J.Fabray and Associates
ABN: 696 758 696 16
14 Copeland Crescent
Nakara NT 0810

Phone/fax: 08 89454070
Mobile: 0427 182584
email: jfabray@bigpond .com.au

Report on the Geology and Exploration Potential of the Nabarlek Area.

For Cameco, Australia Pty Ltd

By

John Fabray MSc MAusIMM ASIA

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CONTENTS

FIGURES

1. INTRODUCTION

Cameco Australia Pty Ltd (Cameco) have recently been granted tenure over the Nabarlek Area which was previously covered by EL 2508 (see Figure 2). The author was responsible for planning and conducting exploration on EL 2508 from 1988 to 1994 for Queensland Mines Ltd. This report has been prepared to assist Cameco in their exploration activities in the Nabarlek Area.

2. EXPLORATION

Queensland Mines Ltd (QML) started exploring EL 2508 in 1988 soon after grant of the tenement. The exploration manager at the time, John Noakes, had designed a programme to completely explore all of the accessible portions of the exploration licence during the first two years of tenure. His philosophy was that QML would only get one chance to explore the area, so it had to be done thoroughly. To this end a contractor, Surtec, was brought in to grid, sample and survey all of the accessible parts of the EL in the first two field seasons. A detailed airborne radiometric/magnetic survey was also flown in the first year. Basically the entire EL, except for no-go zones and rugged sandstone escarpment country, was gridded at 200x100m, with detailed grids at 100x50 and 50x25 over the known radiometric anomalies and other areas of interest. Soil samples were taken at each grid peg for uranium and base metal analysis. Both in-ground and surface spectrometer readings were taken and track-etch cups were placed in the ground at the sample sites. Reconnaissance geological mapping was also carried out over the gridded area.

Detailed follow-up of the radiometric anomalies began in the first year with trenching and limited RC percussion drilling. This programme continued in the second year. Trenching was found to be ineffective in testing bedrock due to the deep tropical weathering profile, and the technique was abandoned at the end of the second year in favour of RAB drilling. The major success of the first two years of exploration was the discovery of primary uranium mineralisation hosted by Oenpelli Dolerite at anomaly N147.

In 1990 those parts of the EL covered by rugged sandstone escarpment were explored by ground traverses with rock chip sampling and track-etch cup placement. The work was reasonably effective given the fact that most of the escarpment country was inaccessible.

RAB drilling was undertaken on a number of surface anomalies and proved to be effective in obtaining bedrock samples in sand covered areas. In later years regional RAB traverses were done to map the bedrock beneath sand covered areas and to gain samples for bedrock geochemistry.

Highlights of the 1990 exploration programme included the discovery of a second zone of uranium mineralisation in dolerite at anomaly N147 and the detection of primary uranium mineralisation in dolerite at anomaly U42. Copper mineralisation was found at anomaly N7.

The 1991 programme continued the exploration of anomalies N147 and U42. However no economic ore zones were found in the dolerite. Further drilling at anomaly N84 intersected a zone of strong chloritic alteration in the basement with no uranium mineralisation. A Geotem survey was flown in this year and delineated some conductors, the most interesting of these was one which trended through anomaly S27.

Exploration in 1992 was concentrated on the SML boundary area (SMLB), N147, N84 and S27. Ground EM surveys were completed on the airborne EM anomalies from the 1991 Geotem survey. A blind zone of primary uranium mineralisation was discovered at SMLB. Weak uranium mineralisation was found at S27 during drilling of an EM anomaly. Further drilling at N147 and N84 failed to intersect any significant uranium mineralisation.

Further work at SMLB, N84 and S27 was done in 1993. Anomaly U65 was tested for the first time. Exploration was completed on anomalies N7, N23, U40 and U42. No further zones of uranium mineralisation were discovered at SMLB, however a significant fault zone was outlined but not tested. Work at anomaly N84 did not intersect any significant uranium mineralisation. Further drilling at anomaly S27 followed the EM anomaly to the east with little success. Initial work at anomaly U65 showed that the surface anomaly was due to dolerite mineralisation.

The 1994 exploration programme targeted the fault zone at SMLB and discovered significant narrow zones of uranium mineralisation (7.4m at 0.17%U). Further drilling was also carried out at anomaly U65 with little success. Exploration was carried out within SML94 for the first time since the early 1980’s. Drilling of the southern part of the Nabarlek Shear zone and parallel structures did not intersect any significant zones of uranium mineralisation.

In subsequent years exploration in the Nabarlek area was confined to anomaly N147, anomaly U65 and the SMLB prospect, which were covered by ERLs when EL2508 was relinquished.

3. GEOLOGY

The geology of the Nabarlek area was poorly known when exploration by QML began in 1988. Previous exploration by QML in the early 1970’s had concentrated on drilling out the Nabarlek deposit and there had been little work done on the regional geology. In 1988 and 1989 reconnaissance geological traverses were carried out over the Surtec grid and around the sandstone escarpment. It was found that the best outcrops occurred on escarpment faces close to the unconformity in many areas. There was little outcrop on the alluvial plains. It was next to impossible to build up a coherent picture of the regional geology of the area from the limited outcrops.

The BMR had mapped the area in 1972/73 and produced a geological sheet (Geology of the Nabarlek Region) in 1982. The basement rocks in the Nabarlek area were mapped as part of the BMR's Myra Falls Metamorphics. In the Mekin Valley, where outcrop is better, the BMR mapped similar rocks as belonging to the Lower Cahill Formation. The Lower Cahill Formation hosts the main uranium ore bodies in the Alligator Rivers Uranium Field (ARUF) to the west. Subsequent work by Uranerz and Afmeco led to the adoption of the stratigraphy as shown in Figure 3. As work progressed in the Nabarlek area it was found to be possible to identify some of the Cahill Formation units in the regional RAB traverses and prospect drilling. The Amphibolitic Unit and Kudjumarndi Quartzite proved to be particularly useful as marker horizons. The Upper and Lower Arkosic Units were difficult to differentiate in core and chips. It was generally observed that if graphite was found in a sequence then it was likely that it was from the Lower Arkosic Unit.

The Amphibolitic Unit was found to comprise both ortho and para amphibolites. Graphitic bands were commonly associated with the para amphibolites ('banded' units). The ortho amphibolites were thought to be intrusive dolerite and some chilled margins were observed in core. These intrusive amphibolites may be equivalents of the Zamu Dolerite. Elsewhere in the Pine Creek Inlier it has been noted that the Zamu Dolerite preferentially intrudes the Koolpin Formation (Stuart-smith et al, 1993). The current interpretation is that the Amphibolitic Unit hosted the Nabarlek Orebody.

The BMR mapped Kudjumarndi Quartzite in the eastern part of EL 2508. Subsequent work by QML cast some doubt on whether these poor outcrops were in fact Kudjumarndi Quartzite as there was no Calc-Silicate Unit found in the area.

4. ANOMALIES TESTED AND RESULTS OBTAINED.

Only a brief overview of the main anomalies, which were tested during the period 1988 to 1994, will be given here. Further details can be found in the interpretation reports. Some anomalies were tested by trenching in 1988/89 and these are not detailed here eg. Anomalies S3, S18 and S19.

"N" anomalies were discovered by QML in the 1970's. "S" anomalies were found by the Surtec ground surveys of 1989 and 1990. The "U" anomalies are those identified by the 1988 airborne survey. The locations of the anomalies are shown on Figure1.

- **N7 (U51)**

This is a prominent radon/radiometric anomaly which was identified in the early work during the 1970's. QML tested the anomaly by grid RAB drilling and RC drilling in 1990. The anomaly is due to uranium enrichment in laterite and may represent the remnants of mineralised dolerite. Primary weak copper mineralisation was found in graphitic schists and was not closed-off by the single diamond drillhole completed in 1993. The anomaly has been adequately tested for uranium mineralisation.

- **N23 (U89)**

This anomaly was identified by the 1970 airborne survey but was not followed-up until 1989. RAB drilling was done in the area in 1990 and showed that a bedrock uranium anomaly occurred adjacent to a downfaulted block of sandstone. RC and diamond drilling in 1991 and 1993 failed to identify any zones of uranium mineralisation. The uranium enrichment in the area appears to be related to the east-west fault line. The position of the anomaly is similar to the situation at Steven's anomaly to the east. The area of greatest interest lies to the east of anomaly N23 within a sacred site exclusion zone.

- **N24**

This anomaly has a strong ground and airborne radiometric response. It was tested by trenching, RAB and RC drilling in 1989 and 1991. No zones of primary uranium mineralisation were discovered. The uranium enrichment occurs in the weathering zone and appears to be related to adsorption of uranium on clays. The source of the uranium has not been found.

- **N30 (U53)**

This anomaly was discovered in 1975 by a regional track etch survey and confirmed on the ground in 1989. The anomaly was tested by RAB drilling in 1990. Weakly anomalous bedrock values (30 ppm U) were found beneath the surface anomaly. Microgranite was identified in the RAB holes but its provenance is unclear (Nabarlek or Nimbuwah?). The anomaly is interesting, as it is located close to the assumed contact of the Nimbuwah Complex.

- **N31**

This anomaly was tested by trenching and RC drilling in 1988 and 1989. Much of the data on this area were in the anomaly files of QML, which have not been returned to Cameco. From memory there was little uranium mineralisation in bedrock. It would certainly be worthwhile to checkout this anomaly in more detail.

- **N37**

This anomaly was tested by RAB drilling in 1990. It probably lies close to the same fault that anomaly N23 is associated with. The anomaly is due to surficial enrichment in laterite which covers sandstone. Drilling through the sandstone (6-12 m thick) showed that the basement was unmineralised.

- **N41**

Similar to anomaly N31 and in the same area. Tested by pitting and RC drilling in 1988 and 1989. The regolith described by Rutherford is close to this anomaly.

Many of the holes drilled amphibolite and the details would be in the QML anomaly files. Probably not as interesting as N31 but worth another look.

- **N84**

Work on this anomaly began in 1989 with trenching and RC drilling. In subsequent years RAB, RC and diamond drilling was undertaken. The initial exploration was carried out on an airborne anomaly associated with an outcropping pyritic quartz-breccia. Weak primary uranium mineralisation was discovered in Oenpelli Dolerite to the north of the original anomaly. Subsequent drilling discovered a blind zone of strong chloritic alteration within the basement metamorphics to the northwest of the original anomaly. There has been no discovery of significant uranium mineralisation in the metamorphic sequence in this area. The origin of the strongly altered zone is problematic, as no major structure has been intersected which could explain it. It appears unlikely that it is related to a mineralising event.

- **N91**

This anomaly is similar to anomaly N84 with weakly anomalous radioactivity being associated with an outcropping quartz breccia. RC drilling was undertaken in 1989 but was unsuccessful. The quartz breccia disappears to the north of the Myra Falls-Nabarlek track.

- **N92**

This anomaly was tested by trenching in 1989, and by RAB drilling in 1990. Chloritic alteration in schist and dolerite was found with weakly anomalous uranium values which explained the anomaly.

- **N147**

A lot of work has been done in this area which is located about 1.5 km south east of the Nabarlek mine. The anomaly was discovered in 1970 and confirmed by airborne and ground surveys in 1988. Trenching was carried out in 1988 and the anomaly was found to be caused by uranium enrichment in laterite overlying Oenpelli dolerite. A RC drilling programme completed in 1989 intersected primary uranium mineralisation in the dolerite. Further drilling in 1989 and 1990 outlined two uneconomic pods of uranium mineralisation in the dolerite. The best intersection was 7.1m at 0.51% U.

The exploration emphasis at this prospect shifted in later years to exploring for Nabarlek-style uranium deposits within the basement sequence beneath the sandstone to the southeast of the dolerite-hosted mineralisation. No synthesis of this later work has been done.

- **S1 (Libby's anomaly)**

This anomaly was discovered by the ground surveys in 1989. Trenching and RC drilling were completed in 1989 and 1990. The anomalous radioactivity was caused by uranium enrichment in laterite.

- **S2**

Another anomaly discovered by the ground surveys in 1989. Tested by one RC drillhole in 1989 and found to be caused by thorium enrichment in the sandstone.

- **S6**

An airborne magnetic anomaly and weak surface anomaly which was tested by RAB drilling and one RC drillhole in 1991. It lies to the east of anomaly N147. The anomaly is related to weak uranium mineralisation in dolerite that has intruded the sandstone.

- **S13**

Three RC/diamond drillholes were completed in this area in 1994. The holes were designed to test the Khyber Pass structure close to Nabarlek. The fault was intersected but proved to be barren. Zones of strong chloritic alteration were found in the basement but did not contain any uranium mineralisation.

- **S22**

This is a laterite anomaly which was tested by RAB drilling in 1991. The anomalous uranium may have originated from weak uranium mineralisation in the underlying dolerite.

- **S27**

This is a surface geochem and radiometric anomaly discovered during the 1989 Surtec survey. The sandstone in the area is ferruginous and faulted. Initial RC drilling in 1990 did not discover any significant uranium mineralisation. Airborne and ground EM surveys in 1991 and 1992 outlined a conductor that was tested by RC and diamond drilling in 1992 and 1993. Weak uranium mineralisation (best intercept - 3 m at 240 ppm U) occurred in banded amphibolite and associated graphitic schists close to the unconformity. The severe topography precluded further drilling of the prospective zone to the east.

- **U11**

This airborne anomaly was tested by RAB drilling in 1991. The anomaly is caused by uranium enrichment in laterite that covers dolerite. There may be some weak mineralisation in the dolerite.

- **U15 & U19**

These weak airborne anomalies were tested by RAB drilling in 1991. No anomalous uranium values were found in the drillholes. The anomalies are probably related to surface enrichment in lateritic soils.

- **U28**

Strong airborne radiometric anomalies (including U28) were found in a number of valleys in the southern part of the EL. These anomalies are caused by radium-enriched black soils. The radium has precipitated from spring waters originating from the sandstone. Anomaly U28 was tested by a RC/diamond drillhole in 1991. No uranium mineralisation was found. The basement consisted of amphibolite and schist.

- **U33**

This anomaly was tested by RAB drilling in 1990. No anomalous bedrock uranium values were found. The anomaly is probably caused by lateritic enrichment.

- **U34**

Two RC drillholes tested this anomaly in 1989. RAB drilling was undertaken in 1990. The prospect is characterised by radon, radiometric and soil uranium anomalism. Some anomalous bedrock uranium values (up to 105 ppm U) were intersected in the drillholes. Pyritic schists were encountered in the southern part of the anomaly. The surface anomalism appears to be related to lateritic enrichment.

- **U38, U39 and U41**

These anomalies are located at the margin of an Oenpelli dolerite intrusion which hosts primary uranium mineralisation. All of the anomalies were tested by RAB drilling in 1990 and 1991. No significant bedrock uranium values were found and the anomalies are thought to be due to lateritic enrichment.

- **U40**

This anomaly is located between anomalies U39 and U 41 close to the northern EL boundary. It was tested by RAB and RC/diamond drilling in 1991 and 1993. Weak uranium mineralisation was found in the dolerite and in the basement schists, and probably explains the surface anomaly. Anomalous uranium values were also found in the sandstone (up to 60 ppm U). A major shear zone was intersected in some of the drillholes.

- **U42**

This anomaly was discovered by the 1998 airborne survey and confirmed by the 1989 ground surveys. It was tested by RAB and RC drilling in 1990. The RAB drilling discovered mineralisation in dolerite (250 and 340 ppm U) which was followed up by RC drilling (best intersection-10m at 500 ppm U). Further RAB and

RC/diamond drilling in 1991 and 1993 failed to discover significant zones of uranium mineralisation in the dolerite or in the basement sequence. The narrow zones of uranium mineralisation intersected in the dolerite are not considered to be economic.

- **U58**

This is a lateritic anomaly which was identified by the 1998 airborne anomaly. It was RAB drilled in 1990 and no anomalous uranium values were found in bedrock. Granite was identified in some of the holes and may be similar to that found at anomaly N30 (see above). The source of the uranium in the laterite was not identified.

- **U59**

An airborne anomaly which was tested by RAB drilling in 1991. Strong chloritic alteration was found in two holes but no anomalous uranium values were intersected. The anomaly is probably caused by lateritic enrichment of uranium.

- **U65**

This anomaly was discovered during helicopter rim-flying in 1988. A prominent radon and ground radiometric anomaly was found during the 1989 ground surveys. RC drilling in 1992 showed that weak uranium mineralisation occurred in the Oenpelli dolerite and was the cause of the anomaly. Drilling completed in 1993 and 1994 targeted the metamorphic sequence below the sandstone to the north of the dolerite with little success. Later work on ERL 152 included helicopter drilling from the top of the sandstone escarpment also with little success.

- **U66**

This airborne anomaly was tested by RAB drilling in 1991. No anomalous bedrock uranium was found, some of the holes intersected chloritised schist.

- **South Gabo**

This surface anomaly was tested by trenching in 1989 and found to be caused by lateritic enrichment. RAB drilling done in 1990 targeted uranium mineralisation in the underlying dolerite, however no mineralisation was found.

- **SMLB**

This was a conceptual target to test the proposed northwestern extension of the Nabarlek Shear below sandstone cover. The initial drilling phase in 1992 consisted of a line of seven RC/diamond drillholes sited along the SML boundary. Exploration within the SML was not permitted at this stage. The initial drilling was successful and intersected a zone of weak primary uranium mineralisation in the basement close to the unconformity. Further drilling took place in 1993 and indicated the presence of a fault zone within the sandstone. A major drilling programme in 1994 targeted the prospective fault zone both within the SML and in the EL. Thin zones of ore-grade uranium mineralisation were intersected in the fault zone. Later work in ERL 150 targeted the extension of the fault into the basement sequence with little success. A good summary and appraisal of the work completed in this area was written by Brisset in 1999.

- **SML 94**

An agreement was reached in 1993 with the TOs and NLC for permission to explore within SML 94. This work consisted of drilling in 1994 at SMLB (see above) and on the southeastern extension of the Nabarlek Shear and parallel structures. Unfortunately no significant zones of uranium mineralisation were discovered.

5. DISCUSSION

In any major exploration programme extending over a number of years there is a tendency to become focussed on the major prospects to the detriment of other possibilities. This was certainly the case with exploration in the Nabarlek area, which was concentrated on five major prospects ie: N84, N147, SMLB, U42 and U65.

Following the discovery in 1989 of primary uranium mineralisation in the Oenpelli dolerite at N147, a considerable effort was mounted to test other areas that could host this style of mineralisation. This led to the discovery of uranium mineralisation at U42. In hindsight it could be argued that this exploration effort was wasted as no economic ore bodies were ever discovered in the Oenpelli dolerite. The rationale for further work in these areas was that the dolerite-hosted mineralisation at N147 occurred on the extension of the Nabarlek Shear zone only 1200m away from a major uranium orebody. There was always the possibility that uranium mineralisation in the dolerite could be used as a guide to a nearby ore body in the basement. Unfortunately this model has never been proved to be correct.

The southern part of the N147 prospect was the focus of considerable exploration effort. This area is underlain by about 180 metres of sandstone that is chloritically altered and brecciated over 10-20 metres at its base. The origin of the alteration and brecciation has been variously ascribed to fluids emanating from the dolerite, phreatomagmatism associated with the dolerite and/or mineralising fluids associated with basement uranium mineralisation. Drilling of the basement intersected some zones of shearing and strong chloritic alteration with minor uranium mineralisation similar to that found close to the Nabarlek orebody. No economic orezones have been found.

Anomaly N84 was another teaser where just enough encouragement was gained each year to continue exploration. The original quartz breccia target was found to contain sporadic weak uranium mineralisation that is not considered to be significant. The strong zone of chloritic alteration intersected to the west of the original prospect was never shown to be associated with uranium mineralisation.

The orientation of the zone was always an issue and the final drillhole completed on the prospect in 1994 was probably drilled too far to the north to test the zone.

The U65 area was put forward as being a Nabarlek look-alike with a basin of Oenpelli dolerite underlying the sandstone of the Spencer Massif. The presence of mineralisation in the dolerite was also considered to be a positive indication. Helicopter drilling from the top of the sandstone during 1997 to 1999 (within ERL152) showed that there was no uranium mineralisation in the basement beneath the sandstone and above the dolerite.

The SMLB prospect was an exploration success with the discovery of blind uranium mineralisation beneath sandstone cover. The drilling completed to date has failed to outline an economic orebody. The prospective Boundary Fault has been tested at a nominal 100 metre spacing and although some high-grade intersections were found no coherent ore zone was delineated. A zone of pyritic mineralisation occurs in the basement on the up-thrown side of the fault. It is not known whether this zone has had a bearing on the reduction and concentration of uranium mineralisation.

There was a view amongst some in AFMEX (Bruneton, 1996) and the French Academic Community (Cuney) that the Nabarlek and Tin Camp Creek Granites were important in the genesis of uranium mineralisation in the Nabarlek area. This view envisaged a granite-related phase of mineralisation (vein-style) prior to the deposition of the sandstone. These uranium deposits would have been subsequently remobilised after the intrusion of the dolerite by oxidising fluids circulating in the sandstone sequence. This theory may also explain the presence of remobilised thorium mineralisation at Caramal. Any mineralisation related to the granites would probably occur in close proximity to them. It should be noted that Nabarlek granite was intersected about 400 metres below the Nabarlek orebody, and if the dolerite was removed then the granite would have been only 200 metres below the orebody. The possible continuation of the orezone below the dolerite was a QML target but it was never tested.

As has been noted above the geology of the Nabarlek area is poorly known due to the lack of outcrop and paucity of marker horizons. The stratigraphy proposed by Uranerz and Afmeco (Figure 3) has been used in the Nabarlek area with some success. The Amphibolitic Unit has been recognised in the SW Window Area (N31, N41 and N84), at S27 and U28, in the mine area, at SMLB and probably at S1. The unit is gently folded to flat lying. It has not been definitely recognised in the eastern part of the area, although amphibolites were found in RAB holes to the south of the granite (U66), to the north of U41 and south of N7 at U59. As noted above (Geology) part of the Amphibolite Unit is definitely of intrusive origin and may be correlated with the Zamu Dolerite. Normally the Amphibolitic Unit contains a banded member (para amphibolite) and zones of graphitic schist. Amphibolites also occur in other parts of the succession and are predominantly of intrusive origin.

The Upper and Lower Arkosic Units are similar in composition and it can be very difficult to tell them apart. The Lower Arkosic Unit can contain graphitic horizons and this differentiates it from the Upper unit.

The lowermost part of the sequence has only been recognised in drillcore at anomaly U65. Kudjumarndi Quartzite and the Calc-silicate Unit were intersected in a number of drillholes. No uranium mineralisation was found in the Calc-silicate unit.

Both the BMR and NTGS (Ferenczi and Sweet, 2004) correlate the Cahill Formation with the Masson Formation of the Namoona Group. Some geologists have suggested that the Masson Formation is equivalent to the Whites Formation of the Mount Partridge Group (Nicholson et al, 1994). The Whites Formation hosts base metal and uranium mineralisation in the Rum Jungle area. This would seem to be a logical correlation. The Whites Formation is underlain by the Coomalie Dolomite that could be represented in the ARUF by the dolomites at the base of the Cahill Formation. The basal Crater Formation at Rum Jungle is perhaps equivalent to the Kudjumarndi Quartzite.

The author has recently been working at Rum Jungle and has been impressed by the amount of carbonaceous material and sulphide mineralisation in the Whites Formation. The Cahill Formation as mapped in the Nabarlek Area is singularly lacking in carbonaceous (graphite) material when compared to this unit. Is the currently accepted correlation correct or is the Cahill Formation as currently mapped in the Nabarlek area in fact much higher in the sequence? If the Kudjumarndi Quartzite is correlated with the Acacia Gap Quartzite/ Mundogie Sandstone then the Cahill Formation could be the equivalent of the Wildman Siltstone or Koolpin Formation. As noted previously the Zamu Dolerite commonly intrudes the Koolpin Formation in the Pine Creek Inlier and may be represented by the Amphibolitic Unit in this area.

There has been some conjecture (Fabray, 2003) that there is a "sequence *of graphitic and sulphide-rich meta-sediments and calcsilicate rocks which appear to lie stratigraphically beneath the Kudjumarndi Quartzite. Similar rocks are known from the Two Rocks area and this sequence has been called the Two Rocks unit.*" These rocks could be correlatable with the Whites Formation and occur in the Mekin Valley. They have not been identified in the Nabarlek area.

Over 40% of the Nabarlek area is covered by Kombolgie sandstone. Limited exploration has been conducted over these sandstone-covered areas due to the difficult terrain and exclusion zones. Drilling through the sandstone has been done at U28, S27, SMLB, and the area to the northwest of SMLB and U65 with little success.

The sandstone massif to the west of Nabarlek is not considered to be prospective. Drilling on EL3419 (Kunanj) by AFMEX found that the sandstone was thick and unaltered, and was underlain by possible Upper Arkosic Unit rocks. The sandstone block to the northwest of Nabarlek was tested by drilling in 2002, however the results were not encouraging. The Spencer Range to the south of

Nabarlek has been tested at S27 and U28 with some success. The Khyber Pass valley is characterised by radon anomalies and there are a number radon springs originating from the sandstone block on the east side of the valley. This block is considered to be prospective, although it may be underlain by granite that outcrops to the north of the block. The eastern portion of the Spencer Massif to the west of U65 has had little work done on it. There is some evidence of radon anomalism at anomaly Q7.

The sandstone block, which lies to the northeast of Nabarlek and north of the granite, has had no systematic work done on it. It has some prospectivity given its proximity to the granite and its location between a number of known zones of mineralisation.

The far eastern block of sandstone has had no work done on it but is probably underlain by Nimbuwah Complex.

6. CONCLUSIONS

The following conclusions are made:

- The ground exploration conducted by QML in the period 1988 to 1994 has adequately explored the accessible parts of the Nabarlek area.
- The data set acquired by QML from the Surtec and airborne surveys in 1988/89 should provide a comprehensive foundation for future exploration in the area.
- It seems very unlikely that any outcropping uranium deposit has been missed by the exploration completed to date.
- The major anomalies explored by QML ie: N84, N147, SMLB, U42 and U65, have been comprehensively tested.
- Anomalies N84, U42 and U65 have been explored in enough detail to significantly reduce the chances of discovering a uranium orebody. The chloritic alteration zone at N84 has not been closed off to the north, however there is no evidence that it would contain a uranium orebody if it did extend in that direction.
- There is still some scope for further exploration at anomaly N147 and at SMLB. However the exploration completed to date has not discovered economic uranium orezones in either area.
- There are a number of minor anomalies that require further work, however these are considered to be of low priority.
- The sandstone-covered parts of the Nabarlek area have not been explored in as much detail as the accessible portions of the area.

- The Spencer Range massif to the south of Nabarlek is considered to be the most prospective of the sandstone-covered areas. The radon anomalies in this area may be caused by underlying Nabarlek Granite.

- The sandstone-covered area to the northeast of Nabarlek and north of the granite has been poorly explored and has a moderate prospectivity.

- The lithostratigraphy developed by Uranerz and Afmeco appears to fit with the geology outlined by QML in the Nabarlek area. The position of this lithostratigraphy within the overall stratigraphic column of the Pine Creek Inlier is uncertain.

- The Nabarlek and Tin Creek granites may have played a role in the development of uranium mineralisation in the area.

- The uranium mineralisation in the Oenpelli dolerite does not appear to be a guide to the presence of ore zones in the adjacent basement.

- There have been no economic ore zones found in the Oenpelli dolerite in the Nabarlek area.

7. RECOMMENDATIONS

The following recommendations are made:

- The data set acquired by QML in 1988/89 should be reappraised to identify any subtle anomalies that may have been missed during the original assessment.

- Further assessment of anomalies N147 and SMLB is required.

- No further work is recommended for anomalies N84, U42 and U65.

- The following minor anomalies require further assessment: N24, N30, N31, N41, S27, U34, U40, U58 and U66.

- The Spencer Massif, south of Nabarlek, requires further exploration. It is recommended that the sandstone block exhibiting anomalous radon values should be tested by drilling.

- The sandstone-covered area to the northeast of Nabarlek and north of the granite requires further exploration.

- Research should be carried out on the lithostratigraphy of the Nabarlek area and where it fits into the overall stratigraphy of the Pine Creek Inlier.

- Some work is required on the role of the Nabarlek granite in the genesis of uranium deposits in the area.

- Further exploration of Oenpelli dolerite-hosted uranium mineralisation is not recommended.

John Fabray MSc MAusIMM 12 October, 2006

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