED QUARTZ-BIOTITE SCHIST (EX-SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 12 MINEX Registered No. IL-9244
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-6, 57.5m.
Minerals Visible: Amphibole, biotite, quartz, and fine opaques.
Texture: Indeterminate, probably mainly finely subidioblastic and idioblastic.
Colour: Dark green, almost black.
Grain Size: Fine-grained.
Other Comments: This non-ferromagnetic, amphibolitic metamorphic rock appears under a hand lens to consist of interlocking green metamorphic hornblende, granoblastic quartz, minor fine porphyroblastic biotite, and scattered opaques. Most diagnostic relic textures may have been obliterated, making precise identification of the precursor impossible.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 60% Amphibole, variety green metamorphic hornblende, occurs as fine, often interlocking, randomly oriented acicular, tabular, and prismatic subidioblasts and idioblasts associated with finely granoblastic and xenoblastic quartz, and occasionally biotite, and scattered opaques. The strongly pleochroic hornblende is probably pseudomorphous after prismatic essential pyroxene, although fresh pyroxene is absent.

ACCESSORY & SECONDARY MINERALS

39% Quartz occurs as fine xenoblasts, and abundantly as patchy granoblastic mosaics interlocked with the metamorphic hornblende, and minor untwinned plagioclase, opaques, and biotite. Relic quartz and feldspar clasts are absent.

1% Opaques occur as very fine to fine erratically distributed anhedral to euhedral grains locked mainly in the hornblende. It is probably mainly magnetite, or titanomagnetite. Precise identification of opaque phase minerals is not possible in thin section.

Biotite occurs as several fine scattered flakes in the quartz and amphibole.

Texture: Finely subidioblastic, idioblastic, and granoblastic.
Alteration: None apparent.
Petrogenesis: A fine-grained, biotitic orthoamphibolite (ex-basic volcanic?).
Remarks: Since there are no diagnostic relic textures visible in thin section, particularly clastic textures, the metamorphic silicate mineral assemblage suggests a fine-grained basaltic precursor. The original basic volcanic was recrystallized during amphibolite facies grade burial metamorphic processes as the green hornblende suggests. Relic quartz clasts are absent.

ROCK NAME: FINE-GRAINED, BIOTITIC ORTHOAMPHIBOLITE (EX-BASIC VOLCANIC?).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 13 MINEX Registered No. IL-9245
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-8, 81.75m.
Minerals Visible: Biotite, sericite, quartz, and fine opaques.
Texture: Foliated.
Colour: Brown, with silky lustre.
Grain Size: Fine-grained.
Other Comments: This foliated, micaceous metamorphic rock appears under a X20 hand lens to consist predominantly of quartz, biotite, and sericite. Although most diagnostic relic textures may have been destroyed during regional metamorphic recrystallization processes, the precursor was probably a fine-grained sediment.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 50% Sericite (muscovite) occurs as very fine to fine suboriented and oriented flakes, and as discontinuous and continuous lepidoblastic aggregates interlocked with oriented biotite and quartz. It encloses fine scattered xenoblasts of recrystallized angular, subangular, and subrounded quartz, and rarely fine opaque granules.

ACCESSORY & SECONDARY MINERALS

41% Biotite occurs as very fine to fine suboriented and oriented flakes that like the associated sericite parallel the foliation planes. There are no sericite or biotite pseudomorphs after mafic or felsic silicate minerals of clastic origin. Chloritized biotite is present in places.

8% Quartz occurs as fine scattered xenoblasts that by their distinctive angular, subangular, and subrounded shapes suggest relic clasts. Twinned and untwinned feldspars are absent. There is no evidence of grading.

1% Opaques, probably mainly magnetite, occur as very fine erratically distributed anhedra locked in the silicate mineral assemblage. Precise identification is impossible in thin section.

Texture: Foliated, and relic clastic.
Alteration: None apparent.
Petrogenesis: A fine-grained, quartz-biotite-sericite schist, ex-sediment.
Remarks: The only relic textures visible in thin section are fine, metamorphically deformed quartz clasts scattered through the sheet silicate mineral assemblage, consisting of predominantly suboriented and oriented biotite and sericite. The original rock was probably a fine-grained pelitic sediment, with argillaceous matrix material. Trace fine secondary chlorite is present.

ROCK NAME: FINE-GRAINED, QUARTZ-BIOTITE-SERICITE SCHIST (EX-SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 14 MINEX Registered No. IL-9246
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-10, 61.00m.
Minerals Visible: Amphibole, quartz, ?feldspar, ?chlorite, and fine opaques.
Texture: Indeterminate, probably mainly subidioblastic and idioblastic.
Colour: Dark green, almost black.
Grain Size: Fine-grained.
Other Comments: This non-ferromagnetic amphibolitic metamorphic rock may have been derived during amphibolite facies grade burial metamorphic recrystallization processes from either a fine-grained basic volcanic (lava), or from an impure sediment. Few relic textures may have survived recrystallization.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 60% Amphibole, variety green metamorphic hornblende, occurs abundantly as fine to very fine randomly oriented, and often interlocking tabular, acicular, and prismatic subidioblasts and idioblasts, and as crystalline aggregates that enclose quartz, and is occasionally enclosed by it. It is not pseudomorphous after essential igneous pyroxene. Remnant pyroxene is absent.

ACCESSORY & SECONDARY MINERALS

32% Quartz occurs as fine to very fine scattered xenoblasts, and as patchy mosaics with granoblastic fabric interlocked with the dominant hornblende, and often enclosed by it. Many of the quartz xenoblasts closely resemble relic clasts. Twinned and untwinned clastic feldspar is at times associated.

6% Plagioclase, both twinned and untwinned types, occur as fine scattered angular, subangular, and tabular relic clasts associated with the quartz.

2% Opaques occur as very fine to fine scattered anhedra to euhedra, and blebs enclosed by the metamorphic hornblende. Magnetite, or titanomagnetite may be dominant. Precise identification is impossible.

Texture: Finely subidioblastic and idioblastic.
Alteration: None apparent.
Petrogenesis: A fine-grained para-amphibolite, ex-sediment.
Remarks: The remaining relic textures as manifest in thin section by fine scattered quartz and feldspar clasts, suggest that the precursor was a fine-grained poorly sorted, impure arenaceous sediment, and not an ortho-amphibolite derived from a basic volcanic. Some of the finely mosaic textured quartz may be of metasomatic origin. The metamorphic grade of burial metamorphic recrystallization was in the amphibolite facies. Igneous textures are absent.

ROCK NAME: FINE-GRAINED PARA-AMPHIBOLITE (EX-SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 15 MINEX Registered No. IL-9247
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-14, 105.50m.
Minerals Visible: Quartz, chlorite, biotite, garnet, ?feldspar, and fine opaques.
Texture: Foliated.
Colour: Dark grey, with minor brown and red.
Grain Size: Fine-grained.
Other Comments: This non-ferromagnetic metamorphic rock appears under a X20 hand lens to be composed of quartz, feldspar and biotite, and minor chlorite and garnet. It was probably a fine-grained arenaceous sediment. The garnet occurs as fine idioblastic grains. Sufficient quartz clasts may have survived regional, or polymetamorphic recrystallization processes.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 50% Quartz occurs abundantly as very fine to fine-grained scattered subangular and subrounded xenoblasts set in a microcrystalline, recrystallized matrix composed of granoblastic quartz, oriented biotite, and minor feldspar, garnet, chlorite, and fine scattered opaques. Many of the recrystallized quartz grains still retain the relic clastic textures of a poorly sorted arenaceous sediment. Volcaniclasts are absent.

ACCESSORY & SECONDARY MINERALS

33% Biotite, with green and brown colours, occurs as very fine to fine, suboriented and oriented flakes, and as discontinuous to continuous lepidoblastic aggregates. Partially to completely chloritized biotite is also present. It is of metamorphic origin.

8% Chlorite, penninite, occurs as very fine scattered flakes ex-biotite, and as fracture fillings in the dominant quartz. The fracture filling chlorite is probably of metasomatic origin.

4% Garnet, variety almandine, occurs as fine, scattered, and at times partly chloritized idioblastic porphyroblasts in the granoblastic quartz mosaics.

4% Plagioclase occurs as fine relic clasts locked in the quartz.

1% Opaques occur as very fine to fine scattered anhedra, subhedra, and blebs.

Texture: Foliated and granoblastic. (Relic clastic).
Alteration: None apparent.
Petrogenesis: A garnetiferous, chlorite-biotite-quartz schist, ex-arenaceous sediment.
Remarks: There can be little doubt when the thin section is examined, that the precursor was prior to regional metamorphic recrystallization, a fine-grained arenaceous sediment. Fine relic quartz and feldspar clasts can be seen. This rock was also weakly metasomatized as the very fine fracture filling chlorite suggests. Minor chloritized biotite is also present.

ROCK NAME: GARNETIFEROUS, CHLORITE-BIOTITE-QUARTZ SCHIST (EX-ARENACEOUS SEDIMENT).

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 16 MINEX Registered No. IL-9248
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-5, 91.20m.
Minerals Visible: Quartz, feldspar, sericite, chlorite, and fine opaques.
Texture: Hypidiomorphic granular, slightly porphyritic.
Colour: Greyish.
Grain Size: Fine to medium-grained.
Other Comments: This quartzofeldspathic rock appears both megascopically, and under a hand lens to be burial metamorphosed, and possibly weakly metasomatized, two mica granite, or porphyry. It is not a recrystallized arkosic sandstone (meta-arkose). The accessory biotite may have been chloritized.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 49% Alkali feldspars occur as fine to medium-grained, randomly oriented tabular, lath shaped and anhedral grains of almost completely to completely argillitized and sericitized orthoclase, little altered, to fresh microcline, and minor oligoclase-albite interlocked with quartz, subordinate muscovite, and chloritized biotite flakes. The coarser microcline is phenocrystal in size.

ACCESSORY & SECONDARY MINERALS

42% Quartz occurs as fine to medium-grained anhedra and patchy mosaics that often exhibit undulose extinction due to stress. Relic quartz and feldspar clasts to suggest a sedimentary origin are absent.

7% Muscovite (sericite), occurs as fine to medium-grained, randomly oriented flakes, as patchy flaky aggregates in the quartz, and as very fine to fine flakes, and matted aggregates in the feldspars, including the argillitized alkali feldspar.

1% Chlorite, ex-biotite, occurs as fine scattered flakes in the quartz-feldspar assemblage.

1% Opaques occur as fine scattered anhedra of indeterminate composition.

Texture: Hypidiomorphic granular. Mildly porphyritic.
Alteration: None apparent.
Petrogenesis: A porphyritic, two mica granite.
Remarks: Despite the effects of burial metamorphic recrystallization, argillic alteration, and partial sericitization of the feldspars, the relic textures clearly indicate that the precursor was an acidic igneous rock with granitic norm. It is mildly porphyritic. The original fine biotite was chloritized since trace remnant biotite can be seen in places. Similar rocks are occasionally auriferous.

ROCK NAME: PORPHYRITIC, TWO MICA GRANITE.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 18 MINEX Registered No. IL-9250
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample from BHD-9, 84.00m.
Minerals Visible: Phlogopite, epidote, quartz, carbonate, and fine opaques.
Texture: Indeterminate, probably mainly micaceous and granular.
Colour: Brown, various shades.
Grain Size: Fine-grained.
Other Comments: This very altered rock appears under a hand lens to consist mainly of phlogopitic mica, epidote-group minerals, carbonate, and quartz stained by very fine Fe-hydroxides. A fine stringer of altered phlogopite and carbonate traverses the silicate mineral assemblage, mainly quartz and epidote. Most diagnostic relic textures may have been totally destroyed. The carbonate is probably ankerite. It may be an intensely metasomatized sediment.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 40% Phlogopite and sericite occur as very altered (stained) flakes and flaky aggregates interlocked with epidote group minerals, quartz, and carbonate stained by Fe-hydroxides, and as two (2) fracture fillings with carbonate selvedge. The optical properties have been obscured due to alteration. Pleochroism is weak. Chlorite is rare.

ACCESSORY & SECONDARY MINERALS

35% Epidote and clinozoisite occur as very fine to fine anhedra to euhedra, as granular aggregates, and rarely as scattered medium-grained anhedra and fracture fillings. It is probably of metasomatic origin. It does not pseudomorph any essential basic or felsic silicate minerals.

10% Carbonate, probably ankerite or siderite, occurs as fine fracture fillings associated with phlogopite, and as minor fine scattered anhedra. It is stained.

10% Quartz occurs as fine scattered anhedra, and patchy mosaic textured aggregates interlocked with the epidote-group minerals, and phlogopite. Clasts are absent.

5% Goethite-limonite occurs as very fine anhedra and aggregates of exotic origin.

Texture: Granular and micaceous.
Alteration: Oxidation and weathering.
Petrogenesis: A very altered, weakly carbonatized, quartz-epidote-sericite-phlogopite rock.
Remarks: Because there are no diagnostic relic igneous or clastic textures visible in thin section, this very altered rock is best described as a weakly carbonatized, quartz-epidote-sericite-phlogopite rock. Fine irregular and parallel disposed stringers (veinlets) consisting of interlocked carbonate and phlogopite, or of phlogopite with carbonate selvedges, can be seen. The original rock was intensely metasomatized.

ROCK NAME: VERY ALTERED, WEAKLY CARBONATIZED, QUARTZ-EPIDOTE-SERICITE-PHLOGOPITE ROCK.

MINTEK SERVICES
27 Burma Road, Lesmurdie. W.A. 6076 Telephone 291 7491

BRIEF PETROGRAPHIC DESCRIPTION

Specimen No. 20 MINEX Registered No. IL-9252
Thin section.

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small core sample.
Minerals Visible: Amphibole, quartz, ?biotite, epidote, feldspar, and fine opaques.
Texture: Foliated.
Colour: Dark green, almost black.
Grain Size: Fine-grained.
Other Comments: This in places strongly ferromagnetic, weakly mineralized amphibolitic metamorphic rock may have been derived from a recrystallized basic lava (orthoamphibolite), or an impure arenaceous sediment (para-amphibolite). Sufficient relic textures may have been preserved despite the effects of amphibolite facies grade regional metamorphic recrystallization processes. The opaque mineral assemblage can only be identified in polished section.

MICROSCOPIC CHARACTERISTICS

Constituents: (Percent visual estimate)

ESSENTIAL MINERALS 70% Amphibole, variety brownish green metamorphic hornblende, occurs as very fine to fine suboriented and oriented acicular and prismatic subidioblasts and idioblasts, and as parallel disposed nemato-blastic aggregates that alternate with quartz rich bands with granoblastic fabric. The amphibole encloses fine scattered anhedra, subhedra, and patchy clusters of epidote, and opaques. The amphibole may be pseudomorphous after pyroxene, since no relic clastic textures and clasts can be seen.

ACCESSORY & SECONDARY MINERALS

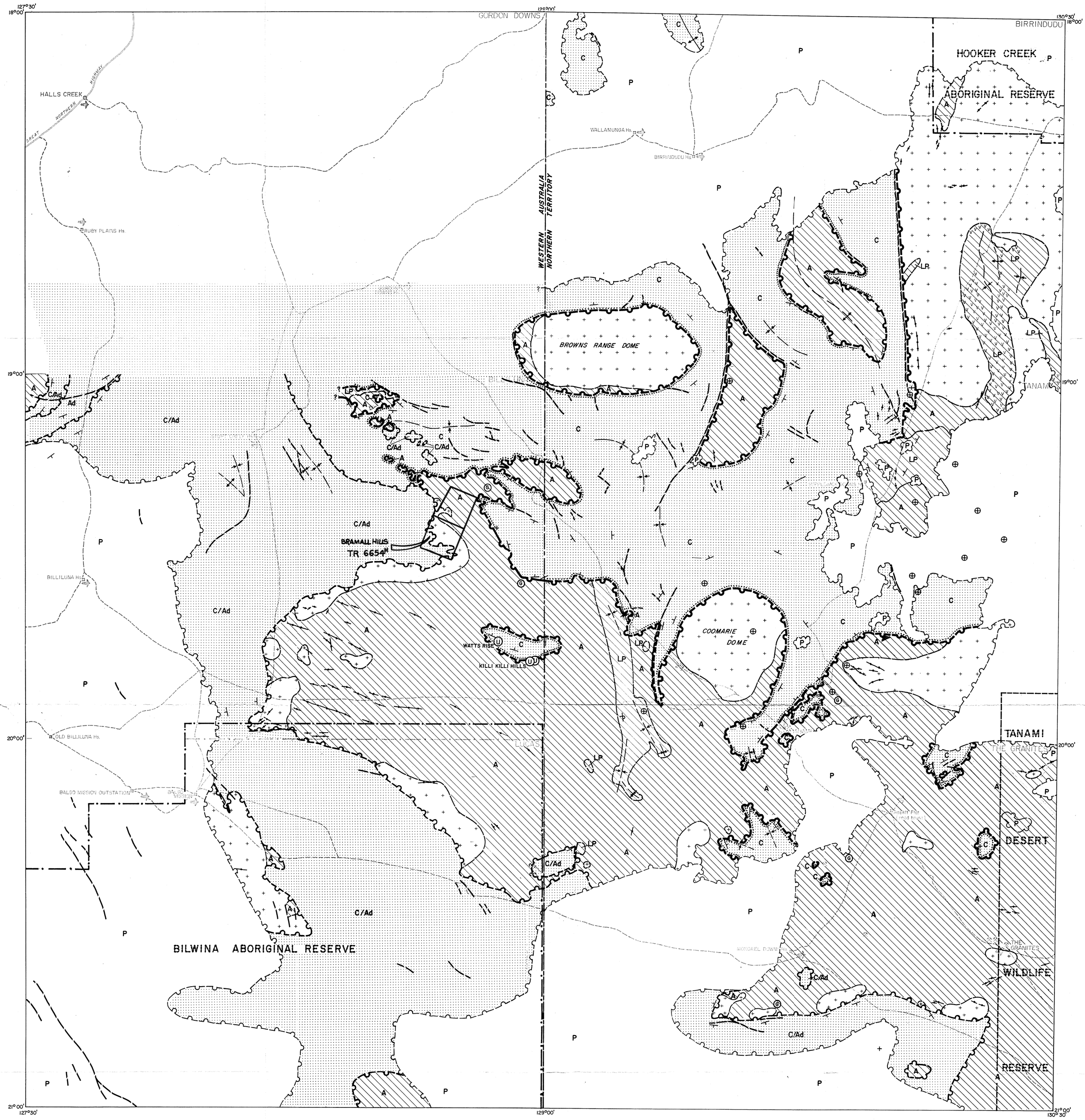
21% Quartz, and minor associated twinned and untwinned plagioclase, occur predominantly as fine, foliation oriented, often discontinu-ous granoblastic bands that enclose fine hornblende, and rarely epidote and opaques. Relic clasts are absent.

7% Opaques occur as fine scattered anhedral, subhedral, and euhedral grains and blebs, enclosed mainly by the hornblendic amphibole. Magnetite and/or titanomagnetite may be dominant. Trace fine sulphides are also present in places, but cannot be identified in transmitted light.

2% Epidote occurs as fine scattered grains and aggregates.

Texture: Nematoblastic and granoblastic.
Alteration: None apparent.
Petrogenesis: A fine-grained, weakly mineralized, orthoamphibolitic schist.
Remarks: Since there are no diagnostic relic clastic textures visible in thin section, it can be assumed from the metamorphic silicate mineral assemblage, that the precursor was probably a basic lava (volcanic). There are no relic quartz or feldspar clasts. The original rock was recrystallized during high grade, epidote-amphibolite facies grade regional metamorphic processes. Abundant fine magnetite is present.

ROCK NAME: FINE-GRAINED, WEAKLY MINERALIZED, ORTHOAMPHIBOLITIC SCHIST.



Miles 10 0 10 20 30 Miles
Kilometres 10 0 10 20 30 40 50 Kilometres

SCALE 1: 500 000

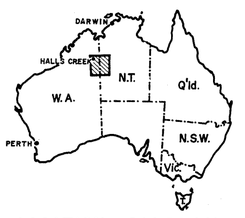
REFERENCE

- Highway
- Roads and tracks
- Airstrip
- Abandonned gold diggings or occurrences
- Boundary of Aboriginal Reserves

PALAEOZOIC	P	Sediments and basalts.
UPPER PROTEROZOIC (Adeladian)	Ad	Edward Albert Group and Duerdin Group.
UPPER to MIDDLE PROTEROZOIC	C/Ad	Redcliffe Pound Group
MIDDLE PROTEROZOIC (Carpentarian)	C	Birrindudu Group; Gardiner Sandstone at base.
		Coomarie Dome Granite Browns Range Dome Granite Lewis Granite and granite unamed.
LOWER PROTEROZOIC	LP	Mt. Winnecke Formation.(volcanics) Pargee Sandstone
LOWER PROTEROZOIC/ ARCHAEAN?	A	Tanami Complex Halls Creek Metamorphics

- (U) Uranium occurrence
- ⊕ Airborne radiometric anomaly
- (G) Stratiform gossan

- Unconformity
- Fault.
- Geological boundary
- Inferred geological boundary
- Synclinal axis
- Anticlinal axis
- Dip and strike
- Overturned
- Flat
- Quartz veins
- Base of the Gardiner Sandstone.



LOCATION DIAGRAM

A 8295

URANEX PTY LTD

BILLILUNA-TANAMI URANIUM PROJECT AREA
REGIONAL GEOLOGICAL INTERPRETATION MAP

68

Scale: 1: 500 000	Map Ref:	
Data by: C.J. Flesher		Project No.: 1314
Drawn by: C. Parker	Date: July, 1978	Plan No.: 5.

TR 6532H

Mt Mansbridge Road

Very minor stream sediment sampling by Alcoa (1976-77)

TR 6393 (Alcoa)

PECHINEY AIRBORNE RADIOMETRIC SURVEY (1972-73)
More extensive on N.T. side of border.
Two scintillometers used; crystal size not known

ALCOA (1976-77)
Stream sediment sampling

GAYWOOD GRID (ALCOA 1976-77)
1. Geochemical drilling at 350 X 350 m. spacing
2. Rotary-percussion drilling – 12 holes for 469m.
(Best value: 56 ppm U_3O_8 over 2.0 m)

TR 6745H

ALCOA
Stream sediment sampling

TR 6531H

TR 6720H

Minor geological reconnaissance and anomaly inspections in this general area by Pechiney (1972-73)

TR 6654H

TR 5902 (Pechiney)

TR 6394 (Alcoa)

To Sturt Creek Station (90km approx)

ALCOA AIRBORNE RADIOMETRIC SURVEY (1976-77)
904 cubic inch crystal used in 4 channel differential spectrometer. (Alcoa colour air photography and 1:25 000 geological mapping also covers all/much of this area.)

Bradshaw Well

Carol Field

TR 6395 (Alcoa)

Bluff Road North

ALCOA (1976-77)
Stream sediment and rock chip sampling

ESSO GRID (1973-74)
1. Geochemical drilling at 1000 X 500 m. spacing (Spacing reduced to 100 X 100 m. in selected areas)
2. Percussion drilling – 87 holes for 5017m. (Mostly at 1000 X 200 m. spacing)
3. Small, experimental radon-cup survey
4. Best values obtained are:-
   a. Geochemical drilling – 51 ppm U
   b. Rock chip samples (surface) – 227 ppm U
   c. Percussion drilling – 57 ppm U over 3.0 m.

TR 6719H

Bluff Road South

LARRANGANI GRID (ALCOA 1976-77)
1. Geochemical drilling at 250 X 250 m. spacing
2. Rotary-percussion drilling – 9 holes for 360 m. (Best value 19 ppm U_3O_8 over 2.0 m.)

TR 5794 (Esso)

TR 5792 (Esso)

PART OF ESSO AIRBORNE RADIOMETRIC RECONNAISSANCE SURVEY (1973-74)
(Using a hand-held scintillometer in helicopter)

HEART-BOB'S KNOB GRID (ALCOA 1976-77)
1. Geochemical drilling at 250 X 250 m. spacing
2. Rotary-percussion drilling – 6 holes for 253 m. (Best value 57 ppm U_3O_8 over 2.0 m.)

TR 6396 (Alcoa)

TR 6797 (Alcoa)

Granny Soak

Mount Brophy Spring

Brophy Creek

Claypans

Mount Stobbins

Mount Weekes

Bindi Bindi Waterhole

Jinellga Pool

Pechiney Camp

Rabbit Gap

Pechiney Spring

Lake Villiers

Spinifex

Areas of airborne radiometric surveys

Anomalous area (uranium channel) located by Alcoa airborne radiometric survey

Anomaly (total count) located by Pechiney airborne radiometric survey

Area of ground surveys

Area of rotary-percussion drilling and/or anomalous geochemical results

Expired Temporary Reserve TR 5792

Existing Tenements TR 6531H

Middle Proterozoic Unconformity

Fault contact

m. 2000 0 2 4 6 8 10 Km.

SCALE 1: 100 000

1:250 000
SHEET LAYOUT DIAGRAM

MT. RAMSAY · GORDON DOWNS · BIRRINDUDU · MT. BANNERMAN · BILLILUNA · TANAMI · CORNISH · LUCAS · THE GRANITES

LOCATION DIAGRAM

DARWIN · HALLS CREEK · N.T. · QLD. · W.A. · S.A. · N.S.W. · PERTH · VIC.

A 8295

URANEX PTY LTD

BILLILUNA TANAMI URANIUM PROJECT

SUMMARY MAP OF PREVIOUS EXPLORATION

Scale: 1: 100 000		Map Ref: Billiluna 1:250 000 sheet.
Data by: V.T. Roberts & Associates		Project No.: 1234
Drawn by:	Date: July, 1978	Plan No.: 29

1150 E 1200 E 1300 E 1400E 1500E 1600E 1700 E 1800E 1850 E

3500 S 3600 S 3700 S 3800 S 3900 S 4000 S 4100 S

BHD3 BHD1 BHD11 BHD13 BHD15

Amp Sch q

Scattered Laterite

Laterite outcrops

Laterite outcrops

Laterite outcrops

Baseline

Magnetic North

840

66
1386

20 10 0 10 30 50 75 100 metres

SCALE 1:1000

A 8295

Granite

Amp Amphibolite (fine to medium grained) oxidized

Sch Schist oxidized

Boundary of rubble

Boundary of outcrop and geological contact

Dip and strike of bedding

Quartz vein

Limonite-haematite quartz vein (dip indicated)

Fault

Drainage

Drill hole previous exploration

BHD3 Diamond drill hole URANEX PTY LTD

URANEX PTY. LTD.

BILLILUNA TANAMI URANIUM PROJECT
BRAMALL HILLS BH1 GRID
GEOLOGY

70

Scale: 1:1000	Map Ref:	
Data: N.PRATT		Project No.: 1234
Drawn by: MINEX Services	Date: October 1978	Plan No.: 45

1150 E 1200 E 1300 E 1400 E 1500 E 1600 E 1700 E 1800 E 1850 E

3500 S 3600 S 3700 S 3800 S 3900 S 4000 S 4100 S

BHD3 BHD1 BHD11 BHD13 BHD15

Amp Sch q

Scattered Laterite

Laterite outcrops

Laterite outcrops

Laterite outcrops

Baseline

Magnetic North

Uranium ppm

A	> 400
B	301 - 400
C	201 - 300
D	100 - 200
	< 100

20 10 0 10 30 50 75 100 metres

SCALE 1:1000

Granite

Amp Amphibolite (fine to medium grained) oxidized

Sch Schist oxidized

Boundary of rubble

Boundary of outcrop and geological contact

Dip and strike of bedding

Quartz vein

Limonite-haematite quartz vein (dip indicated)

Fault

Drainage

Drill hole previous exploration

BHD3 Diamond drill hole URANEX PTY LTD

Rock sample location

069 Rock sample number

A 8295

URANEX PTY. LTD.

BILLILUNA TANAMI URANIUM PROJECT

BRAMALL HILLS BH1 GRID

SAMPLE LOCATION 71

Scale: 1:1000		Map Ref:
Data : N.PRATT		Project No.: 1234
Drawn by: MINEX Services	Date: October 1978	Plan No.: 46

1200 E 1300 E 1400 E 1500 E 1600 E 1700 E 1800 E

3500 S 3600 S 3700 S 3800 S 3900 S 4000 S 4100 S

BHD3 BHD 1 BHD 15 BHD 11 BHD 13

Baseline

BHD 3 Diamond drill hole URANEX PTY LTD.

Drill hole previous exploration Esso

COUNTS PER MINUTE

800 600 500 400 300 200 100

• Sample station

Instrument : Spectrometer GR-410
21·2 cu. ins. crystal

Operator : B. Armstrong

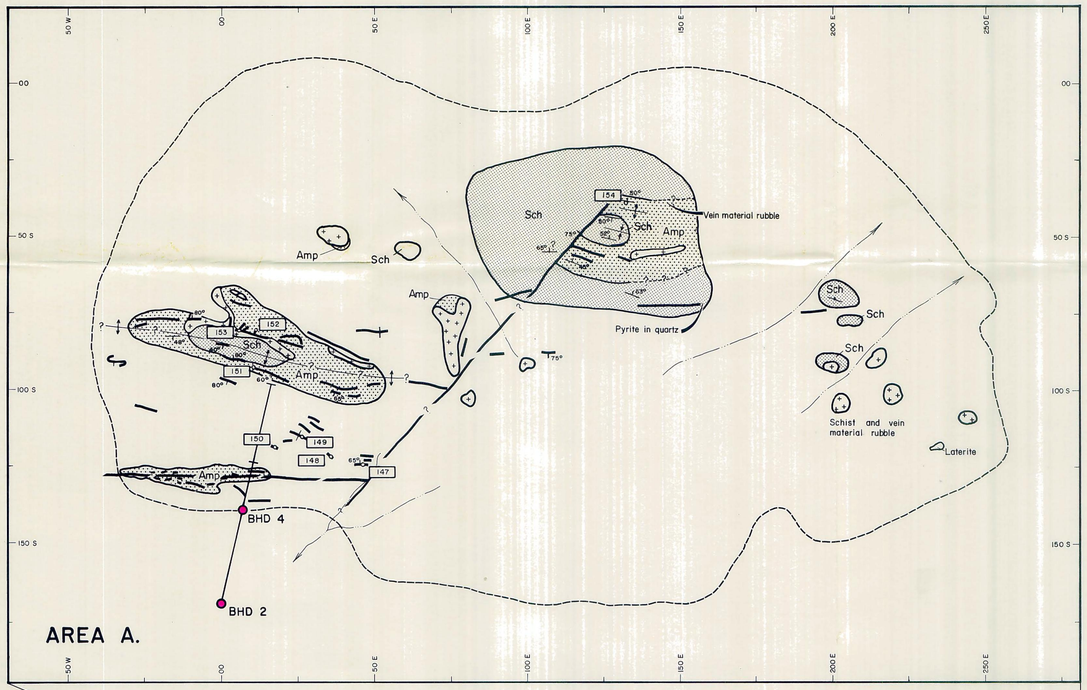
A 8295

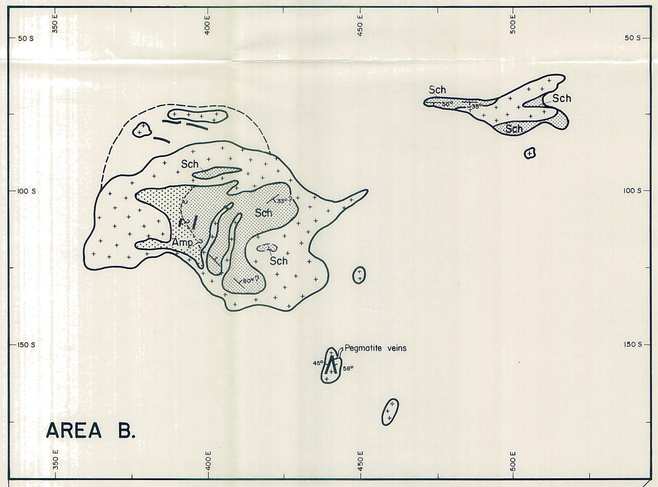
URANEX PTY. LTD.

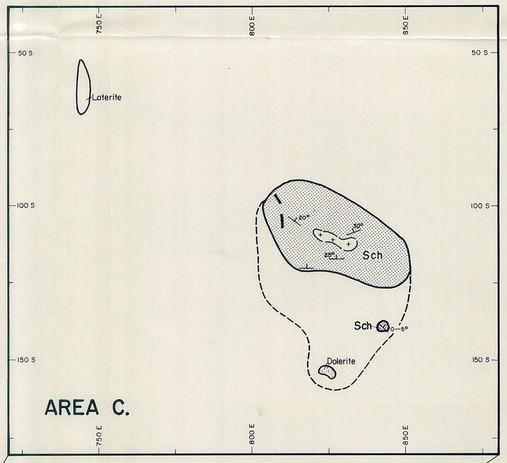
BILLILUNA TANAMI URANIUM PROJECT
BRAMALL HILLS BH1 GRID
URANIUM

72

Scale: 1 1000	Map Ref:	
		Project No.: 1234
Drawn by: MINEX Services	Date: October 1978	Plan No.: 47







Scale 1:1000

metres 25 20 10 0 25 50 75 100 metres

GRID NORTH

MAGNETIC NORTH

310°

Scale 1:2500

metres 50 25 0 50 100 150 200 metres

ROCK SAMPLE ASSAYS

No.	U	Th	Cu	Pb	Zn	Ag
147	140	15	115	20	80	x
148	140	7	130	15	125	x
149	150	x	140	20	120	x
150	110	15	150	20	100	x
151	30	20	60	25	95	x
152	160	x	190	20	165	x
153	130	4	160	30	120	x
154	140	15	205	25	150	x

(ppm)

Sample point

149 Rock sample number

Granite

Amp Amphibolite (fine to medium grained) oxidized

Sch Schist oxidised

Boundary of outcrop

Boundary of rubble and sub-outcrop

Geological boundary inferred

Limonite – haematite quartz vein (dip indicated)

Fault

Drainage

Strike and dip of bedding

Horizontal dip

Vertical dip

Strike and dip of schistosity

Anticline

Syncline.

BHD 2 Diamond drill hole URANEX PTY. LTD.

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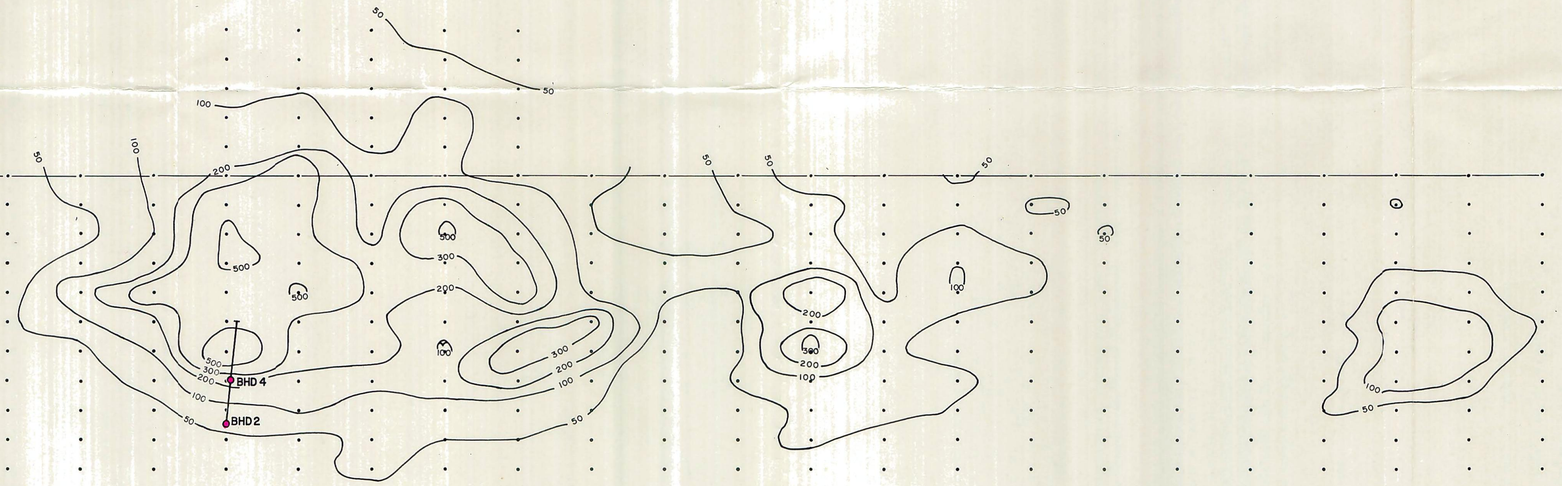
BILLILUNA TANAMI URANIUM PROJECT
BRAMALL HILLS BH2 GRID
GEOLOGY 73

Scale:	Map Ref:	
Mapped by N. Pratt		Project No.: 1234.
Drawn by: MINEX Services	Date: October, 1987.	Plan No.: 51

200W 00 200E 400E 600E 800E 1000E

200N 00 200S 400S



Grid North

Magnetic North

310°

metres 50 0 50 100 150 200 metres

SCALE 1:2500

Base line

Sample station

Spectrometer GR-410
21·2 cu ins crystal

Operator : P.Smyrk

COUNTS PER MINUTE

500
300
200
100
50

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BILLILUNA TANAMI URANIUM PROJECT
BRAMALL HILLS BH 2 GRID
URANIUM 74

Scale: 1:2500	Map Ref:	
		Project No.: 1234
Drawn by: MINEX Services	Date: October, 1978	Plan No.: 52

4950 E 5000 E 5100 E 5200 E 5300 E 5400 E 5500 E 5600 E 5700 E 5750 E

5000 S 5100 S 5200 S 5300 S 5400 S 5500 S

Magnetic North

BHD5 BHD7 BHD9

Minor quartzite · Minor Amphibolite · Minor quartzite · Minor sstn · Minor quartzite · Minor sstn · Minor quartzite · Minor quartzite · Quartzite · Minor quartzite · Minor quartzite · Minor quartzite · Drill hole (Esso) · Crenulated black shale · Ferrugenous sstn · Quartz rubble · Amphibolite · Amphibolite boulder · Minor amphibolite · Crenulated sh · Minor crenulated sh · Minor sltn · Minor sltn · Minor sltn · Minor sltn · Minor sltn · Minor sltn · Minor sltn · Minor sltn · Crenulated sh · Minor granite · Minor granite and sltn · Minor sh · Minor sstn · Drill hole (Esso)

141 142 143 144 145 146

ROCK SAMPLE ASSAYS

No.	U	Th	Cu	Pb	Zn
141	65	25	155	20	55
142	180	20	60	20	90
143	30	30	60	15	50
144	20	20	60	15	135
145	45	35	370	35	145
146	20	20	60	20	45

(ppm)

25 metres 0 50 100 metres

SCALE : 1 : 1000

24 SOA 800

32 798 800

Granite

sstn Schist oxidized ~ Mainly medium grained ? Meta sandstone

sltn Schist oxidized ~ Mainly sericitic meta - siltstone with some sericitic shale

sh Schist oxidized ~ Black shale occasionally crenulated, sericitic in places

Boundary of rubble

Boundary of outcrop and geological contact

Geological boundary inferred

Limonite - haematite quartz vein (Dip indicated)

q Quartz vein

40° Dip and strike of bedding

Vertical dip

40° Plunge of anticline

40° Plunge of fold

Dip and strike of schistosity

Drainage

o Sample point

146 Rock sample number

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BILLILUNA TANAMI URANIUM PROJECT

BRAMALL HILLS BH 3 GRID

GEOLOGY 75

Scale: 1:1000	Map Ref:	
MAPPED BY B. ARMSTRONG		Project No.: 1234
Drawn by: MINEX Services	Date: October 1978	Plan No.: 54

4950E 5000E 5100E 5200E 5300E 5400E 5500E 5600E 5700E 5750E

5000S 5100S 5200S 5300S 5400S 5500S

MAGNETIC NORTH

BHD9

BHD7

BHD5

Drill hole (Esso)

Drill hole (Esso)

25 metres 0 50 100 metres

SCALE : 1 : 1000

COUNTS PER MINUTE

500
400
300
200
100

• Sample Station

Instrument: Spectrometer GR-410
21·2 cu ins crystal

Operator : J. Gray

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URANEX PTY. LTD.

BILLILUNA TANAMI URANIUM PROJECT

BRAMALL HILLS BH3 GRID

URANIUM 76

Scale: 1 : 1000	Map Ref:	
		Project No.: 1234
Drawn by: MINEX SERVICES	Date: NOVEMBER 1978	Plan No.: 55

5100S 5200S 5300S 5400S

URANIUM CPM
1000 900 800 700 600 500 400 300 200 100 0

GAMMAS
650 600 550 500 450 400

MAGNETICS

RADIOMETRICS

O DEPTH IN METRES

BHD 7

Sch Sch Sch Sch Sh

0·5/30
0·6/40

1·1/33
0·7/417
0·6/165
0·2/200
0·5/40

T.D. 140m

50 100 150

LEGEND

25m 0 25 50 75 100m

SCALE 1 : 1000

GRANITE

QUARTZ–LIMONITE

AMPHIBOLITE – fine to medium grained, massive to foliated, may contain chlorite and/or biotite, sometimes felspathic
(Amp)

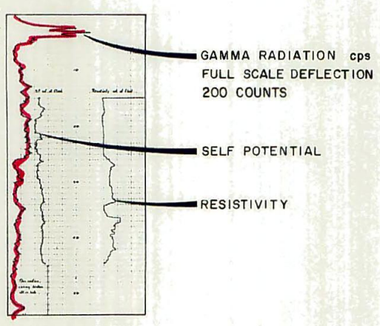
SCHIST – quartz-biotite-felspar schist, quartz-sericite schist, biotite-sericite schist, quartzite. mainly fine to medium grained but occasionally coarse. massive to banded. occasionally contains andalusite, garnets, chlorite
(Sch)

SHALE AND CARBONACEOUS SHALE – well banded to laminated with fine grained felspathic schist. often pyritic with andalusite common
(Sh)

CHEMICAL ASSAYS – sample length in metres/uranium in ppm (> 30ppm only)

1·46/73

RADIOMETRIC LOG



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BILLILUNA TANAMI URANIUM PROJECT
BRAMALL HILLS BH3 GRID
SECTION: 5200E - BHD 7

77

Scale: 1 : 1000	Map Ref:	
		Project No.: 1234
Drawn by: MINEX Services	Date: NOVEMBER 1978	Plan No.: 57

4900 E 5000 E 5100 E 5200 E 5300 E 5400 E 5500 E 5600 E 5700 E 5750 E

4900 S 5000 S 5100 S 5200 S 5300 S 5400 S 5500 S 5600 S 5700 S 5800 S

Meta granodiorite rubble

Granite rubble

Granite rubble

Gossanous quartz vein

Sch

Sch

Amp

Sch, Amp

Sch rubble

Amp

Minor Granite

Quartz rubble, granite and minor Amp

BHD 6 and BHD8

Granite

Minor Sch

Granite

BHD 14

Haematite rubble

Haematite rubble

BHD 10

Laterite Minor Amp

Haematite rubble

Soil

Haematite rubble

Minor Haematite

Granite

? Sch

Sch

Amp

Haematite and quartz

Quartz rubble

Sch

Amp

Sch

Sch

Amp

Sch

Minor Haematite rubble

Amp

Minor Quartz, haematite and Amp rubble

Sch

Quartz

Minor Sch

Minor Amp rubble

Amp

Haematite

Quartz

Quartz

BHD 12

Minor Sch

Minor Haematite rubble

Minor Ferruginous Sch

Minor Haematite rubble

Minor + granite

Amp

Minor Haematite rubble

Quartz

Minor Quartz rubble

Minor Sch rubble

Minor granite

Quartz

Minor granite

Minor Sch

Minor Sch

Amp

Minor Haematite rubble

Amp

Amp

ROCK SAMPLE ASSAYS

No.	U	Th	Cu	Pb	Zn
119	110	20	270	40	140
120	130	x	230	50	190
121	50	8	130	40	150
122	85	60	285	60	230
123	65	6	265	70	155
124	160	25	340	110	240
125	135	x	270	80	190
126	140	15	155	45	320
127	240	x	340	55	225
128	115	x	180	30	195
129	75	10	165	20	145
130	200	x	270	25	160
131	140	x	195	20	145
132	130	x	185	30	235
133	160	x	330	200	160
134	80	x	200	35	220
135	90	15	210	50	265
136	55	6	150	140	195
137	125	20	135	30	170
138	160	6	180	40	210
139	95	7	95	25	110
140	70	9	160	30	110

(ppm)

Granite

Sch — Shist oxidized

Amp — Amphibolite (fine to medium grained) oxidized

Sample point

132 — Rock sample number

BHD10 — Diamond drill hole URANEX PTY LTD

Boundary of rubble

Boundary of outcrop and geological contact

Geological boundary inferred

Limonite - haematite quartz vein (Dip indicated)

Quartz vein

Granite dyke

Strike and dip of bedding

Vertical dip

Strike and dip of schistosity

Anticline (Overturned)

Syncline (Overturned)

Plunge of anticline

Plunge of syncline

Form line (Photo interpretation)

Drainage

metres 25 30 10 0 20 40 60 80 metres

Scale 1:1000

N

MAGNETIC NORTH

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URANEX PTY. LTD.

BILLILUNA TANAMI URANIUM PROJECT

BRAMALL HILLS BH 4 GRID

GEOLOGY 78

Scale: 1: 1000	Map Ref:	
Mapped by B. Armstrong		Project No.: 1234
Drawn by: MINEX Services.	Date: October, 1978	Plan No.: 59

4900 E 5000 E 5100 E 5200 E 5300 E 5400 E 5500 E 5600 E 5700 E 5750 E

4900 S
5000 S
5100 S
5200 S
5300 S
5400 S
5500 S
5600 S
5700 S
5800 S

BHD6 and BHD8

BHD14

BHD10

BHD12

Magnetic North

COUNTS PER MINUTE

1000
800
600
500
400
300
200
100

• Sample station

Instrument : Spectrometer GR-410
21·2 cu ins crystal

Operator : P.Smyrk

A 8295

URANEX PTY. LTD.

BILLILUNA TANAMI URANIUM PROJECT
BRAMALL HILLS BH 4 GRID
URANIUM 79

Scale: 1 1000	Map Ref:	
		Project No.: 1234
Drawn by: MINEX Services	Date: October 1978	Plan No.: 60

Slatey Creek

Approx boundary TR 6654 H
(Northern sector)

Atk

Pgs

Prl

Atk

Atk

Atk

North

QUATERNARY	Qz	Sand, gravel, rubble
PROTEROZOIC ADELAIDEAN	Prl	Lewis Range Sandstone. — Quartz arenite, conglomerate
CARPENTARIAN	Pdt	Talbot Well Formation. — Chert; arenite, siltstone, limestone.
	Pdg	Gardiner Sandstone. — Arenite, siltstc shale, conglomerate.
	Pgs	Slatey Creek Granite
LOWER PROTEROZOIC	Pld	Pargee Sandstone. — Arenite
ARCHAEAN?	Atk	Killi Killi Beds. — Metasediments.

Geological boundary

Approximate geological boundary or limit of outcrop.

Fault

05880 Flight line, with fiducial number and line number

L 19

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BRAMALL HILLS T.R. 6654 H

PORTION RETAINED FEBRUARY 1979

PHOTOGEOLOGY, AIRBORNE RADIOMETRIC / MAGNETIC SURVEY

FLIGHT LINES

80

Scale: Approx. 1: 25000		Map Ref: Billiluna 1:250 000 sheet
		Project No.: 1234
Drawn by:	Date: February 1979	Plan No.: 70