E.L. 1321. N'GALIA BASIN

NORTHERN TERRITORY

AFMECO PTY. LTD.

REPORT NO 257

D.J. FRENCH

K.A. MC PHEE
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1. SUMMARY

E.L. 1321 was granted to AFMECO PTY. LTD. of Frewville, South Australia, on March 16th, 1977.

The area of E.L. 1321 contains outcropping Carboniferous Mount Eclipse Sandstone, and Quaternary sediments.

Eight (8) drillholes on E.L. 1321 penetrated the Mount Eclipse Sandstone in the subsurface. A total of 1034 metres was drilled for a direct cost of $33,332-53.

No significant Uranium anomalies were encountered in the subsurface.
2. INTRODUCTION

2.1. Location, Title, Logistics

E.L. 1321 is centred on longitude 131°05'E and latitude 22°15'S (Fig. 1.)

Permission to carry out mineral exploration on E.L. 1321 was granted by the Assistant Director of Mines on March 16th, 1977, this being effective for twelve (12) months. The expiry date is 15th March, 1978.

The area granted is 136.21 square kilometres (52.59 Square miles).

Access to the area is by way of an unsealed station road branching off the main Tanami Beef Road some 310 kms north-west of Alice Springs (Fig. 2.). Access to E.L. 1321 is via station fire-break tracks branching off the main Vaughan Springs access track. A further 7 km of track was cleared by AFMECO PTY. LTD. for the purpose of providing access and siting drillholes.

Roads in the region are readily accessible unless subjected to heavy and continuous rains. Even then, access is not prevented for extended periods. Off road travel is easily manageable by 4-wheel drive vehicles.

Water available for drilling purposes is scarce. Permanent water does not exist, however, water supplies can be obtained from bores constructed by the pastoralist. Water found in these bores is usually saline.
2.2. Programme objectives

Due to lack of available ground covering extensions to known mineralization, the exploration licence was applied for to allow a drilling programme to test for mineralization potential in the upper units of the succession.

The granitic terrain to the north of the N'Galía Basin apparently was the provenance for the sediments that now comprise the (?)Carboniferous Mount Eclipse Sandstone. The granites appear to have an above average Uranium content with 5 - 20 ppm U being common (values of 30 ppm and 60 ppm are known from the Napperby sheet area, and similar values can be expected to the north of the N'Galía Basin in this area).

The Uranium within the granite is in a form that allows it to be mobilized, by groundwater action, along existing fractures. This is exemplified by the Dingo's Rest South area. The Uranium can also be mobilized by the chemical action of present day rainwater as Quaternary outwash areas draining the granites show a high radiometric background.

Within the Mount Eclipse Sandstone, suitable physical traps (in the form of fractures or as porous horizons) must exist. The Bigrily Prospect mineralization occurs in such zones close to the local base of the Mount Eclipse Sandstone. The mineralization occurs in what is termed the "Bleached Zone" - a light biscuit-red coloured medium to coarse grained quartz sandstone with minor carbonaceous matter - that appears to be discordant to bedding. In the most important area of mineralization at Bigrily the "Bleached Zone", containing disseminated carnitite and uraninite, occurs above a calcite cemented level that may have acted as a chemical barrier to the migration of the uraniumiferous waters percolating through the area. Thus both suitable physical and chemical traps exist in the area.

At present the only mineralized "Bleached Zone" recognized in the immediate proximity to E.L. 1321 is that at the Bigrily Prospect. The drilling programme was designed to locate other such bleached and mineralized zones in the upper levels of the Mount Eclipse Sandstone.

Starting from the northern edge of the N'Galía Basin, a measured traverse was done over outcropping basin sediments within E.L. 605, and this was continued through E.L. 1321 as a drill traverse (Section 2, Plate 2).

The objectives of this programme were:

- 2.2.1. to obtain a geological section through the complete local sequence of the basin,

- 2.2.2. to test for mineralization potential. A locally weakly anomalous "Bleached Zone" outcrops on both limbs of the Patmungala Syncline. Drillholes, located at the outcropping margins of the Patmungala Syncline, were planned to test this zone,

- 2.2.3. to obtain stratigraphic and structural data on the Patmungala Syncline. A series of five 200-300 metres holes was planned to span the Patmungala Syncline to provide information on the upper part of the sequence in the Patmungala Syncline.
3. PREVIOUS EXPLORATION

The only previous geological mapping done in the region was that undertaken in 1967, to compile the 1:250,000 scale Mount Doreen sheet (Sheet SF 52-12). E.L. 1321 lies within the limits of the Mount Doreen sheet.

As an aid to mapping, geophysical methods have been widely used. Airborne magnetic surveys, reconnaissance and detailed gravity surveys, and seismic reflection surveys, were conducted by various private companies and the BMR, between 1963 and 1971.

Up until 1974, Central Pacific Minerals had undertaken a number of airborne radiometric surveys over outcropping Mount Eclipse Sandstone.

In 1974-1975, C.P.M. undertook, over what is now E.L. 1321, a reconnaissance track-etch survey, track-etch detailing over regional anomalies, and drilling of resultant anomalous areas. Results indicate that the anomalies are related to claypans or to surface drainage patterns. Hand auger holes drilled encountered weathered Mount Eclipse Sandstone. No anomalous radioactivity was detected.
4. REGIONAL GEOLOGY AND STRUCTURE

4.1. Geology and Stratigraphy

The regional geology and structure of the N'Galia Basin is well documented in B.M.R. Reports and company reports.

The N'Galia Basin is an east-west trending intracratonic depression, being, at its extremities, some 420kms long and 70 kms wide. Up to 4900 metres of sediments are preserved in the basin. It is located between latitude 22°S and 23°S, and longitudes 129°E and 133°45'E (Fig. 3.)

In the western portion of the basin, a sequence consisting of Proterozoic, Ordovician and Carboniferous sediments overlie a Lower Precambrian crystalline basement. Table 1 summarizes the general stratigraphy of the western portion of the basin. The (?) Carboniferous Mount Eclipse Sandstone is the unit within which all known Uranium mineralization, within the basin, has been discovered.

4.2. Structure

The N'Galia Basin is an assymmetrical basin with deformation more pronounced towards its northern margin. Two major diastrophic events have affected the basin, these being preceded by several minor epeirogenic episodes. The first major event (the Kerridy Movement) occurring after the deposition of the Ordovician, caused major faulting and minor folding, especially along what is now the northern margin of the basin. The second event, in the Lower Carboniferous or later (the Mount Eclipse Orogeny) caused major faulting, thrusting and folding.

In places the basement was thrust in a southerly direction over basin sediments to form nappes and associated structures. The basin has been stable since the latter diastrophic event.
<table>
<thead>
<tr>
<th>AGE</th>
<th>SYSTEM</th>
<th>FORMATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Sand, gravel beds, calcrete; fluvialite and aeolian</td>
</tr>
<tr>
<td>Carboniferous</td>
<td></td>
<td>Mount Eclipse</td>
<td>Arkose, subarkose, calcarenite, siltstone, minor shales and carbonaceous</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sandstone</td>
<td>shales in part, plant fossils present; continental fluvialite; 2000 - 4000 m</td>
</tr>
<tr>
<td>Ordovician</td>
<td></td>
<td>Kerridy Sandstone</td>
<td>Sandstone, subgreywacke, local siltstone and calcareous siltstone interbeds;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>probably fluvialite; 700m (max)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Djugamara Formation</td>
<td>Glaucite sandstone, local siltstone levels, shallow marine; 320 + m</td>
</tr>
<tr>
<td>Adelaidian</td>
<td></td>
<td>Mount Doreen</td>
<td>Siltstone, laminated dolomite, red shale; fluvioglacial and partially marine;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formation</td>
<td>340m (max)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vaughan Springs</td>
<td>Silicified sandstone with basal coarse grained sandstone and conglomerate;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quartzite</td>
<td>shallow marine; 2400 m Treuer Member of silicified sandstone and siltstone;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>shallow marine; 1370 + m</td>
</tr>
</tbody>
</table>
FIG. 3 STRUCTURE AND SOLID GEOLOGY - N'GALIA BASIN
5. SURFACE GEOLOGY AND STRUCTURE. E.L. 1321

5.1. Geology

Within the limits of E.L. 1321 only the (?)Carboniferous Mount Eclipse Sandstone outcrops. The majority of the E.L. is covered by Quaternary dune sand and alluvium. Vaughan Springs Quartzite, Mount Doreen Formation, and Djagamara Formation crop out to the north of E.L. 1321.

The Vaughan Springs Quartzite (Adelaidean) is a completely recrystallized sequence of quartzite and interbedded metashales.

The Mount Doreen Formation (Adelaidean) is locally exposed as a grey to pink to yellow crystalline dolomite containing chert. The horizon is believed to have been completely recrystallized, and acted as the plane of decollement, or as a fluid medium during overthrusting. The maximum thickness of this unit is uncertain, but could be of the order of 300 metres (Section 2, Plate 2).

The Djagamara Formation (Ordovician) consists of a grey to brown to purplish brown pitted sandstone containing green sand-sized grains of glauconite. Outcrops seen are up to 10 metres thick in Sections 1 and 2 (Plate 2).

The Mount Eclipse Sandstone (Upper Devonian-Lower Carboniferous) is the host to Uranium mineralization in the N'Galia Basin. The lowest unit of this formation is a high energy large scale cross-bedded unit, often having a calcareous cement. Nodules of chert and dolomite from the Mount Doreen Formation, are found in some horizons towards the base in this area. These nodules are probably residual cherts and dolomite left after the calcite has been dissolved out. This dissolved calcite has then been precipitated to form a calcite cement in the surrounding sandstone levels. This high energy facies with very large scale crossbedding has not been identified within the area of E.L.1321.

The "Channelling facies", which appears to be critical to the presence of Uranium, is overlain by the "bleached zone" - a pyritic, carbonaceous sequence which, when weathered, becomes friable, kaolinitic and biscuit coloured (in contrast to the normal red colours), and is prospective for Uranium. Clay pellets and abundant muscovite are characteristic of this "zone".

The units above the "bleached zone" consist essentially of a rhythmic sequence of coarse grained quartz sandstones to siltstone. A break follows the siltstone and the sequence then repeats itself, starting with a coarse grained level. This type of rhythmic sequence is present throughout the area of E.L. 1321. Pebble layers are sometimes seen at the base of the rhythmic units. Crossbedding, appropriate in size to the grain size and thickness of the units, is a widespread feature.

The regional dips away from the northern margin of E.L. 1321 are in the 5° to 40° range. Exposure of the upper, flatter horizons is poor, due perhaps both to the presumed upward fining of the sequence and the sand cover in poorly drained areas.
The maximum measured thickness of sediments in the Patmungala Syncline is about 2000 metres, however BMR seismic surveys suggest the total thickness of post-Vaughan Springs Quartzite sediments to be 5000 metres. Within the licence area, seismic data suggests no more than 1000 to 1600 metres of post-Vaughan Springs Quartzite sediments.

The quartz sandstones have a radiometric background of 60-65 cps (SRAT SPP2-NF), the intercalated siltstone levels having surface background radioactivity in the range of 100-125 cps. This increases up to 250 cps when a shallow (15-30cm deep) pit is dug into the weathered zone of the outcrop.

During the mapping programme, outcropping medium grained quartz sandstones and siltstones in the centre of the Patmungala Syncline were found to have a higher surface radiometric background (160-250 cps) than outcrops elsewhere in the syncline. The outcrop where this is most evident commences adjacent to the hinge fold and trends to the southwest. A portion of this outcrop occurs in E.L. 1321, the remainder being in the northwest of E.L.A. 1307 and the southwest of S.M.L. 72.

The sedimentation for the Mount Eclipse Sandstone appears to be by progradation by advancing sequences from the northern basin margin and along the Patmungala Synclinal axis. Scattered current direction observations in the western sub-basin suggest palaeocurrents were broadly directed away from the basin margins, and towards the southwest (i.e. in a direction parallel to the western sub-basin axis).

5.2. Structure

The basic structure of the area is that of a "basin and dome" fold pattern (Plate 1, Section 1, Plate 2). This broad warping of the floor is believed to have been present prior to deposition of the Mount Eclipse Sandstone (it probably dates from the Karridy Movement), and has had a strong control over the deposited facies.

The results of the Alice Springs Orogeny, clearly post-dating the Mount Eclipse Sandstone, are seen as a series of "hinge folds" or overturned synclines paralleling the northern margins of the Mount Eclipse Sandstone. A statistical study suggested the "hinge fold" plane dips approximately 40° N (pers. comm.- A.A.E.C. personnel). In places where overthrusting was such as to indicate a possible break rather than a sharp fold, this "hinge fold" is depicted as a fault.

Lateral compression also heightened the existing anticlines and depressed the synclines and caused local folding and faulting oblique to maximum stress.

Plates 1 and 2 illustrate our understanding of the "hinge folds", and their relationship to the Patmungala Syncline. The actual fold can sometimes be seen in the field, but more often the distinction is drawn by the amount of induration north of the fold, by slickensides sub-horizontal to bedding plane slip, and by the very rapid change in bedding attitude.

The beds on the northern margin of E.L. 1321 vary in attitude from overturned to vertical, to steeply dipping. This steep attitude rapidly flattens basinwards to be less than 10° along the section drilled (Sections 2 and 2A, Plate 2).
6. DRILLING PROGRAMME

6.1. Timing

The drilling programme was conducted in two phases. Phase I commenced on June 19th, 1977, and continued through to July 21st, 1977. Lost time delays due to mechanical breakdowns amounted to 5 days. Phase II commenced on September 3rd, 1977, and continued through to September 13th, 1977. Lost time delays amounted to two days. A total of 1034 metres was drilled during these phases for a total direct drilling cost of $33,332.

6.2. Contractor and Equipment

Contractor:
W.L. Sides & Son Pty. Ltd.,
Wellington Road,
Clayton. Victoria. 3168

Equipment:
1 Mayhew 1000 rotary drilling rig mounted on all-wheel drive truck (Phase I).
1 T 64 H-B Schramm drilling rig (Phase II).
1 All-wheel drive water tanker of 4500 litre capacity.
1 High pressure 250 l/sec x 1745 k Pa compressor on all-wheel drive truck (coupled with Schramm rig compressor to give total output of 360 l/sec)
1 Toyota 4WD service utility
  All drilling equipment necessary
1 Caravan for personnel

Personnel
3 per shift, 1 driller, 2 offsiiders.

6.3. Sampling, Lithologging, Personnel

Representative unsplit chip samples were collected for every one (1) metre penetrated. A portion of this, retained in a plastic bag, is to be forwarded to the Mines Branch (Alice Springs) upon termination of the licence.

Each sample obtained was systematically examined and described. A 1:500 scale representation of the obtained data for each hole accompanies this Repo.

AFMECO personnel onsite were D. French (Project Geologist), and K. McPhee (Geologist). Lithological descriptions and electric-log interpretation by K. McPhee.
6.4. Discussion of Drilling Methods

As requested, the contractors supplied a Mayhew 1000 drilling rig for Phase I of the programme. No auxiliary air was requested however, due to very hard rock conditions and abundant groundwater. A 250 litre/second x 1745 kpa compressor along with a 34.15 Mission Megadrill was introduced to increase penetration rates (from less than 4 m/hr to 6-7m/hr using the Mayhew).

The Mayhew 1000 with added air still proved to be ineffective for our purposes. The rig was in bad mechanical repair and had an effective limit of 120-130 metres (wet holes), and slightly more in dry holes. The depth in wet holes could have been fractionally increased had mud-based drilling been employed, however this method may still have been ineffective as the holes tended to wash and cave badly. The Mayhew 1000 onsite proved to be unsatisfactory for reaching our target depths, and was replaced.

For Phase II of the programme, the contractors supplied a Schramm Model T 64H-B heavy duty air operated rig with a Mission 43-15 down-hole hammer. This rig proved quite capable and effective in penetrating the rock conditions present. The major drawback was the absence of a suitable mud-pump for use below the limit of the hammer tool. In hole 1321/8 water pressure set the effective limit of the hammer at approximately 200 metres. Below this a tricone bit (using air) was tested. Sample return suffered in quantity and quality, and its felt that, had a suitable mud-pump been available, effective mud-based drilling may have enabled us to reach our target depth of 300 metres.

Blade drilling, effective in the upper weathered levels (approximately 10m thick) was used for 4.5% of the programme and averaged 9-10m/hr penetration. Tricone drilling was used for 10% of the programme. Average penetration was 6-7m/hr with the Mayhew 1000 in the friable lithologies of hole 1321/1 and 3-4m/hr (Schramm) in the indurated lithologies below 200m in 1321/8. The hammer tool, used for 85.5% of the programme averaged 6-7m/hr penetration for both rigs although the Schramm did obtain penetration rates of 14-15m/hr at times.

Table 2 is a summary of the drilling activities.
<table>
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<tr>
<th>Hole</th>
<th>Elapsed Time Start</th>
<th>Elapsed Time Finish</th>
<th>Drilled Depth m</th>
<th>Probed Depth m</th>
<th>Cost $</th>
<th>Standby at $54/hr Hr</th>
<th>Work Time at $72/hr Hr</th>
<th>Water Carting at $1.10/km Km</th>
<th>Travel between holes $54/hr Hr</th>
<th>Misc (PVC, etc) $</th>
<th>TOTAL COST $</th>
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<td>477.40</td>
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7. SUBSURFACE GEOLOGY AND MINERALIZATION

7.1. Geology

The holes drilled penetrated an intercalated sequence of quartz sandstones, subarkoses, arenaceous siltstones and siltstones of the (?)Carboniferous Mount Eclipse Sandstone.

The sequence penetrated is much finer grained compared with outcropping Mount Eclipse Sandstone in the eastern part of the Patmungala Syncline.

The arenaceous facies (Quartz sandstones and subarkoses) have pale red or light grey colours. Components consist of milky, "rose" (orange tinted) and clear quartz plus minor dark lithic fragments. Minor to rare centimetric sized quartz, quartzite, and (?)Metasedimentary pebbles occur in parts, especially in those holes to the north of the synclinal axis (holes 1321/1, 1321/2, 1321/3 and 1321/5). Grain size is commonly fine to medium, but minor coarse grained levels exist. Hole 1321/1, adjacent to the outcropping northern synclinal limb, shows semi-cyclic (a very coarse to fine grained rhythm), while the remaining holes through the syncline are apparently devoid of this rhythm. Sorting of individual levels is fair to good. Induration is good except in some levels of holes 1321/1 and 1321/2. Minor bleached, friable sandstone, the host lithology for Uranium mineralization in the Biggyli Prospect, is present in hole 1321/1 and is due to groundwater action causing feldspar decay and removal. Subarkoses (quartz sandstone with >5% visible K-feldspar) are present in holes 1321/6 and 1321/7 - those towards the axis of the Davis Anticline. The percent of subarkose in the sequence increases towards this axis. Minor (<2%) kaolinitic K-feldspar is present in some quartz sandstone intervals in hole 1321/8. All the arenaceous facies penetrated are non-calcareous in nature.

The pelitic facies, consisting of siltstones and arenaceous siltstones, are generally red brown (with minor small green spots or streaks in part) in colour. Minor grey green colours were found in holes 1321/5 (44.5 - 50.0m) and 1321/6 (132.0 - 134.5m), and grey colours in holes 1321/7 (38.0 - 45.0m) and 1321/8 (54.0 - 64.0m). Induration of the facies members is fair to good. Calcareous components are almost totally absent from the pelitic sequence, except for thin intervals in holes 1321/7 and 1321/8.

Siltstone content varies in the drill holes. In hole 1321/1, 15% of the sequence is siltstone while in holes 1321/2 to 1321/7, it varies from 37% to 63%. In hole 1321/8 siltstone accounts for 70% of the drilled sequence. The marked increase in siltstone content up the sequence could be due to initial sedimentation by a stream channel system that then evolved into the quieter environment of a flood plain. Changes in palaeotopography would have caused the stream system to dissipate and become more of a flood plain transected at intermittent stages by flooding channels.

Of all the holes drilled, 1321/6 is the easiest on which to attempt a subdivision. A study of electric log characteristics and lithological divisions enables a broad division of the sequence into units. The ratio of sandstone: siltstone content decreases up a positively evolving unit and, in general, the final bed of a unit will be a major siltstone level. A division on this basis can be made at 100 metres where the top of a major siltstone interval depicts the closure of sedimentation in one unit before initiation of another unit by way of deposition of a sandstone level.
7.2. Correlations

Electric log correlation between the holes is fair. As nearby outcrops show dips of $70^\circ$ S, no electric log correlation exists between holes 1321/1 and 1321/2. Between holes 1321/2 and 1321/7 the sequence is flatter and correlations were made by way of density (between holes 1321/2 and 1321/3), or S.P./Resistivity (1321/3 to 1321/7) logs.

The correlation between holes 1321/1 and 1321/7 has defined the shape of the Patmungala Syncline (Sections 2 & 2a, Plate 2), and given some indication of lithofacies variations. Correlation between holes 1321/3 and 1321/8 indicates a gentle ($1-2^\circ$) westerly plunge of this portion of the syncline (in contrast to a $17^\circ$ E plunge to the western portion; pers. comm. A.A.E.C.)

Table 3 lists relevant correlation data.

The sequence is approximately the same thickness throughout the transverse section, but individual levels show slight variation in thickness.

Correlation between subsurface and surface geology exists. A well developed fine grained level outcropping to the west of the 1321/1 to 1321/7 drill profile can be correlated with the siltstone level between 100m and 138m of hole 1321/6.

Similarity of overall lithologies between holes 1321/5 and 1321/6 is evident. There is a repetition of fine sandstone facies and siltstones, and the distribution of these levels is somewhat the same in the two holes. The distribution and character of lithologies in the upper levels of the Mount Eclipse Sandstone is also uniform.
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<td>1</td>
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<td>84.2-86.8</td>
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<td>97.8-100.2</td>
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<td>56.4-59.6</td>
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<td>67.0-69.2</td>
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<td>8</td>
<td>77.0-81.3</td>
<td>82.2-86.0</td>
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<td>138-140.0</td>
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</table>

CORRELATION POINT - refer Plate 2, Section 2A

56.6 - 70.2 correlatable interval as defined by electric log

56.6 - 70.2, 60.6 - 70.7 isochronous correlatable interval between holes
7.3. Mineralization

There are no significant gamma peaks in any of the holes drilled.

Permeability and porosity are generally low with water being encountered only in holes 1321/1, 1321/2, 1321/5 and 1321/8. The absence of suitable aquifers reduces the favourability of the area because of the necessity to have suitable groundwater situations for the formation of a sedimentary Uranium accumulation.

Reduced siltstone facies are present in two places:— in the holes drilled towards the axis of the Davis Anticline (1321/5, 1321/6, 1321/7), and in hole 1321/8 near the northern synclinal limb, but further to the east of previous line. The change from oxidized to reduced facies, the physico-chemical conditions ideal for Uranium precipitation, exist between holes 1321/4 and 1321/5, and between holes 1321/2 and 1321/8. No significant gamma peaks are associated with these changes.

Water analyses (Table 4) show higher Uranium values for holes to the north of the Patmungala Synclinal axis compared for those to the south of the axis.
8. HYDROLOGY

The occurrence of large volumes of groundwater was noted in a number of the holes drilled.

Permeability present is of a secondary nature, coming from a structural rather than diagenetic cause. The water present exists in aquifers produced by fracturing of the host sandstones.

Where water exists in the area cannot be safely predicted, except perhaps where drillholes are sited close to the outcropping northern margin of the Patmungala Syncline. Holes drilled near this margin (1328/1, 1328/2, 1321/8) had yields of 3.0 - 5.0 litre/second compared with hole 1321/5 (to the south of the synclinal axis) that yields less than 0.5 litre/sec. All other holes were dry or slightly damp (having no significant yield).

In all wet holes the static water level is 6 - 7 metres below ground level.

The results of water analysis are shown in Table 4.

<table>
<thead>
<tr>
<th>Hole No.</th>
<th>U (ug/l)</th>
<th>SO₄ (mg/l)</th>
<th>HCO₃ (mg/l)</th>
<th>U 9mg/l</th>
<th>Hole depth at sampling</th>
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</thead>
<tbody>
<tr>
<td>1321/2</td>
<td>115</td>
<td>4440</td>
<td>230</td>
<td>17200</td>
<td>T.D. (104m)</td>
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<tr>
<td>1321/5</td>
<td>85</td>
<td>1260</td>
<td>395</td>
<td>2270</td>
<td>T.D. (123m)</td>
</tr>
<tr>
<td>1321/8</td>
<td>230</td>
<td>3540</td>
<td>340</td>
<td>9950</td>
<td>181m</td>
</tr>
</tbody>
</table>
9. CONCLUSIONS AND RESULTS

Five holes of 200 - 300 metres depth were planned on a section line across the Patmungala Syncline. As the Mayhew 1000 Rig onsite was mechanically incapable of reaching these depths, the programme was revised and seven shallower holes (120 - 140m) were planned, and subsequently drilled, on the section line. Drilling was then suspended and a Schramm rig was mobilized and used in an attempt to drill one 300 metre deep hole two kilometres east of hole 1321/2. Nearby outcropping Mount Eclipse Sandstone shows bleaching in part, and this deep hole was planned and sited to intersect the sub-surface extension of this bleached zone. No evidence of this bleached zone was found in the sub-surface.

The results of the shallow hole portion of the programme give geological and structural data on the upper sequence in the Patmungala Syncline. The drilled interval shows an abundance of siltstone facies (Section 2A, Plate 2) and the conclusion that can be reached from this is that this portion of the sequence is towards the end of a positive depositional cycle.

Using lithologic characters (as well as electric logs), a subdivision into two units has been made in hole 1321/6 at 100 metres depth. A correlation between the subsurface and surface geology exists in the Patmungala Syncline where the major siltstone level that defines the top of one unit in hole 1321/6 (100 - 138m), can be correlated with a well developed fine grained level outcropping to the west of the profile.

The structure of the Patmungala Syncline is shown as Section 2 (Plate 2). The most important feature of the area is the hinge fold, and the influence it has on the structure of the syncline is quite marked. The electric log and lithological correlation have enabled a better understanding of the structure of the syncline to be obtained.

The sedimentation for the Mount Eclipse Sandstone appears to be by progradation by advancing sequences from the northern basin margin and along the Patmungala Syncline axis. The huge fold and Davis Domal feature must have had an effect on the sedimentation in the area, but to what extent, we are unsure of at present.

There is a lack of significant gamma anomalies in the area drilled.
10. RECOMMENDATIONS

Because no significant gamma anomalies occur in the holes, it is recommended that no further drilling be carried out in the Patmungala Syncline.

Depending on results obtained in a proposed programme in areas closer to the base of the Mount Eclipse Sandstone in the Dirgo's Rest area, the investigation of the subsurface in the Davis Dome area could be worthwhile.
REFERENCES


HOLE NUMBER 1321/1

LOCATION: N'Gala Basin, Northern Territory, EL 1321.

CO-ORDINATES: 22°14'15"S 131°08'00"E

DRILLING: Blades 0-15
           Tricone 15-60
           Hole Dia.: 12 cm

T.D.: 60 m

SAMPLES: Cuttings per dm

GEOLeGIST: K. McPhae 21-6-77

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Red soil, alluvium; unconsolidated.
Red to pale red arenaceous siltstone; weathered, friable; non-calcareous.
Pale red fg (with minor mg; 5-6m to part) quartz sandstone; oxidized from light grey colour; friable; non-calcareous; fair to poor sorting.
Red to light red brown arenaceous siltstone; vfg-fg glassy, milky quartz grains; friable to fair induration; vfg muscovite; non-calcareous; sandy feel; lower dm has light grey vfg-fg quartz sandstone interbeds.
Pale orange fg-mg (minor eg) quartz sandstone; friable; poor sorting.
Buff to pale red fg-mg (rare eg) quartz sandstone; fair sorting; poor to fair induration; non-calcareous; milky quartz, clear quartz, rose quartz.
Buff to light red mg-eg (minor vg) quartz sandstone; fair to poor sorting; pebbly in 18-19m level; pebbles of quartz and quartzite to 2cm dia.
Pale orange fg quartz sandstone; well sorted; non-calcareous; milky and clear quartz euhedral grains.
Red brown fg-mg-eg (rare vg) quartz sandstone; poor sorting; friable to fair induration; constituents of milky quartz + tinted quartz; highly permeable; oxidized.
Bleached fg-vg quartz sandstone; very poor sorting; fair induration; pure; milky, rose, orange tinted, clear quartz, dark lithic fragments; non-calcareous; light brown to pale red.
Red brown siltstone & arenaceous siltstone; green specks throughout; vfg muscovite; indurated; non-calcareous.
Pale purplish with minor light red brown colour in part fg-mg (1mm) quartz sandstone; fair sorting; good induration; non-calcareous; oxidized; quartz grains stained with iron.

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* Water struck at 13m; flow of minimum of 3.3 litres/sec
  S.W.L. 25m
HOLE NUMBER 132/2

LOCATION: N'Galia Basin, Northern Territory, EL 1321.

CO-ORDINATES: 22°16'30" S 130°07'55" E

DRILLING:
- Blades: 0-10
- Hammer: 10-104m
- Hole Dia.: 12cm
- T.D.: 104m

SAMPLES: Cuttings per 1 metre

GEOLOGIST: K.A. McPhee 1/7/77

Red-brown to brown sand, silt, alluvium; non-calcareous; unconsolidated.
Brown - orange brown siltstone, arenaceous in part; weathered; clayey in part; poor induration; ves - fg subrounded quartz fragments; non-calcareous; minor light grey colour in part; however intercalated with red brown colours.

Pale red to light brown fg (0.5mm) quartz sandstone; upper 3m mg (2-4mm); fair to good sorting; fair induration; non-calcareous; abundant vesicule in lower levels; consists of glassy milky quartz, oxidized.
Light grey fg - eq minor ves quartz sandstone; non-calcareous; constituents of subrounded milky + minor clear quartz; fair induration; lower 3m mg (2-4mm) well sorted; minor pebbles to upper level (i.e. fair to poor sorting); pebbles of milky quartz.

Pale red brown siltstone, minor arenaceous content; fair induration.

Pale red fg - eq (minor veq) quartz sandstone; poorly sorted; non-calc.; fair induration; minor subrounded milky quartz + quartzite pebbles.
Light grey to pale red fg - eq, minor ves quartz sandstone; fair to poor sorting; minor pebbles milky quartz + quartzite, clay/sediment, rare ech.; matrix of milky, clear, rose quartz + minor lithic fragments.
Red brown fg - eq (3mm) quartz sandstone; subrounded - subangular quartz grains; fair sorting; fair induration; non-calcareous.
Light grey fg - eq quartz sandstone in upper levels down to red brown fg quartz sandstone; non-calcareous; fair sorting; fair induration.

Red-brown siltstone/shale, rarely arenaceous; very well indurated.

Light grey to pale red brown fg - eq quartz sandstone; poorly sorted; non-calcareous; rare 'basement' pebbles in matrix of milky + rose quartz; well indurated; rare shale fragments in lower level.

Red brown siltstone/arenaceous siltstone; very good induration; veq quartz fragments (glassy + milky); faintly laminated; minor green specks; non-calcareous.

Light grey to pale red fg - eq (2-4mm) quartz sandstone; fair to poor sorting; matrix pebbles 50-80mm; fair to good induration; non-calcareous.
Red brown siltstone, locally arenaceous; well indurated; arenaceous component veq fg glassy milky quartz; non-calcareous.
Pale red to light grey fg - eq quartz sandstone; indurated; fair sorting; non-calcareous.

Red brown siltstone; minor green spots; indurated; non-calcareous.
Light grey to pale red fg - eq quartz sandstone; fair sorting; well indurated; non-calcareous; constituents as previous.
Red brown siltstone/arenaceous siltstone with minor Light grey to red brown fg - eq quartz sandstone; internal well indurated; non-calcareous.

Water at 20m; minimum flow of 2.5 l/s.
S.W.L. 7m
HOLE NUMBER 131/3

LOCATION: Ngalia Basin, Northern Territory EL 1311

COORDINATES: 22°14'38" S 131°07'30" E

DRILLING:
Blades 0-6
Tricone 6-26
Hole Dia. 12cm
Hammer 26-123m
T.D. 132m

SAMPLES: Cuttings 1 per 1m.

GEOLeITT: K. A. McPhee 7-7-77

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Red brown alluvium; weathered shale to lower; minor gypsum in parts; friable, unconsolidated.

Light green grey f-kg quartz sandstone; fair sorting; weathered dolomite, non-calcareous.

Light grey mg-kg (5-2mm) quartz sandstone; fair to poor sorting; non-calcareous; consists of subrounded to subangular milky to clear quartz; fair induration.

Red brown siltstone, v/g muscovite; finely arenaceous in parts; fair induration; non-calcareous.

Red brown siltstone, with thin calcite/claystone; massive, non-calcareous; felsic feel to which member.

Red brown siltstone with pale purplish, v/g-kg quartz sandstone in lower 2m; siltstone non-calcareous, finely muscovite, rare to minor, green spots, fair to good induration; sandstone good sorting, well indurated, non-calcareous.

Light grey f-kg (5-2mm) quartz sandstone; fair to poor sorting in upper 2m; Sorting is subangular; good induration; non-calcareous; consists of milky quartz with minor gravel-size quartz.

Red brown to pale purplish siltstone; indurated v/g muscovite; rare laminae; a rare arenaceous.

Pale purplish (minor green spots) v/g-kg (5-2mm) quartz sandstone; well indurated; rare f/g muscovite; rare to minor, green spots; subangular gr. Red brown siltstone; v/g muscovite; rare laminae; non-calcareous.

Pale purplish v/g-kg quartz sandstone; as 110-132m.

Red brown siltstone (as previous).

Pele purplish v/g-kg quartz sandstone (as previous).

Light grey f-kg quartz sandstone, conglomeric 5+2-5m; well indurated; non-calcareous; pebbles of green mohacite in mg-kg (2mm) quartz sandstone.

Pale purplish v/g-kg quartz sandstone; as previous.

Light grey-b pale red v/g-kg quartz sandstone; v/g biotite; colour bimodal; well indurated; fair sorting; non-calcareous; rare muscovite.

Red brown siltstone; minor green spots; v/g muscovite in part; non-kaolinite.

Light grey f-kg, minor f-kg quartz sandstone; fair sorting; non-calcareous; silica cement (well indurated)

Red brown siltstone; well indurated; non-calcareous.

Light grey f-kg quartz sandstone; poor sorting; milky & clear quartz; rare lithic fragments; well indurated; non-calcareous.

Red brown siltstone with intercalated pale purplish v/g-kg quartz sandstone (with f/g biotite); well indurated; non-calcareous.

Light grey f-kg quartz sandstone; upper level f-kg; milk & clear quartz; rare, lithic fragments; well indurated; fair sorting; minor pebbles of milky quartz in sediments in lower level.

Red brown siltstone with rare pale purplish f-kg quartz sandstone (as previous); siltstone with rare green spots; with rare f/g arenaceous content in part; well indurated; non-calcareous.

Light grey f-kg quartz sandstone; fair to good sorted level; contained in previous; well indurated; non-calcareous; lower 5m.

Red brown to brownish siltstone; v/g muscovite to upper 4m.

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Red brown soil and alluvium; per consolidation.

Red brown weathered f.d. quartz sandstones and siltstones; friable.

Pale red to light grey siltstones; weathered; friable; finely muscovite, minor pale purple quartz; sandstone; interbedded; local lenses.

Red brown siltstones; very muscovite; fair induration; rare green spots.

Pale purple to light grey f.d. - mg (6 mm) quartz sandstone; fair sorting; text; local lenses; minor red brown quartzes; sandstone; good induration; pale green spots; rare clear quartz; minor yellow quartz; very fine biotite; minor muscovite; no visible porosity.

Red brown siltstones; fair induration; weakly laminated in parts.

Light pink f.d. (rare mg) quartz sandstone; "rose" milky quartz; good induration; fair to good sorting; non-calcareous.

Light red brown siltstone; locally arenaceous; very muscovite in part; poor to good induration; weakly laminated in part; non-calcareous.

Light pink f.d. (lower levels minor f.d.) quartz sandstone; good to excellent induration; fair sorting; text; very fine muscovite.

Red brown siltstones; very muscovite; fair induration; non-calcareous.

Red brown f.d. (8 mm) quartz sandstone; indurated; minor light green spots in part; good sorting; non-calcareous; composed or surrounded by subangular milky + "rose" quartz grains; slight cement; no visible porosity.

Red brown siltstone; fine muscovite in part; fair induration; green spots a blocks are minor; non-calcareous.

Pale red brown to rust red f.d. (6 - 8 mm) quartz sandstone; well sorted; good induration; SA - Sd. milky + "rose" quartz; non-calcareous.

Red brown siltstone; very muscovite in part; traces weak laminate.

Red brown f.d. - mg (6 mm) quartz sandstone; indurated; fair sorting; red brown siltstones (as above).

Light grey mg (minor very f.d. 3 mm) quartz sandstone; indurated; fair sorting;subordinate to subangular components; mainly milky quartz.

Light grey to light pink f.d. - mg (6 mm) quartz sandstone; indurated; fair sorting; non-calcareous; SA - Sd. milky + "rose" quartz; minor light green spots; slight cement; no visible porosity.

Light grey mg (minor very f.d. 3 mm) quartz sandstone; rare pebbles 12 - 13 mm. indurated; fair sorting; constituents as above.

Light grey f.d. - mg (6 mm) quartz sandstone; indurated; fair sorting; non-calcareous; silica cement; minor f.d. muscovite.

Light grey mg (minor very f.d. 3 mm) quartz sandstone (as proven).

Light grey + red brown f.d. - mg (6 mm) quartz sandstone; indurated; excellent sorting; minor red brown siltstone/shale in lower levels; fibre in tact.

Red brown siltstone; indurated; minor very f.d. muscovite; non-calcareous.

Purplish a green grey f.d. (8 mm) quartz sandstone; well indurated; well sorted; SA - Sd. milky quartz; "rose" quartz in part; silica cement; non-calcareous.

Red brown + purplish siltstone/shale; well indurated; minor green spots; locally very arenaceous; very muscovite.

Green grey (minor red brown) f.d. (6 mm) quartz sandstone; well indurated; good sorting; subordinate to subangular milky quartz; predominately non-calcareous.

Red brown - purplish siltstone/shale; well indurated; minor green spots; locally very arenaceous; very muscovite.

Water at 17 m, minimum flow 0.2 cubic/sec.

S.W.I. 56 m
HOLE NUMBER 132/7

LOCATION: N'Gulia Basin, Northern Territory, EL 1321.

COORDINATES: 22°15'25"S 131°07'10"E

DRILLING: Blades 0-6
Hammer 6-121m

T.D. 121m

Hole Dia. 12cm

SAMPLES: Cuttings per 1m.

GEOLOGIST: K. McPhee
23-7-77

Red brown alluvium, soil; gravel bed w-5m; unconsolidated, non-calcareous.

Light green grey clay, weathered shale; minor arenaceous content; abundant gypsum (especially 9-10m); non-calcareous; poor consolidation.

Purplish red vfg-fy (55mm) quartz sandstone; fair induration; good sorting; non-calcareous; rare vfg muscovite.

Grey brown vfg quartz sandstone; fair induration; non-calcareous.

Red brown siltstone; rare green spots; fair induration; non-calc.

Pale purplish vfg-fy quartz sandstone; as previous; joint fractures with opal-like coating.

Red brown siltstone; fair induration; non-calcareous; vfg muscovite, especially in lower levels.

Pale purplish vfg-fy (55mm) quartz sandstone; as previous.

Light green grey fgy quartz sandstone; mottled red brown colours; abundant; good sorting; non-calcareous; 55-30 milky quartz. Light green grey fgy (55mm) quartzose, kaolinized feldspar; good induration; good sorting; non-calcareous; 55-30 milky quartz.

Pale purplish fgy quartz sandstone; as previous.

Red brown to deep red brown siltstone; fair to good induration; non-calcareous; vfg muscovite, especially in lower 7m.

Grey (mottled with red brown) siltstone; good induration; weakly calcareous (AFS) 0.2-4.4m; otherwise non-calcareous; talcose feel parts.

Gray tilled purplish vfg-fy (55mm) quartz sandstone; good induration; good sorting; 95% vfg muscovite; 55-30 milky quartz; non-calc.

Siltstone; 55-45-85 grey tilled purple, 45-50-50 pale purple, 50-50-50 red-brown, 55-55-55 pale purple; indurated; non-calc.; minor muscovite.

Pale pink mg (5mm); minor eg.; rare vfg <3mm) quartz sandstone; indurated; fair sorting; non-calcareous; 55-30 milky glassy quartz; rare "rose" quartz; to lower 1m; rare kaolinized feldspar flakes.

Red brown siltstone; minor green spots; indurated; non-calcareous; weakly laminated in part.

Pale pink fgy (55mm) subarkose; fair to good induration; good sorting; 55-30 milky quartz, glassy quartz, minor rose quartz; rare dark lithic fragments; kaolinized feldspar; non-calcareous.

Red brown siltstone; finely arenaceous in upper levels; indurated; non-calcareous; minor green spots; vfg muscovite in lower levels.

Pale red to pale pink mg (rare eg. <3mm) subarkose; indurated; fair sorting; non-calc.; subrounded-subangular clear to milky quartz, minor "rose" quartz, very rare dark lithic fragments; kaolinized feldspar.

Red brown siltstone; indurated; non-calc.

Pale purplish fgy (55mm) quartz sandstone; indurated; well sorted; non-calcareous; constituents as previous.

Red brown siltstone; indurated; non-calc.; minor to abundant (55%) green spots.