REPORT ON INVESTIGATIONS DURING THE PERIOD:

13th June, 1979 TO 12th June, 1980.
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ABSTRACT

During the period 13th June, 1979 to 12th June, 1980, the Bauhinia Joint Venture undertook a program of geological mapping and geochemical sampling in addition to the implementation of geophysical surveys including I.P./resistivity and regional gravity. Due to the isolated and leached nature of the outcrops within the licence, geological and geochemical interpretation has been made difficult. However a number of positive features have been located as a result of the regional gravity survey. Drilling is scheduled to commence over two of these features in the second year of tenure.
INTRODUCTION

Exploration Licence 2072 in the Warramana Creek locality covers an area of 496.35 square miles and was granted to A.O. (Australia) Pty. Ltd. on the 13th June, 1979. The licence is located in the McArthur River region and is one of several exploration licences which are the subject of a Joint Venture Agreement known as the Bauhinia Joint Venture.

During the first year of tenure, exploration centered on the implementation of a gravity survey, geological mapping and geochemical sampling in the western section of the licence. In addition an induced polarization/resistivity program of 1.6 kilometres was carried out in the southwestern portion of E.L. 2072.

This report represents a summary of work carried out in E.L. 2072 during the first year of tenure, 13th June, 1979 to 12th June, 1980. A statement of expenditure covering this period is included in the report.
2.00 TENURE AND JOINT VENTURE

2.10 Title

Exploration Licence 2072, covering an area of 496.35
square miles in the McArthur River region, was granted
to A.O. (Australia) Pty. Ltd. on 13th June, 1979, for a
period of twelve months. An outline of the licence is
given in Figure 1 and the area fully described below:

Commencing at the intersection of latitude 15 degrees
29 minutes with longitude 136 degrees 00 minutes thence
proceeding to the intersection of latitude 15 degrees
29 minutes with longitude 136 degrees 15 minutes thence
proceeding to the intersection of latitude 15 degrees
45 minutes with longitude 136 degrees 15 minutes thence
proceeding to the intersection of latitude 15 degrees
45 minutes with longitude 135 degrees 50 minutes thence
proceeding to the intersection of latitude 15 degrees
30 minutes with longitude 135 degrees 50 minutes thence
proceeding to the intersection of latitude 15 degrees
30 minutes with longitude 136 degrees 00 minutes thence
proceeding to the intersection of latitude 15 degrees
29 minutes with longitude 136 degrees 00 minutes.

There are no known mining tenements within the licence.

Pursuant to the provisions of the Mining Ordinance an
application was lodged for the renewal of E.L. 2072 over
the whole of the area for a further twelve months. Approval
for renewal was subsequently granted.

2.20 Bauhinia Joint Venture

Exploration Licence 2072 is one of a number of licences in
the McArthur River region which are the subject of the
3.

Bauhinia Joint Venture in which the following companies are participants:

A.O. (Australia) Pty. Ltd.
Electrolytic Zinc Company of Australia Ltd.
Penarroya (Australia) Pty. Ltd.
Preussag Australia Pty. Ltd.

The Joint Venture was formed in November 1976 with the aim of locating economic lead-zinc mineralization of the H.Y.C.-type within the McArthur River region. The Agreement was approved and registered under the Northern Territory Mining Ordinance on the 28th January, 1977 with A.O. (Australia) Pty. Ltd. as Manager. On 9th July, 1979, Shell Company of Australia Ltd. entered into an agreement with the four abovementioned companies by which it can earn a fifty percent interest in the Bauhinia Joint Venture.

During various stages, the Joint Venture has held and investigated in excess of 3,000 square miles. A wide range of techniques have been employed including -

1. INPUT surveys
2. photogeological and ERTS studies
3. induced polarization/resistivity surveys
4. gravity surveys
5. ground magnetic traversing
6. diamond drilling
7. geological reconnaissance
8. detailed geological mapping
9. geochemical programs - rock and soil
10. literature reviews

To date, a total of more than one million dollars had been expended by the Bauhinia Joint Venture on the McArthur River Project.
3.00 GEOGRAPHY

3.10 Location and Access

The eastern boundary of E.L. 2072 is located approximately 11 kilometres west of the Bing Bong Homestead. The majority of the licence occurs within the Bing Bong and Tawallah Range 1:100,000 topographic sheet areas and the central eastern portion of the Mt. Young 1:250,000 sheet. The northeastern portion of the licence occurs in the Rosie Creek 1:100,000 topographic sheet.

No established vehicle tracks exist within the licence and access is restricted due to thick vegetation cover. Station tracks emanating from Bing Bong Homestead impinge on the eastern boundary of the licence (see Figure 2). Access to the western portion of the licence is gained via surveyed gravity lines both in E.L. 2072 and from gravity lines in E.L. 1728 to the immediate south where base camp was established on Pine Creek.

3.20 Physiography

Exploration Licence 2072 falls almost entirely within the Coastal Plain. Areas of the Gulf Fall topographic unit skirt the southwestern corner of the licence.

A number of consequent streams flow through the licence area in a northeasterly direction towards the Gulf of Carpentaria, notably Rosie, Warramana and Pine Creeks and just south of the licence, Bing Bong Creek.
5.

The Coastal Plain is a low lying area between the coast and the hilly country of the Gulf Fall, the elevation generally ranging from sea level to thirty metres. A maximum elevation of forty-six metres occurs in the Coastal Plain of E.L. 2072. The plain is underlain by mainly horizontal Lower Cretaceous rocks, with some inliers of Proterozoic rocks. A laterite profile, commonly truncated by erosion, is exposed in creek banks near the coast. The Coastal Plain is now covered by sand, probably of marine origin and is commonly underlain by a cemented detrital laterite; alluvial flats occur along the major streams. Ancient northwest trending sand dunes of very low relief are exposed in places on the Coastal Plain, being cemented by ferruginous material. Tidal flats occur on the seaward side of the plain, within the northeastern sector of E.L. 2072.

Elevations of up to 124 metres occur in the Gulf Fall in the southwest corner of E.L. 2072. The relief of the Fall is strongly controlled by underlying lithology. Immediately east of the Tawallah Range, fault blocks of Masterton Formation and Tootoola Sandstone form prominent mesas with less resistant rocks of the McArthur Group in the valleys between. Further east, the McArthur Group crops out as low rounded hills, 16 to 30 metres above the surrounding plain.
COMPARISON A.D., C.E.C. AND B.M.R. NOMENCLATURE.
East of Tanawiah Fault and excluding environs of H.Y.C. deposit.

COMPARISON OF STRATIGRAPHIC NOMENCLATURE

TABLE 1

BAUHINIA JOINT VENTURE

AUGUST 1980
6.

4.00 GEOLGY AND STRUCTURE

4.10 General

A program of geological mapping was undertaken in conjunction with a regional gravity survey in the western portion of the licence.

The geological mapping was hampered by the extremely poor outcrop and thick vegetation cover. Where outcrop does occur extreme leaching makes interpretation difficult.

The interpreted geology at 1:50,000 scale is presented in Map 1. However the geological interpretation shown is, in most cases, based on extremely liberal extrapolations of airphoto bedding trends and a few isolated leached outcrops. The stratigraphic nomenclature adopted by the Bauhinia Joint Venture is illustrated in Table 1.

4.20 Cretaceous and Younger Units

4.21 Alluvium

True alluvium is more common than is shown on Map 1, but the unit often becomes difficult to trace due to presence of older high terrace deposits.

4.22 Residual Sand Deposits

Most of the area investigated is covered with sand probably derived from the Cretaceous cover. Thick sand is also present in areas where bedding trends show on photos and it is possible that the area was once covered by a Tertiary-Quarternary sand sheet of strand plain origin. The sand has only been shown where it produced a distinct vegetation
type or where it is present as a lithified pink sugary quartzite. This rock is very like the local form of the Tatoola Sandstone.

4.23 Cretaceous
Cretaceous rocks are exposed in leached form only, often displaying typical lateritic mottling effects. The stratigraphic sequence includes a basal section varying from sandstone to pebbly sandstone with cobble conglomerate to a boulder breccia. The overlying unit appears to be composed of fine sandy mudstones.

4.30 Upper McArthur Group
4.31 Yalco Formation
The Yalco Formation has been divided into three members. The upper unit \( (Pmj_3) \) is non-outcropping but has a distinct airphoto contrast with the underlying unit which outcrops in the form of very tough white chert with chert nodules and in the better preserved outcrops some stromatolitic chert can be discerned.

4.32 Lynott Formation
4.321 Donnegan Member \( (L_5) \). One outcrop of the characteristic sandstone (tuff) cauliflower association has been found on gravity Line 20N (refer to Map 1). The outcrop is considered to be fault controlled.

4.322 \( L_4 \) Member. Sandy siltstones with evaporitic relicts, some stromatolitic chert and green tuffs have been mapped as the \( L_4 \) member to the south of the licence. However within
8.

E.L. 2072 no definite outcrops of the unit were identified and the Lynott Formation above the L_3 member has been inferred and shown on Map 1 as L_{4-5}.

4.323 **L_3** Member. A resistant horizon of coarse sandstone overlain by a distinctive grey stomatolitic chert marks the base of the L_3 member. The remainder of the unit is non-resistant and was not observed. The sandstone occurs by itself along the access track south of gravity Line 24N. An area shown as L_3? along the western end of Line 12N is based on float material only.

4.324 **L_2** Member. Despite the non-resistant nature of this unit which typically consists of dolomitic siltstones, some identifiable outcrops occur, notably north of gravity Line 22N in a tributary of Rosie Creek.

4.40 **Umbolooga Sub-Group**

4.41 **Reward Formation**

4.411 **Boko Beds** (R_2). This unit, the presumed equivalent of the "Upper Reward Dolomite Breccia" contains similar lithologies to the Barney Creek Formation. The rock types comprise leached ex-pyritic siltstones and mudstones sometimes with minute shale chips indicating turbidite conditions. Bedding is regular. Some fresh material was collected, pyrite content is low as can be deduced from low-intensity liesegang banding.

Outcrops are confined to creek sections south of Rosie Creek.
4.412 **Reward Dolomite (R₁)**. No dolomite occurs in the area but a degenerate thin bedded chert form is present which sometimes resembles the Yalco Formation. In the absence of adjacent formations it is often difficult to assign the thin bedded chert lithology to the correct formation. An outcrop in Rosie Creek one kilometre upstream of the track crossing and one outcrop next to the central access track south of gravity Line 16N are thought to be Reward Dolomite.

4.42 **Barney Creek Formation**

An outcrop of possible Barney Creek Formation occurs to the south of gravity Line 16N. Identification of the formation has been possible to the south of E.L. 2072 where the unit occurs adjacent to outcropping Reward Dolomite. However the presence of the typical shale break and absence of flintiness helps distinguish the interpreted outcrop south of Line 16N from the Boko Beds.

4.43 **Undifferentiated Toogalinie Formation to Teena Dolomite.**

This "unit" is the one practical division to apply to presumed ex-dolomitic rocks between the Barney Creek Formation and the Tatoola Sandstone. The only rocks outcropping are ex-dolomitic chert breccias, often with stromatolites, and leached mudstones.

4.44 **Tatoola Sandstone**

The rocks classified as Tatoola Sandstone are generally of a different aspect to typical Tatoola lithology. Rocks most resembling the "normal" Tatoola Sandstone occur in an outcrop southwest of the western end of gravity Line 24N. The lowest sandstone member appears to be pyritic with abundant iron
oxide plaque developed on the joint surfaces. Even in this area the sandstone does not appear to have the multitude of ripple marks and thin crossbedded units of the familiar facies. Above the section the sandstones are usually pink where well exposed, although purple and white silicified variants are found.

The belt of outcrops of Tatoola Sandstone along Warramana Creek and further north forms conspicuous tors topography. This sandstone appears to occur as a series of lenses, with the poorly outcropping section above it apparently containing some pink crossbedded sandstone. This is in turn overlain by conglomerate and purple pebbly sandstone.

The remainder of the Tatoola consists of pink, white and purple sandstones generally with beds less than one metre thick with occasional ripple marked surfaces. Towards the top, red mudstone beds progressively replace the sandstone.

The unit is considered to represent a marine regression and the atypical facies is ascribed to a continental environment.

4.45 Undifferentiated Amelia Dolomite and Mallapunyah Formation.

Actual dolomite was observed only as float beyond the western end of Line 24N.

The best outcrops of the weaker rocks of the Mallapunyah Formation are in a creek section extending south from the western end of gravity Line 16N. The most common rock is
pink calcrete presumed to replace red shale, thin bedded ex-dolomitic chert and pink clayey sandstone. Near the base there are beds of purple and white sandstone, often ripple marked which are resistant enough to produce hills in the southwest of E.L. 2072. There appears to be a lot of weak shales interbedded with the sandstone.

4.50 Tawallah Group

4.51 Masterton Sandstone

Strongly outcropping sandstone in the southwest of E.L. 2072 is believed to represent the lower part of the Masterton Sandstone. The Gold Creek Volcanic Member is thought to underlie most of the plain country in this area although identification of the volcanics is based on a few small creek sections.

4.52 Wollogorang Formation

There is only one outcrop area of the formation within the licence, but the creek exposures are relatively good and include fresh dark grey dolomite, some with clots of pyrite associated with leached shales.

4.53 Below the Wollogorang Formation

Rocks from this part of the sequence do not occur in E.L. 2072 but are quite well exposed west of the boundary.

4.60 Structural Interpretation

A preliminary interpretation of Landsat linear features conducted by the Bauhinia Joint Venture concluded that of the two northern branches of the Emu Fault mapped by the B.M.R., the main branch
12.

was the western arm and that the northern extension of this branch of the fault was traced by a prominent linear for a distance of some sixty (60) kilometres northwards of Pine Creek - the area in which the Mount Young 1:250,000 geological sheet shows the main branch of the Emu Fault as terminating. The extension was traced across the western section of E.L.2072.

Further study of Landsat imagery and available air photography has delineated a number of major, north to northwest trending faults diverging from the northern projection of the Emu Fault (see Map 1). The favourable structural setting of the western section of Exploration Licence 2072 was a major consideration in initial programs being undertaken in this region.
<table>
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<tr>
<th>Sample No.</th>
<th>Cu ppm</th>
<th>Pb ppm</th>
<th>Zn ppm</th>
<th>As ppm</th>
<th>U ppm</th>
<th>Sample Description</th>
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<td>20</td>
<td>20</td>
<td>25</td>
<td>9</td>
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<td>Purple laminated shales with small white crystalline intergrowths</td>
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<td>70</td>
<td>25</td>
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<td>Crumbly limonitic spotted calcareous siltstone - Mallapunyah Formation</td>
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<tr>
<td>8157</td>
<td>155</td>
<td>20</td>
<td>25</td>
<td>12</td>
<td>-1</td>
<td>Vuggy Fe oxide coated, leached dolomitic siltstone - ?Wollogorang Formation; ?Mallapunyah Formation</td>
</tr>
<tr>
<td>8174</td>
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<td>6</td>
<td>-1</td>
<td>Leached purple shale</td>
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<tr>
<td>8175</td>
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<td>50</td>
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<td>15</td>
<td>Dark purple/black, heavy, finegrained flinty shale</td>
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<tr>
<td>8176</td>
<td>2</td>
<td>20</td>
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<td>Grey metallic? mineral in small white quartz fragments</td>
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<tr>
<td>8177</td>
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<td>20</td>
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<td>Purple and white (caliche replacements) shales - Mallapunyah Formation</td>
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<tr>
<td>8178</td>
<td>60</td>
<td>20</td>
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<td>Oolitic ferruginous and jasperoidal cherty sandstone - Mallapunyah Formation</td>
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<td>20</td>
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<td>-1</td>
<td>Purple shales (caliche) - Mallapunyah Formation</td>
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<tr>
<td>8180</td>
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<td>20</td>
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<td>Hard purple dolomitic shale with pink tuff - Mallapunyah Formation</td>
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<tr>
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<td>130</td>
<td>10</td>
<td>10</td>
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<td>Dark grey crystalline (Fe rich dolomite) with fine pink laminae. Leached yellow with manganese staining - Mallapunyah Formation</td>
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<td>8182</td>
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<td>Dark purple shales - Mallapunyah Formation</td>
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<td>8192</td>
<td>25</td>
<td>20</td>
<td>190</td>
<td>65</td>
<td>4</td>
<td>Ferruginous sandstone associated with cauliflower nodule beds (gossan) as above</td>
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<td>8193</td>
<td>20</td>
<td>30</td>
<td>180</td>
<td>75</td>
<td>12</td>
<td>Ferruginous sandstone and shale with very smooth chert nodules - nodules often replaced by limonite</td>
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<tr>
<td>8194</td>
<td>10</td>
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<td>80</td>
<td>35</td>
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<td>Light pink basic volcanic with green mineral (?celadonite, ?malachite) - Gold Creek Volcanic Member, Masterton Formation.</td>
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<td>50</td>
<td>80</td>
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<td>Porphyritic basic volcanic with large feldspar crystals in fine grained light pink feldspathic groundmass. - ? Gold Creek Volcanic Member, Masterton Formation.</td>
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<tr>
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<td>Purple/pink/green laminated (tuff?) ferruginous shales with distinctive (clusters and isolated) small white and colourless crystals. ?Gold Creek Volcanic Member</td>
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<td>8143</td>
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<td>30</td>
<td>30</td>
<td>12</td>
<td>2</td>
<td>Pink/purple weathering leached ferruginous siltstone with very small vughs. (Pitted surface - ex sulphide?) - ?Gold Creek Volcanic Member</td>
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<td>30</td>
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<td>Grey laminated crystalline and algal dolomite with rare pyritic blebs. - Wollogorang Formation</td>
</tr>
<tr>
<td>Sample No.</td>
<td>Cu ppm</td>
<td>Pb ppm</td>
<td>Zn ppm</td>
<td>As ppm</td>
<td>U ppm</td>
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<td>25</td>
<td>-4</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>800</td>
<td>40</td>
<td>100</td>
<td>70</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>0.11%</td>
<td>45</td>
<td>250</td>
<td>135</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>1927</td>
<td>640</td>
<td>40</td>
<td>50</td>
<td>70</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>1928</td>
<td>90</td>
<td>30</td>
<td>20</td>
<td>20</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>25</td>
<td>20</td>
<td>5</td>
<td>35</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>35</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>1931</td>
<td>60</td>
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<td>10</td>
<td>18</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>1939</td>
<td>40</td>
<td>15</td>
<td>20</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8141</td>
<td>30</td>
<td>15</td>
<td>190</td>
<td>5</td>
<td>-1</td>
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</tr>
<tr>
<td>8147</td>
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<td>35</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8148</td>
<td>45</td>
<td>25</td>
<td>30</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

**Sample Description**

- **Leached yellow laminated dolomitic siltstone with hematite spots and fracture fill**
- **Microbreccia (white siltstone fragments set in red hematitic matrix)**
- **Reward float - chert laminae with oxidised silty matrix**
- **Leached white dolomitic siltstone with small limonite concretions**
- **Chert with limonite/manganiferous concretionary clusters**
- **"Chert tile marker" material, probably as large clasts in basal Kl breccia.**
- **Leached mudstones sampled over - 15m.**
- **Leached shales - 10m.**
- **Boko Beds - leached shale - 10m.**
- **Boko Beds - weathered dolomite**
- **Boko Beds - flinty tuff**
- **Refer to Figure 4**
- **Creek section including non outcropping areas**
- **Boko Beds - leached shales 8129 - top of section**
- **Boko Beds - leached shales 8133 - bottom of section**
- **Barney Creek Formation - leached shales**
- **Boko Beds - leached laminated purple/buff - 3m**
- **Limonitic spotted mudstone (small outcrop upstream from high lead samples viz, 8133 etc)**
- **Reward Boko - leached purple and white shale**
- **Toogainnie Fm? ex dolomite and siltstone, limonitic chert**
- **Toogainnie Fm? ferruginous spongy chert; ex dolomite**
- **Toogainnie Fm? ferruginous spongy chert; ex dolomite**
- **Toogainnie or Myrtle. Shale break, purple and white leached shale with one band with domalstromatolites and minor spongy chert ex dolomite**
- **Thinbedded siltstone with hard cement (siliceous? dolomite? clay?) with alternating dolomite rich and dolomite poor bands; possibly a siliceous gossan.**
- **Thinbedded shale and siltstone with hard cement, as above**
- **Weathered shale, relatively fresh cores, purple Myrtle?**
- **Dark purple siliceous shales - Mallapunyah Formation**
- **Leached purple siltstones - Mallapunyah Formation**
- **Laminated dark grey/green silicified shale - Mallapunyah Formation**
- **Purple laminated shale - Mallapunyah Formation**
### Table 2: Rock Geochemistry - E.L. 2072

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Cu ppm</th>
<th>Pb ppm</th>
<th>Zn ppm</th>
<th>As ppm</th>
<th>U ppm</th>
<th>Sample Description</th>
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</thead>
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<tr>
<td>8123</td>
<td>45</td>
<td>65</td>
<td>30</td>
<td>580</td>
<td>10</td>
<td>X1 - oolitic sandstone gossan?</td>
</tr>
<tr>
<td>8124</td>
<td>85</td>
<td>120</td>
<td>35</td>
<td>0.12%</td>
<td>15</td>
<td>X1 - gossanous sandstone?</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>95</td>
<td>30</td>
<td>0.11%</td>
<td>15</td>
<td>- reassay</td>
</tr>
<tr>
<td>8159</td>
<td>140</td>
<td>10</td>
<td>20</td>
<td>5</td>
<td>-1</td>
<td>Leached manganese dendrites/stained dolomitic sandstone - 7L2</td>
</tr>
<tr>
<td>1903</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>18</td>
<td>-4</td>
<td>Second chert tile horizon of Boko Beds on Line 16N, grab sample over section approximately 10 cm from bed of waterhole - possibly silica/limonite gossan</td>
</tr>
<tr>
<td>8160</td>
<td>5</td>
<td>40</td>
<td>5</td>
<td>20</td>
<td>2</td>
<td>Leached shales - 5m - Boko Beds</td>
</tr>
<tr>
<td>8161</td>
<td>5</td>
<td>20</td>
<td>5</td>
<td>7</td>
<td>-1</td>
<td>Leached shales - 2m - Boko Beds</td>
</tr>
<tr>
<td>8162</td>
<td>5</td>
<td>30</td>
<td>10</td>
<td>12</td>
<td>1</td>
<td>Leached buff dolomitic shales - 4m - Boko Beds</td>
</tr>
<tr>
<td>8163</td>
<td>5</td>
<td>20</td>
<td>15</td>
<td>3</td>
<td>3</td>
<td>Leached buff dolomitic shales - 5m - Boko Beds</td>
</tr>
<tr>
<td>8164</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>8</td>
<td>-1</td>
<td>Leached white/buff shales - 4m - Boko Beds</td>
</tr>
<tr>
<td>8165</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>7</td>
<td>-1</td>
<td>Leached white/buff - 4m - Boko Beds</td>
</tr>
<tr>
<td>8153</td>
<td>10</td>
<td>55</td>
<td>10</td>
<td>45</td>
<td>-1</td>
<td>Purple/white and brown mottled siliceous flinty shales (minor dolomitic breccia). Sparodic outcrop over - 8m - Reward Boko</td>
</tr>
<tr>
<td>8154</td>
<td>10</td>
<td>30</td>
<td>10</td>
<td>30</td>
<td>-1</td>
<td>Purple/white + brown leached siliceous flinty shales over 5m</td>
</tr>
<tr>
<td>8155</td>
<td>10</td>
<td>25</td>
<td>10</td>
<td>20</td>
<td>-1</td>
<td>Same as above - 5m</td>
</tr>
<tr>
<td>8156</td>
<td>10</td>
<td>30</td>
<td>10</td>
<td>35</td>
<td>-1</td>
<td>Same as above - 5m</td>
</tr>
<tr>
<td>8158</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>-1</td>
<td>Leached white/buff shales - Reward Boko</td>
</tr>
<tr>
<td>8110</td>
<td>105</td>
<td>40</td>
<td>45</td>
<td>30</td>
<td>10</td>
<td>Reward (chert breccia facies). Dark grey laminated chert and sandstone fragments. Leached matrix often vuggy and limonitic stained/spotted.</td>
</tr>
<tr>
<td>8111</td>
<td>45</td>
<td>75</td>
<td>55</td>
<td>135</td>
<td>15</td>
<td>Reward (chert breccia facies). Gossanous silty nodule (probably sample of dark grey silty-sandy chert nodules</td>
</tr>
<tr>
<td>8112</td>
<td>5</td>
<td>20</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>Reward (chert breccia facies) grey dolarenite and dololutite with small cubic vughs - greenish tinge</td>
</tr>
<tr>
<td>8113</td>
<td>30</td>
<td>40</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>Reward leached laminated dolomitic siltstone with chert fragments</td>
</tr>
<tr>
<td>8114</td>
<td>150</td>
<td>65</td>
<td>180</td>
<td>110</td>
<td>10</td>
<td>Reward breccia gossan?</td>
</tr>
<tr>
<td>8115</td>
<td>50</td>
<td>120</td>
<td>230</td>
<td>180</td>
<td>25</td>
<td>Reward chert breccia, gossan</td>
</tr>
<tr>
<td>8116</td>
<td>260</td>
<td>40</td>
<td>85</td>
<td>130</td>
<td>15</td>
<td>Reward - spotted manganese/limonite in chert breccia</td>
</tr>
<tr>
<td>8117</td>
<td>105</td>
<td>50</td>
<td>60</td>
<td>140</td>
<td>-5</td>
<td>Shale bed within Reward or Barney Creek Formation? Spotted silicified shale.</td>
</tr>
<tr>
<td>8135</td>
<td>80</td>
<td>65</td>
<td>125</td>
<td>12</td>
<td>10</td>
<td>Reward/chert breccia. Gossan?</td>
</tr>
<tr>
<td>8136</td>
<td>65</td>
<td>20</td>
<td>50</td>
<td>-1</td>
<td>-5</td>
<td>Reward - Chert, tile facies limonitic and specular pyrolusite?</td>
</tr>
<tr>
<td>8168</td>
<td>115</td>
<td>25</td>
<td>45</td>
<td>16</td>
<td>2</td>
<td>Thinely laminated leached dolomitic siltstone and chert. Red hematitic fracture filling.</td>
</tr>
</tbody>
</table>
5.00 **GEOCHEMISTRY**

Geochemical sampling results for E.L. 2072 are presented in Table 2 and sample localities in Map 1.

Extreme leaching of the few outcrops present makes geochemistry of doubtful value in the licence area, nevertheless some interesting results have been recorded. For instance an area sampled along Buffalo Creek north of Line 20N returned slightly elevated values for the Reward Formation as evidenced in the table below:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Cu ppm</th>
<th>Pb ppm</th>
<th>Zn ppm</th>
<th>As ppm</th>
<th>U ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>8110</td>
<td>105</td>
<td>40</td>
<td>45</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>8111</td>
<td>45</td>
<td>75</td>
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<td>135</td>
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<td>8114</td>
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<td>65</td>
<td>180</td>
<td>110</td>
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<td>8115</td>
<td>50</td>
<td>120</td>
<td>230</td>
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</tr>
<tr>
<td>8116</td>
<td>260</td>
<td>40</td>
<td>85</td>
<td>130</td>
<td>15</td>
</tr>
<tr>
<td>8117</td>
<td>105</td>
<td>50</td>
<td>60</td>
<td>140</td>
<td>&lt;5</td>
</tr>
</tbody>
</table>

In the same area, a sample of Cretaceous sandstone, 8124 recorded 1200 ppm arsenic and 120 ppm lead.

The outcrop of inferred Barney Creek Formation north of Line 14N was found to contain 45 ppm lead (sample 8134), the highest value recorded for the formation from the geochemical sampling program (which included sampling in E.L. 1728 immediately south of the licence). Sample 8134 occurs in an area of anomalous lead called the lead creek anomaly area. Boko Beds material collected from the creek section (samples 8128-8133 on Map 1) have significant lead values (see Figure 4). Elsewhere the Boko Beds material has low base metal geochemistry.
Leached dolomitic silt & chert balls.

8128 - Crumbly weathered dolomite

~2m sampled

"BOKO BEDS"

ESTIMATED TRUE THICKNESS OF BOKO BEDS

From base of sample 8133 to Reward Dol. (including non-cropping sections): - Approx. 30m. True sample: - Approx. 15m.

~3m sampled

Sample No. | Cu | Pb | Zn
--- | --- | --- | ---
8128 | 30 | 300 | 10
8129 | 15 | 310 | 10
8130 | 15 | 220 | 5
8131 | 25 | 820 | 35
8173 | 15 | 240 | 10
8132 | 10 | 290 | 5
8133 | 20 | 640 | 5

White/orange mottled leached shales

Shales have distinctive orange/red pigment

Some repetitive sampling may have occurred here as a result of almost vertically dipping strata within tight local folds.

FIGURE 4

SKETCH OF ANOMALOUS LEAD SAMPLE LOCATIONS - BOKO BEDS WARRAMANA CREEK
(Creek Bed Section)

BAUHINIA JOINT VENTURE

AUGUST 1980
Values ranging from 220 - 820 ppm Pb were recorded in Boko Beds from the lead creek anomaly area. In addition an isolated float sample 300 metres west of the creek section returned 1800 ppm lead (sample 8172). Further sampling of the creek section located a speckled mudstone of the Reward Formation, sample 8184 which yielded 1200 ppm lead.

It is considered that some halo effect is being detected in this area. Further encouraging features are the proximity to an I.P. anomaly two kilometres along strike on Line 14N (refer to Section 6.10) and the setting of the site - in a structural low between a major lineament to the west and a structural high to the east represented by isolated Tatoola Sandstone outcrops.

Anomalous copper values were recorded in a number of samples from the Toogainie and Mallapunyah Formations as well as from the Gold Creek Volcanic Member of the Masterton Formation, the most notable of these being:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Formation/Member</th>
<th>Cu ppm</th>
<th>Pb ppm</th>
<th>Zn ppm</th>
<th>As ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>Toogainie</td>
<td>800</td>
<td>40</td>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>1926</td>
<td>&quot;</td>
<td>1100</td>
<td>45</td>
<td>250</td>
<td>135</td>
</tr>
<tr>
<td>1927</td>
<td>&quot;</td>
<td>640</td>
<td>40</td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>8182</td>
<td>Mallapunyah</td>
<td>420</td>
<td>15</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>8143</td>
<td>Gold Ck. Volcanic</td>
<td>430</td>
<td>20</td>
<td>40</td>
<td>10</td>
</tr>
</tbody>
</table>
6.00 GEOPHYSICAL SURVEYS

6.10 I.P. Survey
An induced polarization/resistivity survey was carried out by Geoterrex Limited in E.L. 2072 during the 1979 field season and was confined to one 200 metre dipole spread on gravity Line 14N, two kilometres south of the lead creek anomaly area. Values up to 15.5 millimolts per volt (i.e. 10 mv/v above background) were recorded near 2600 to 2800W. The anomalous zone appears near surface (see Plan 1).

6.20 Gravity Survey

6.21 General
A regional gravity survey totalling approximately 457 kilometres was performed in a number of licences held by the Bauhinia Joint Venture during the 1979 field season. Approximately 170 kilometres were surveyed in E.L. 2072 over ten east-west traverses (refer to Map 1).

A gravity survey was performed by the B.M.R. in 1978 within the Batten Trough and Wearyan Shelf of the McArthur Basin, including one traverse over the H.Y.C. ore body. A number of anomalous gravity features were delineated and it was found that these could be interpreted in the context of ore bodies and mineralized zones. The gravity survey, undertaken by A.O. (Australia) Pty. Ltd. on behalf of the Bauhinia Joint Venture, was carried out on the basis of the B.M.R. results in the hope of delineating drilling targets.
6.22 Survey Instrumentation
The 1979 regional gravity survey was performed with the use of a Worden Master 806 Gravity Meter. The meter is exceptionally accurate and incorporates a low-powered temperature stabilizer system which maintains a nearly constant internal temperature. The scale value of the meter was 0.0869 milligals per division.

Each line was optically levelled prior to commencement of the survey. Temperature readings were taken at each 200 metre station and, in order to account for drift, base stations were reoccupied and the gravity readings retaken a number of times for each line. The meter drift was very low and it is considered that the quality of the field readings is good.

6.23 Survey Parameters
The ten east-west traverses surveyed in E.L. 2072 incorporated 850 stations with the traverses being positioned approximately 3 kilometres apart. An arbitrary datum was used.

Computation and interpretation of the data was carried out by Wongela Geophysical Pty. Ltd.. Bouguer anomaly and elevation profiles at a scale of 1:50,000 were prepared (see Plan 2) and the accuracy of the Bouguer anomaly values was considered to be ± 0.02 milligals. A density of 2.5 gm/cm³ was used for the elevation correction.

The traverses made in E.L. 2072 were tied for both gravity and elevation allowing Bouguer anomaly contours at a scale
of 1:50,000 with a contour interval of 1 milligal to be prepared (see Plan 3).

6.24 **Gravity Features**

The gravity pattern is dominated by north-south trending, moderately short wavelength features with high amplitudes. The most conspicuous positive features have been numbered and these are shown on Plan 3.

Feature 1 is a broad positive feature at traverse 30 N with an amplitude of 4 milligals. The maximum expression is on traverse 26 N where the amplitude is 5 milligals. The anomaly narrows to the south and south of traverse 22 N the anomaly intensity is greatly reduced.

On the western flank of the feature is a short wavelength positive residual anomaly, best defined on traverses 26, 24 and 22 N at 1800 W, 2400 W and 3000 W respectively.

West of Feature 1 is a smaller positive trend with a maximum amplitude of 2 milligals. It can be correlated from 5400 W on traverse 30 N to 5000 W on traverse 22 N.

East of Feature 1 at 6000 E on traverse 30 N is a pronounced positive feature which does not extend further south. However there is a positive narrow feature with a maximum amplitude of 2 milligals at 8400 E on 30 N which can be correlated south to 4400 E on 22 N.
South from 22 N the gravity pattern changes. A large north-south trending positive anomaly (Feature 2) with an amplitude of up to 5 milligals extends from 3400 W on 20 N to 6000 E on 16 N. West of this feature there are many short wavelength positive features some with high amplitude. The most pronounced of these are on 18 N at 600 W and 3200 W.

Feature 3 is a positive feature with an amplitude of 3 milligals extending from 1800 E on 16 N to 1800 E on 14 N.

Feature 4 is another positive feature with a maximum amplitude of 6 milligals extending from 12000 W on 20 N to 3200 W on 16 N.

6.25 Interpretation
The Warramana area (western section E.L. 2072) is one of sparse outcrop. Rocks of the Yalco, Lynott, Reward and Barney Creek Formations have been mapped in the northern and eastern parts of the area. Older rocks of the Mara and other formations crop out in the southwestern part of the area.

Gravity Feature 1 correlates with a synclinal feature plunging to the north. The syncline contains outcrops of the Yalco and Lynott Formations in the centre, while on the western flank there are outcrops of the Reward and Barney Creek Formations.

The short wavelength residual gravity anomaly on the western flank of Feature 1 best expressed on traverses 26 N, 24 N and 22 N is located on or near Barney Creek Formation outcrop. The best expression of the feature is on 26 N and it is
considered to be of interest.

On the eastern side of Feature 1 an anomaly at 6000 E on 30 N correlates with an outcrop of the Lynott Formation.

The narrow positive anomaly extending from 8400 E on 30 N to 4400 E on 22 N may be the expression of concealed Barney Creek Formation.

Gravity Feature 2 correlates with a north plunging syncline containing sediments of the Yalco and Lynott Formations. It is offset to the east from the syncline which correlates with gravity Feature 1. It is evident from the contour pattern that there is a NE-SW striking traverse structural feature separating the two synclinal areas.

Rocks of the Reward Formation crop out sparsely on the flanks of the syncline, however no outcrops of the Barney Creek Formation are in evidence.

The narrow positive residual anomalies at 5800 W on 20N and 4600 E on 18 N indicate high density material possibly associated with concealed Barney Creek Formation.

Gravity Feature 3 is coincident with exposures of the Tatoola Sandstone and may represent an uplifted area of these older rocks.

Gravity Feature 4 is in an area of no outcrop. It is a well defined positive trend with maximum anomaly expression of
6 milligals at 3400 W on 18 N. The anomaly may represent concealed rocks of the Barney Creek Formation.

6.26 Conclusions and Recommendations

It is apparent from a study of the gravity data in places where there is geological control, that there is good correlation between gravity anomalies and geological structure and lithological changes.

More specifically, the rocks of the Barney Creek Formation stand out as positive anomalies. Where the anomalies are very large it is possible that mineralization may be present.

It was considered that the gravity technique provided useful information and allowed delineation of follow-up targets although the method was unable to distinguish between dense pyritic shales and lead-zinc rich shales.

Wongela Geophysical Pty. Ltd. recommended the areas listed below for follow-up:

(a) The western flank of gravity Feature 1. In particular the area between traverses 28 N and 22 N from 1000 W to 4000 W. The most attractive area on the data available is on traverse 26 N.

(b) The positive short wavelength feature on traverses 30 N to 22 N towards the eastern ends of the lines. The best expression is on traverse 22 N at 4400 E.

(c) The positive feature on the western flank of gravity Feature 2, well shown on traverses 20 N and 18 N at 5800 W and 4600 E respectively.

(d) Gravity Feature 4. The best expression is at 3400 W on traverse 18 N.
CONCLUSION

Geological mapping in the western portion of the licence proved extremely difficult due to poor outcrop. As a result geological interpretation was generally based on airphoto extrapolation and isolated outcrop. Extreme leaching of these outcrops has made geochemistry of doubtful value within the licence. However, one area of interest, the lead creek anomaly area, has been located to date within the licence.

A number of positive features were defined during the interpretation study of the original gravity survey and diamond drilling has been scheduled over two of these features in the coming year. It is proposed that Warramana 1 and 2 be located on gravity Lines 16 N (3000 W) and 22 N (4400 E) respectively. It is intended that such drilling will test the validity of the gravity survey already completed over the western portion of the licence before further surveying is attempted.
BAUHINIA JOINT VENTURE

EXPLORATION LICENCE No. 2072

Expenditure 13th June, 1979 to 12th June, 1980

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
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<tr>
<td>Salaries &amp; Wages</td>
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<tr>
<td>Field Expenses</td>
<td>25,519</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>10,727</td>
</tr>
</tbody>
</table>

Expenditure for the period  
13th June 1979 to 12th June 1980  $ 58,620