FINAL REPORT

EL 5602

UMBEARRA

11 - 12 - 88

TO

10 - 12 - 89
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SECOND SCHEDULE

(PLAN OF AREA)

EL 5602
146 BLOCKS
470 sq km
Figure 2. Location and Access - E.L. 5602.
Figure 1. TENAMENT ELS602.
INTRODUCTION

EL 5602 was taken out to prospect the area using traditional means for gold, tin or any mineral which may be found by study of heavy particles in streams and soil.

Samples were also analysed using Amdel Laboratory.
<table>
<thead>
<tr>
<th>AGE</th>
<th>NAME AND MAP SYMBOL</th>
<th>LITHOLOGY</th>
<th>THICKNESS (M)</th>
<th>STRATIGRAPHIC RELATIONSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alluvium (Qa)</td>
<td>Alluvial gravel, sand, clay, red earth plains.</td>
<td></td>
<td>Superficial</td>
</tr>
<tr>
<td></td>
<td>Sand (Qs)</td>
<td>Aeolian sand.</td>
<td></td>
<td>Superficial</td>
</tr>
<tr>
<td></td>
<td>Travertine, caliche (Qt)</td>
<td>Travertine, caliche</td>
<td></td>
<td>Superficial</td>
</tr>
<tr>
<td>Tertiary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conglomerate (Tc)</td>
<td>Conglomerate, breccia.</td>
<td></td>
<td>Superficial</td>
</tr>
<tr>
<td></td>
<td>Limestone (Tl)</td>
<td>Lacustrine limestone, calcareous siltstone, siltstone, sandstone.</td>
<td></td>
<td>Superficial</td>
</tr>
<tr>
<td></td>
<td>Silcrete (Tb)</td>
<td>Silcrete, grey billy</td>
<td></td>
<td>Superficial</td>
</tr>
<tr>
<td>Jurassic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rumbalara Shale (Klr)</td>
<td>Shale, siltstone, some porcellanite</td>
<td>300 south of Charlotte Waters Bore</td>
<td>Unconformable on De Souza Sandstone.</td>
</tr>
<tr>
<td></td>
<td>De Souza Sandstone (Kl)</td>
<td>Sandstone, pebbly sandstone, coarsely cross-bedded, bands and lenses of claystone and siltstone. Some pipe rock.</td>
<td>100 + in Charlotte Waters Bore</td>
<td>Unconformable on Crown Point Formation Finke Group, and PreCambrian</td>
</tr>
<tr>
<td>AGE</td>
<td>NAME AND MAP SYMBOL</td>
<td>LITHOLOGY</td>
<td>THICKNESS (M)</td>
<td>STRATIGRAPHIC RELATIONSHIP</td>
</tr>
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<td>-----------</td>
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<td>------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Perm.-Devo.
Devonian - Carboniferous<br>Finke Group | Crown Point Formation (Pc)                | Poorly sorted sandstone, boulder beds, tillite, interbedded siltstone and claystone. Striated and faceted erratics. | 50 at Crown Point | Unconformable between Finke Group and De Souza Sandstone.        |
<p>|           | Idracowra Sandstone (Pzi)                  | Fine and medium-grained white kaolinitic sandstone, conglomeratic and cross-bedded near base. | About 65 exposed | Conformable on Horseshoe Bend Shale. Top eroded                  |
|           | Horseshoe Bend Shale (Pzh)                 | Red-brown and green biotitic calcareous and gypsiferous shale; fine to medium sandstone interbeds at base. | 100 at Horseshoe Bend | Conformable with Idracowra Sandstone and Langra Formation; unconformable under Crown Point Formation and De Souza Sandstone |
|           | Langra Formation (Pzn)                     | Fine and coarse yellow sandstone, beds of conglomerate with phenoclasts of granites, metamorphics, Stairway Sandstone. Interbeds of red-brown siltstone | 150 at Horseshoe Bend | Conformable with Polly Conglomerate and Horseshoe Bend Shale. Unconformably underlies Crown Point Formation and De Souza Sandstone and overlies Precambrian. |</p>
<table>
<thead>
<tr>
<th>AGE</th>
<th>NAME AND MAP SYMBOL</th>
<th>LITHOLOGY</th>
<th>THICKNESS (M)</th>
<th>STRATIGRAPHIC RELATIONSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omangatian</td>
<td>Stairway Sandstone</td>
<td>White thin bedded fine and medium sandstone, minor conglomerate and siltstone. Base a coarse sandstone to fine conglomerate.</td>
<td>About 15 at Mt. Watt</td>
<td>Unconformable on Winnall Beds and possibly on Inindia Beds and Bitter Spring Formation</td>
</tr>
<tr>
<td></td>
<td>Winnall Beds (Puw)</td>
<td>Silicified white and purple-brown thin to thick bedded sandstone, dark green and brown siltstone, glauconitic siltstone.</td>
<td>600 approx. @ Eridunda No. 1</td>
<td>Unconformable on Inindia Beds and with Stairway Sandstone and Polly Conglomerate</td>
</tr>
<tr>
<td></td>
<td>Inindia Beds (Pun)</td>
<td>Banded chert, chertbreccia, red-brown and grey siltstone. Coarse cross-bedded sandstone, medium silicified sandstone, siltstone, fine pink and yellow dolomite, conglomerate and chert pebbles and siltstone</td>
<td>Unknown</td>
<td>Disconformable on Bitter Springs Formation and unconformable with Winnall Beds.</td>
</tr>
<tr>
<td></td>
<td>Bitter Springs Formation (Pub)</td>
<td>Dark grey and pink fine to medium dolomite, partly recrystallized. Numerous stromatolites.</td>
<td>Unknown</td>
<td>Base not exposed. Disconformable with Inindia Beds</td>
</tr>
<tr>
<td>Mid-Precambrian Complex</td>
<td>Dolerite</td>
<td>Olivine dolerite dykes. Last igneous activity known.</td>
<td>-</td>
<td>Intrudes Precambrian gneiss and granite</td>
</tr>
<tr>
<td></td>
<td>Granite</td>
<td>Porphyritic microgranite, biotite granite, biotite leucogranite, microgranite; dykes of pegmatite, nonporphyritic microgranite, leucogranite, aplite, reef quartz.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Gneiss and amphibolite</td>
<td>Coarsely foliated medium grained gneiss and fine grained granite: gneiss, amphibolite and diorite. Generally staurolite-almandine sub-facies of regional metamorphism.</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
3. PREVIOUS WORK

Exploration by early field parties commenced in 1889 but the first major work in the area was a photo geological interpretation by Institute Francais de Petrole in 1960 followed by regional mapping of the south-eastern Amadeus Basin (Wells, Stewart and Skwarko, 1966). The 1:250,000 Finke Sheet was mapped in 1966 and published in 1969.

The area was previously held by Le Nickel (E.L.'s 744, 745, 746 and 747) and Afmeco (E.L.'s 820 and 821) in 1973 and work carried out during this period consisted of an airborne radiometric and magnetic survey combined with field assessment of the results of these surveys and petrological descriptions of samples from the basement rocks, Langra Formation, De Souza Sandstone and Rumbalara Shale.

In 1977 Agip Nucleare Australia Pty. Ltd. carried out an exploration programme consisting of mapping, ground radiometric reconnaissance and gridding and percussion drilling for a total of 984 metres.
4. REGIONAL GEOLOGY

Stratigraphy

The stratigraphy of the area is shown in Table 1. The area consists of a small part of the southeastern Amadeus Basin sediments of the Great Artesian Basin, and outcrops of crystalline basement rocks. The oldest Precambrian rocks mapped are granite and gneiss in the southwest; they are part of the exposed basement along the southern margin of the Amadeus Basin and western edge of the Great Artesian Basin.

The earliest sediment of the exposed Amadeus Basin succession is the Proterozoic dolomite of the Bitter Springs Formation, which elsewhere in the basin is separated from basement rocks by the Heavitree Quartzite. The Bitter Springs Formation is succeeded disconformably by thick sediments of the Inindia Beds which are in part glacial, and are overlain unconformably by thick sandstone and siltstone of the Winnall Beds. No Cambrian sediments crop out, but they may occur subsurface north of the Black Hill Range. The Stairway Sandstone, the only formation of the Larapinta Group that crops out, is preserved as small outliers; at Mount Watt it overlies the Proterozoic Winnall Beds with an angular unconformity. The formation may also be preserved north of the Black Hill Range beneath younger Palaeozoic rocks. The Finke Group of probable Devonian to Carboniferous age forms part of the Great Artesian Basin succession and rests unconformably on the older formations exposed in the area. The Finke Group, the glacialis of the Permian Crown Point Formation, and the Mesozoic De Souza Sandstone are separated by unconformities, and in places the Cretaceous Rumbala Rale Shale rests with probable unconformity on the De Souza Sandstone. Thin remnants of Tertiary sediments are preserved in small outcrops and superficial Quaternary deposits mask outcrops over most of the area.

Structure

Because of the poor exposure the structure must be inferred largely from a study of the history of neighbouring areas, and the development of the structure of the Amadeus Basin is most important in this respect. The sediments in the basin have been deformed by two major earth movements. The first, the Petermann Ranges Orogeny, occurred in the late Proterozoic and affected the Precambrian sediments mainly along the southern margin of the Basin. The second, the Alice Springs Orogeny, began in the Devonian, and the most intense deformation was concentrated along the northern margin of the Basin. During this period all the sediments of the Amadeus Basin were folded.
The structural history of the Precambrian crystalline rocks is not known, but presumably they were affected by a much earlier orogeny than the Petermann Ranges Orogeny. Throughout the area of outcrop of the gneissic rocks the strike of the foliation maintains an east-west trend, and the dip directions indicate a number of synforms and antiforms. The limbs dip at about 45° and the axes trend east-west. Whether or not the east-west axes correspond to the original folds in the sediments has not been proved at this stage.

The Proterozoic rocks were folded during the Petermann Ranges Orogeny and a large block of these sediments north of the Black Hill Range was downfaulted against Precambrian crystalline rocks which have since been eroded and covered by younger sediment. The fault trends east-northeast along the southern side of the Black Hill Range. The Proterozoic rocks in the Black Hill Range dip at moderate to steep angles to the north or are steeply overturned to the south. The northerly dips are probably due to drag against the fault plane and the overturning possibly due to later readjustments along the fault plane, probably during the Alice Springs Orogeny.

The Proterozoic rocks were eroded and removed from the area south of the Black Hill Range. The earliest Palaeozoic sediments known in the area are those of the Ordovician Stairway Sandstone. The formation is preserved in flat lying outliers unconformably resting on Proterozoic sediments and in isolated outcrops near the Black Hill Range Fault, where they are in places steeply overturned to the north.

The Ordovician sediments and succeeding formations of the Finke Group were probably only subjected to minor movements during the Alice Springs Orogeny and for the most part are only gently tilted. However, the Palaeozoic sediments were locally steeply upthrown next to the Black Hill Range, probably by renewed movements of the Black Hill Range Fault during the Alice Springs Orogeny.

The Mesozoic sediments in the Finke Sheet area are for the most part flat lying and show only regional tilting (Wells, 1969).
5. **EXPLORATION ACTIVITIES**

5.1 Geology

The E.L. is situated on the southern margin of the Lilla Creek Basin where the Finke Group rests unconformably on the Musgrave Complex (Plan 234100c/2).

**Pre-Cambrian Musgrave Complex**

The Musgrave - Mann Complex forms the southern limit to the Amadeus Basin and also the Lilla Creek Basin. It is composed of interbedded micaceous schist, grey-brown garnet schist, quartz schist and quartzite which have in the area of the E.L. been converted to orthogneiss and paragneiss. The mineral assemblage of these gneissic rocks corresponds to the amphibolite facies of regional metamorphism.

These rocks have been intruded and in some cases further metamorphosed to granite and granitoid rocks (Thin Sections AGNA 3645, 6307 - Appendix IV).

The final stage in the formation of the basement was the intrusion of dolerite and microgabbroic dykes along an E-W or NE-SW trend.

No attempt was made to subdivide the metamorphic, gneissic or granitic rocks during the field mapping.

**Polly Conglomerate**

The Polly Conglomerate is the basal unit of the Devonian-Carboniferous Finke Group and rests unconformably on the Musgrave Complex. The angle of the unconformity has been estimated at 50° plus near the western edge of the E.L and it is postulated that the southern margin of the basin is fault controlled.

The Polly Conglomerate has very poor outcrops in the E.L. and consists mainly of boulder-covered hills. In the southwest corner of the E.L. and at location 61 (12km east of Umbarrna Homestead) the conglomerate consists of a sequence of massive boulder beds with a close packed framework of boulders of granite, gneiss and vein quartz. The boulders range up to 1 metre in diameter and are generally well rounded. Most of the boulders are fresh although the coarser grained rock types are highly weathered.

Within the boulder beds several thin (less than 2 metres) lenses and beds of coarse feldspathic sandstone have been mapped. These lenses are usually of limited extent and outcrops are usually covered by scree from the boulder beds. All the strike and dip measurements within the Polly Conglomerate have been taken from these sandstones.
The Polly Conglomerate is not continuous along the southern margin of the basin and does not appear to be present between Christmas Creek and Mongumina Creek. It was not intersected in the drilling section along Mongumina Creek.

In the outcrops exposed in creeks north and east of Umbeara Homestead (localities 47, 86, 66 and 68) the Polly Conglomerate is represented by a conglomerate and conglomeratic sandstone which is almost identical to the rock type described at Horseshoe Bend.

The boulder beds are thought to represent the original stream channels in a very rapidly subsiding basin with the sandy facies representing a lateral transition. This would also explain the lack of Polly Conglomerate over parts of the southern margin. The thickest sequence of Polly Conglomerate is near the western boundary of the E.L where a thickness of 60 to 80 metres has been estimated.

**Langra Formation**

The Langra Formation is conformable with the Polly Conglomerate and where the Polly Conglomerate is absent rests unconformably on the Musgrave Complex.

The lithology of the sediments is very similar to that of the Langra Formation at Horseshoe Bend and Umbeara.

**Unit LI**

No outcrops of this unit are known in the area of the E.L. One small outcrop 1.5km west of the western boundary of the E.L. is the only exposure on the southern side of the basin. This unit was intersected in all ten drill holes where it consists of a cyclical sequence of conglomerate, coarse feldspathic sandstone, fine micaceous sandstone and red-brown micaceous siltstone.

**Unit LII**

This unit does not outcrop in the E.L. and was not apparently intersected in any of the drill holes.

**Unit LIII**

This unit outcrops north of Outside Creek and along Lilla and Corella Creeks. Outcrops are generally poor but the lithologies are very similar to those at Horseshoe Bend and Umbeara. Fine grained kaolinitic and quartz sandstone and micaceous sandstone predominate. Steep-angled current bedding, scour and fill structures and graded bedding are common. Several breaks in sedimentation have been noted and these are marked by local ferruginous horizons (Thin Sections AGNA 6101, 6102, 6106, 6107, 6108 - Appendix IV).
Dips in the Langra Formation are shallow - 0° to 5° and slight folding along a NE-SW axis has been noted.

Horseshoe Bend Shale

This unit conformably overlies the Langra Formation and is identical to the unit at Horseshoe Bend. The thin sandstone units are still evident near the base of the Horseshoe Bend Shale and all other features are as previously described (Thin Sections AGNA 6103, 6104 - Appendix IV).

The contact with the Langra Formation is flat, as shown in Corella Creek where the contact is exposed in scattered outcrops over a distance of 15km.

The thickest sequence of Horseshoe Bend Shale is approximately 20m in an exposure near Angathita Bore. The Langra Formation - Horseshoe Bend Shale contact is also exposed at this locality.

The top section of the Horseshoe Bend Shale has been eroded off, probably during the period of deposition of the Idracowra Sandstone which is not known to outcrop south of the Black Hill Range.

Crown Point Formation

The Crown Point Formation does not outcrop within the E.L., the closest outcrop being 1km east of the eastern boundary near the junction of Corella and Lilla Creeks. At this locality the unit consists of a massive boulder bed comprising extremely well-rounded quartz boulders with a white rock flour matrix overlying a thin white sandstone.

The white sandstone does not correlate with any known rock type in the area and may be the time equivalent of the Idracowra Sandstone but contact with the Horseshoe Bend Shale or the boulder beds of the Crown Point have not been observed, hence the unit has tentatively been included in the Crown Point Formation.

De Souza Sandstone

Unconformably overlying all the previously described units is the Jurassic (?) De Souza Sandstone. The De Souza Sandstone is a medium to coarse grained white kaolinitic sandstone with prominent cross-bedding and minor conglomeratic units. This unit has a regional dip of 3° east and usually forms conspicuous mesa type outcrops.

The maximum exposed thickness of De Souza Sandstone is 35m in some of the mesas near the eastern edge of the E.L.
Undiagnostic plant remains and worm tubes and burrows are a common feature of the De Souza Sandstone.

Tertiary Sediments

Silcrete ("Grey Billy")

This is not technically a separate rock unit but is a Tertiary silification of the pre-existing rocks. The silcretes are generally two to five metres thick and have developed over the Langra Formation, Horseshoe Bend Shale and more commonly over the De Souza Sandstone. In each case the silcrete has a different appearance and retains some of the characteristics of the underlying rock types.

Sandstone, Conglomerate And Siltstone

The Tertiary sediments cover a large proportion of the Lilla Creek drainage system and are generally in the order of 5 to 10 metres thick. Sandstone and siltstone outcrop in a small area near Junction Bore. The sediments are very fine grained and have a calcareous matrix giving a weathered appearance similar to that of a calcrete.

The conglomerate is widespread and is composed of a coarse conglomeratic feldspathic sandstone and an unconsolidated pebble scree. The sandstone has a close resemblance to the Langra Formation but can be differentiated by the presence of ferruginous pebbles, silcrete and well-rounded quartz pebbles derived from the Crown Point Formation.

These Tertiary sediments unconformably overlie all the previously mentioned rock units.

Quaternary Deposits

Fine red-brown aeolian sand covers the northern part of the E.L. forming a large area of longitudinal static dunes. There is no outcrop of any other older rock types in this area.

Structure And Geological History

The basement rocks of the Musgrave Block along the southern margin of the Kulgera Sheet area show evidence of a complex history but the details are unknown. The oldest rocks were regionally metamorphosed to schist and gneiss and were later intruded by granites. The last igneous activity was the injection of olivine dolerite dykes.

The sedimentary history of the Amadeus Basin began in this area with the deposition of the marine carbonate rocks, shale
and sandstone of the Bitter Springs Formation. This was followed by a long hiatus in sedimentation until the deposition of the Inindia Beds, a marine sequence with a partial glacial provenance. The Inindia Beds were then deformed to some extent, for in places the Winnall Beds overlie them unconformably. The Winnall Beds consist of marine shale, siltstone and sandstone and suggest a period of quiet marine deposition.

Near the end of the Proterozoic major earth movements (the Petermann Ranges Orogeny; Forman, 1966), which had their centre further to the west, produced close folds with east-west axes, and the southern margin of the Amadeus Basin retreated northwards to the northern part of the Kulgera Sheet area.

A fault along the southern margin of the Black Hill Range resulted in the subsidence and preservation of a large area of Proterozoic sediments to the north of the fault plane.

The newly raised land surface was eroded, and large areas of basement rocks were exposed.

Subsidence in Ordovician times allowed deposition of the Stairway Sandstone with the Black Hill Range being the approximate southern limit. Rejuvenation of the Black Hill Range Fault between the Ordovician and Devonian Alice Springs Orogeny, caused the Stairway Sandstone to be overturned in places and started the formation of the Lilla Creek Basin. Faulting was also occurring along the southern margin of the basin at approximately the same time.

The block of Precambrian sediments and basement rocks, which had formed an eroding land mass since the end of the Precambrian, started to sink toward the end of the Devonian. This was the initiation of the western part of the Great Artesian Basin. While the siltstone of the Pertnjara Group was being deposited in the northern part of the Kulgera Sheet area, freshwater conglomerate (the basal unit of the Finke Group) was filling hollows in this sinking block to the south-east. The Black Hill Range which formed the southern margin of the Amadeus Basin during the deposition of the siltstone also acted as the northern margin of the Lilla Creek Basin during the accumulation of the Polly Conglomerate and to a lesser extent the Langra Formation. Continued subsidence of the basin during deposition resulted in the steep dip of the Polly Conglomerate recorded along the margins of the basin. The Horseshoe Bend Shale was deposited over a large area at a time when the Black Hill Range was no longer a barrier.

Uplift and erosion at the end of the Carboniferous resulted in the partial stripping of the Horseshoe Bend Shale. This was followed by the deposition of the glacial Permian Crown Point Formation, during the Permian.
Deposition did not start again until late Jurassic or earliest Cretaceous time, when the De Souza Sandstone was deposited in freshwater, followed by a marine transgression and deposition of the Rumbalara Shale (Aptian). There was probably no sedimentation during the Neocomian, between the laying down of these two units.

Some time after the Aptian, a general uplift occurred, followed by erosion and deposition of the early Tertiary sediments. A long period of weathering followed, and lasted to about middle Tertiary time (perhaps Miocene). This produced the surface silicification of the Proterozoic, lower Palaeozoic, and middle Palaeozoic rocks, and the silcrete on the upper Palaeozoic, Mesozoic, and early Cainozoic sediments. Erosion in later Tertiary times stripped away much of the silicified and underlying rocks, the more resistant rocks were left as flat-topped mountain ranges, flanked by piedmont deposits of conglomerate, breccia, and gravel. A few freshwater lakes formed, and allowed deposition of fine-grained calcareous rocks. In the Quaternary, the drainage system of the area became internally directed, and a chain of salt lakes formed across the Sheet area and to the north-west. The climate became more arid, the lakes dried up, and a sheet of shifting sand dunes covered large areas of the landscape. The climate moistened slightly in recent times, and the dunes are now fixed by vegetation; erosion was renewed to a certain extent, and sheets and valley fills of alluvium were deposited.

5.2 Ground Radiometrics

The reconnaissance ground radiometric survey gave results almost identical to those described in the Horseshoe Bend E.L. Only one anomaly was detected - a 250 cps horizon within the Langra Formation. This anomaly was over highly ferruginous rocks and is thought to be due to the scavenging of uranium by iron.

A more detailed radiometric survey was carried out in vehicles and on foot to determine if this type of survey would give more information than the regional survey (plan 234100c/5). A total of 51 line km of survey was completed with stations ranging from 17m to 50m apart. The traverses were selected to cover the outcrop or suboutcrop areas of the Langra Formation.

The only positive result indicated by the survey was that the Tertiary sediments which cover the Langra Formation in the region of traverses A, C, D, E, F, G, H had a higher radiometric background than the underlying Langra Formation. This is probably due to the presence of calcareous and ferruginous material in the Tertiary sediments.
E.L. 5602

EXPLORATION CONCEPTS

E.L. 5602, comprising 146 blocks, covers an area of Lower Proterozoic Stratigraphy exposed in the southern Alice Springs district just east of Kulgera. The area has not been covered by an E.L. previously and due to the lack of standing water and low relief, early traditional prospecting of the area around the turn of the century would have been superficial at best.

The area has undergone regional metamorphism which has resulted in amphibolite grade being attained. Granites are extensive in the area and associated with these are pegmatites some of which are known to contain late stage mineral such as beryl.

Fold structures, shears and faults are all known to be present and with the possibility of at least one, and possibly two thermal events (regional and possibly contact metamorphism) it is possible that hydrothermal fluxing within faults/shears has occurred. It is on the possibility that any such hydrothermal fluids were mineralized that the E.L. was taken out.

The area has also been intruded by acid and basic dykes. Beryl is known, suggesting the possibility of late stage mineralized pegmatites. Such minerals as tin, tungsten, tantalite/columbite, beryl, uranium and rare earth minerals are possibilities. Anatase, the rare earth epidote is known in the granite intrusives and it is possible that ore grades might be present in some pegmatites, especially those "intruding" any of the numerous amphibolites present in the area (c/f White Range allanite occurrences).

To date no economic mineral occurrences have been found in the district but then, no active, professional, exploration programme has ever been mounted in the area.
E.L. 5602

Work Programme - 1989

Photogeology and ground reconnaissance has revealed a number of shear/fault and fold structures together with some intrusives that warrant further investigation in 1989.

It is anticipated that all of the fault/shear structures discovered to date will have been tested by the following means by years end:

A. Rock chipping of appropriate rock types within shears/faults.

B. Testing of heavy mineral concentrates from streams sourced near faulted/sheared areas.

A similar programme involving testing of heavy mineral concentrates will be undertaken on material from streams sourced near interpreted anticlines.

Acid intrusives (i.e pegmatite dykes) will be investigated for their potential to host tin, tungsten, tantalite, beryl and rare earth minerals. Some allanite has been noted in granite intrusions in the area and hence dyke material will be screened for late stage concentrations of this mineral. A geiger counter will be used to test radioactivity.

Ongoing reconnaissance of as yet unexplored areas of this rather large (146 blocks) exploration lease will continue during the 1989 programme.
GENERAL

The program attempted on EL 5602 was of a traditional nature, mainly pan concentrate in areas of streams.

The program unfortunately was by no means exhaustive and the area certainly warrants a systematic modern style exploration program.

Unfortunately due to the remoteness and lack of any success at our level we did not have the results to interest a joint venturer.

Also during the year 10 months were spent in Indonesian Exploration and this detracted from my proposed program.
EXPLORATION

During 1989 a field trip of one week was undertaken during which time numerous samples were taken from areas not yet tested. Most creeks contained heavy black sand, however no economic mineral seemed to be present.

Also a potch-like material is found in several localities. This was sent to Adelaide Mines Department via an opal mining company "Australian Opal Mines".

It was not identified but was not opal potch. Further observation of the material would probably indicate it being ?
RESULTS

A large bulk of black sand was collected. A sample was sent for possible diamond indicator minerals. None were identified, however tin, biotite, amphibole, zirconium were observed. This was from the non magnetic fraction and these minerals only comprised 1% of the sample, the remainder being quartz.

Numerous samples were taken from streams and were bulked into the above.

Rock chip samples were crushed in a hammer mill and panned off. None showed any heavy minerals.

Results can be summed up as nothing of visible interest.
# EXPENDITURE

<table>
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<th>Item</th>
<th>Amount</th>
</tr>
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<tbody>
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</tr>
<tr>
<td>Wages - Field hand</td>
<td>876.00</td>
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<td>Vehicle and fuel</td>
<td>2369.00</td>
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<td>Camping and supplies</td>
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<td>Administration</td>
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<tr>
<td>Samples and lab</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$10465.00</strong></td>
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