ROBERTSON RESEARCH (AUSTRALIA) PTY. LIMITED

REPORT NO. 509
PROJECT NO. 789/1039

NORTHERN TERRITORY EXPLORATION LICENCE 1484
ANNUAL REPORT UP TO 6.III.79
AND FINAL REPORT
MINES BRANCH
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by.

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Prepared for:
Sutton Group of Companies,
114 Bourke Street,
EAST SYDNEY N.S.W. 2011

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SUMMARY

Northern Territory Exploration Licence 1484 was taken up by the Sutton Group of Companies in 1978 as one of a group of tenements approximately coincident with Tipperary Pastoral Holding, which is also held by the Group. The relatively small tenement is on the northeastern flank of the Daly River Basin, in which early Palaeozoic sediments accumulated over Lower Proterozoic metasediments and Middle Proterozoic granites in the Pine Creek Geosyncline.

The tenement has been covered by an airborne spectrometer and magnetometer survey, flown by Aero Exploration Pty. Limited over the entire area of the Suttons group of tenements. All of the tenements were included also in a photogeological interpretation commissioned from R.F. Loxton, Hunting and Associates.

Because EL 1484 is on the periphery of the area of principal interest to the Group, and because of the generally negative results from the airborne survey over this tenement, EL 1484 was relinquished in March 1979 after twelve months' tenure.
Northern Territory Exploration Licence (EL) 1484 is one of eight tenements (Table 1) which were taken up in 1977 and 1978 by the Suttons Group of Companies over an area substantially coincident with the Pastoral Lease area of Tipperary Station (Figure 1). Tipperary Pastoral Lease is also owned by the Group. The generalised solid geology of the region is shown in Figure 2.

All of the Suttons tenements have been covered by an airborne magnetic and radiometric survey. A new photogeological map of the tenements was also commissioned from Loxton, Hunting and Associates. The northeastern of four photogeological maps produced by Loxton, Hunting contains EL 1484 and it is presented, with flightlines from the airborne survey, as Figure 3.

The eight tenements cover ground in the western parts of Australian National Grid map sheets SD/52-8 ("Pine Creek"; Malone, 1962) and SD/52-12 ("Fergusson River"; Pontifex and Mendum, 1972), with the greater part falling within the northern, Pine Creek, sheet. One tenement (EL 1597) extends west to overlap onto map sheet SD/52-11 ("Fort Keats"; Morgan, 1972).

Primary access to the tenements is gained via the supply track serving Tipperary Station (13°44'S., 131°02'E) from the all-weather Stuart Highway near Mount Shoobridge. From Tipperary itself, well-maintained station tracks offer ready access to most parts of the Licence areas.

There are relatively few impediments to off-road travel by four-wheel-drive vehicles within the tenements. Much of the area consists of undulating plains covered by open forest or scrub; sparse rocky hills are rarely higher than about 15 m above the soil flats, and occasional mesas have scarp faces up to about 6 m high. In the north of EL 1359, at the northern end of the group of tenements, a more rugged uplands topography has a relief of up to 60 m, with steep-sided hills and long ridges separated by narrow valleys. A partially-dissected tableland, in which deep erosion has created rough rocky hills, falls within some of the most westerly tenements, but in general this tableland is excluded from the licence areas. Scarp faces are not generally present on the eastern side of the tablelands adjacent to the tenements.
## TABLE I

NORTHERN TERRITORY EXPLORATION-LICENCE AREAS
HELD BY THE SUTTON GROUP OF COMPANIES

<table>
<thead>
<tr>
<th>EL NO.</th>
<th>NAME</th>
<th>AREA (km²)</th>
<th>LICENCE</th>
<th>DATE GRANTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1355</td>
<td>Tipperary</td>
<td>1226.2</td>
<td>Suttons Motors (Darwin) Pty. Ltd.</td>
<td>8.VII.77</td>
</tr>
<tr>
<td>1357</td>
<td>Daly River</td>
<td>865.9</td>
<td>Sydney Motor Auctions Pty. Ltd.</td>
<td>8.VII.77</td>
</tr>
<tr>
<td>1358</td>
<td>Fish River</td>
<td>494.0</td>
<td>Autopool Pty. Ltd.</td>
<td>8.VII.77</td>
</tr>
<tr>
<td>1359</td>
<td>Noltenius</td>
<td>946.1</td>
<td>Gilbert and Roach Pty. Ltd.</td>
<td>8.VII.77</td>
</tr>
<tr>
<td>1484</td>
<td>-</td>
<td>113.0</td>
<td>Suttons Motors (Chullora) Pty. Ltd.</td>
<td>6.III.78</td>
</tr>
<tr>
<td>1597</td>
<td>Chilling Creek</td>
<td>248.7</td>
<td>Autopool Pty. Ltd.</td>
<td>8.VII.77</td>
</tr>
<tr>
<td>1598</td>
<td>Allia Creek</td>
<td>132.6</td>
<td>Autopool Pty. Ltd.</td>
<td>8.VII.77</td>
</tr>
<tr>
<td>1724</td>
<td>-</td>
<td>39.9</td>
<td>Suttons Motors (Chullora) Pty. Ltd.</td>
<td>6.III.78</td>
</tr>
</tbody>
</table>

4066.4
2. GEOL OGY OF TIPPERARY STATION AREA

Stratigraphic units cropping out within and near the tenement areas are summarized in Table II. The following brief descriptions include the distribution of each unit within the group of eight tenements.

2.1 ARCHAEO BASEMENT: HERMIT CREEK METAMORPHIC ROCKS

The Hermit Creek Metamorphic Complex includes migmatites, granulites, gneisses and schists which, although formerly metamorphosed to amphibolite grade, have suffered retrograde metamorphism to greenschist facies. The age of the retrogression is likely to be that of the 1800 m.y. prograde metamorphism of the sediments of the Pine Creek Geosyncline. Archaean granites have intruded the metamorphic rocks, but they are not easily distinguished in the field from the later granites of the Litchfield Complex, within which the Archaean rocks are now enclosed as rafts, inliers or pendants. For clarity, the entire Litchfield Complex outcrop area is identified as Archaean in the geological map accompanying this appraisal (Figure 2).

Neither the Archaean rocks nor the main massifs of the Litchfield Intrusive Complex crop out extensively within the Suttons EL areas, but they are close to them on their western side and the westernmost PL (1597) extends onto the Litchfield Complex. To the north of the tenements, Archaean rocks are seen in the Rum Jungle and Waterhouse Complexes, which are mantled gneiss domes forming inliers within the Pine Creek Geosyncline. Rocks of the Rum Jungle Complex have been dated at 2550 m.y. (Walpole et al., 1968). On the eastern side of the Geosyncline, analogous inliers of Archaean rocks crop out, indicating that the Geosyncline is shallow, and probably underlain everywhere by a continuous Archaean Shield with an irregular palaeorelief surface.

2.2 LOWER PROTEROZOIC: PINE CREEK GEOSYNCLINE

In their comprehensive review of the sediments of the Pine Creek Geosyncline, Walpole et al. (1968) defined four time-rock groups which reflect conditions of sedimentation in different parts of the geosyncline. Sedimentation, in turn, reflected the structure and palaeorelief within the composite trough.
<table>
<thead>
<tr>
<th>AGE</th>
<th>UNIT</th>
<th>SYMBOL</th>
<th>LITHOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAINozoic</td>
<td>(Three post-Cretaceous erosion cycles)</td>
<td>$\varepsilon_z$ $\varepsilon_z l$</td>
<td>Mud, silt, colluvium; thin sand; etc. Detrital and late laterite</td>
</tr>
<tr>
<td>CRETACEOUS</td>
<td>Mullanan Beds</td>
<td>$K_{lm}$</td>
<td>Sandstone; shale, conglomerate, porcellanite; much lateritization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>unconformity</strong></td>
</tr>
<tr>
<td>ORDOVICIAN-</td>
<td>Daly River Group</td>
<td>$O_{lo}$</td>
<td>Silicified limestone; chert bands</td>
</tr>
<tr>
<td>CAMBRIAN</td>
<td>Ooloo Limestone</td>
<td>$\varepsilon_{/olj}$</td>
<td>Ferruginous sandstone, siltstone with halite pseudomorphs; silicified and dolomitic limestone; marl</td>
</tr>
<tr>
<td></td>
<td>Jinduckin Formation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tindall Limestone</td>
<td>$G_{mt}$</td>
<td>Black crystalline limestone; chert bands and nodules; some clastic interbeds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>unconformity</strong></td>
</tr>
<tr>
<td>LOWER CAMBRIAN</td>
<td>Antrim Plateau Volcanics</td>
<td>$\varepsilon_{la}$</td>
<td>Basalt, dolerite, tuffaceous sandstone; basal arkosic quartzite</td>
</tr>
<tr>
<td></td>
<td>Witch Wai, Jarong Conglomerates</td>
<td>$\varepsilon_{lw}$</td>
<td>Conglomerate, sandstone</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>unconformity</strong></td>
</tr>
<tr>
<td>ADELAIDEAN</td>
<td>Tolmer Group</td>
<td>$R_{ug}$</td>
<td>Ferruginous sandstone; siltstone; silicified limestone, marl; halite pseudomorphs</td>
</tr>
<tr>
<td></td>
<td>Waterbag Creek Formation</td>
<td>$P_{uh}$</td>
<td>Dolomite, dolomitic limestone; locally silicified Quartz-sandstone; minor siltstone, shale</td>
</tr>
<tr>
<td></td>
<td>Hinde Dolomite</td>
<td>$P_{uy}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stray Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sandstone Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depot Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sandstone Member</td>
<td>$R_{uo}$</td>
<td>Quartz sandstone, locally silicified</td>
</tr>
</tbody>
</table>
(TABLE II (Continued))

<table>
<thead>
<tr>
<th>AGE</th>
<th>UNIT</th>
<th>SYMBOL</th>
<th>LITHOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARLY</td>
<td>Reynolds River</td>
<td>Ege</td>
<td></td>
</tr>
<tr>
<td>CARPENTARIAN</td>
<td>Granite</td>
<td></td>
<td>Granodiorite to granite</td>
</tr>
<tr>
<td>INTRUSIVE</td>
<td>Soldiers Creek</td>
<td>Egs</td>
<td></td>
</tr>
<tr>
<td>ROCKS</td>
<td>Granite</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Titree Granophyre</td>
<td>Egi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Litchfield Complex</td>
<td>Egl</td>
<td></td>
</tr>
<tr>
<td>LOWER</td>
<td>Zamu Complex</td>
<td>Edo</td>
<td>Dolerite</td>
</tr>
<tr>
<td>PROTEROZOIC</td>
<td>Chilling Sandstone</td>
<td>Elh</td>
<td>Quartz-sandstone</td>
</tr>
<tr>
<td>intrusive</td>
<td>*Berinka Volcanics</td>
<td>Eli</td>
<td>Intermediate to acid lavas and</td>
</tr>
<tr>
<td>contact</td>
<td>Burrell Creek Formation</td>
<td>Elb</td>
<td>tuffs</td>
</tr>
<tr>
<td></td>
<td>Noltenius Formation</td>
<td>Eln</td>
<td>Greywacke, siltstone, greywacke-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>siltstone</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quartz-greywacke, siltstone,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>conglomerate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCHAEOAN</td>
<td>Hermit Creek</td>
<td>Ah</td>
<td>Migmatite, quartzite, granulite,</td>
</tr>
<tr>
<td></td>
<td>Metamorphics</td>
<td></td>
<td>schist.</td>
</tr>
</tbody>
</table>

*Not known within Exploration Licence areas described in this report. Acid volcanic rocks, not shown on published maps, are present in the vicinity of the Daly River copper mine.
On and near Tipperary Station, the exposed sediments of the Pine Creek Geosyncline belong to the Finniss River Group. They are the Noltenius and Burrell Creek Formations, which are believed to represent the second phase of sedimentation into the geosyncline; to be derived from source areas west of the trough; and to be restricted to the geosyncline's western side. Initial sedimentation in the western part of the trough near the tenements resulted in deposition of the Batchelor Group (derived from the west) and of the Goodparla Group (derived from the east). Following uplift on the western side of the fault zone (Giants Reef Fault) believed to form the western margin of the geosyncline, the rocks of these two earlier depositional facies were then overlain, partially unconformably and partially gradationally, by the sediments of the Finniss River Group.

The rocks of the Finniss River Group are tightly folded, and faulting is common within them. They were regionally metamorphosed to greenschist facies at approximately 1800 m.y.; within EL 1359, locally higher grade metamorphism produced mica-schist and andalusite-mica-schist.

Walpole et al. regarded the Noltenius Formation as the near-shore facies of Finniss River Group sedimentation. It contains cobble and pebble conglomerates, greywacke and quartz greywacke, and siltstone and claystone. It appears to grade laterally eastwards into the relatively distal sediments of the Burrell Creek Formation, which is composed of generally fine-grained greywacke and siltstone, with neither conglomerate horizons nor conspicuously graded bedding. However, more recent investigations in the Rum Jungle area have shown that the Burrell Creek and Noltenius Formations are not simple divisions of the Finniss River Group, but they are complexly interbedded and grade imperceptibly into each other (Ingram et al., 1974). This situation is probably found also in the northern part of EL 1359 and the eastern part of EL 1598, the only parts of the tenements in which the Finniss River Group is exposed.

Near the Suttons tenements, the Noltenius Formation grades upwards into the Chilling Sandstone, which in this area, is regarded as part of the Pine Creek Geosynclinal sequence. (Farther west, there is a sharp facies change between the Noltenius Formation and the Chilling Sandstone on the Chilling Platform, outside the geosynclinal limits). The Chilling Sandstone is a typically medium-grained, ripplemarked quartz sandstone containing rare pebble conglomerate horizons, and like the Finniss River Group its provenance was west of the Pine Creek Geosyncline.
The Berinka Volcanics, which crop out near but not within EL 1597, are believed to be intercalated within the Noltenius Formation although the relationship has not been conclusively demonstrated. The volcanic rocks include intermediate to acid flows and pyroclastic horizons.

The sediments within the Pine Creek Geosyncline have been intruded by Lower Proterozoic basic sills and other minor intrusions, most of which are now seen as amphibolite following low-grade regional metamorphism. Part of only one restricted exposure of these Zamu Complex rocks is inferred within the tenements from photointerpretation; it is at the eastern edge of EL 1598.

As noted above, the Finniss River Group is exposed within the northern part of EL 1359, where both the Burrell Creek Formation and the Noltenius Formation, as mapped in the 1960's, are present. Chilling Sandstone, in association with relatively subordinate exposures of rocks of the Noltenius Formation, crops out in EL 1597; Noltenius Formation is also exposed in the eastern part of EL 1598 in association with the photointerpreted exposure of basic intrusive rocks of the Zamu Complex.

2.3 EARLY CARPENTARIAN GRANITES

Rather small plutons of granitic rocks of early Carpentarian age are present within EL 1359, and others are partially within EL's 1358, 1597 and 1598. These rocks are generally massive and coarse-grained or porphyritic, the main local exception being the Titree Granophyre of southern EL 1597. The intrusions which were intruded discordantly or partially concordantly into the rocks of the Pine Creek Geosyncline, have been isotopically dated at 1760 m.y. by Compston (Walpole et al., 1968, p. 286).

The relatively extensive granite mass of the Litchfield Complex, flanking the tenement areas to the west, is regarded as partly an early Carpentarian intrusion like the smaller bodies. However, it contains rafted Archaean migmatites, and this massif contains Archaean granites as well as the Carpentarian material. In Figure 1, the Litchfield Complex is identified wholly as Archaean, to simplify the presentation of surface geology.
The Daly River Basin contains Adelaidean (upper Proterozoic) to Ordovician sediments, the former resting with marked unconformity on the sediments of the Pine Creek Geosyncline and the Carpentarian granites intruding them. Within the relatively undeformed and unmetamorphosed Daly River sediments, unconformities are present above the Adelaidean sequence and above the Lower Cambrian Antrim Plateau Volcanics.

The Adelaidean rocks constitute an arenite-carbonate-lutite assemblage known as the Tolmer Group. The basal Buldiva Sandstone is a shallow marine deposit, subdivided into the underlying Depot Creek Sandstone Member and the overlying Stray Creek Sandstone Member; the latter contains interbedded lenses of siltstone which are not present in the lower unit. Both members are up to about 300 m thick. In spite of the large time-break inferred at the unconformity below these rocks, there are only rare conglomeratic lenses in the Depot Creek Sandstone Member, and those that are known are all at the base of the sequence and contain only pebbles of local origin. The Buldiva Sandstone is overlain by the Hind Dolomite, a generally massive dolomite noted for its content of algal structures (Collenia); the dolomite is up to 60 m thick. It is succeeded by the Waterbag Creek Formation, the highest in the Tolmer Group. It consists of up to possibly 150 m of ferruginous sandstone and variegated siltstone with lenses of silicified limestone and marl. The sandstone and siltstone contain halite pseudomorphs.

The Tolmer Group crops out very extensively in EL's 1357 and 1358, and also in the western part of EL 1359.

The unconformity above the Waterbag Creek Formation is marked by occasional pockets of boulder-conglomerate up to 10 m thick, below the Lower Cambrian Antrim Plateau Volcanics. One such pocket of Witch Wai Conglomerate is partially within EL 1357, and another (Jarong Conglomerate) is adjacent to EL 1598. The Antrim Plateau Volcanics are composed of massive and vesicular tholeiitic basalts; there are some intercalated sandstones, and volcanic conglomerate, conglomerate or arkose have been noted from place to place at the bottom of the volcanic succession.
Up to 60 m of volcanics appear to be present near the Suttons Group tenements, although thicknesses elsewhere may be much greater (about 1000 m); the basalts crop out very extensively south of the EL's. Their eruptive centres are not known but they may be localized along the Halls Creek Mobile Zone, where the greatest thicknesses of lava are present.

The Antrim Plateau Volcanics are extensively exposed in EL's 1357, 1358, and western EL 1359.

Sedimentation in the Daly River Basin was completed after the eruption of the Volcanics by the subsequent deposition of the Cambrian to Ordovician Daly River Group. The basal member of the Group, the Middle Cambrian Tindall Limestone, is a fine-grained to coarsely crystalline limestone up to 150 m thick, containing lenses of sandstone and siltstone and also bands and lenses of chert. It is succeeded by the siltstones, ferruginous sandstones, and carbonates of the 200-m-thick Jinduckin Formation, and these in turn are overlain by flaggy silicified limestone (Ooloo Limestone) which has a similar thickness.

The Daly River Group forms large exposure-areas within EL's 1355, 1357, and 1358, and it extends north into EL 1359 and east into EL's 1484 and 1724.

2.5 MESOZOIC TO RECENT ROCKS

Throughout the Suttons Group tenements, generally horizontally stratified sandstones, siltstones and shales of Cretaceous age remain as mesas. It is believed that there is a passage upwards from freshwater to marine sediments in these strata, which unconformably overlie the older rocks. From place to place, there is a considerable variation in the levels of the surfaces covered by these Mullaman Beds. Since the Mesozoic, the area has been subjected to at least three erosional cycles, with consequent deep weathering of the near-surface rocks (weathering may be expected to have affected most exposures not subjected to active erosion, to depths of up to 100 m). Laterite and soil profiles, and alluvium, colluvium, talus and sand accumulations have developed, probably mostly during the Quaternary.
3. MINERALISATION IN TIPPERARY STATION AREA

Three instances of minor surface mineralisation are known within the Suttons tenement areas.

3.1 BARITE-FLUORITE-LEAD-ZINC

The Northern Territory Geological Survey reports (Lau, 1977) four separate occurrences of barite and fluorite, with minor sphalerite and galena, within an area of about 2.5 km x 1 km, about 15 km south of Tipperary Homestead within EL 1355. These occurrences are within the Middle Cambrian to Lower Ordovician Daly River Group. Although outcrop in the general vicinity is generally poor, it is believed that the occurrences are in the middle to upper part of the Middle Cambrian Tindall Limestone.

3.2 COPPER

Minor copper mineralisation is known near the bottom of the Antrim Plateau Volcanics, 21 km west-north-west of Tipperary Homestead (Walpole et al., 1968, p. 99). Malachite and azurite occur in basalt near the contact with underlying ferruginous sandstone, probably belonging to the Waterbag Creek Formation. Similar small copper shows are not uncommon outside the tenements, in places where the bottom of the volcanics is exposed; also Traves (1955), describing an area well to the west of the Suttons tenements, records minor copper mineralisation within the main mass of the lava pile.

3.3 MANGANESE

EL 1724, in the north-east of the group of tenements, probably covers some of the small manganese prospects recorded by Walpole et al. (1968, p. 232) in the Green Ant Creek area. These occurrences are irregular bodies of low-grade manganese ore at the unconformity below the Cretaceous Mullaman Beds, where they overlie steeply-dipping siltstones and greywackes of the Burrell Creek Formation. Walpole et al. indicate that the mineralisation probably formed by replacement of siltstone horizons in the Burrell Creek Formation, suggesting that it is pre-Cretaceous in age.
A total of 540 tons of ore was taken from this field for use at the Rum Jungle treatment plant, but the occurrence is believed to lack any present or future economic potential.
4. EXPLORATION BY SUTTONS GROUP OF COMPANIES

Suttons initiated its exploration of the tenements by commissioning the following investigations, which covered also ground between and adjacent to the EL's:

(i) Geological photointerpretation (J.B. Jeppe, R. F. Loxton, Hunting and Associates);
(ii) Airborne magnetic and gamma-radiation survey (Aero Exploration Pty. Ltd.);
(iii) Consultant’s general assessment (Barrie, 1978)

4.1 GEOLOGICAL PHOTINTERPRETATION

J. B. Jeppe of R. F. Loxton, Hunting and Associates, was commissioned to prepare a photogeological study of the area of Tipperary Pastoral Holding. The exercise was carried out in order to provide a detailed information base for the planning of mineral exploration in the area, and also for the planning of agricultural and pastoral development. The study, covering 5,600 km², used Division of National Mapping RC9 black-and-white photography (1962; 1:80,000). The study covers four map-sheets, of which the northeastern one forms Figure 3 of this report. The work was principally directed towards differentiation of the Cambro-Ordovician strata, rather than the relatively minor outcrop areas of Middle and Upper Proterozoic rocks.

4.2 AIRBORNE MAGNETIC AND GAMMA-RADIATION SURVEY

This survey was flown by Aero Exploration Pty. Ltd. (partly owned by the Suttons Motors Group) under the general direction of John Barrie, then consultant to the Group. Equipment specifications were as follows:

<table>
<thead>
<tr>
<th>AIRCRAFT</th>
<th>Twin Pioneer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAGNETOMETER</td>
<td>Varian V85, resolution 0.1 gamma</td>
</tr>
<tr>
<td>SPECTROMETER</td>
<td>Hamner (Harshaw Chemical Company, U.S.A.) 18,533 cm³ crystal; differential analysis by windows; Lancer data acquisition system; Brush 6-channel and Hewlett-Packard 2-channel recorders</td>
</tr>
</tbody>
</table>
The survey was flown in September and October 1977. Information was produced along a total of about 14,500 line-km, on about 150 flightlines. Nominal altitude over ground surface was 300 ft. (90 m). Flightlines were spaced at a nominal half-mile (800 m) with 25 percent allowance for quarter-mile (400 m) fill-in flightlines, which were subsequently flown along the edge of the Daly River Basin, over the Upper Proterozoic exposure areas, and along the Giants Reef Fault.

The information collected in 1977 comprises:

- Complete magnetic-tape records
- Complete print-out of magnetic tape
- Analog profiles for magnetometer, altitude, and gamma-radiation channels total count, thorium, uranium, potassium (TC, Th, U, K) (Appendix I)
- Detailed magnetic profiles of most lines (Appendix I)
- Flightline plots on 1:88,000 black-and-white aerial photographs

Some data have been affected by equipment malfunction. During only the early part of the survey, test runs showed that the Th channel responded to a U source, and that the U channel responded to a K source (responses were also obtained in the correct channels). The Doppler navigation equipment failed on several occasions, at which times sampling occurred at 1-second intervals instead of intervals (ranging from 0.7 to 1 second) depending on aircraft speed.

4.3 GAMMA-RADIOMETRIC SURVEY RESULTS

The data on profiles and magnetic tapes are "raw". Background correction was applied to the gamma-radiation channels by zeroing them at 2000 ft (600 m) altitude relative to ground level, but compton-scatter and altitude corrections have not been applied to the collected information.
The airborne-radiometric information has not been computer-processed. Preliminary subjective analysis of the data resulted in definition of a number of uranium and thorium anomalies, of which very few were near the eastern side of the block of tenements. In particular, no clearly-defined uranium anomalies are present in EL 1484 and in southeastern EL 1355; in EL 1724, one uranium anomaly was noted in the eastern central part of the tenement, but it was not among those selected for ground follow up.

The following observations are of interest:

(i) Different rock-types generally have different characteristic radiometric-background signatures. These background levels agree with those shown on the B.M.R. reconnaissance radiometric maps.

(ii) Some Carpentarian granites are characterized by high background U, Th and K.

(iii) Very small, but persistent, U anomalies are present along the unconformity between Upper and Lower Proterozoic successions.

4.4 MAGNETIC SURVEY RESULTS

Magnetic data were collected on all flightlines. (The magnetic information collected on early flightlines is shown on charts separate from those on which radiometric and altitude data are presented.) The magnetic data have been subjected to preliminary examination, with observation of background levels, changes in background levels and zones of magnetic noise. The available information correlates well with magnetic-profile data published by the Bureau of Mineral Resources.
CONCLUSIONS

EL 1484 is on the eastern periphery of the area selected by the Suttons Group for investigation. The airborne and photogeological surveys have produced no information which indicates that farther work on the tenement is justified, and application has been made to relinquish the tenement in March 1979.
REFERENCES


APPENDIX I

ANALOGUE PROFILES, AIRBORNE SURVEY
OVER EL 1484

Seven traces on the charts represent, from top to bottom:

Magnetometer
Flight Altitude
Gamma-radiation, total count
Gamma-radiation, uranium channel
Gamma-radiation, thorium channel
Gamma-radiation, potassium channel

Ground-location camera trip interval; selected frames identified by number
EXPLORATION LICENCE AREAS (BOTH GRANTED AND UNDER APPLICATION) AND SUTTONS GROUP PASTORAL LEASE BOUNDARY

FIGURE 1
SCALE 1:250,000

LEGEND

AREA UNDERS
GOVERNMENT RESERVES

CA 19/84
17th July, 1980.

Attention: Mr. A.W. Newton

Northern Territory Department of Mines and Energy,
P.O. Box 2901,
DARWIN. N.T. 5794

Dear Sir,

Re: Your letter dated 8/7/80 Ref. MG/2/12 AWN/SW:190

In reply to your letter of 8th July, I must apologize for us having overlooked the commitment made in our previous correspondence to provide substitute maps for the final reports on E.L. 1484 and 1724. Unfortunately, the relevant originals are still in our Northern Territory field camp but we are making arrangements to have them sent to us so that substitute maps can be prepared for you to put on open file.

With regard to your request for advice on the scales for the analogue records, they are as follows:

PRODUCTION LINES 1230-1300 INCLUSIVE AND 1171, 1182

200 CPS Full Scale Deflection (CPSFSD) in 'K' Channel
100 CPS Full Scale Deflection in 'U' Channel
100 CPS Full Scale Deflection in 'TH' Channel
1000 CPS Full Scale Deflection in Broad Band (B/B) Channel

PRODUCTION LINES 10, 11, 32, 40, 41, 50, 60, 70

500 CPS Full Scale Deflection (CPSFSD) in 'K' Channel
500 CPS Full Scale Deflection in 'U' Channel
200 CPS Full Scale Deflection in 'TH' Channel
2000 CPS Full Scale Deflection in Broad Band (B/B) Channel

ALL OTHER LINES

500 CPS Full Scale Deflection (CPSFSD) in 'K' Channel
200 CPS Full Scale Deflection in 'U' Channel
200 CPS Full Scale Deflection in 'TH' Channel
2000 CPS Full Scale Deflection in Broad Band (B/B) Channel

with time constants (TC) of 2 sec, 2 sec, 2 sec and 0.5 sec respectively in all cases.

Yours faithfully,

R.D. BUTLER.
General Manager.

RDB/ss