TECHNICAL REPORT ON MINERAL EXPLORATION

TENEMENTS IN AUSTRALIA HELD BY

LARAMIDE RESOURCES LTD

Frontispiece: Location of Laramide Resources Ltd’s project areas

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TABLE OF CONTENTS

TABLE OF CONTENTS...........................................................................................................ii
1 SUMMARY ...................................................................................................................... iv
2 INTRODUCTION AND TERMS OF REFERENCE .......................................................1
3 DISCLAIMER ...................................................................................................................2
4 PROPERTY DESCRIPTIONS AND LOCATION...........................................................2
   Property Details ............................................................................................................2
   Royalties ......................................................................................................................4
   Permits and Obligations...............................................................................................6
5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND
   PHYSIOGRAPHY .........................................................................................................7
   Access .........................................................................................................................7
   Climate .......................................................................................................................8
   Local resources .........................................................................................................9
   Infrastructure ............................................................................................................9
6 HISTORY ....................................................................................................................10
   Discovery and Ownership..........................................................................................10
   Previous Resource and Reserve Estimates ................................................................12
7 GEOLOGICAL SETTING ............................................................................................13
   Regional Geology .....................................................................................................13
   Geological History ..................................................................................................17
   Geophysics ...............................................................................................................19
   Tectonics ..................................................................................................................23
8 DEPOSIT TYPES .......................................................................................................23
   SANDSTONE-HOSTED URANIUM DEPOSITS.......................................................24
   UNCONFORMITY-RELATED URANIUM DEPOSITS ............................................24
9 MINERALISATION .....................................................................................................25
   Deposits ...................................................................................................................28
10 EXPLORATION .........................................................................................................30
11 DRILLING ...................................................................................................................32
12 SAMPLING METHOD AND APPROACH ................................................................33
13 SAMPLE PREPARATION, ANALYSES AND SECURITY .....................................33
14 DATA VERIFICATION ............................................................................................33
15 ADJACENT PROPERTIES .......................................................................................33
16 MINERAL PROCESSING AND METALLURGICAL TESTING ............................34
17 MINERAL RESOURCE AND RESERVE ESTIMATES ..........................................34
18 OTHER RELEVANT DATA AND INFORMATION ..............................................34
19 INTERPRETATION AND CONCLUSIONS .........................................................35
20 RECOMMENDATIONS ............................................................................................36
ITEM 23. REFERENCES ..................................................................................................37
GLOSSARY OF TECHNICAL TERMS ..............................................................................39
CERTIFICATE ..................................................................................................................43
LETTER OF AUTHORISATION.......................................................................................45
Figures

Frontispiece Location of Laramide Resources Ltd’s project areas

Fig. 1 Local Access 6
Fig. 2 Average Temperature and Rainfall 7
Fig. 3 Geological Regions 14
Fig. 4 Generalised geology, Westmoreland area 15
Fig. 5 Simplified Stratigraphy in the Westmoreland Region 15
Fig. 6 Diagrammatic section looking west towards the Northern Territory border 16
Fig. 7 Private Airborne Magnetic/Radiometric Surveys in the Westmoreland Region 20
Fig. 8 Block diagram looking NNW along Emu Fault 21
Fig. 9 Cartoon sketch showing various types of uranium deposits 23
Fig. 10 Locations of Principal Uranium Deposits, Westmoreland Region 28
Fig. 11 Schematic longitudinal section, Redtree area 29
Fig. 12 High Resolution Radiometric Survey showing Total Uranium Count 31
Fig. 13 Drill hole collar positions, Redtree prospect 32

Photos

Photo 1 Artesian bore flow 8
Photo 2 Westmoreland Conglomerate dip slope 16
Photo 3 Nicholson Granite boulder in Westmoreland Conglomerate 17

Tables

Table 1 Schedule of Laramide Tenements in Queensland as at 30 Nov 2005 3
Table 2 Schedule of Laramide Tenements in NT as at 30 Nov 2005 3
Table 3 Population Centres (from 2001 Census) 10
Table 4 Inferred Resources, Westmoreland 13
Table 5 Government Magnetic/Radiometric Surveys in the Westmoreland Region 19
Table 6 Private Airborne Magnetic/Radiometric Surveys in the Westmoreland Region 21
Table 7 Proposed exploration budget, Westmoreland 35
1 SUMMARY

This report is a description of the mineral tenements held by Laramide Resources Ltd ("Laramide") under various joint venture agreements and/or through its 100% owned Australian subsidiary Lagoon Creek Resources Pty Ltd ("Lagoon Creek"). Lagoon Creek is a private company with its registered office located in Brisbane, Queensland, Australia. Lagoon Creek has 3 Exploration Permits for Minerals ("EPMs") and 2 EPM Applications ("EPMAs") located in the State of Queensland, Australia, contiguous with 4 Exploration Licences ("ELs") and 3 EL Applications ("ELAs") located in the Northern Territory ("NT"), Australia. At the request of Mr Peter Mullens, Director of Laramide, Mining Associates Pty Ltd was commissioned in October 2005 to prepare a Technical Report on Laramide's mineral properties.

The area occupied by Laramide's mineral tenements extends for 200 km east-west and 150 km north-south, straddling the Queensland-NT border (see Frontispiece). For the sake of simplicity the area is collectively referred to in this report as "Westmoreland". Westmoreland is located in a region known as the Gulf Country, which includes the southern shores of the Gulf of Carpentaria and the country around the many rivers that flow into the Gulf. It is the largest tropical savannah region in Australia, with an area of 425,000 sq km.

The Westmoreland region was probably first prospected in the 1890s, after the discovery in 1887 of silver-lead deposits at Lawn Hill, 100 km south. Pitchblende was found in the Pandanus Creek area of the Northern Territory in 1955 by prospector R T Norris and mined in the late 1950s.

In early November 1956 the federal government Bureau of Mineral Resources ("BMR") commenced an airborne scintillometer survey of the Westmoreland area. Anomalies located by the BMR were notified to the holders of mineral tenements in the area as soon as they came to hand, together with a comment as to their relative value. While following up one of these anomalies during the second week of November 1956, a promising occurrence of torbernite was found in the Westmoreland Conglomerate, in the vicinity of Lagoon Creek, by prospector A Blackwell from Mount Isa Mines Limited ("MIM"). The deposit was given the name Redtree. Exploration by various companies through the next 15 years discovered numerous other deposits and prospects, and a significant resource of uranium was delineated.

Exploration continued in the Westmoreland region through the 1970s and 1980s. By 1990 CRA Ltd held a dominant interest in tenements in the region. An internal reorganisation saw CRA absorbed into the Rio Tinto group, which by 1996 had published an inferred resource of 17.4Mt @ 0.12% U₃O₈ containing 20,900 tonnes of U₃O₈ (Rheinberger et al, 1998).

Rio Tinto relinquished the EPMs in 2000 and subsequently Tackle Resources Pty Ltd filed applications over the areas previously held by Rio Tinto.

The Westmoreland region lies within the Palaeoproterozoic Murphy Tectonic Ridge, which separates the Palaeoproterozoic Mt Isa Inlier from the Mesoproterozoic McArthur Basin and the flanking Neoproterozoic South Nicholson Basin. The oldest rocks exposed in the area are early Proterozoic sediments, volcanics and intrusives which were deformed and regionally metamorphosed prior to 1875 Ma. These Murphy Metamorphics are represented mainly by phyllitic to schistose metasediments and quartzite. They are overlain by two Proterozoic cover sequences laid down after the early deformation and metamorphism of the basement, and before a period of major tectonism which began at about 1620 Ma. The oldest cover sequence is the Cliffdale Volcanics unit, which unconformably overlies the Murphy Metamorphics. The Cliffdale Volcanics are comagmatic with the Nicholson Granite and together they comprise the Nicholson Suite. SHRIMP dating of both the Nicholson Granite and the Cliffdale Volcanics gave an age of 1850 Ma. The Nicholson Granite is predominantly I-type granodiorite in composition.

Unconformably overlying the Nicholson Suite is the Tawallah Group. This is the oldest segment of the southern McArthur Basin. The base is a sequence of conglomerates and sandstones comprising the Westmoreland Conglomerate. The conglomerates thin out to the southeast and are in turn unconformably overlain by the Seigal Volcanics, an andesitic to basic sequence containing interbedded agglomerates, tuffs and sandstones. Together these units comprise about two-thirds of the total...
thickness of the Tawallah Group. The Seigal Volcanics are overlain in turn by the McDermott Formation, the Sly Creek Sandstone, the Aquarium Formation and the Settlement Creek Volcanics.

The principal uranium deposits are contained within the Westmoreland Conglomerate. The deposits are associated with an altered basic dyke system intruded along faults. Mineralisation is present in both the sandstones and dyke rocks. It is postulated that the conglomerate had a high inherent uranium content that was remobilised in a convective cell system, possibly triggered by the dolerite dykes that intrude the conglomerate or by heat flow along rejuvenated structures.

Laramide has obtained a commanding strategic position in the uranium exploration industry in Australia, by securing a series of contiguous mineral tenements that cover almost all of the known uranium deposits in the Westmoreland region, a major Australian uranium province. Previous exploration has identified a series of significant potentially economic deposits that require relatively modest investment to advance their status to an indicated resource. Subject to a change in state government policy in Queensland, Laramide could move quickly to a bankable feasibility study and, potentially, into production should this be warranted.

Laramide’s proposed budget at Westmoreland for 2006 is summarised below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost CAD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff and wages costs</td>
<td>1,152,000</td>
</tr>
<tr>
<td>Consultants</td>
<td>102,000</td>
</tr>
<tr>
<td>Field costs</td>
<td>529,600</td>
</tr>
<tr>
<td>Surface geology</td>
<td>296,000</td>
</tr>
<tr>
<td>Drilling costs</td>
<td>1,750,000</td>
</tr>
<tr>
<td>Environmental</td>
<td>320,000</td>
</tr>
<tr>
<td>Metallurgical</td>
<td>335,000</td>
</tr>
<tr>
<td>Pre-feasibility</td>
<td>180,000</td>
</tr>
<tr>
<td>Administration</td>
<td>132,000</td>
</tr>
<tr>
<td>Contingency</td>
<td>300,000</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>5,096,600</strong></td>
</tr>
</tbody>
</table>

It is commendable that direct drilling costs will comprise almost 35% of the total budget, while administration costs will absorb less than 3% of the budget. If achieved, this would be quite remarkable and a very efficient use of available resources.

It is recommended that an updated resource estimate using modern geostatistical techniques be undertaken as soon as the original data can be retrieved.

The budget breakdown appears reasonable, and the total adequate to achieve Laramide’s objective, which is to drill out the resource to a standard suitable for a feasibility study. The work programme on this very substantial project should commence as soon the wet season has passed.
2 INTRODUCTION AND TERMS OF REFERENCE

This report is a description of the mineral tenements held by Laramide Resources Ltd ("Laramide") under various joint venture agreements and/or through its 100% owned Australian subsidiary Lagoon Creek Resources Pty Ltd ("Lagoon Creek"). Lagoon Creek is a private company with its registered office located in Brisbane, Queensland, Australia. Lagoon Creek has 3 Exploration Permits for Minerals ("EPMs") and 2 EPM Applications ("EPMAs") located in the State of Queensland, Australia, contiguous with 4 Exploration Licences ("ELs") and 3 EL Applications ("ELAs") located in the Northern Territory ("NT"), Australia. At the request of Mr Peter Mullens, Director of Laramide, Mining Associates Pty Ltd was commissioned in October 2005 to prepare a Technical Report on Laramide's mineral properties.

In particular, Laramide intends that this report satisfy Part 4 Section 4.1 (1) of Canada’s National Instrument 43-101 Standards of Disclosure for Mineral Projects. This section states that:

PART 4 OBLIGATION TO FILE A TECHNICAL REPORT

4.1 Obligation to File a Technical Report Upon Becoming a Reporting Issuer

(1) Upon first becoming a reporting issuer in a Canadian jurisdiction an issuer shall file with the regulator in that Canadian jurisdiction a current technical report for each property material to the issuer.

At Laramide’s request, the scope of the inquiries and of the report included the following:

- A review of the exploration portfolio of the Company with respect to exploration history, exploration potential and the Company’s exploration strategy
- A review of the budgets proposed for the Company for its first two years, including a scaled-down budget in the case that only the minimum subscription level is achieved
- A review of the budgets referred to above to determine if they accord with the Company’s various joint venture arrangements and statutory expenditure levels,
- A review of the work plans associated with the budgets referred to above
- A review of the proposed geological models that the Company intends to employ on its tenements
- Anything else that Mining Associates believed is necessary.

Mining Associates has not been requested to provide an Independent Valuation, nor has Mining Associates been asked to comment on the Fairness or Reasonableness of any vendor or promoter considerations, and therefore no opinion on these matters has been offered.

This report is based on a large volume of technical data provided by Laramide to Mining Associates, as well as discussions with Greg Duncan, exploration consultant to Laramide. Laramide provided open access to all personnel and records necessary, in the opinion of Mining Associates, to enable a proper assessment of the Company’s exploration tenements. Laramide has warranted in writing to Mining Associates that full disclosure has been made of all material information and that, to the best of Laramide’s knowledge and understanding, such information is complete, accurate and true. Readers of this report must appreciate that there is an inherent risk of error in the acquisition, processing and interpretation of geological and geophysical data, and Mining Associates takes no responsibility for such errors.

Mining Associates’ Project Co-ordinator was Mr David Jones, who was also responsible for the geological interpretation. Mr Andrew Vigar peer reviewed the report.

Additional relevant material was acquired independently by Mining Associates from a variety of sources. The list of references at the end of this report lists the sources consulted. This material was used to expand on the information provided by Laramide and, where appropriate, confirm or provide alternative assumptions to those made by Laramide.
Three weeks were spent on data collection and analysis and preparation of this report. An additional three field days were spent in northwest Queensland examining key areas, including detailed inspection of the Redtree, Junnagunna and Long Pocket prospects.

Appraisal of all the information mentioned above forms the basis for this report. The views and conclusions expressed are solely those of Mining Associates. When conclusions and interpretations credited specifically to other parties are discussed within the report, then these are not necessarily the views of Mining Associates. Mining Associates and David Jones have not been involved in the preparation of, or authorised issue of, any other part of the Prospectus in which this Technical Report is included.

Geological information usually consists of a series of small points of data on a large blank canvas. The true nature of any body of mineralization is never known until the last tonne of ore has been mined out, by which time exploration has long since ceased. Exploration information relies on interpretation of a relatively small statistical sample of the deposit being studied; thus a variety of interpretations may be possible from the fragmentary data available. Investors should note that the statements and diagrams in this report are based on the best information available at the time, but may not necessarily be absolutely correct. Such statements and diagrams are subject to change or refinement as new exploration makes new data available, or new research alters prevailing geological concepts.

3 DISCLAIMER

The opinions expressed in this report have been based on information supplied to Mining Associates by Laramide, its associates and their staff, as well as various government agencies including the Geological Survey of Queensland and the Geological Survey of the Northern Territory. Mining Associates has exercised all due care in reviewing the supplied information, including an extensive review of the Laramide data located at their office in Brisbane, Queensland, and a recent visit to key sites in Queensland. Although Mining Associates has compared key supplied data with expected values, the accuracy of the results and conclusions from this review are reliant on the accuracy of the supplied data. Mining Associates has relied on this information and has no reason to believe that any material facts have been withheld, or that a more detailed analysis may reveal additional material information. Mining Associates does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

The authors have not relied on reports, opinions or statements of legal or other experts who are not qualified persons for information concerning legal, environmental, political or other issues and factors relevant to this report.

4 PROPERTY DESCRIPTIONS AND LOCATION

Property Details

A Schedule of Tenements has been provided by Laramide. The legal status of the tenure of Laramide's tenements is the subject of a separate Legal Report. The Laramide tenement situation has not been independently verified by Mining Associates, apart from a search of the Queensland Interactive Resource and Tenement Map (“IRTM”) on-line database and the Northern Territory Titles Information System (“TIS”) on-line database. The result of these searches is shown in Table 1 and Table 2 below:
Technical Report on Laramide Resources Ltd Mineral Tenements in Australia

Table 1
Schedule of Laramide Tenements in Queensland as at 30 Nov 2005

<table>
<thead>
<tr>
<th>Original Applicant</th>
<th>Tenement No.</th>
<th>Area sub blocks</th>
<th>Area Sq km</th>
<th>Lagoon Creek Interest</th>
<th>Grant Date</th>
<th>Expiry Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagoon Creek Resources Pty Ltd</td>
<td>EPMA 14967</td>
<td>100</td>
<td>328</td>
<td>100%</td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EPMA 15061</td>
<td>100</td>
<td>328</td>
<td>100%</td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td>Tackle Resources Pty Ltd</td>
<td>EPM 14558</td>
<td>100</td>
<td>328</td>
<td>100%</td>
<td>26 Jul 2005</td>
<td>25 Jul 2010</td>
</tr>
<tr>
<td></td>
<td>EPM 14672</td>
<td>100</td>
<td>328</td>
<td>100%</td>
<td>26 Jul 2005</td>
<td>25 Jul 2010</td>
</tr>
<tr>
<td><strong>TOTAL AREA:</strong></td>
<td>500</td>
<td>1640</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2
Schedule of Laramide Tenements in the Northern Territory as at 30 Nov 2005

<table>
<thead>
<tr>
<th>Original Applicant</th>
<th>Tenement No.</th>
<th>Area sub blocks</th>
<th>Area Sq km</th>
<th>Lagoon Creek Interest</th>
<th>Grant Date</th>
<th>Expiry Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norquest Mines Pty Ltd</td>
<td>EL 23573</td>
<td>67</td>
<td>194</td>
<td>Earning 60%</td>
<td>23 Dec 2003</td>
<td>22 Dec 2009</td>
</tr>
<tr>
<td>Hartz Range Mines Pty Ltd</td>
<td>EL 10335</td>
<td>473</td>
<td>1524</td>
<td>Earning 90%</td>
<td>15 Aug 2002</td>
<td>14 Aug 2008</td>
</tr>
<tr>
<td></td>
<td>EL 22579</td>
<td>144</td>
<td>472</td>
<td>Earning 90%</td>
<td>29 Jul 2002</td>
<td>28 Jul 2008</td>
</tr>
<tr>
<td></td>
<td>EL 24358</td>
<td>70</td>
<td>229</td>
<td>Earning 90%</td>
<td>16 Mar 2005</td>
<td>15 Mar 2011</td>
</tr>
<tr>
<td>Lagoon Creek Resources Pty Ltd</td>
<td>ELA 24644</td>
<td>482</td>
<td>1580</td>
<td>100%</td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ELA 24645</td>
<td>453</td>
<td>1485</td>
<td>100%</td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ELA 24666</td>
<td>384</td>
<td>1259</td>
<td>100%</td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL AREA:</strong></td>
<td>2073</td>
<td>6743</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Laramide’s Westmoreland EPMs, EPMAs, ELs and ELAs are mainly contiguous, and the group is centred about 400 km NNW of Mt Isa, a major city in northwest Queensland (see Fig.1 below).

It should be noted that the Queensland Boundaries Declaratory Act 1982 purports to fix the Queensland-Northern Territory border at a line surveyed on the ground in the late 19th century. In the Westmoreland area, this line runs some 600m west of the 138th meridian of longitude. The 138th meridian was previously generally understood to be the border line: “by letters patent made 13 March 1862 there was annexed to the Colony of Queensland the territory lying northward of the latitude 26 degree south and between the longitudes 141 degree east and 138 degree east” (preamble to the 1982 Act).

However, the 1982 Act declares that: “a reference to a parallel of latitude or a meridian of longitude referred to in Letters Patent; shall be taken to be a reference to that boundary of the State that has been permanently fixed by marking it upon the surface of the earth before the year 1900”. The surveyor, Augustus Poeppel, lost the use of one eye during the original survey, which may explain the error made while he was marking the border on the ground during the period 1883-1886. At 1,047 km, it is the longest surveyed straight line in Australia, and Poeppel accomplished this feat with the aid of only two theodolites, two camels and a field assistant. The border was re-surveyed in 1986 by a Department of National Mapping team led by Ken Redwood, wherein the border was defined as a bearing of 359° 59’ 30” from Poeppel’s Corner. Poeppel’s Corner marks the meeting point of the Queensland, Northern Territory and South Australian borders.

**PURCHASE AGREEMENT AND JOINT VENTURE TERMS**

Tackle Resources Pty Ltd

On 28 April 2004, Laramide signed a binding letter of intent and paid Tackle Resources Pty Limited (“Tackle”) an initial $50,000 non-refundable payment. Laramide was entitled to exercise its option and acquire 100% of Tackle by issuing Tackle up to 4.5 million shares of Laramide and agreeing to make a further payment of $100,000 on the anniversary date of the option exercise.

Laramide was not required to issue the shares to Tackle until such time as Tackle received formal granting of EPM 14558 - the permit covering the bulk of the Westmoreland deposits. The grant was
issued by the Queensland government on 26 July 2005. Tackle had also applied for an adjacent exploration area which covers a number of smaller but prospective mineral occurrences. This EPM 14672 was also granted on 26 July 2005 and will also form part of the Laramide acquisition. A further Tackle EPM 14589 lies well to the south near the Century zinc mine.

On 16 Aug 2005 Laramide announced that the acquisition of Tackle had been completed. A finder’s fee of 300,000 shares of Laramide was paid to Ironbark Geoservices SRL for locating this project.

**Arafura Resources NL**

EL 23573 was granted to Norquest Resources Pty Ltd (“Norquest”) on 23 Dec 2003. The Northern Territory Department of Primary Industry, Fisheries and Mines (“NTDPI”) has confirmed that the licence was transferred to Arafura Resources NL (“Arafura”) on 2 Feb 2004. Arafura was admitted to the Australian Stock Exchange (“ASX”) official list on 3 Nov 2003, with Norquest as a major shareholder entitled to 1.8 million shares and 900,000 options. Presumably the shares were issued to Norquest in exchange for the exploration licence. The following are the terms of the Joint Venture on EL 23573:

- Laramide to make one payment of A$50,000 on signing, and another payment of A$50,000 within 90 days.
- Laramide to raise a minimum of A$4 million within 90 days of consummating the agreement.
- Laramide’s minimum expenditure commitment before withdrawal is A$1 million.
- Laramide to spend A$3 million before 24 May 2009 to earn 50%. Then spend a further A$2.5 million to total A$5.5 million before 24 May 2010 and earn an additional 10%.

At the date of this report Laramide has spent approximately $117,000 on this Joint Venture.

**Hartz Range Mines Pty Ltd**

The following are the terms of the Debbil Debbil Creek Uranium Project Joint Venture, which comprises ELs 10335, 22579, and 24358:

- Laramide to make one payment of A$50,000 on signing, and another payment of A$50,000 within 90 days.
- As soon as practicable after the payment of the initial A$50,000, Laramide to spend A$250,000 on an agreed exploration programme.
- Laramide will make additional quarterly payments to Hartz Range Mines in a mixture of cash and shares, the amount of which will be 10% (including GST) of the actual exploration expenditure for the previous quarter.
- When the exploration expenditure exceeds a cumulative total of A$2 million, the quarterly payments will be calculated at 5% of the actual exploration expenditure for the previous quarter.
- When the exploration expenditure exceeds a cumulative total of A$5 million, the quarterly payments will be calculated at 2.5% of the actual exploration expenditure for the previous quarter.
- Laramide will be deemed to have earned a 90% interest in the tenements on completion of a bankable feasibility to develop a mine, and the granting of all permits, licences and consents to develop a mine.
- If Laramide at its absolute discretion decides to withdraw from the agreement at any time, ownership of the entire project reverts to Hartz Range Mines.

At the date of this report Laramide has spent approximately $330,000 on this Joint Venture.

**Royalties**

In Australia, each state owns all petroleum and gold and most minerals. Royalty is payable to the state government when a mineral is sold, disposed of or used. In Queensland, the *Mineral Resources Act 1989* requires that the holder of a mining lease or mining claim lodge a royalty return and any royalty payable at least annually for all leases and claims held, even if no production took
Larger producers are required to pay royalty on a quarterly basis, while smaller producers generally pay royalty on an annual basis.

On 14 December 1995, the Queensland Governor in Council approved the Mineral Resources Amendment Regulation (No. 10) 1995 which gave effect to new royalties for base and precious metals effective from 1 January 1996.

The key features of the Queensland royalty arrangements are:
- companies to elect for each mining project, for a five year period, between a fixed (2.7%) or variable (1.5% - 4.5%) ad valorem rate royalty, with the latter dependent on London market metal prices;
- royalty rate to be applied to the value of payable metal;
- $4,000,000 half royalty threshold for each base metal mining project;
- royalty discounts to apply from 1 January 1998 to base metals processed to 95% contained metal in Queensland.

Note that since the Queensland Labour government has a policy of discouraging the mining of uranium, no royalty level has been set for uranium. However, should the policy change, it is to be expected that the royalty level would be similar to that set out above.

The Northern Territory Mineral Royalty Act levies a royalty on recovery of mineral commodities from a mining tenement in the Northern Territory. It is payable by the holder of a mining tenement to the Government as owner of the site or the mineral rights over the site.

The Act is a profit based royalty regime that uses the Net Value of a mine’s production to calculate royalty instead of production value or tonnage. This approach results in a far more equitable regime than value and tonnage based royalties, which do not adequately allow for the fluctuating fortunes of the mining industry. Furthermore, other regimes generally do not allow for the high costs of remote deposits and low grade or hard-to-mine ore. In the Northern Territory system:
- Both prices and mining costs are taken into account in royalty calculations. If production costs rise or fall, royalty may decline or increase accordingly.
- Royalty will generally be payable in years when ability to pay is the greatest.
- Mines operating in isolated locations or with high costs of extraction may pay less royalty than mines in good locations or with simple operations.
- If it is more costly to extract ore from deeper sections of an ore-body, less royalty will be paid. If low-grade core results in less production and less sales, then less royalty will be payable.

The Mineral Royalty Act levies royalty at a rate of 18 per cent of the Net Value of mineral commodities sold or removed from a production unit, regardless of the type of mineral commodity or whether the mine is situated on Crown, freehold, leasehold or aboriginal land. Net Value is calculated as follows:

Net Value = GR – (OC + CRD + EEE + AD)

where –
- GR is the gross realisation from the production unit;
- OC represents the operating costs of the production unit for the royalty year;
- CRD is the Capital Recognition Deduction on eligible capital assets expenditure;
- EEE is any eligible exploration expenditure; and
- AD represents additional deduction as approved by the Minister.

A "production unit" is a mining tenement or two or more mining tenements operating as part of an integrated operation. It also extends to other facilities (whether or not adjacent to the mining tenements) that are essential for the production of a saleable mineral commodity.

Net value for royalty is thus defined as the value of minerals sold or removed without sale plus an adjustment for assets disposed of, less:
All operating costs directly attributable to the production of saleable mineral commodity including certain marketing and administration costs, except income tax, royalty and royalty-like payments

An allowance for capital investments called Capital Recognition Deduction (CRD). CRD is akin to depreciation and incorporates an interest rate factor (based on the Australian Federal Securities long term bond rate plus 2 per cent) over a CRD life category life category of 3, 5 or 10 years. The CRD life category is based on the period over which depreciation is allowed for income tax purposes.

Eligible Exploration Expenditure;

Approved negative Net Value from previous years, which can be carried forward provided the production unit continues to operate, if approved by the Department; and

Any additional deductions under section 4CA of the Act.

The first $50 000 of Net Value is not liable to royalty. This exempts a number of small mines from royalty payment entirely.

Royalty is payable by six monthly provisional payments. An annual return detailing the actual royalty payable together with payment for any additional liability must be lodged within three months after the end of each royalty year.

Permits and Obligations

In Australia all minerals belong to the Crown. Under the Australian Federal system the Commonwealth and State Governments are responsible for different aspects of the regulatory system. The Commonwealth Government is responsible for overall economic policy, tax, interest rates, foreign investment and corporate law, and for regulations regarding environmental and safety aspects of uranium mining and the sale of uranium product. The six States and the Northern Territory of Australia own and allocate mineral property rights for exploration and mining, regulate operations and collect royalties on minerals produced.

The various regulatory authorities and other parties with responsibilities or interests in the area of the mining tenements are:

- Queensland Department of Natural Resources and Mines (“DNR”)
- Northern Territory Department of Primary Industry, Fisheries and Mines (“NTDPI”)
- Queensland Environmental Protection Agency (“EPA”)
- Queensland Department of Transport
- Burke Shire Council
- Various Pastoral Lease holders

Before exploration can begin, a Queensland Exploration Permit for Minerals (“EPM”) or Northern Territory Exploration Licence (“EL”) must be granted. An EPM/EL is a tenure granted for the purpose of exploration and if exploration is successful, may eventually lead to an application for a mineral development licence or mining lease. This type of permit may be granted for a period of up to five years (Queensland) or six years (NT) and may be renewed. Registered native title parties have a right to be consulted about the proposed exploration permit, a right to object to the granting of the proposed exploration permit and a right to negotiate with a view to reaching agreement about the granting of the proposed exploration permit.

In Queensland, “Mining Activity” is classified as an “Environmentally Relevant Activity” under the Environmental Protection Act 1994. An EPM will not be granted until an Environmental Authority (Exploration) has been issued by the EPA. This requirement does not apply in the Northern Territory.

An EPM/EL allows the holder to take action to determine the existence, quality and quantity of minerals on, in or under land by methods which include prospecting, geophysical surveys, drilling, and sampling and testing of materials to determine mineral bearing capacity or properties of mineralisation.
Once a significant mineral resource has been identified, a holder then has the option of undertaking further exploration under a mineral development licence. A mineral development licence allows the holder to undertake more thorough testing to evaluate the economic viability of developing the mineral resource.

A mining lease must be obtained before full-scale mining can take place. The term of the lease is determined in accordance with the amount of reserves identified and the projected mine life.

Under the Queensland Mining Act (Mineral Resources Act 1989), and the Northern Territory Mining Act, holders of EPMs/ELs must comply with certain conditions to maintain tenure of their permits, the most important of which regarding the Laramide EPMs/ELs are as follows:

- Payment of an annual rental fee to the DNR/NTDPI.
- Conduct of activities in accordance with EPA requirements.
- Compliance with all compensation agreements and making compensation payments as required (see below).
- Depositing security and financial assurance in the form of bank guarantees.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

Access
Westmoreland is located in a region known as the Gulf Country, which includes the southern shores of the Gulf of Carpentaria and the country around the many rivers that flow into the Gulf. It is the largest tropical savannah region in Australia, with an area of 425,000 sq km.

Fig. 1 Local Access
Figure compiled by D G Jones from published topographic maps

The largest city, Mt Isa, has a population of 21,636 according to the 2001 Census. It is serviced by direct daily jet flights from Brisbane by Qantas, the Australian national air carrier. The main road and
rail system in Queensland connects Mt Isa to Townsville, the largest city in Queensland outside of the capital. Mt Isa is a major mining industrial city. The population of other centres in the region are tabulated in Table 3 below.

The major land use in the region is pastoral, although most income is generated by mining with several large mines in the region including the Mount Isa copper mine and the McArthur River and Century lead-zinc mines. The fishing industry is also a major employer in the region. Any skilled workforce for a mining development in the region would be expected to be drawn from Mt Isa.

The eastern and north-eastern North Queensland EPMs are readily accessible by a sealed highway from Mareeba known as the Cape Development Road (Fig.1). Another sealed highway, the Burke Development Road, gives general access to the southern and western EPMs. A network of local formed roads and pastoral tracks provides good access to most of the area of interest. During occasional periods of intense rainfall in summer both the major and minor creeks may be impassable for some days.

The tenements are situated in remote, sparsely populated, rugged hill country. Topography ranges from broad gentle valleys covered by open woodland dominated by grey box eucalypt trees, to steep rugged east-west trending ridges on the flanks of the valleys. The terrain ranges in elevation from 350m to 780m.

**Climate**

A number of the Gulf's climatic gradients appear to be aligned with the coast as well as having a north-south component. Average summer rainfall ranges between 400 mm in the south up to 800 mm in the north with moderate to high variability each year. Temperatures are hot with maximums around 36ºC, however, more frequent pleasant weather is recorded in the far north coastal sections and the extreme eastern areas in Queensland. Winter dry-season temperatures can drop, after warm, sunny days, to an average overnight low of 12ºC.

The graphs below show climate data for Burketown, a small town (population 220) located 150 km east of the tenement block (see Fig.1 above). Weather observations have been recorded at Burketown since 1886. Westmoreland and Burketown are within the influence of the Gulf of Carpentaria which modifies the temperatures somewhat from the extremes further inland. The bulk of the rainfall occurs during the summer monsoon from December through March. Average maximum precipitation in January, the wettest month, is 212 mm, although it can be as high as 1,000 mm.

![Fig.2 Average temperature and rainfall at Burketown](image)
Local resources

Lagoon Creek is the major local watercourse at Westmoreland. It is dry for half the year, but in the monsoon the braided channels fill and overflow creating a floodway some 3 km wide and quite impassable. The nearest gauging station is on the Nicholson River at Doomadgee (see Fig.1 above). Mean discharge of the Nicholson River is 985,000 megalitres per day (data from National Land and Water Resources Audit, 2003) from its 72,000 sq km catchment area. Highest monthly discharge ever recorded in the Nicholson River was Jan 1974 following Cyclone Tracy when average discharge for the month was 2 million megalitres per day.

Although the creeks are dry during the winter, artesian water was observed flowing copiously from a bore near the Redtree uranium prospect (Photo 1). The most likely aquifer is the Westmoreland Conglomerate, and this may offer a ready source of water for any potential mineral processing plant in the area.

![Photo 1. Artesian water flow](image)

*Photo taken by D G Jones adjacent to the Redtree project, at UTM Zone 54K coordinates 0195711m N, 8066683m E.*

Infrastructure

The major towns in close proximity to the Westmoreland tenement block are tabulated below and shown on Fig.1 above. Facilities are as would be expected from small communities of the size indicated. There is a significant generation facility (total of 325 MW) at the Mica Creek Power station near Mt Isa. This station supplies the Mt Isa network, which covers customers in Mount Isa, Cloncurry and several mines in this area. Smaller towns generate their own power from diesel generators.

There are two designated Gulf ports in the region, Burketown and Karumba. However, Burketown is a non-trading port and is not active.
Table 3. Population Centres (from 2001 Census)

<table>
<thead>
<tr>
<th>Town</th>
<th>Population</th>
<th>Principal Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mt Isa</td>
<td>21,636</td>
<td>Mining</td>
</tr>
<tr>
<td>Cloncurry</td>
<td>4,828</td>
<td>Mining</td>
</tr>
<tr>
<td>Normanton</td>
<td>1,447</td>
<td>Fishing</td>
</tr>
<tr>
<td>Karumba</td>
<td>1,346</td>
<td>Fishing</td>
</tr>
<tr>
<td>Doomadgee</td>
<td>1,100</td>
<td>Indigenous</td>
</tr>
<tr>
<td>Borroloola</td>
<td>769</td>
<td>Pastoral</td>
</tr>
<tr>
<td>Burketown</td>
<td>221</td>
<td>Pastoral</td>
</tr>
</tbody>
</table>

The Port of Karumba is viewed as the economic pearl of the Gulf of Carpentaria. It has strategic importance with relation to mining with the export of zinc from Century Mine, live animal exports and provides a facility for the fishing and prawning fleets of the Gulf. Karumba Port also services several coastal communities for general freight as well as being a major centre of export of live cattle to Asian countries.

The Port of Karumba was dredged in 1996, increasing the draft capacity of the port and further enhancing the strategic importance for the region. In 2004 more than 1 Mt of Century mine concentrate was exported from Karumba in regular monthly shipments.

The Savannah Highway passes through and around the north end of the Westmoreland tenements (see Fig.1 above). In this area it is a wide, formed gravel road, popular with tourists ("the grey nomads") in the dry season. There is a small roadhouse and airstrip at Hells Gate, 20 km south of the Lagoon Creek crossing. The roadhouse stocks fuel, and has basic accommodation facilities. A network of pastoral station tracks provides generally ready access to most part of the tenement block.

6 HISTORY

Discovery and Ownership

The Westmoreland region was probably first prospected in the 1890s, after the discovery in 1887 of silver-lead deposits at Lawn Hill, 100 km south. Copper was discovered in 1911 at Settlement Creek and at the nearby Redbank lode in the Northern Territory in 1916. In 1912 the Packsaddle and Bauhinia copper lodes were discovered near Wollogorang homestead. Pitchblende has been mined in the Peters Creek Volcanics, which overlie the Westmoreland Conglomerate, 20-30 km west of Redtree (Syvret, 1957).

Uranium exploration in Australia was initiated in 1948 by requests from the United States and British governments for uranium oxide. The federal government encouraged explorers by offering tax-free rewards up to $50 000 for uranium discoveries, and by offering a guaranteed price for any uranium produced. A local prospector found secondary uranium minerals on his leases at Rum Jungle in 1949, which initiated the first uranium exploration boom in the Northern Territory.

The BMR acquired regional airborne radiometric data and offered free geological advice to prospectors to further encourage exploration. Individual prospectors or newly formed companies undertook most exploration activities, which mainly involved ground-truthing BMR airborne radiometric anomalies using Geiger counters. Most of the smaller vein-type deposits were found at this time, including those in the Pandanus Creek area of the Northern Territory in 1955 by prospector R T Norris (Lord, 1955). The main deposit was discovered in 1958 by Eva Clarke, niece of Norris, who was found playing with yellow pebbles of autunite and torbernite (Morgan, 1965), and named the Eva prospect.

Mount Isa Mines Limited ("MIM") were granted Authority to Prospect ("AP") 46M on 1st August 1956. The AP covered 1,800 sq miles (4,662 sq km) from Westmoreland station to Lawn Hill station, adjacent to the Queensland-Northern Territory border. The principal targets were copper and uranium. In early November 1956 the Bureau of Mineral Resources ("BMR") commenced an airborne scintillometer survey of the Westmoreland area. Anomalies located by the BMR were notified to the MIM field party as soon as they came to hand, together with a comment as to their relative value. While following up one of these anomalies during the second week of November 1956, a "promising...
occurrence of torbernite was found in the Westmoreland Conglomerate, in the vicinity of Lagoon Creek”, by prospector A Blackwell from the MIM field party (Battey, 1956). The deposit was given the name Redtree.

During 1958 MIM drilled 277m in 11 holes at Redtree using a wagon drill with a 6 cm bit. Target depth of the holes was 30m, which was rarely attained. All the holes returned visible torbernite. The best assay was 12m @ 0.25% U\textsubscript{3}O\textsubscript{8}. Two core holes were drilled the following year, one to 37m and one to 12m depth. The core assays confirmed the wagon drill results.

Up to 12 mineralised horizons were reported by MIM in the secondary mineralisation, which averaged 7.3m in thickness over an area 430m long by 90m wide. Grade ranged from 0.05% to 0.5%, averaging 0.15% U\textsubscript{3}O\textsubscript{8} (Brooks, 1960).

Because of the low grade and the remote location of the deposit, MIM relinquished the AP but pegged three mining lease applications over Redtree and other known surface uranium mineralization. The leases were granted in 1959 to a 50:50 MIM/Consolidated Zinc Pty Ltd joint venture. Consolidated Zinc later became CRA, which subsequently purchased a 100% interest in the leases.

Subsequent drilling (12,000m of core), pitting and shaft sinking by Queensland Mines Ltd (“QML”) at the Redtree prospect during 1967-69 indicated continuous primary uranium mineralization between minimum depths of 15m and maximum depths of 135m extending for at least 4800m along a major joint system. The average width of mineralization was stated to be 9.5m. Assays varied between 0.05% and 1%, averaging 0.2% U\textsubscript{3}O\textsubscript{8}. The Queensland Geological Survey reports that: “At this stage, the total resource was estimated to contain 16,000 tonnes of uranium oxide.” (Culpeper et al, 1999). The Huarabagoo deposit was discovered during this programme.

At the same time, BHP carried out an airborne radiometric survey of 1,224 line km cutting across the strike of the Westmoreland Conglomerate. Only minor anomalies were recorded.

Following the discovery of the Nabarlek deposit in 1971, QML ceased exploration at Westmoreland to concentrate their efforts in the Alligator Rivers area of the NT. In 1975 QML formed a joint venture with Urangesellschaft Australia Pty Ltd (“UAPL”), Anglo Australian Resources NL and CRA Ltd. UAPL discovered the Junganunna deposit in the period 1976 to 1983 when they were managing the joint venture. Omega Mines Ltd entered the joint venture in 1982 and completed a programme of drilling and re-assay of core for gold at Huarabagoo. Results confirmed some erratic high grades up to 86 g/t Au. In 1990 CRA took over management, and purchased 100% of the joint venture in 1996. Prior to this time, CRA had purchased a 100% interest in the old MIM mining leases at Redtree.

During the late 1960s uranium prices had begun to rise in expectation of increased demand for nuclear powered electricity generation. In Australia, the federal government relaxed the export policy for uranium to encourage exploration. During this period, large private companies, rather than prospectors, undertook all the exploration. From 1960 to 1980, more than 20 EPMs were explored in the Queensland section of area covered by Laramide’s Westmoreland tenements, generating over 90 open file reports,. Apart from the work discussed above, this exploration included:

- **BHP (1967-73)** - airborne radiometrics followed up by percussion drilling (6,900m) and diamond drilling (2,400m) in 146 holes. Best intersection was 2m @ 0.92% U\textsubscript{3}O\textsubscript{8} at the Amphitheatre prospect.
- **US Steel International (1968-70)** - stream sampling for base metals around the Gulf of Carpentaria, as part of a manganese-uranium search.
- **Westmoreland Minerals Limited (1970)** - field inspection of base metal anomalies in Hedley’s Creek.
- **Esso Mineral Enterprises Australia Ltd (1971-72)** - 3 vertical holes (664m total) to max 275m in alluvial plain of Lagoon Creek without reaching the Seigal Volcanics/Westmoreland Conglomerate contact, considered to be the prospective horizon.
Technical Report on Laramide Resources Ltd Mineral Tenements in Australia

- Mt Arthur Molybdenum NL (1973-79) - reconnaissance radiometrics, including 170km of Track Etch lines, plus 3000m of auger drilling in 2,565 holes.

- Savage Exploration Pty Ltd (1975-81) - soil geochemistry, airborne radiometrics, track etch, and diamond drilling 50 holes (2,500m).

- Mines Administration Pty Ltd (1977-79) - stream sediment geochemistry and ground radiometrics for uranium, tin and tungsten.

The surge in gold exploration from 1980-1990 was reflected in the increased tempo of exploration in the Westmoreland area. Close to 30 EPMs were granted in the area now covered by Laramide's tenements in Queensland; more than 70 open file reports record the work done through this decade while 18 ELs were explored by 6 companies on the Northern Territory side. Some of the more significant exploration, apart from that already described above, was as follows:

- Kratos Uranium NL (1975-1988) - geochem sampling, radiometrics and drilling in the Pandanus Creek (NT) area.

- Triako Mines NL (1979-80) - drilled 47 RC holes in the Redbank area.

- Minatome Australia Pty Ltd (1980-82) - ground geophysics, trenching and 9 percussion drill holes into dolerite dykes targeted to 200m depth.

- Total Mining Australia Pty Ltd (1983-84) - ground geophysics (including Track Etch) for uranium in the Lagoon Creek area.

- Central Electricity Generating Board Exploration (Australia) Pty Ltd (1983-89) - BLEG sampling for gold and soil gas sampling for radon; RAB and percussion drilling (2,610m).

- International Mining Corporation NL (1984-85) - stream sediment sampling for gold, diamonds, uranium and base metals.

- CSR Ltd (1987) - BLEG and rock chip sampling for epithermal gold in the Cliffdale Volcanics.

- Golden Plateau NL (1988-89) - BLEG and rock chip sampling for gold.

- Uranerz Australia Pty Ltd (1982-89) - explored for uranium on both sides of the border; BLEG sampling for gold; ground geophysics; RAB drilling (16 holes, 601m); one percussion hole (44m); one core hole (169m).

Since 1990, the pace of exploration has declined, and through the past 15 years there have been only 11 EPMs turned over in the Queensland area covered by Laramide's tenements. Only 15 open file reports have been lodged with the GSQ detailing the exploration completed during this era, all by CRA describing the work outlined above. On the Northern Territory side, exploration since 1990 has been dominated by major companies, including Mt Isa Mines, CRA, and Poseidon.

By 1990 CRA Ltd held a dominant interest in tenements in the region. An internal reorganisation saw CRA absorbed into the Rio Tinto group. Rio Tinto relinquished its tenements in 2000 and subsequently Tackle Resources Pty Ltd filed applications over the areas previously held by Rio Tinto.

Previous Resource and Reserve Estimates

The Australasian Institute of Mining and Metallurgy ("The AusIMM") published a resource estimate for the Westmoreland deposits, prepared by Rio Tinto Exploration (Rheinberger et al, 1998). These are tabulated below. The resource category chosen was based on the Australian JORC code guidelines of the time. The estimates have not been verified by Mining Associates as the data was not available in digital form at the time of this review to undertake such an exercise and confirm (or disprove) these figures.
Table 4. Inferred Resources, Westmoreland

<table>
<thead>
<tr>
<th>Deposit</th>
<th>Mt</th>
<th>Grade % U$_3$O$_8$</th>
<th>Tonnes U$_3$O$_8$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redtree</td>
<td>10.2</td>
<td>0.126</td>
<td>12,600</td>
</tr>
<tr>
<td>Junnagunna</td>
<td>5.4</td>
<td>0.098</td>
<td>5,300</td>
</tr>
<tr>
<td>Huarabagoo</td>
<td>1.8</td>
<td>0.169</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>17.4</strong></td>
<td><strong>0.120</strong></td>
<td><strong>20,900</strong></td>
</tr>
</tbody>
</table>

7 GEOLOGICAL SETTING

Regional Geology

Laramide’s tenements are situated within the Calvert Hills, Mt Drummond (Northern Territory) and Westmoreland (Queensland) 1:250,000 geological sheets. The first geological observations in the area were reported by explorer Ludwig Leichhardt in 1847. However, little geological work was done until the late 1930s when the federal government funded the Aerial Geological and Geophysical Survey of Northern Australia (“AGGSNA”). This was followed in the mid-1950s by a joint federal Bureau of Mineral Resources (“BMR”) and Geological Survey of Queensland (“GSQ”) survey. The Westmoreland sheet was first mapped in 1955-57 (Carter et al, 1958) and the Calvert Hills sheet in 1957-61 (Yates et al, 1962). Mapping on 1:25,000 scale colour air photos of the Seigal and Hedley’s Creek 1:100,000 geological sheets was undertaken during 1972-73 (Sweet et al, 1981). Current maps covering the area include:

- 1:250,000 scale “Calvert Hills Metallogenic Sheet SE 53-8”, First Edition 1989, published by the NTGS.
- 1:100,000 scale “Seigal NT and Hedleys Creek Qld” First Edition 1980, published by the Bureau of Mineral Resources.

The Westmoreland region lies within the Palaeoproterozoic Murphy Tectonic Ridge, which separates the Palaeoproterozoic Mt Isa Inlier from the Mesoproterozoic McArthur Basin and the flanking Neoproterozoic South Nicholson Basin.

The oldest rocks exposed in the area are early Proterozoic sediments, volcanics and intrusives which were deformed and regionally metamorphosed prior to 1875 Ma. These Murphy Metamorphics (Yates et al, 1962) are represented mainly by phyllitic to schistose metasediments and quartzite. They are overlain by two Proterozoic cover sequences laid down after the early deformation and metamorphism of the basement, and before a period of major tectonism which began at about 1620 Ma. The oldest cover sequence is the Cliffdale Volcanics unit, which unconformably overlies the Murphy Metamorphics. The Cliffdale Volcanics contain over 4000 m thickness of volcanics of probably subaerial origin, more than half of which consist of crystal-rich ignimbrites with phenocrysts of quartz and feldspar. The remainder are rhyolite lavas, some of which are flow banded. The ignimbrites are more common in the lower part of the sequence, with the Billicumidjii Rhyolite Member occurring towards the top.

The Cliffdale Volcanics are comagmatic with the Nicholson Granite and together they comprise the Nicholson Suite. SHRIMP dating of both the Nicholson Granite and the Cliffdale Volcanics gave an age of 1850 Ma (Scott et al, 1997). The Nicholson Granite is predominantly I-type granodiorite in composition.
The Nicholson Suite shows little evidence of fractional crystallisation and on this basis the potential for forming large tonnage deposits is considered to be minor, although small tonnages of high grade are possible. In the vicinity of the granites there are no significant potential host rocks documented. Potential exists for small Sn and W deposits within the granite and for smaller Cu and Au deposits outside the granite (Budd et al, 2001).
Fig. 4 Generalised geology, Westmoreland area.  
Compiled by D G Jones from published data; for legend see Fig. 5 below.

Fig. 5 Simplified Stratigraphy in the Westmoreland Region.  
Compiled by D G Jones from published data

Unconformably overlying the Nicholson Suite is the Tawallah Group (Yates et al, 1962). This is the oldest segment of the southern McArthur Basin. The base is a sequence of conglomerates and sandstones comprising the Westmoreland Conglomerate (Carter et al, 1958). The conglomerates thin out to the southeast and are in turn conformably overlain by the Seigal Volcanics (Grimes & Sweet, 1979), an andesitic to basic sequence containing interbedded agglomerates, tuffs and sandstones. Together these units comprise about two-thirds of the total thickness of the Tawallah Group. The volcanics are overlain in turn by the McDermott Formation, the Sly Creek Sandstone, the Aquarium Formation and the Settlement Creek Volcanics. Uranium mineralisation has been recognised in the Westmoreland region in numerous structural and stratigraphic positions. These include:

1. associated with faults and fractures in Murphy Metamorphics;
2. in shear zones in the Cliffdale Volcanics near the Westmoreland Conglomerate unconformity;
3. at the reverse-faulted contact between Cliffdale Volcanics and Westmoreland Conglomerate;
4. within Westmoreland Conglomerate about 50m above its base;
5. in Westmoreland Conglomerate in close proximity to the overlying Seigal Volcanics;
6. in association with mafic dykes and sills; and
7. In shear zones within the Seigal Volcanics.

The most important uranium deposits occur on the northern dip slope of the Westmoreland Conglomerate in situation 5 above. The deposits represent thicker and higher grade concentrations of trace uranium mineralisation than is regionally common beneath the Seigal Volcanics-Westmoreland Conglomerate contact and along the flanks of the Redtree dyke zone. Mineralisation in other settings is only present in trace amounts (Rheinberger et al, 1998).

They deposits are associated with an altered basic dyke system intruded along faults. Mineralisation is present in both the sandstones and dyke rocks. To the north the Westmoreland Conglomerate is overlain by the Seigal Volcanics under Recent alluvium cover.

Fig. 6 Diagrammatic section looking west towards the Northern Territory border.

Photo 2. Westmoreland Conglomerate dip slope, looking west.
Photo taken by D G Jones adjacent to the Pioneer prospect, at UTM Zone 54K coordinates 0200846m N, 8072729m E.
The Westmoreland Conglomerate is a flat-lying sequence dipping between 5° and 10° to the NNW. The dominant fault directions are WNW and NE. A prominent open joint system trending NE appears to have some control on the mineralisation.

Locally, the Westmoreland Conglomerate consists of a sequence of coarse to gritty feldspathic sandstone with local pebble and cobble lenses, overlaying a basal conglomerate bed containing abundant volcanic material.

Vesicular tholeiitic dykes have intruded along the fault zones in an en echelon pattern. The dykes weather more easily than the conglomerate and thus tend to be obscured at surface. Fresh dykes in core are brecciated and sheared, and extensively altered along the contact zones. The unaltered dyke is typically a dark green dolerite.

**Geological History**

Sands, muds and calcareous sediments were deposited prior to 1900 Ma over much or all of the regions shown in brown on Fig.3 above. The source area for the sediments was probably the Archaean granitic terrane to the west. Felsic and minor mafic volcanism related to accompanying intrusive activity affected some areas of the Murphy Tectonic Ridge.

During the Barramundi Orogeny (1860-1850 Ma) the basement rocks were tightly folded and regionally metamorphosed to greenschist facies, to form the Murphy Metamorphics. The tectonism resulted in uplift and erosion, and by 1875 Ma most of the region was probably a land area where large tracts of metamorphic rocks were exposed.

From 1840 to 1800 Ma, widespread felsic volcanic activity together with minor mafic volcanism and local clastic sedimentation took place to form the Cliffdale Volcanics. The abundance of ignimbrites indicates that the eruptions were predominantly subaerial. Comagmatic with the volcanics, granites of the Nicholson Granite Complex were emplaced. A suite of mafic dykes were intruded about the same time.

Some contact metamorphism and local folding, tilting and faulting accompanied the granite emplacement and volcanism, but no major region-wide deformation or regional metamorphism took place during this period. Most of the region was probably a land area subjected to erosion throughout this period. By 1800 Ma, parts of some granite plutons had become unroofed and metamorphic basement rocks were exposed.

Sudden regional subsidence in a linked array of basins controlled by segmented north-striking extensional faults resulted in rapid sedimentation re-commencing about 1790 Ma to form the Westmoreland Conglomerate, the basal unit of the Tawallah Group. The first sediments laid down were alluvial fan and braided stream deposits derived locally from the basement rocks. Rounded boulders of Nicholson Granite around 30 cm diameter are common in the basal conglomerates (see Photo 2).
The fluvial sedimentation was followed by subaerial and possibly shallow-water felsic and mafic volcanism around 1680 Ma to form the Seigal Volcanics. After a short period of erosion, the volcanics were covered by near-shore marine and lagoonal dolomite, sandstone and siltstone of the McDermott Formation. The sea withdrew and there was a short hiatus in sedimentation; then sea level rose and sandstones and minor conglomerates of the Sly Creek Sandstone were laid down unconformably on the Seigal Volcanics and McDermott Formation. The Sly Creek Sandstone is overlain by poorly exposed sedimentary rocks of the Aquarium Formation and extrusives of the Settlement Creek Volcanics, which mark the top of the Tawallah Group in the Westmoreland area. The youngest internal SHRIMP zircon ages obtained for the Tawallah Group are 1713±7 Ma for the Tanumbirini Rhyolite and 1708±5 Ma for the Nyanantu Formation near the top of the group (Page and Sweet, 1998).

Major tectonism, involving thrusting, folding, faulting, mafic dyke emplacement and regional metamorphism affected the entire region between 1620 and 1550 Ma. Two main phases of deformation, D1 and D2, have been recognised. The first resulted in extensive thrusting and nappe formation, while the second was characterised by tight folding about northerly trending, steeply dipping to vertical axial planes. A later phase of deformation, D3, resulted in the formation of NNW and NNE-trending shear zones around 1480 Ma. Most of the mineral deposits in the region were probably formed during the deformation events in this period.

Some time after tectonism at 1450 Ma but before 1200 Ma, shallow-water sediments of the South Nicholson Group were deposited in the South Nicholson Basin. Some post-metamorphic NNE-trending mafic dykes were intruded around 1115 Ma. Vertical and lateral movements took place along the major faults of the region during the late Proterozoic, and gentle basin-and-dome folding affected the South Nicholson Group and underlying units.
Technical Report on Laramide Resources Ltd Mineral Tenements in Australia

Geophysics

Radiometrics

Airborne radiometric surveys are the most common technique used in uranium exploration and have successfully discovered many significant deposits in the Northern Territory and worldwide. The technique is based on the measurement of natural emissions of gamma radiation from the radioactive decay of uranium, thorium and potassium by an airborne sensor containing a sodium iodide crystal. Early scintillometers measured the total amount ('total count') of gamma radiation emitted and were unable to distinguish between different element sources. Development of the gamma-ray spectrometer in the early 1970s allowed emissions from uranium, thorium and potassium to be separated, which provided a more useful exploration tool.

The main limitation of airborne radiometric surveys is that a radioactive source must be at or very close to the surface to produce an anomaly. The experience at Jabiluka, 750 km northwest of Westmoreland, showed that even a large deposit is rendered 'blind' by a thin cover of overburden (less than 3 m over Jabiluka 1). These surveys are still used as a very cost-effective means of rapidly assessing large areas for priority targets from surface anomalies.

The first airborne surveys in the region were undertaken by the BMR in 1956 and 1957, using a tiny Auster aircraft. These were followed up in 1964 using a DC3 aircraft. Details of these and subsequent government surveys are set out in the table below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Agency</th>
<th>Line km</th>
<th>Line Spacing</th>
<th>Ground clearance</th>
<th>Orientation</th>
<th>No. Lines</th>
<th>Data Sampled</th>
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</thead>
<tbody>
<tr>
<td>1956</td>
<td>BMR</td>
<td>7,040</td>
<td>400m</td>
<td>60m</td>
<td>North-South</td>
<td>RAD</td>
<td></td>
</tr>
<tr>
<td>1957</td>
<td>BMR</td>
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<td>320m</td>
<td>60m</td>
<td>North-South</td>
<td>RAD</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>BMR</td>
<td>91,039</td>
<td>3,200m</td>
<td>230m</td>
<td>East-West</td>
<td>507</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1973</td>
<td>BMR</td>
<td>9,882</td>
<td>1,500m</td>
<td>150m</td>
<td>North-South</td>
<td>MAG/RAD</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>BMR</td>
<td>33,267</td>
<td>3,000m</td>
<td>150m</td>
<td>East-West</td>
<td>213</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1984</td>
<td>BMR</td>
<td>7,408</td>
<td>1,500m</td>
<td>150m</td>
<td>East-West</td>
<td>MAG/RAD</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>NTGS</td>
<td>300,000</td>
<td>400m</td>
<td>80m</td>
<td>North-South</td>
<td>MAG/RAD</td>
<td></td>
</tr>
</tbody>
</table>

Ground radiometric surveys use a hand-held, or vehicle-mounted Geiger-Muller counter or Scintrex spectrometer. Ground surveys allow the detection of more subtle anomalies than can be detected by airborne techniques and can also resolve large airborne anomalies into complex, multi-point sources. Ground radiometric surveys are therefore used either to target rock sampling by trenching or drilling over known airborne anomalies, or for the assessment of areas that do not contain airborne anomalies, but are nonetheless considered to be geologically prospective.

This approach led to the discovery of Redtree, where trenching over the highest point sources located mineralised cobbles a few metres beneath the surface.

Various methods are used to detect radon gas and its immediate decay products emanating from uranium-bearing bodies as an exploration tool. In the alpha-track etch recording method, film sensitive to alpha radiation is enclosed in small sampling cups that are placed in shallow holes in the ground and left undisturbed for several weeks to collect radon. The films are then retrieved and analysed to determine the amount of alpha radiation at each sample point. This method is easy to set up and the long time period of sampling avoids short-term variations due to soil and weather conditions. Uranium and thorium emanations cannot be distinguished however, and the long turnaround time may be a problem in some cases.

The track-etch system was tested by various companies during early exploration in the Northern Territory, where it successfully ‘detected’ the Koongarra orebody at a depth of 75 m by an anomaly of 40 times background (Gingrich and Fisher, 1976). However, there are no examples in the Northern Territory of radon emanometry locating mineralisation that could not be detected by other methods (eg airborne or ground radiometrics). However, it may be of use in areas where prospective basement is covered by unconsolidated Cretaceous or younger sediments.
Borehole Gamma Spectrometry

In the early 1960s, gamma borehole logging became standard practice. The down-hole sensor is a modification of the portable gamma ray instrument designed for surface measurements and detects small variations in total gamma activity. It has been successfully used in detecting mineralisation and distinguishing stratigraphic units in drill holes.

Borehole spectrometry is now used routinely for logging of drill core and also for grade control monitoring of blast holes at a number of uranium mines. The instrument can record separately and simultaneously radiation related to potassium, uranium and thorium. When calibrated against geochemical analyses in test drillholes or trenches, the instrument can be used for quantitative measurement of uranium, which provides a rapid assessment of mineralisation in the field without having to wait for assay results. Gamma logs also aid in stratigraphic correlation and lithological identification.

Magnetics

Aeromagnetic data is routinely collected at the same time as airborne radiometrics and provides a useful tool to aid in regional mapping of prospective basement lithologies and structure and therefore serves as an indirect exploration technique.

It is possible that large-scale alteration zones associated with some deposits could be detected as zones of demagnetisation within otherwise magnetic units, for example the dykes in the Westmoreland Conglomerate.

Electromagnetic surveys are primarily used to detect changes in basement lithology beneath cover. In the Athabasca Basin of Canada, uranium mineralisation has a strong association with graphitic shear zones and lithologies in the basement, which are easily detected by EM techniques. Concealed mineralisation is characterised by a discrete basement graphitic EM conductor within a broad zone of low resistivity, indicating hydrothermal alteration (McMullan et al 1989). In the Westmoreland area, the association of uranium and graphitic basement does not occur and airborne EM is not as useful for basement mapping. However, airborne time-domain EM (TEMPEST) surveys have recently been successfully used in the Northern Territory to determine the depth to hard rocks below recent alluvial cover, since the contact is characterised by a low-resistivity zone (Beckitt 2003).
A large number of company airborne surveys have been carried out in the Westmoreland region, and these are summarised below:

### Table 6. Private Airborne Magnetic/Radiometric Surveys in the Westmoreland Region

<table>
<thead>
<tr>
<th>Year</th>
<th>Company</th>
<th>Line km</th>
<th>Line Spacing</th>
<th>Ground clearance</th>
<th>Orientation</th>
<th>Data sampled</th>
</tr>
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<tr>
<td>1962</td>
<td>Mid-Eastern Oil</td>
<td>14,634</td>
<td>3,200m</td>
<td>300m</td>
<td>East-West</td>
<td>MAG</td>
</tr>
<tr>
<td>1963</td>
<td>Mines Administration</td>
<td>10,100</td>
<td>3,200m</td>
<td>300m</td>
<td>East-West</td>
<td>MAG</td>
</tr>
<tr>
<td>1968</td>
<td>BHP</td>
<td>1,224</td>
<td></td>
<td>91m</td>
<td>East-West</td>
<td>RAD</td>
</tr>
<tr>
<td>1968</td>
<td>Queensland Mines Ltd</td>
<td>91m</td>
<td></td>
<td>East-West</td>
<td>MAG/RAD</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>Westmoreland Minerals Ltd</td>
<td>4,347</td>
<td>91m</td>
<td>North-South</td>
<td>RAD</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>Aquitaine Aust Minerals</td>
<td></td>
<td></td>
<td></td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1971</td>
<td>Inco</td>
<td></td>
<td></td>
<td></td>
<td>MAG/RAD</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>Afmeco</td>
<td>2,512</td>
<td>500m</td>
<td>75m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
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<td>GeoTerrex</td>
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<td>250m</td>
<td>80m</td>
<td>East-West</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1983</td>
<td>Ashton Mining Ltd</td>
<td>80,641</td>
<td>300m</td>
<td>80m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1984</td>
<td>Ashton Mining Ltd</td>
<td>41,696</td>
<td>300m</td>
<td>80m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1985</td>
<td>CEGB</td>
<td>1,000</td>
<td>300m</td>
<td>90m</td>
<td>East-West</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1986</td>
<td>CEGB</td>
<td>300m</td>
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<td>90m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1986</td>
<td>Stockdale Prospecting</td>
<td>250m</td>
<td></td>
<td>70m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1988</td>
<td>CRA</td>
<td>5,634</td>
<td>200m</td>
<td>80m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1990</td>
<td>CRA</td>
<td>100</td>
<td>400m</td>
<td>120m</td>
<td>North-South</td>
<td>MAG/EM</td>
</tr>
<tr>
<td>1991</td>
<td>BHP</td>
<td>500m</td>
<td></td>
<td>120m</td>
<td>East-West</td>
<td>MAG/EM</td>
</tr>
<tr>
<td>1994</td>
<td>CRA</td>
<td>3,151</td>
<td>300m</td>
<td>60m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
<tr>
<td>1995</td>
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<td>70m</td>
<td>North-South</td>
<td>MAG/RAD</td>
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<tr>
<td>1995</td>
<td>CRA</td>
<td>443</td>
<td>100m</td>
<td>60m</td>
<td>East-West</td>
<td>MAG/EM</td>
</tr>
<tr>
<td>1996</td>
<td>BHP</td>
<td>500m</td>
<td></td>
<td>105m</td>
<td>North-South</td>
<td>MAG/EM</td>
</tr>
<tr>
<td>1996</td>
<td>BHP</td>
<td>1,000</td>
<td></td>
<td>105m</td>
<td>North-South</td>
<td>MAG/EM</td>
</tr>
<tr>
<td>1997</td>
<td>BHP</td>
<td>500m</td>
<td></td>
<td>105m</td>
<td>North-South</td>
<td>MAG/EM</td>
</tr>
<tr>
<td>1999</td>
<td>Rio Tinto</td>
<td>189</td>
<td>50m</td>
<td>25m</td>
<td>North-South</td>
<td>MAG/RAD</td>
</tr>
</tbody>
</table>

### Seismic

A deep reflection seismic traverse across the southern McArthur Basin was carried out in 2002 by GeoScience Australia (Rawlings et al, 2000), as part of a study to examine the fundamental basin architecture of the Southern McArthur Basin and the nature of underlying basement. Most of the profile is dominated by a series of west-dipping faults, interpreted to be part of a major thrust belt which propagated eastward. Within the section, displacement on the thrusts tends to be greatest in the west and diminishes to the east. Deformation and fault geometries are consistent with an east- to northeast-striking compressional axis. Like the Emu and Narwimbi Faults in the McArthur Basin, the Calvert Fault in the Westmoreland area is most likely a strike-slip fault with a positive flower structure.
Fig. 8  Block diagram looking NNW along Emu Fault. Depth to basement 10 km.

This model substantiates the fluid flow model proposed for the origin of the McArthur River lead-zinc deposit (Large et al., 2002), in which the Emu Fault is a conduit for the introduction of deep-seated oxidised metalliferous brines into the floor of the anoxic McArthur Basin and precipitate sulphides contemporaneously with the sediments. It is possible that the Calvert Fault system could have acted in the same way in relation to the introduction of uranium-bearing metalliferous fluids into the Westmoreland Conglomerate.

**Gravity**

Gravity surveys can provide useful information where other exploration methods do not work. For example, gravity may be used to map bedrock topography under a landfill or cover sediment. Gravity can also be used to map lateral lithologic changes, and faults.

A gravity survey is conducted by acquiring data on the ground at predetermined points using a gravimeter which measures the earth’s gravitational attraction at various points over the area of interest. Gravity anomalies are due to differences in the density of underlying materials.

The gravity data for Queensland is quite coarse, and is incorporated into the GeoScience Australia database on a continent-scale compilation. Although more government data is available on the Northern Territory side, this too is only suitable for broad-scale information.

**Airborne Hyperspectral Surveys**

This is a relatively recent innovation in remote sensing technology that measures reflectance data in the visible to shortwave infrared regions of the electromagnetic spectrum. Both airborne (eg HYMAP, ARGUS) and satellite-based (eg JERS, ASTER) systems are commercially available. The systems are capable of providing mineral abundance maps that can be used for discrimination of geology and detection of hydrothermal alteration. In the Northern Territory, airborne hyperspectral surveys are used as a tool in exploration for unconformity-type deposits (Beckitt, 2003).

However, orientation data is lacking over known deposits (eg Eva, Redtree) and results are currently assessed using models based on the Athabasca region deposits in Canada.
Tectonics

Cratonisation of the northern Australian orogenic domains during the Barramundi Orogeny was accompanied by the establishment of a fundamental framework of deep-seated NW, NNW to NNE and NE -trending crustal structures (Etheridge et al., 1987). It is widely speculated that these structures were reactivated and became the major controlling influence on the depositional geometry of succeeding basin phases and the localisation of subsequent deformation (e.g., Plumb, 1979; Etheridge and Wall, 1994; Rogers, 1996). The majority of models for the evolution of the McArthur Basin promote extensional tectonics, in which specific fault orientations acted as normal or ‘growth’ structures and others acted as accommodation or transfer structures during various stages of basin formation. The most influential aspect of McArthur Basin geology that has driven extensional models is the presence of significant volcanic and coarse-grained clastic rocks at the base of the basin succession (Rogers, 1996).

The igneous rocks of the Westmoreland region are markedly bimodal with respect to silica content, a typical feature of intracratonic rifting. No rocks older than the Murphy Metamorphics are known east of the Westmoreland area, implying that the detrital sediments of the Tawallah Group were derived from either within or west of the Murphy Tectonic Ridge. The Tawallah Group is dominated by shallow-water marine sediments deposited on a regionally extensive platform.

Subsequent contractional reactivation of earlier ‘extensional fault systems’ is thought to have occurred at least three times during and after basin development (Plumb, 1994; Rogers, 1996).

According to Scott et al, 2000, the geodynamical evolution of basins and magmatic events in the Westmoreland region are largely the result of repeated episodes of subduction and intervening orogenic events. During times of subduction wholesale tilting of the craton occurred. During episodes of orogeny, thermal, isostatic and flexural mechanisms enhanced subsidence in the craton and promoted regional strike-slip deformation. Repeated development and destruction of alternating subducting slabs and orogenic roots led to the development of a lateral temperature gradient, enhanced mantle convection and anomalous and fluctuating thermal conditions under the craton.

8 DEPOSIT TYPES

Kesler (1994) gives a useful description of various uranium deposit types, and summarised them in the diagram reproduced below. Unlike the classic uranium deposits illustrated in Fig.9, the Westmoreland deposits occur within conglomerate, sandstone and mafic volcanic rocks. They have some features in common with both sandstone-hosted and vein types, as well as unconformity-related deposits. They are all associated with redox boundaries near the contact of different lithologies in various geological settings. Some workers (e.g. Hochman and Ypma, 1984) consider the Westmoreland deposits to represent a special type of sandstone-hosted deposit.
SANDSTONE-HOSTED URANIUM DEPOSITS

Sandstone-hosted deposits are contained within fluvial or shallow marine sandstone. Host rocks are medium- to coarse grained, poorly sorted sandstones that generally contain pyrite and organic matter of plant origin. Primary mineralisation consists of pitchblende and coffinite, and weathering produces secondary minerals including carnotite and uranophane. Globally, sandstone-hosted deposits contain a large proportion of known uranium resources, although they are mostly of low to medium grade (0.05-0.4 % \( U_3O_8 \)). Individual deposits can contain up to 50 000 t \( U_3O_8 \), and cumulative tonnages within a province or basin may be several hundred thousand tonnes (Dahlkamp 1993).

UNCONFORMITY-RELATED URANIUM DEPOSITS

Unconformity-related deposits arise from geological changes occurring close to major unconformities. Below the unconformity, the rocks are usually faulted and brecciated. The overlying younger Proterozoic sandstones are usually undeformed. The ore minerals are generally uraninite and pitchblende.

This type includes some of the largest and richest deposits of uranium known. The main deposits occur in Canada (the Athabasca Basin, Saskatchewan and Thelon Basin, Northwest Territories); and Australia (the Alligator Rivers region in the Pine Creek Geosyncline, NT and Rudall River area, WA). The deposits in the Athabasca Basin occur below, across and immediately above the unconformity, with the highest grade deposits situated above (eg Cigar Lake, averaging 9.1% \( U_3O_8 \), some zones over 50% \( U_3O_8 \)) and across the unconformity (eg Key Lake).

Unconformity-related deposits constitute a major proportion (22%) of Australia's total uranium resources and more than 80% of Australia's total production since 1980 has been mined from two of these deposits: Ranger #1 and Nabarlek (now mined out). Other major deposits in the Alligator Rivers region are Ranger # 3, Jabiluka (North Ranger), Koongarra and Ranger 68. In the Alligator Rivers region, the known deposits are below the unconformity and are generally much lower grade than the Canadian deposits.
MINERALISATION

Uranium Minerals
Pitchblende is the main uranium mineral and occurs on both the Westmoreland Conglomerate and the altered dykes. In the sandstones it occurs as grains between the sand particles, and also along fine fractures. Rare veins up to 1 cm thick have been reported. Some pitchblende has been dissolved by groundwater and re-distributed as sooty or colloform masses.

Gold
Gold has been noted as small grains up to 10µm across either as inclusions in the pitchblende or in between the sand particles and in the dyke rocks.

According to Schindlmayr and Beerbaum (1986), the origin of the uranium in the Westmoreland deposits is still open to interpretation. Introduction of uranium into the sedimentary system may have taken place either detritally, or by exhalative volcanogenic activity, or by hydrothermal remobilisation from deep-seated sources. These authors also postulate that heatflow at about 820 Ma generated and maintained hydrothermal convection cells in the permeable host rocks. Uranium introduced to circulating oxygenated formation waters by one or more of the above processes was precipitated against physicochemical barriers such as basic dykes or lavas, due to the abundant supply of divalent iron as a reducing agent. The Nicholson Granite is not the mineralising source as its pre-dates the Westmoreland Conglomerate.

Hochman and Ypma (1984) made thermoluminescence measurements on some 800 samples from the Westmoreland orebodies and surrounding host rocks up to 8 km away. They concluded that the Westmoreland Conglomerate has suffered major radiation damage attributable to at least 10 ppm uranium over 1 Billion years, and that it had a high inherent uranium content that was remobilised in a convective cell system, possibly triggered by intrusion of dolerite dykes or by heat flow along rejuvenated structures.

Rheinberger et al (1998) also consider that the primary conduits for the uranium-bearing fluids are the major north-east structures such as the Redtree dyke zone. Migration of the uranium-bearing fluids away from the structures was controlled mainly by the porosity of the sediments. Uranium was precipitated adjacent to mafic rocks when oxidising groundwaters were reduced by reaction with Fe²⁺ in solution. Hematite also formed during the reactions. Chloride ions released by uraninite precipitation were used in chlorite formation. This explains the hematite-chlorite alteration. The flat-lying mineralisation at Redtree formed immediately underneath the Seigal Volcanics and subsequent erosion of the basalt and weathering of the mineralisation has changed the primary assemblage. Uraninite has weathered to secondary uranium minerals and chlorite has weathered to a mixture of iron oxides and clay (Rheinberger et al, 1998).

The uranium mineralisation at Pandanus Creek has been dated at 850 Ma, and Morgan and Campi (1986) postulated that it was preceded by widespread faulting of the overlying Palaeoproterozoic rocks.

Because the bulk of the known uranium resource is in sandstone, the deposits are collectively grouped here as of sandstone type, even though many deposits, including Eva (Pandanus Creek), Cobar 2 and El Hussen, are in volcanics and belong to the vein type. Even Westmoreland deposits hosted entirely within sandstone are regarded as vein-type by some authors.

Ahmad (1987) classified the Westmoreland uranium occurrences into five types, based on their hydrological and geological settings. Within each class, the Westmoreland Conglomerate was considered to be the most permeable unit:

- Type A: Contact of Cliffdale Volcanics thrust over Westmoreland Conglomerate (Type A1), or contact of Seigal Volcanics conformably overlying Westmoreland Conglomerate (Type A2).

- Type B: Near a contact between impermeable vertical mafic dykes and Westmoreland Conglomerate.
Technical Report on Laramide Resources Ltd Mineral Tenements in Australia

- Type C: Hosted by Cliffdale Volcanics beneath exhumed unconformable contact with overlying Westmoreland Conglomerate.

- Type D: Hosted by fractures in Seigal Volcanics at some distance above the contact with Westmoreland Conglomerate.

- Type E: Hosted by Murphy Metamorphics.

**Type A**

Type A deposits lie at the contact between Westmoreland Conglomerate and Cliffdale or Seigal Volcanics. In sub-type A1 occurrences, the contact between Cliffdale Volcanics and Westmoreland Conglomerate is a reverse fault. In sub-type A2 deposits, the contact between Westmoreland Conglomerate and Seigal Volcanics is conformable. Overlying volcanics, Westmoreland Conglomerate, or both units may be mineralised adjacent to the contact. Mineralisation is seldom more than a few metres in width, but anomalous radioactivity occurs for several tens of metres along the strike of the contact (Ahmad 1987).

**Subtype A1**

Sub-type A1 occurrences are associated with east-trending reverse faults that contain Cliffdale Volcanics in their hanging wall, and all are located in the Northern Territory. Drilling along the Redrock and Main Range Faults indicated that they dip 50° south (Pietsch and Tucker 1972), whereas geology suggests that the Maniw Fault dips north.

At Redrock, anomalous radioactivity extends discontinuously about 2 km along strike and is associated with haematitic and brecciated Cliffdale Volcanics in the hanging wall of the Redrock Fault. A narrow zone of patchy radioactivity extends for 2 km along the footwall of the Main Range Fault and defines the Jackson Pit, Jim Beam, Jacques and Southern Comfort prospects.

**Subtype A2**

Subtype A2 occurrences occur at the conformable contact between Westmoreland Conglomerate and overlying Seigal Volcanics. A horizon of reddish brown siltstone a few metres thick commonly occurs along this contact. Mineralisation may be contained within conglomerate, volcanic rock or the siltstone horizon. Subtype A2 is the most common type of occurrence in the Northern Territory, and most are clustered around the flanks of the El Hussen Anticline (Ahmad 1987).

Most occurrences in this subtype are highly radioactive patches associated with secondary uranium minerals at surface. One exception is the El Hussen prospect, which was discovered by NAUC in 1957. It occurs as a northwest-trending zone of anomalous radioactivity 1.5 km long that contains patchy but rich uranium mineralisation. The zone is a northwest-trending fault in Seigal Volcanics, which is parallel to the steeply southwest-dipping contact with Westmoreland Conglomerate.

Costeanning, drilling and exploratory mining failed to establish a resource due to the discontinuous nature of mineralisation (Ahmad and Wygralak 1989), but samples contained up to 0.234 % U3O8 (Hills 1970). Mineralisation occurs as disseminations within crushed and altered Seigal Volcanics, where alteration is present as alternating bands of kaolinite and hematite (Hills 1970). Minor mineralisation is also present in sandstone of Westmoreland Conglomerate in contact with sheared volcanics. Most mineralisation is secondary, consisting of torbernite, gummite and carnotite, and pitchblende is present below the zone of oxidation. At the McGuinness prospect costeanning indicated high-grade, but very patchy, uranium mineralisation along the sandstone-volcanic rock contact.

**Type B**

Type B occurrences are the second most common in the region, and the largest deposits are of this type. Mineralisation occurs as sub-horizontal and sub-vertical lenses in Westmoreland Conglomerate adjacent to highly altered, generally subvertical dolerite dykes that may also be mineralised. Individual dykes are up to 20 m wide, 1 km long and are arranged in en echelon sets along northeast-trending lineaments over 15 km long. Several of these dykes cut Nicholson Granite and Cliffdale Volcanics (Sweet et al 1981), but no uranium mineralisation has been reported where they cut rock types other
Technical Report on Laramide Resources Ltd Mineral Tenements in Australia

than Westmoreland Conglomerate. Dyke intrusion was probably contemporaneous with Seigal Volcanics, but no age dating has been carried out to confirm this relationship.

Uranium mineralisation is associated with three major northeast-trending lineaments, called the Westmoreland, Redtree and El Nashfa dyke zones. The last two are in Queensland and contain the largest known uranium resources in the region.

Drilling on profiles across the Westmoreland dyke zone in the Northern Territory intersected uranium grades from 0.04 to 2.4 % U3O8 and gold grades from 1 to 16 g/t (Stewart 1990) at the Mageera, Intermediate and Cogoodoo prospects. However, mineralised zones were narrow and discontinuous and reserves or resources could not be calculated.

In Queensland, the Redtree dyke zone extends over a strike of 20 km, and hosts the Moongooma, Namalangi, Redtree, Januguna and Wanigarang prospects. Rheinberger et al (1998) contains descriptions of the main deposits, which were explored by various companies from 1956 to 1998, when CRA Ltd acquired full ownership. Inferred resources were determined for the three largest deposits: Redtree has 10.2 Mt of ore grading 0.126 % U3O8, Junnagunna has 5.4 Mt of ore at 0.098 % U3O8, and Huarabagoo has 1.8 Mt at 0.169 % U3O8 (Rheinberger et al 1998). Mineralisation within and proximal to the dyke zones is associated with an alteration assemblage of quartz-sericite ± kaolinite in sandstone, and hematite-quartz in dolerite. Mineralisation distal to dyke zones is associated with chlorite and minor hematite alteration. Primary ore consists mainly of uraninite with varying amounts of autunite, ninyoite, bassettite and coffinite. Uranium minerals occur as either interstitial to sand grains or as fracture coatings in sandstone and within hematite-quartz veins in dolerite (Ahmad and Wygralak 1989, Rheinberger et al 1998). Gold is also present, but grade intersections are generally narrow and erratic.

Only minor mineralisation is associated with vertical dyke structures in the El-Nashfa dyke zone. However, flat-lying mineralisation at the Long Pocket prospect is related to dolerite sills within sandstone. Total inferred resources in two small orebodies in the prospect area are 1.013 Mt ore grading 0.16 % U3O8 (Rheinberger et al 1998).

**Type C**

Only 3 type C deposits are known in the Westmoreland-Murphy region, and all are in the Northern Territory. Type C deposits are hosted by intensely altered Clifdale Volcanics close to the exhumed unconformity with overlying Westmoreland Conglomerate. The only deposit of this type in the Laramide tenements is Duccio, which has no apparent structural control. Eva (Pandanus Creek) is the only significant uranium deposit of this type in the region. It is located outside the Laramide tenements, as is Crippled Horse, which is associated with a subvertical quartz-filled fault zone.

**Type D**

Eight type D occurrences are related to fractures in the lower part of the Seigal Volcanics up to 200 m above the contact with underlying Westmoreland Conglomerate. Cobar 2 is associated with a north-trending subvertical fracture that probably extends into Westmoreland Conglomerate, and produced 78 t of hand-picked ore that graded 0.477 % U3O8. The ore mineral assemblage consists of pitchblende, hematite and quartz with minor chalcopyrite, pyrite and arsenopyrite (Newton and McGrath 1958). Old Parr and Kings Ransom are also in north-trending fractures similar to Cobar 2. Other occurrences of this type are small zones of anomalous radioactivity that generally relate to secondary uranium minerals in vertical fractures. Newton and McGrath (1958) noted that mineralised fractures in this type of occurrence are generally intensely silicified and include some hematite. Very little other information is available.

**Type E**

Three type E occurrences are situated in faults and fractures in the Murphy Metamorphics. Drilling indicated minor mineralisation at Anomaly 30 (Ahmad 1987).
**Deposits**

**Cobar 2**

The Cobar 2 deposit (Newton & McGrath, 1958) was tested and worked from 1956 to 1959 by North Australian Uranium Corporation NL and produced 72 t hand-sorted ore grading 10.52% U3O8, which was trucked to Rum Jungle. The deposit occurred in a steeply dipping shear in altered basalt of the Seigal Volcanics. The main ore mineral was uraninite, associated with hematite. Other prospects in the Pandanus Creek area include Kings Ransom, El Hussen, Old Parr, Mageera and Oogoodoo. The first three are in shears in the Seigal Volcanics. At El Hussen, uranium also occurs along the sheared contact with the Westmoreland Conglomerate (Sweet & others, 1981). At the Mageera and Oogoodoo prospects, uranium is present along the Westmoreland Conglomerate/Seigal Volcanics contact where this is cut by a north-east-trending fault.

![Fig.10 Locations of Principal Uranium Deposits, Westmoreland Region. Compiled by D G Jones from published data.](image)

**Redtree**

In the Westmoreland area most of the deposits are flat-lying lenses flanking the north-east-trending Redtree joint zone (Culpeper et al, 1999). Basic dykes are emplaced along the joint zone, the southern part of which is known as the Namalangi section, and the northern part the Huarabagoo section. Uranium mineralisation occurs either as:

- horizontal mineralisation (Fuchs & Schindlmayr, 1981), either subparallel to the contact of the overlying Seigal Volcanics or parallel to intermediate sills in the uppermost units of the Westmoreland Conglomerate, or

- vertical mineralisation as steeply dipping lenses next to and within the Redtree dyke. Horizontal mineralisation may grade into vertical mineralisation near the Redtree joint zone (Hills & Thakur, 1975; Schindlmayr & Beerbaum, 1986). Significant horizontal mineralisation may extend up to 600 m away from the zone.
The Redtree deposit (Rheinberger et al, 1998) comprises horizontal mineralisation in the Jack, Garee and Langi lenses and vertical mineralisation in the Namalangi lens. The deposit occurs at the southwestern end of the Redtree dyke zone. The horizontal mineralisation is entirely hosted by sandstone and is associated with chlorite and minor hematite alteration. The Jack and Langi lenses on the north-western side of the dyke zone form flat lying zones of mineralisation 0.10 m below surface, 0.5-15 m thick and up to 500 m wide. The mineralisation thickens and steepens near the dyke where it is 30-40 m thick. The Langi deposit is some 600 m north-east of the Jack deposit. Grades are fairly uniform and average around 0.1% U3O8, with torbernite, metatorbernite and carnotite the main ore minerals. Closer to the Redtree joint zone the deposit grades into discontinuous vertical lenses of primary uranium mineralisation.

The Garee lens, on the south-eastern side of the dyke zone, is 5-30 m below surface, and up to 30 m thick where it is adjacent to the dyke zone. Mineralisation is mainly pitchblende, with secondary uranium mineralisation at its eastern end. The Namalangi lens comprises vertical mineralisation in the Redtree dyke zone, mainly in the sandstone between the dykes. The dykes exhibit chlorite-calcite alteration at their margins and the Westmoreland Conglomerate is chloritised near the dykes.

Huarabagoo

The Huarabagoo deposit is located 3 km north-east of the Redtree deposit. It is a zone of vertical mineralisation in a structurally complex area of the Redtree dyke zone. Multiple injections of smaller dykes (steeply dipping and horizontal) are associated with the two main vertical dykes. Most of the mineralisation is within the sandstones adjacent to the dykes and the remainder is in the dykes.

Junnagunna

The Junnagunna deposit, approximately 7 km north-east of the Redtree deposit, consists of flat-lying mineralisation within sandstone immediately below the Seigal Volcanics contact. The mineralisation is 20.30 m below surface and 0.5.10 m thick and developed on both sides of the dyke zone, and is associated with chlorite and minor hematite alteration. It is covered by soil and also by the Seigal Volcanics. This deposit was discovered by drilling on radon anomalies.
Long Pocket

The Long Pocket area contains the Outcamp, Sue and Black Hills deposits. These deposits are hosted by sandstone. Mineralisation occurs as a number of horizontal lenses, 0.5-5 m thick, over an area of approximately one square kilometre. Mineralisation occurs along the upper and lower contacts of a subhorizontal dolerite sill approximately 5 m thick (Rheinberger & others, 1998). Approximately 90% of the mineralisation is in sandstones along the contact and the rest is in the sill.

The Black Hills deposit is hosted by sandstone and is adjacent to the contact with the overlying Seigal Volcanics. The mineralisation, which is spatially related to the east-trending Black Hills dyke, appears to be discontinuous. Insufficient drilling has been completed at Black Hills to allow an estimate of resources (Rheinberger et al, 1998).

Schindlmayr & Beerbaum (1986) noted that uranium oxides are the main economic minerals at Westmoreland, and secondary uranium minerals of the phosphate, vanadate, silicate, arsenate and sulphate groups are dominant in the weathered parts. In horizontal orebodies open to surface oxidation (such as Jack, Langi, upper part of Garee) secondary mineralisation is associated with hematite, chlorite and sericite, and forms grain coatings and interstitial fillings. Oxides are the main ore minerals deeper in the Garee deposit, in the horizontal orebodies below volcanics (Junnagunna, Sue, Outcamp), and in almost all vertical-type mineralisation. Uranium and gold mineralisation coexist in places and this association is the youngest mineral phase. Parts of the Junnagunna horizontal-type mineralisation and of the vertical type mineralisation at Huarabagoo contain gold; values of up to 80 g/t have been obtained, but more commonly the gold assays about 0.2-7.0 g/t.

It was originally thought that the vertical-type mineralisation in the Redtree joint zone had more potential than the horizontal deposits near the joint zone. Later these vertical lenses were found to be discontinuous and the substantial resource tonnages attributed at first to the vertical lenses could not be sustained (Fuchs & Schindlmayr, 1981). The bulk of the known uranium resource is contained in the stratabound horizontal deposits. Rio Tinto further explored the vertical mineralisation at Huarabagoo in 1990-97 and delineated an inferred resource of 3000 t U3O8.

10 EXPLORATION

No exploration has been carried out on the property by Mining Associates behalf of the issuer. Exploration work by the present owner has been limited to airborne geophysical surveying, pending the completion of access agreements with the various indigenous land claimants.

Preliminary images from Laramide’s high-resolution airborne survey were just becoming available as this report was being prepared. A quick scan of the images indicates that they are of very high quality, and have detected a number of radiometric anomalies not previously discovered by earlier explorers. Fig.11 below shows a total uranium count image, with known uranium prospects as yellow dots and new anomalies circled. This work indicates that considerable potential exists for expanding the uranium resources in the Westmoreland region.
Laramide has proposed a budget of CAD $5 million to carry out the next stage of work at Westmoreland. The objective is to complete sufficient work in 2006 to allow a pre-feasibility study to be completed in 2007, should permitting of a mine development seem likely.

The budget is designed to support the drilling of 16,000m of infill drilling to verify and improve the quality of previous drilling results. In addition, a further 5,000m is allocated to expand the exploration of the area. Previously, Rio Tinto had completed approximately 50,000m of drilling to produce what Rio classed as a JORC-compliant inferred resource. However, without access to the raw data, Mining Associates is unable to verify the Rio estimate. Laramide is currently negotiating with Rio Tinto to obtain the full data set. Fig.12 below illustrates the drill density at the Redtree deposit, based on plots of known drill collar positions. So far, Laramide has identified 916 drill collar positions on the Queensland portion of their Westmoreland tenements, and 241 drill holes on the Northern territory side.

Laramide’s budget also includes provision for environmental baseline studies and metallurgical test work.
11 DRILLING

As far as Mining Associates is aware, Laramide has not carried out any drilling to date, and cannot do so in Queensland until the required agreements are finalised with the indigenous land claimants. Drilling is planned to commence in the Northern Territory following the current wet season.
Technical Report on Laramide Resources Ltd Mineral Tenements in Australia

12 SAMPLING METHOD AND APPROACH
As far as Mining Associates is aware, Laramide has not carried out any field sampling to date on the Queensland side of the border, and cannot do so until the required agreements are finalised with the indigenous land claimants. Access agreements have been finalised for all tenements on the Northern Territory side of the border, and some preliminary reconnaissance work has commenced.

13 SAMPLE PREPARATION, ANALYSES AND SECURITY
As far as Mining Associates is aware, Laramide has not carried out any field sampling to date in Queensland, and cannot do so until the required agreements are finalised with the indigenous land claimants. Only preliminary reconnaissance work has been conducted by Laramide in the Northern Territory.

14 DATA VERIFICATION
The area was visited by David Jones of Mining Associates as part of the project review for the preparation of this report. During the visit, a number of bore collars were observed in the Redtree, Junnagunna and Long Pocket prospect areas. Numerous outcrops of the Westmoreland Conglomerate and the dykes that intrude it were inspected. The location of the core drilled by previous explorers has not, at this stage, been ascertained so the core could not be inspected. The area of the Laramide licences in Queensland and the Northern Territory was overflown at low altitude and evidence of exploration work and mining was observed at all significant localities marked in the open file reports.

As well as several hundred open file reports made available by the NTGS and the GSQ, a large volume of published data was reviewed by David Jones. These publications are listed in the References. This independent material did not conflict with the information supplied by Laramide.

15 ADJACENT PROPERTIES
The only significant uranium deposit outside the Laramide tenements is Eva, a Type C deposit. Eva was discovered in 1958 from surface showings of secondary uranium minerals in float and evaluated by BHP Ltd during 1958-1959 (Morgan, 1965). During 1960-1962, South Alligator Uranium NL selectively mined 306 t of ore averaging 8.37 % U3O8 to a depth of 28 m, which was trucked to Rum Jungle for processing. It is estimated (Morgan, 1965) that 3,000 t of ore grading 1 % U3O8 remains in a spoil dump at the mine, and 56,00 t ore at 0.56 % U3O8 remains in situ at the deposit (Ahmad 1982).

Geology in the area comprises acid to intermediate volcanic rocks of Cliffdale Volcanics that strike northeast and dip steeply northwest, which are unconformably overlain by moderately to steeply north-dipping Westmoreland Conglomerate. Most mineralisation at Eva is controlled by shears and fractures in intensely altered porphyritic acid volcanic rock (Ahmad 1982). The orebody is lenticular in shape, 60 m long and up to 10 m wide, strikes east-west and dips steeply to the north. Nicholson Granite underlying the deposit and exposed to the west is barren of mineralisation, which cuts out 3-6 m away from the contact with Cliffdale Volcanics (Morgan, 1965).

Alteration at Eva is unlike any of the other occurrences studied in the region (Ahmad and Wygralak 1989). Mineralisation is associated with sericite-epidote-quartz rock with rare hematite. Quartz-topaz rock was noted 100 m along strike to the north of the ore zone, and quartz-cassiterite-topaz veins also occur east of the ore zone. Greisenisation of Cliffdale Volcanics was suggested by these observations (Ahmad and Wygralak, 89), but it is unclear whether it was contemporaneous with uranium mineralisation, or related to known tin-tungsten ore similar to that at Crystal Hill 5 km to the south-southeast of Eva.

High-grade ore lenses that were selectively mined consisted of a central core of remnant pitchblende and secondary uranium minerals surrounded by massive uranium ochres replacing host rocks (Morgan, 1965). Lenses pinched out laterally into barren quartz veins less than 15 cm wide. Low-grade ore consisting of secondary uranium minerals coating joint and fracture surfaces occurred to 8 m depth. Ore minerals were dominated by sklodowskite, boltwoodite, beta-uranophane and remnant pitchblende, with minor amounts of saleeite, autunite and torbernite. Gold and silver was distributed
erratically, but generally associated with high uranium grades. Small amounts of galena, manganese oxide and copper carbonate were also associated with ore.

16 MINERAL PROCESSING AND METALLURGICAL TESTING
As far as Mining Associates is aware, Laramide has not carried out any mineral processing or metallurgical test work to date, and cannot do so until the required agreements are finalised with the indigenous land claimants.

17 MINERAL RESOURCE AND RESERVE ESTIMATES
As far as Mining Associates is aware, Laramide has not at this stage been able to acquire the complete data set from the drilling carried out by CRA, which led to the resource estimate quoted in Rheinberger et al (1998). Until these data are assessed under the current JORC Code, no valid mineral resource and reserve estimate can be made.

18 OTHER RELEVANT DATA AND INFORMATION
Australia is governed by a conservative Federal Liberal party with a minority Federal Labour opposition. However, each of the seven States and Territories are governed by Labour parties with minority conservative oppositions. Some 20 years ago the Federal Labour Party, then in government, declared its opposition to uranium mining in Australia, but allowed three existing uranium mines to continue operating in South Australia and the Northern Territory. The Labour parties in each State, including Queensland, have supported Federal policy. However, there is currently strong pressure from the NSW and South Australian Labour Governments to scrap the 20-year-old policy and allow uranium mining in all States.

There is also growing support within the Federal Labour Party, now no longer in power, for a relaxation of its policy. The shift in policy was stimulated by a speech given to The Sydney Institute on 6th April 2005 by Peter Garrett, former head of The Australian Conservation Foundation and now a Federal Labour Member of Parliament. In that speech Garrett said he wants "a debate on whether nuclear power is a suitable energy substitute for coal-fired power" (Milne, 2005).

This follows a report from the Federal Senate Select Committee on Uranium Mining and Milling that supported the 1977 Fox Inquiry principal findings that there should be no unreasonable impediment to developing Australia's uranium mining. The Committee included members from both the ruling Liberal and the opposition Labour members of Parliament. It concluded that those findings have been "vindicated by two decades' experience". Chairman, Grant Chapman, said that the report "recognises the industry's achievements in being responsive to public interest. It deserves more recognition for its conscientious approach than it receives". "Australia's cautious, careful policy has resulted in mining with minimal impact on the environment. This should continue", he said.

Further, Federal Industry Minister Ian Macfarlane told The Australian newspaper on 26 May 2005 that the current policy governing uranium mining and exploration was not promoting sufficient investment and development because there was no national co-ordination.

"At a time when export prices are off the charts and we need the exploration dollars, potential investors must look at a jurisdictional map of Australia and think it's all too hard and confusing," Mr Macfarlane said. "Canada has a more cohesive national approach to the industry and as a result they produce 29 per cent of the world's uranium from just 17 per cent of the world's deposits," he said. "By contrast, Australia has 41 per cent of the world's deposits but produces only 21 per cent of world demand."

On 30th May 2005, the Australian Federal Liberal Government foreshadowed a dramatic expansion of Australia's uranium mining industry, identifying Indonesia, Thailand and Vietnam as future export markets as South East Asia becomes a player in nuclear energy. Linking the nation's uranium exports to international strategies to combat global warming, the Foreign Affairs Minister Alexander Downer revealed politically contentious plans to boost Australia's uranium exports (Murphy, 2005).
Any sales would have to meet rules that the radioactive material only be used for civilian projects under the gaze of the international atomic energy watchdog and could not be re-exported.

"Indonesia, Thailand and Vietnam are also considering the possibility of nuclear power. These countries could become markets for Australian uranium, provided bilateral safeguards agreements were concluded with them," he said.

The Foreign Minister has used a submission to a current parliamentary inquiry into the strategic importance of uranium resources to confirm Australia remains committed to exporting uranium to China. Any exports would be under a safeguards agreement, and to give strong and unqualified endorsement to nuclear energy as a legitimate tool to lower greenhouse gas emissions.

Labour's leader Kim Beazley and resources spokesman Martin Ferguson have endorsed the Government's plans to export uranium to China.

The mining sector is using the current parliamentary inquiry to run a strong campaign to scrap the state bans on uranium mining and to create a nationally consistent framework to allow Australia to chase high world prices.

Supporting this, Australia's longest-serving premier on 2nd June 2005 pressed for a national debate on nuclear energy as an alternative to fossil fuels, to combat the catastrophic effects of global warming (Hodge, 2005).

Former NSW Labour Premier Bob Carr said nuclear energy could be no more dangerous than burning coal to produce electricity. He said Australians needed to consider the latest methods of nuclear waste disposal and reactor safety, and whether expanding nuclear power would have any effect on the proliferation of nuclear weapons. "I just think the world's got to debate whether uranium-derived power is more dangerous than coal," Mr Carr said.

In August 2005 the Northern Territory Labour government ceded responsibility for licensing of uranium mining in the State to the Federal Liberal government. Subject to meeting environmental standards and reaching agreements with indigenous landowners, there is now no political impediment to new uranium mines opening in the Northern Territory. Whether similar concessions will be negotiated with other state governments is a matter of conjecture, but it would provide them with a way out of the dilemma they find themselves in.

19 INTERPRETATION AND CONCLUSIONS

Laramide has obtained a commanding strategic position in the uranium exploration industry in Australia, by securing a series of contiguous mineral tenements that cover almost all of the known uranium deposits in the Westmoreland region. Previous exploration has identified a series of significant potentially economic deposits that require relatively modest investment to advance their status to an indicated resource. Subject to a change in state government policy in Queensland, Laramide could move quickly to a bankable feasibility study and, potentially, into production should this be warranted.

Laramide's proposed budget at Westmoreland for 2006 is summarised in Table 7 below:

**Table 7. Proposed exploration budget, Westmoreland**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost CAD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff and wages costs</td>
<td>1,152,000</td>
</tr>
<tr>
<td>Consultants</td>
<td>102,000</td>
</tr>
<tr>
<td>Field costs</td>
<td>529,600</td>
</tr>
<tr>
<td>Surface geology</td>
<td>296,000</td>
</tr>
<tr>
<td>Drilling costs</td>
<td>1,750,000</td>
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<tr>
<td>Environmental</td>
<td>320,000</td>
</tr>
<tr>
<td>Metallurgical</td>
<td>335,000</td>
</tr>
<tr>
<td>Pre-feasibility</td>
<td>180,000</td>
</tr>
<tr>
<td>Administration</td>
<td>132,000</td>
</tr>
<tr>
<td>Contingency</td>
<td>300,000</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>5,096,600</strong></td>
</tr>
</tbody>
</table>
It is commendable that direct drilling costs will comprise almost 35% of the total budget, while administration costs will absorb less than 3% of the budget. If achieved, this would be quite remarkable and a very efficient use of available resources.

20 RECOMMENDATIONS

It is recommended that an updated resource estimate using modern geostatistical techniques be undertaken as soon as the original data can be retrieved.

The budget breakdown appears reasonable, and the total adequate to achieve Laramide’s objective, which is to drill out the resource to a standard suitable for a feasibility study. The work programme should commence as soon the wet season has passed.

For and on behalf of Mining Associates Pty Ltd

David G Jones
Effective Date: 20th December 2005
ITEM 23. REFERENCES


GLOSSARY OF TECHNICAL TERMS

This glossary comprises a general list of common technical terms that are typically used by geologists. The list has been edited to conform in general to actual usage in the body of this report. However, the inclusion of a technical term in this glossary does not necessarily mean that it appears in the body of this report, and no imputation should be drawn. Investors should refer to more comprehensive dictionaries of geology in printed form or available in the internet for a complete glossary.

**aeromagnetic survey** Systematic measurement and collection, from an aircraft, of the earth’s magnetic field at regular intervals.

**agglomerate** A volcanic breccia formed by disruption of a solidified lava crust.

**alluvial deposit** A mineral deposit consisting of recent surface sediments laid down by water.

**alteration** The change in the mineral composition of a rock, commonly due to hydrothermal activity.

**alteration zone** A zone in which rock-forming minerals have been chemically changed.

**andesite** A fine-grained, dark-coloured extrusive rock.

**anomaly** A departure from the expected or normal background.

**auger sampling** A sampling technique utilizing a screw-like tool to obtain shallow samples.

**AusIMM** Australasian Institute of Mining and Metallurgy.

**autunite** A lemon-yellow to pale green, strongly radioactive hydrated calcium uranyl phosphate mineral, chemical formula Ca(UO₂)₂(PO₄)₂·11(H₂O).

**basalt** A dark-coloured igneous rock.

**base-metal** A non-precious metal, usually referring to copper, lead and zinc.

**basic** Used to describe an igneous rock having relatively low silica content.

**breccia** A rock composed of angular rock fragments.

**bulk sample** A large volume of soil or rock obtained for examination or analysis.

**Cambrian** A period of geological time approximately from 506 Ma to 544 Ma.

**carboniferous** A period of geological time approximately from 295 Ma to 355 Ma.

**carnotite** A bright yellow to greenish-yellow, radioactive hydrated uranium silicate mineral, chemical formula USiO₄.OH.

**chalcopyrite** A mineral of copper with the chemical formula CuFeS₂.

**clastic** A rock composed principally of fragments derived from pre-existing rocks.

**coffinite** A black to pale brown, radioactive hydrated uranium vanadate mineral, chemical formula K₂(UO₂)₂(VO₄)₂·3(H₂O).

**comagmatic** A set of igneous rocks that are regarded as being derived from a common parent magma.

**complex** An assemblage of rocks of various ages and origins intricately mixed together.

**conglomerate** A sedimentary rock formed by the cementing together of water-rounded pebbles, distinct from a breccia.

**costean** A trench excavated in the surface for the purpose of geological investigation.

**craton** A major part of the Earth’s crust that has been stable and little deformed for a long time.

**cretaceous** A period of geological time approximately from 65 Ma to 135 Ma.

**crosscut** A level driven across the main direction of underground mine workings.

**cut-off grade** The lowest or highest assay value that is included in a resource estimate.

**dacite** A fine-grained extrusive rock composed mainly of plagioclase, quartz and pyroxene or hornblende or both. It is the extrusive equivalent of granodiorite.

**Devonian** A period of geological time approximately from 355 Ma to 410 Ma.

**diamond drilling** Rotary drilling technique using diamond set or impregnated bits, to cut a solid, continuous core sample of the rock. The core sample is retrieved to the surface, in a core barrel, by a wire line.

**dilution** The proportion of material which is inadvertently included during mining operations, and which is generally of a significantly lower grade than the ore zone of interest.

**dip** The angle at which any planar feature is inclined from the horizontal.

**dolerite** An intrusive rock consisting mostly of dark mafic minerals.

**dyke** A tabular igneous intrusion that cuts across the bedding or other planar structures in the host rock.
Technical Report on Laramide Resources Ltd Mineral Tenements in Australia

**EM survey** Electromagnetic survey. A method of measuring the alternating magnetic fields associated with electrical currents artificially or naturally maintained in the subsurface. A technique often used to identify massive sulphide deposits.

**extrusive** Igneous rock that has been erupted on to the surface of the earth.

**feldspar** A group of abundant rock-forming minerals with the general formula \( \text{M}(\text{Al},\text{Si})_3\text{O}_8 \), where \( M \) can be K, Na, Ca, Ba, Rb, Sr or Fe.

**felsic** Light coloured rocks containing an abundance of feldspars and quartz.

**foliation** A planar arrangement of features in any type of rock.

**foreland basin** A basin formed within a continental setting, often adjacent to a mountain range.

**Frasnian** A stratigraphic name for a stage at the base of the European Upper Devonian (around 370-375 Ma).

**Ga** Billion years ago.

**gabbro** A coarse-grained intrusive igneous rock composed chiefly of plagioclase feldspar and pyroxene.

**GIS** Geographic Information System. A system devised to present spatial data in a series of compatible and interactive layers.

**Givetian** A stratigraphic name for a stage at the top of the European Middle Devonian (around 375-380 Ma).

**gossan** A ferruginous deposit remaining after the oxidation of the original sulphide minerals in a vein or ore zone.

**graben** An elongate, relatively depressed crustal unit or block that is bounded by faults on its long sides.

**granitoids** A general term to describe coarse-grained, felsic intrusive plutonic rocks, resembling granite.

**granodiorite** A coarse-grained granitic rock containing quartz, feldspar and biotite.

**gravity survey** Systematic measurement and collection of the earth’s gravitational field at the surface at regular intervals. Used to discern different rock types based on associated variations with differences in the distribution of densities, and hence rock types.

**greenschist** A schistose metamorphic rock which owes its green colour and schistosity to abundant chlorite and lesser epidote and/or actinolite.

**ignimbrite** The rock formed by the widespread deposition and consolidation of volcanic ash flows (=welded tuff).

**indicated resource** A mineral resource sampled by drill holes, underground openings or other sampling procedures at locations too widely spaced to ensure continuity but close enough to give a reasonable indication of continuity, and where geoscientific data is known with a reasonable level of reliability.

**inferred resource** A mineral resource inferred from drill holes, geoscientific evidence, underground openings or other sampling procedures where the gaps in the data are such that continuity cannot be predicted with confidence, and where geoscientific data may not be known with a reasonable level of reliability.

**intermediate** Igneous rocks whose composition is intermediate between felsic and mafic rocks.

**intracratonic** Within a large, stable mass of the earth’s crust.

**IP survey** Induced Polarization survey - an electrical geophysical survey technique measuring the magnetic field spontaneously induced in a volume of rock by the application of an electric current. This technique is often used to identify disseminated sulphide deposits.

**ironstone** A rock formed by cemented iron oxides.

**I-type granite** A granite that results from igneous magmatic processes.

**JORC** Joint Ore Reserves Committee - The Australasian Institute of Mining and Metallurgy. The guidelines of the JORC Code (1999) are observed in the calculation and reporting of ore resources and ore reserves.

**jordisite** An amorphous variety of molybdenite.

**Jurassic** A period of geological time approximately from 135 Ma to 203 Ma.

**LandSat imagery** Reflective light data of the earth’s surface collected by the LandSat satellite and commonly processed to enhance particular features. Includes the visible and invisible light spectrums.

**lithic tuff** A tuff containing fragments of previously formed non-pyroclastic rocks.

**Ma** Million years ago.

**mafic** A dark-coloured rock composed dominantly of magnesium, iron and calcium-rich rock-forming silicates, and for rocks in which these minerals are abundant.

**magma** Naturally occurring molten rock, generated within the earth.
magnetic anomalies Zones where the magnitude and orientation of the earth’s magnetic field differs from adjacent areas.
magnetic survey Systematic collection of readings of the earth’s magnetic field. The data are collected on the surface or from aircraft.
mantle The zone in the earth between the crust and the core.
massive sulphides Rock containing abundant sulphides that constitutes close to 100% of the rock mass.
Mesoproterozoic An era of geological time approximately from 1000 Ma to 1600 Ma.
mesothermal Mineral deposits formed (precipitated) at moderate temperatures.
Mesozoic An era of geological time approximately from 65 Ma to 248 Ma.
metamorphism The mineral, chemical and structural adjustment of solid rocks to new physical and chemical conditions that differ from those under which the rocks originated.
meteoric water Water derived from the earth’s atmosphere.
molybdenite The main ore of molybdenum; a lead-grey hexagonal mineral with composition MoS₂.
monzogranite A granular plutonic rock with a composition between monzonite and granite.
nappe A sheet-like block of rock that has moved predominantly horizontally.
Neoproterozoic An era of geological time approximately from 544 Ma to 1000 Ma.
Ordovician An era of geological time approximately from 435 Ma to 500 Ma.
oxide Pertaining to weathered or oxidised rock.
Palaeoproterozoic An era of geological time approximately from 1600 Ma to 2500 Ma.
Palaeozoic An era of geological time approximately from 544 Ma to 248 Ma.
pelite A sediment or sedimentary rock composed of the finest detritus (clay or mud-sized particles).
penecontemporaneous Formed at almost the same time.
percussion A method of drilling where the rock is broken into small chips by a hammering action.
Permian An era of geological time approximately from 248 Ma to 295 Ma.
phenocryst One of the relatively large and conspicuous crystals in a porphyritic rock.
phylolite A metamorphosed rock, intermediate between slate and schist. Micaceous minerals impart a sheen to the cleavage surfaces, which are commonly wrinkled.
pitchblende A massive brown to black variety of uraninite.
plunge The attitude of a line in a plane which is used to define the orientation of fold hinges, mineralised zones and other structures.
porphyritic Descriptive of igneous rocks containing relatively large crystals set in a finer-grained groundmass.
ppb, ppm Parts per billion, parts per million (quantitative equivalent of g/t).
Proterozoic An era of geological time approximately from 544 Ma to 2500 Ma.
pyrite A common iron sulphide mineral with the chemical formula FeS₂.
quartz A common silica mineral with the chemical formula SiO₂.
RAB drilling Rotary Air Blast drilling - a method of rotary drilling in which sample is returned, using compressed air, to the surface in the annulus between drill-rod and the drill-hole. This is a relatively inexpensive but less accurate drilling technique than RC or diamond coring.
radiometric survey Systematic collection of radioactivity emitted by rocks at or near the earth’s surface; usually collected by helicopter or fixed wing aircraft.
RC drilling Reverse Circulation drilling - a method of rotary drilling in which the sample is returned to the surface, using compressed air, inside the inner-tube of the drill-rod. A more accurate drilling technique than simple percussion drilling, the RC technique minimises contamination.
refractory Descriptive of ore difficult to treat for recovery of valuable minerals.
rhyolite A volcanic rock composed chiefly of potassium feldspar and quartz.
rift basin A large fault-bound depression, in-filled with volcanic and/or sedimentary material.
schist Strongly foliated crystalline metamorphic rock. Elongate minerals tend to be aligned in parallel.
scintillometer An instrument that measures ionising radiation by counting the flashes of light produced in a fluorescent material by radioactive particles.
sericite A white, fine-grained mica, usually formed as an alteration product of various silicates in metamorphic rocks and the wall rocks of ore deposits.
shear zone A zone in which rocks have been deformed primarily in a ductile manner in response to applied stress.
sheetwash A widely distributed, thin blanket of sediment deposited in a broad, poorly defined drainage.
SHRIMP “Sensitive High-Resolution Ion Microprobe”, a very accurate method of determining the ages of rocks.
silicified The alteration or replacement of primary minerals by silica.
Silurian An era of geological time approximately from 410 Ma to 435 Ma.
skarn A thermally metamorphosed impure limestone.
slate Metamorphosed shale that can be split into slabs and thin plates.
soil sampling The collection of soil specimens for mineral analysis.
stockwork A network of (usually) quartz veinlets produced during pervasive brittle fracture.
stratabound Occurring within and parallel to the rock strata, but not necessarily deposited at the same time.
stratiform Occurring within and parallel to the rock strata, and deposited at the same time.
stream sampling The collection of stream sediments for mineral analysis.
strike The direction or bearing of a geological structure on a level surface, perpendicular to the direction of dip.
stringer A small, thin discontinuous or irregular veinlet.
subduction The process where one slab of the Earth’s crust descends beneath another.
syncline A basin-shaped fold.
syntectonic Occurring or forming at the same time as deformation and metamorphism.
t, tpa Metric tonne, tonnes per annum.
tectonics The processes that create the broad architecture of the surface of the earth.
tectonism A general term for all movement of the crust produced by tectonic processes.
Tertiary Applied to the first period of the Cainozoic era, 1.8Ma to 65Ma.
tholeiitic A term applied to mafic or ultramafic rocks composed predominantly of magnesium-rich feldspar and pyroxene minerals.
torbernite A bright green, strongly radioactive hydrated copper uranyl phosphate mineral, chemical formula Cu(UO$_2$)$_2$(PO$_4$)$_2$·11(H$_2$O). Popular with mineral collectors.
trench A long, narrow depression in the sea floor.
Triassic Applied to the first period of the Mesozoic era, 203Ma to 248Ma.
tuff General term for all consolidated volcanic rocks derived from volcanic explosions into the air.
ultramafic Igneous rocks consisting essentially of ferro-magnesium minerals with trace quartz and feldspar.
uraninite The main ore of uranium, essentially UO$_2$.
uranophane A bright yellow radioactive hydrated calcium uranium silicate mineral, chemical formula Ca(UO$_2$)$_2$(SO$_4$)$_2$(OH)$_2$·5(H$_2$O).
vesicular Term for an igneous rock containing small cavities, caused by small bubbles being trapped during the solidification of the rock.
volcanoclastic A sedimentary clastic rock containing volcanic material.
CERTIFICATE

I, David Garred Jones, BSc., MSc., hereby certify that:

I am an independent Consulting Geologist and Professional Geoscientist residing at 2 The Nook, Underwood, Queensland 4119, Australia with my office at Level 5, 80 Albert Street, Brisbane, Queensland 4001, Australia (Telephone +61-7-3012 8499).

I graduated from the University of Adelaide, Adelaide, South Australia in 1964 with a Bachelor Degree in Science in the field of Geology, and received a further degree of Master of Science from the same University in 1976.

I have practised my profession as a Geologist for the past 41 years since graduation, in the field of Mineral Exploration. Since leaving my most recent corporate employer, Newcrest Mining Limited, after 22 years with that company, I have written a considerable number of Independent Geologist’s Reports for companies seeking stock exchange listing or significant additional funds for exploration.

I have carried out geological work in 52 countries and supervised projects in 25 countries including Australia, New Zealand, Papua New Guinea, the Solomon Islands, Vanuatu, Fiji, Indonesia, Thailand, Burma, Laos, Vietnam, China, the Kyrgyz Republic, Turkey, Greece, Bulgaria, Hungary, Romania, the Czech Republic, Slovakia, Scotland, Ireland, Canada, Brazil, and the United States.

My specific experience concerning the Laramide mineral tenements is related to my position as Senior Geologist with Carpentaria Exploration Pty Ltd, when I supervised mineral exploration projects in northwest Queensland and the Northern Territory including the McArthur River project and the MIM uranium leases at Redtree. Subsequently, while Chief Geologist of Newmont Australia Limited, I had oversight of the Kamarga project, a joint venture with CRA centred 150 km southeast of the Westmoreland area. I am thoroughly familiar with the geology and mineralisation in the Westmoreland area.

I was elected a Fellow of the Australasian Institute of Mining and Metallurgy (“The AusIMM) in 1973, having been a member since 1961. My status as a Fellow of The Aus IMM is current, and I am recognized by the Australian Securities and Investments Commission and the Australian Stock Exchange as a Qualified Person for the submission of Independent Geologist’s Reports.

I am also a Fellow of The Institute of Materials, Minerals, and Mining in London, and recognized as a Qualified Person to submit geological reports to various authorities throughout the European Union. In addition, I have been a Member of the Denver-based Society of Mining, Metallurgy and Exploration Inc. continuously for over 25 years, and a Member of the Geological Society of Australia since 1963.

I have based this report on a visit to the subject property on 18th October 2005 and a 15-day review of all available data concerning the project supplied by the present owner, Laramide Resources Ltd, and its affiliated companies.

For the purposes of this Technical Report I am a Qualified Person as defined in National Instrument 43-10. I have read the Policy and this report is prepared in compliance with its provisions.

I have no direct or indirect interest in the property which is the subject of this report. I do not hold, directly or indirectly, any shares in Laramide Resources Ltd.

I do not hold any direct interest in any mineral tenements in Queensland or the Northern Territory.

I will receive only normal consulting fees for the preparation of this report.

Dated at Brisbane this 20th day of December 2005.

Respectfully submitted
David Garred Jones
BSc., MSc., FAusIMM, FIOM3, MAIME, MGSA
Qualified Person
LETTER OF AUTHORISATION

The Directors, Laramide Resources Ltd
The Exchange Tower
130 King Street West
Suite 3680, PO Box 99
Toronto
Ontario M5X 1B1
Canada

Dear Sirs

With this letter is transmitted your signed copies of our report entitled: "TECHNICAL REPORT ON MINERAL EXPLORATION TENEMENTS IN AUSTRALIA HELD BY LARAMIDE RESOURCES LTD" dated 20th December 2005.

You are authorised to use this report for a Prospectus, Statement of Material facts or any other corporate purpose, subject to keeping excerpts from the report in their proper context.

Yours sincerely,

Mining Associates Pty Ltd

per:

David G Jones, FAusIMM
Qualified Person