ANNUAL REPORT FOR 1977
FOR EL 1405
HERMIT HILL
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D.A. BERKMAN

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SUMMARY

Exploration Licence 1405 was granted on 6th September 1977 for a one year term.

During 1977 air photo coverage was obtained, BMR airborne survey plans were purchased, and a reconnaissance inspection of the area was carried out. Radiometric carborne surveys during this inspection did not detect any obvious anomalies.

A suite of rock specimens was collected, representing the various lithologies available at reasonably accessible outcrops. Some improvement in the geological map was obtained.

Expenditure on EL 1405 during 1977 was $6,437.

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(Chief Geologist)
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PLAN: EL 1405, Hermit Hill, Sample
Locality Plan, on scale 1:100 000
INTRODUCTION

Exploration Licence 1405 was granted on 6th September, 1977 for a one year term, for an area of 149.88 square miles (388 km²). The licence extends south from latitude 13°35' to 14°10', and is wholly within meridians 130°25' and 130°30'. The area is thought to be prospective for uranium and base metal deposits in the Hermit Creek Metamorphics.

Rock specimens representing the easily accessible outcropping lithologies were collected from the licence during the period 1st to 5th November, 1977, and the level of radioactivity along roads and tracks was measured. A description of this reconnaissance is presented herein.

The total expenditure on EL 1405 to 31st December, 1977, was $6,437 (see Appendix 1).
GENERAL SETTING

The licence area is very elongate, with a north dimension of about 65km, and east-west widths a maximum of 10km on the northern boundary, and a minimum of 3½km along the southern margin. The western boundary, along 130°25'E, is the eastern boundary of the Daly River Aboriginal Reserve and Wildlife Sanctuary. All of the licence falls within the Elizabeth Downs pastoral lease (see plan).

Only two physiographic types are present, viz:

- **The Coastal Plains**, in the north and northwest of the licence, extending as far south as Mission Billabong. These are quite flat and largely treeless, and are flooded each wet season - partly by run off from the higher plains, and partly by floods from the Daly River. These plains are impassable for vehicles after the monsoon until the high grasses dry and can be burned, usually no earlier than July. The major soil type is a grey to black clay loam, and no rock outcrops are known in this.

- **The Litchfield Plains** are slightly higher than the coastal plains, and are not seasonally flooded (except along the course of Hermit Creek). These plains slope gently to the north, towards the Daly River, and the Hermit Creek drainage system has incised steep sided channels up to 5m deep. Flood debris were noted in the trees at a height of 3m above plains level near the main channel of Hermit Creek! These plains have a yellow brown loamy soil, which supports an open forest cover of eucalyptus species, and occasional bare areas which have isolated swampy patches with cudgibutt and narrow leaf ti tree cover.
Outcrop of ferruginous laterite, and zones of "ironstone gravel" derived therefrom, are fairly common, while rock outcrops are quite rare, and insufficient for mapping geological boundaries. Exceptions are Mt. Green and Hermit Hill in the northern part of the licence, which have ample rock float and reasonable outcrop density.

The only permanent settlement in the licence is the Elizabeth Downs Head Station complex, which includes an airstrip suitable for light aircraft. The formed road to the station provides access to the northern third of the licence, and the Port Keats road and station tracks (on each side of the Hermit Creek system) provide access to the remainder - but these latter are impassable to vehicles for much of the wet season. There is ample water for exploration purposes, all year round, in the Mission billabong area, which provides an excellent camp site.

Previous geological mapping by the Bureau of Mineral Resources has identified Archean Hermit Creek Metamorphics (quartz - mica schist, amphibolite etc.), and Archean - Carpentarian Litchfield Complex (granite, granodiorite etc.) in the licence.
Carborne scintillometer traverses were carried out along most of the accessible station tracks. A Scintrex Model GIS-3 discriminating spectrometer was used, carried on the front seat of the vehicle; readings thus obtained have been doubled to provide the equivalent outcrop or ground value. All of the readings were obtained on the "BB" (broad-band) channel, for which background is about 20 counts per second (c.p.s.) on alluvium, and up to 50 cps on large outcrops of granodiorite.

Observations on specific tracks are provided in Appendix 2, and the thin section description of the rocks collected is presented as Appendix 3.

CONCLUSIONS

1. No obvious radiometric anomalies were found by vehicle scintillometer traversing.

2. Some improvement to the regional geological knowledge was achieved.

3. Based on the data collected to date, an air photo interpretation of the geology of the EL is considered worthwhile.
APPENDIX 1: FINANCIAL STATEMENT

Expenditure on EL 1405 to 31st December, 1977

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Salaries and wages</td>
<td>$2,135</td>
</tr>
<tr>
<td>Field and travel expenses</td>
<td>$1,478</td>
</tr>
<tr>
<td>Assays and investigations</td>
<td>$193</td>
</tr>
<tr>
<td>Sundries, maps, minor supplies, rents</td>
<td>$281</td>
</tr>
<tr>
<td>Supervision and administration</td>
<td>$2,350</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$6,437</strong></td>
</tr>
</tbody>
</table>
APPENDIX 2: RECONNAISSANCE OBSERVATIONS

Observations are related to coordinates on the Australian Map Grid for the Greenwood and Moyle 1:100 000 scale topographic maps (see plan).

1. **Mission Billabong to Elizabeth Downs H.S.**

   562780 Mission Billabong, 20 cps.

   594772 Outcrop of fine grained grey granodiorite, specimen CSC 13, 40 cps. Same lithology outcrops as tors at 595773, 608768 and 617774.

   612767 On Port Keats road, turn E.

   619779 Turn N off Port Keats road, along track on W side of fence, 40 cps.

   608775 to 603776 Granodiorite tors, 40 cps.

   603776 North flank of Hermit Hill, here composed of equigranular fine to medium grained granodiorite, with a compositional banding (quartz - rich and quartz - poor bands) strike $095^\circ$ dip vertical; quartz veins to 25cm wide strike $305^\circ$ dip vertical, 30 - 40 cps. Specimen CSC 14.

   617782 to 616795 Track bearing N, with grey granodiorite tors, 40 cps.

   617800 About 100m N of yards, floaters of dark grey amphibolite, specimen CSC 15, 10 - 15 cps.
616803 to 603830  Grey gritty soil or
(?)granodiorite, last tor seen at
616804, 40 cps.

600837  Mt. Green; entirely pink, pale brown
and pale grey or white quartzite and
quartzite breccia, no bedding seen,
frequent quartz veins to 2cm wide.
Frequent vughs containing quartz crystals
and specular hematite. Specimen CSC 16
of quartzite, 10 - 15 cps on traverse E-W
across Mt. Green.

588870  Small knoll of Mt. Green type quartzite
breccia.

585894  Ditto, ample exposure in road metal pits,
10 - 12 cps.

2. **Port Keats Road**

612767 to 552718  Grey clay loam with coarse angular
quartz fragments, one granodiorite tor at
600752, 20 - 30 cps throughout.

552718 to 524600  Hermit Creek flood plains, no
outcrop or float seen. Creek contains fine
to coarse quartz grit, 30 cps.

557596  Billabong to E of road has large floater of
dark grey feldspar-amphibole schist
(?)metabasalt), specimen CSC 17, 15 cps.

530562  Roadside floaters of same lithology, 40 cps,
country higher and flood free south from here.
3. **Ti-tree Creek track**

545685 Turn SE off Port Keats road, 30 cps.

550646 Billabong, and outcrops of tubular ferruginous laterite, 40 cps.

548640 to 536636 Flat topped ridge, with tubular laterite capping, 30 cps.

545623 Outcrop of reddish brown coarse grained muscovite - quartz schist, foliation strike 360°, dip vertical, 50 - 60 cps, specimen CSC 18.

558525 to 572505 (Moyle Sheet) Open level plain, with occasional tubular ferruginous laterite boulders, 30 cps.
Lowder Geoscience

PETROLOGICAL EXAMINATION OF SAMPLES
FROM EL 1405 & EL 1408, CAPE SCOTT 1:250,000 SHEET,
NORTHERN TERRITORY

Report No.: 77/60
16th December, 1977

For: Australian Oil and Gas Corporation Ltd.

G. G. LOWDER
Consulting Geologist
Eighteen rock samples from EL 1405 and EL 1408 in the Cape Scott 1:250,000 sheet area, N.T., were received with a request for brief petrological examination and comments. Each sample was thin sectioned and brief petrographic notes on these samples are provided below.

The samples fall into at least four, probably five groups. One of these (samples 15, 16, 17, 18) comprises rocks belonging to the Archaean Hermit Creek Metamorphics. Two of these samples (15, 17) are amphibolite and seem to be of basic igneous derivation. Another sample (18) is a well defined quartz-mica schist which could be of acid igneous derivation. The fourth member of the group is a siliceous breccia of uncertain origin but which could have igneous affinities. The second group (5, 6, 9, 12, 13, 14) is composed of acid igneous rocks of deep-seated plutonic character belonging to the Carpentarian Litchfield Complex. These samples are variously described as granite, adamellite or granodiorite and are characterised by coarse grain size, perthitic feldspar and relative abundance of accessory minerals, particularly apatite, zircon and, to a lesser extent, allanite.

Samples in the third group (1, 2, 4, 7, 8) belong to the Moyle River Formation, of Carpentarian or Adelaidean age. All but no. 2 are quartz sandstones with generally well rounded grains and commonly with authigenic quartz cement. Hematite is an important component in some cases. Tourmaline and zircon are common accessories. One sample (2) is schistose but clearly of sandstone origin. Group four (10, 11) comprises sandstones which are quite unlike the sandstones of the third group and are thought to be of Cambrian age. Both of these samples contain abundant feldspar, one (10) being well sorted, the other (11) being unsorted and essentially arkosic. The last group, represented by sample no. 3, probably belongs to the middle Proterozoic basic intrusives (Pdo). It is a quartz gabbro with much fresh augite and there is no evidence of deformation or metamorphism. For this reason it is unlikely that sample no. 3 belongs with the metamorphic rocks of the first group. Nor is it likely that the sample belongs with the largely acidic, plutonic rocks of the Litchfield Complex.

The schistose sandstone (no. 2) has a well developed, regional metamorphic/tectonic texture and cannot be described as cataclastic. Hence, it is difficult to ascribe this schistosity to shearing related to a fault. The plutonic intrusives display lithologies consistent with their belonging to the Litchfield Complex, as described in Cape Scott explanatory notes. Basic igneous origin for the amphibolites is suggested on the basis of conventional hornblende-plagioclase mineralogy, and a lack of diopside.
SAMPLE NO. | BRIEF PETROGRAPHIC NOTES
---|---
CSC 1 | Quartz sandstone, somewhat bimodal size distribution, with well rounded grains 0.5-1.5 mm and subangular to subrounded grains 0.1-0.3 mm. Authigenic silica and hematite cement.
CSC 2 | Quartz-sericite schist, derived from sandstone, as indicated by relict clastic outlines, but quite strongly deformed, with strong strain extinction and partial recrystallisation of schistose quartz grains. Sericite/muscovite relatively abundant and strongly foliated. Conspicuous accessory zircon and tourmaline. Clastic grain size averages 0.5 mm.
CSC 3 | Quartz gabbro, dominantly plagioclase and augite, the latter with common marginal replacement by secondary amphibole, green biotite and minor epidote. Moderate sericite-epidote alteration of plagioclase. Grain size mostly 1 to 2 mm, with interstices filled by quartz or graphic quartz-feldspar intergrowth. Minor components include large skeletal opaque oxide grains, partly altered to green biotite, and sphene. Alteration is probably late-magmatic; no evidence of significant deformation or metamorphism.
CSC 4 | Orthoquartzite, fairly well rounded but poorly sorted quartz grains, tightly bonded by authigenic silica. Some interstitial sericite and chlorite, probably representing former argillic cement. Conspicuous accessory zircon and tourmaline.
CSC 5 | Hornblende-biotite adamellite, coarse grained plagioclase and microperthitic potash feldspar, including microcline megacrysts, with mainly interstitial quartz. Plagioclase moderately altered. Biotite and hornblende common, characterised by many inclusions of apatite and zircon. Several metamict allanite grains, 0.5-1 mm, are present.
CSC 6 | Biotite-hornblende adamellite, substantial hornfelsic recrystallisation, although there are many relict large crystals or megacrysts of microperthite and plagioclase. Biotite also partly recrystallised. Alteration of feldspar generally weak, but patchy epidote and sericite quite common. Conspicuous accessory apatite, sphene, zircon and allanite.
CSC 8 | Quartz sandstone, sorting poor, grains ranging from 0.1 to 2.5 mm, and not as well rounded as in CSC 7, but both sorting and rounding vary in distinct beds. Opaque hematite cement.
CSC 9  Biotite-muscovite granite, substantial recrystallisation but considerable relic, relatively sparse (2-3 mm) microcline, quartz and subordinate plagioclase. Generally minor alteration of plagioclase. Micas fairly fine grained (<0.5 mm), with biotite greatly predominating over muscovite. Accessory tourmaline and apatite.

CSC 10  Labile sandstone, fine, uniform grain size (0.1-0.2 mm), grains well sorted and subangular to subrounded in general, but tightly bonded by authigenic overgrowths. Quartz, plagioclase and potash feldspar clastic grains all abundant, with muscovite and biotite quite common. Relatively high porosity. Spotty limonitic or hematitic staining widespread. Accessory tourmaline, rutile and detrital opaques.

CSC 11  Arkosic sandstone, mixed provenance, including well rounded quartz grains, some with authigenic overgrowths, also angular, unsorted quartz, plagioclase and potash feldspar grains up to 3 mm in size. Numerous mica flakes and argillically altered grains. Prominent bedding indicated by grain size variation and foliation of mica flakes. Considerable porosity; some patches of opal. Common accessory tourmaline and zircon. Hematite or hematitic-argillic cement.

CSC 12  Muscovite-biotite granodiorite, coarse grained plagioclase, quartz, microcline and muscovite. Biotite tends to be finer and is subordinate to muscovite. Plagioclase appears to predominate over microcline and is commonly quite sericitised. Quartz grains strained, with some recrystallisation. Rare accessory zircon.

CSC 13  Muscovite-biotite granodiorite, distinctly finer grained than the previous sample, averaging 1-2 mm. Most plagioclase is quite heavily dusted by sericite. Well developed allotriomorphic granular texture. Muscovite and biotite are about equally abundant and both commonly have prehnite alteration along cleavages. Some chloritisation of biotite. Albitze-prehnite vein. Accessory apatite and zircon.

CSC 14  Biotite granodiorite, broadly similar to the previous sample, but a little coarser grained and lacking muscovite. Biotite rather abundant. Plagioclase moderately sericitised. Accessory zircon and apatite common; also allanite. Prehnite-albite-carbonate veining.

CSC 15  Amphibolite, dominant constituents are plagioclase and pale green hornblende, about equally abundant. Some epidote alteration of plagioclase. Common accessory sphene and Fe/Ti oxide. Metamorphosed, basic igneous rock.

CSC 16  Siliceous breccia, angular, unsorted fragments of quartz, including large single grains and coarse aggregates, smaller grains and aggregates, and fragments of rock, themselves fragmental in nature. These are set in a fine matrix of quartz, clay, sericite. Degraded biotite present locally, possibly some feldspar. Widespread hematite and hematitic dusting of matrix. Rock probably has igneous affinities.
Amphibolite, plagioclase and hornblende about equally abundant. Fairly fine grained, rather hornfelsic texture. Local coarse, poikiloblastic quartz. Accessory apatite, traces of sphene and Fe/Ti oxide. Metamorphosed basic rock.

Quartz-muscovite-biotite schist, with completely chloritised biotite. Fairly well foliated, quite coarse. Minor opaque oxide grains, trace of zircon. Probable acid igneous derivation.