ANNUAL REPORT
YEAR ENDING 12 MAY 1999
EXPLORATION LICENCE 734

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PNC EXPLORATION (AUSTRALIA) PTY LTD
SUMMARY

This report describes exploration work undertaken within Exploration Licence 734 during the 1998 field season. The tenement is located in north western Arnhem Land and was granted in May 1996.

Exploration was carried out by PNC Exploration (Australia) Pty Ltd on behalf of the Nadjinem Joint Venture partners PNC Exploration (Australia) Pty Ltd, Cameco Australia Pty Ltd, and the Nadjinem Aboriginal Corporation.

The primary exploration target is unconformity related vein type uranium deposits similar to the nearby Ranger, Nabarlek and Koongarra deposits.

Exploration work undertaken during 1998 included geological mapping, stream sediment sampling (18), auger sampling (350) and soil sampling (223), ground magnetics (12.9 line kilometres), and RAB drilling (153 holes: 3224 metres). Specific prospects investigated were Fishtail, NIM6, and Dreadnought.

The most significant results were confirmation of prospective pelitic lithologies and further definition on the extent of alteration associated with the Fishtail uranium prospect located in 1997.

Further exploration is required to test the extensive zones of pelitic schists.

There has been no significant environmental impact with vigorous regrowth during the wet season of disturbed areas such as RAB access tracks and core drillhole pads.
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1.0 INTRODUCTION

This report details exploration work completed within Exploration Licence 734 ("EL734") during the third year of tenure (12 months ending 12 May 1999). The tenement was explored concurrently with two adjoining tenements, ELs 5890 and 5891. Exploration commenced in mid May and was completed by early October.

Exploration is subject to the terms of consent documentation dated 1 March 1996 agreed with the Northern Land Council in accordance with the Aboriginal Land Rights (Northern Territory) Act. As required by the agreement the Work Program was cleared at a meeting of the Liaison Committee held on 16 April 1998.

The Work Program was carried out by PNC Exploration (Australia ) Pty Ltd ("PNC") as operator for the Nadjinem Joint Venture, a joint venture between the Arnhem Land West Joint Venture partners, PNC and Cameco Australia Pty Ltd, and the Nadjinem Aboriginal Corporation.

1.1 LOCATION AND ACCESS

EL734 is located in western Arnhem Land and is wholly within Aboriginal land immediately to the north of the now rehabilitated Nabarlek mine (Figure 1). The Oenpelli-Maningrida road provides good access to the southern part of EL734.
1.2 TENURE

EL734 covers an area of 886 square kilometres of which 62 square kilometres has been designated restricted zones following a site survey undertaken by the Northern Land Council. Tenure was granted on 13 May 1996 for a period of six years.

1.3 PERSONNEL

Field work was undertaken by the following PNC geologists: P Melville, L Sawyer, D Follington, and E Sasao. Others working in the field were C Fenton (senior field technician), M Tracey (cook), L Walker (field assistant) and R Duggan (technician). Four local Aboriginal owners, G Wurrkgidj, L Lamilami, C Nawindal and R Managku were also employed as field assistants.

Contractors and consultants used were:

i. Chemnorth/Assaycorp, Darwin for chemical assay;
ii. Pontiflex and Associates, Adelaide, for petrography;
iii. Dr D Emerson of Systems Exploration (NSW) P/L for petrophysical studies; and
iv. Gaden Drilling, Batchelor, to undertake core and RAB drilling.

1.4 PHYSIOGRAPHY

Some remnant sandstone escarpment is present along the southern boundary of EL734, this area is excluded from exploration. The remainder of the tenement consists dominantly of gently undulating sandy plains, generally underlain by a ferruginous duricrust. Erosion of this duricrust in the western part has led to the development of a breakaway along the erosional boundary. Thin remnants of lateritised Cretaceous sediments form tablelands in the eastern part of the tenement. The main drainage system is that of Cooper Creek.

1.5 REGIONAL GEOLOGY

EL734 is located near the north east margin of the Pine Creek Geosyncline, which consists of Palaeoproterozoic sediments and volcanics onlapping Archaean basement highs of the Nanambu Complex and Nimbuwah Complex. The Palaeoproterozoic rocks were metamorphosed during a 1820 to 1870 Ma orogeny. The metamorphic grade varies from lower greenschist to granulite facies with the higher grade rocks (mostly amphibolite facies, minor granulite) restricted to the western Anghem Land area, including EL 5891. The metamorphic rocks are overlain by late Palaeoproterozoic sandstone of the Kombolgie Formation.

A more detailed description of the Pine Creek Geosyncline can be found in previous Annual Reports (Melville et al., 1998).

1.6 EXPLORATION TARGET

The main focus of exploration is the discovery of unconformity related vein type uranium deposits. The nearby uranium deposits of Ranger, Jabiluka, Koongarra and Nabarlek serve as models for this exploration. Nabarlek is particularly appropriate as a model in view of the similar geological setting and close geographical proximity. The presence of economic gold in
Jabiluka 2 and Koongarra plus the gold-platinum group elements +/- uranium mineralisation in a similar geological environment at Coronation Hill south-west of EL734, indicates additional potential for Au and PGE mineralisation. The area is also considered to hold potential for kimberlite or lamproite hosted diamond deposits.

1.7 PREVIOUS EXPLORATION

The area of EL734 was held previously as part of a larger tenement by Union Carbide Exploration Corporation, who undertook substantial exploration in 1970-1972 principally for uranium. They undertook a number of airborne surveys. Most of the area was flown with a total count scintillometer, the western part of EL734 was flown with a spectrometer/magnetometer. A photogeological interpretation was compiled by Hunting Geology and Geophysics over the entire site. Airborne anomalies were ground checked and a number were selected for gridding and more detailed work, consisting generally of ground radiometrics, geochemical sampling (stream sediment, pisoliths, rock chip or termite mounds), geological mapping and in some cases auger drilling. Core drilling was undertaken at the Tadpole Prospect. No mineralisation was intersected apart from one 5mm crystal of pitchblende in drillhole TP7.

Union Carbide’s exploration work was curtailed in early 1973 by a Federal Government imposed moratorium on further exploration pending a resolution of Aboriginal land rights.

PNC 1996 Field Season
Following grant of title in 1996 initial reconnaissance work, orientation geochemistry and airborne surveys were carried out (Mackie, 1997). Airborne surveys included fixed wing magnetics and spectrometrics at 200 metre line spacing.

PNC 1997 Field Season
The 1997 program consisted of follow up geochemistry and RAB drilling of anomalies determined from airborne survey analysis. Regional programs of RAB drilling, BLEG and stream sediment geochemistry with geological mapping were also conducted (Melville et al., 1998).

2.0 EXPLORATION WORK

Exploration focused on the delineation of prospective lithologies towards the base of the Myra Falls Metamorphics (Lower Pelite Zone) as well as evaluation of the Fishtail, NIM6 and Dreadnought anomalies located by previous work.

With very little sandstone cover in EL 734 direct exploration techniques have been employed, particularly airborne and ground spectrometrics, airborne magnetics, and follow up RAB drilling.

The application of various forms of geochemical sampling has proven useful in this environment. Ferricrete and pisoliths, stream sediment and rock material are all being utilised as sampling medium.
2.1 GEOLOGICAL MAPPING

On-going mapping was required as an extension to the regional outcrop search and airborne interpretation of the 1996 - 1997 field seasons. Geological observations were made in conjunction with the RAB drilling and stream sediment sampling programs. Creek traverses were conducted to locate any additional outcrops in the area of Fishtail. In addition, outcrops recorded by both AGSO and Union Carbide which had not been located in the previous year’s investigations, were followed-up and added to the data base.

A revised interpretative tectonostratigraphic map (Plan 1) has been produced which incorporates current field-based outcrop observations and RAB drilling.

Grid work consisted of marking out RAB traverses by differential GPS on a 1km x 400m basis. Additional gridding was done at Dreadnought on a 200m x 100m spacing.

2.2 GEOCHEMICAL SAMPLING

Stream sediment and auger geochemical sampling was conducted to aid in regional assessment. Locations are given in Plan 1.

Stream Sediment
A set of 18 stream sediment samples was collected regionally, covering the Nimbuwah Complex area of north east EL734 (Plan 1). The samples consisted of 50g to 100g of -80# sieved sediment and were analysed for Au, As, Ce, Co, Cu, Fe, Mg, Mo, Ni, Pb, Th, total U, labile U, Y, Zn by ICP-MS.

![Auger Sampling Locations](image-url)
Auger

A power auger was used to obtain ferricrete / pisolith samples up to one metre below surface, using the same procedure as outlined in the 1996 Annual Report (Mackie, 1996). Sampling was conducted over both Fishtail and Dreadnought. A total of 350 samples was collected (Plan 1). Plan 2 shows the auger sample locations over the Fishtail area in detail. Elements analysed for included Au, Al, As, Ba, Ca, Ce, Co, Cu, K, Li, Mn, Mo, Na, Ni, P, Pb, Rb, Sr, Th, Ti, U, Y, Zn and Zr by ICP-MS and Fe, Mg by ICP-OES.

Coincident with sampling the ferricrete / pisolith medium, separate samples of the fine (<1.6mm) fraction were collected for selected traverses (Figure 2) totalling 223 samples. This was done to investigate the relationship between fines and ferruginous materials for alteration / anomaly delineation.

2.3 RAB DRILLING

RAB traverse lines were conducted to confirm the interpreted tectonostratigraphy of the Myra Falls Metamorphics and specifically to identify equivalents of the Lower Cahill Formations in the Fishtail region (Plan 1). Drilling was mainly conducted on east west lines at one kilometre spaced lines and 400 metre site spacings covering the lithological succession from north to south. Additional regional RAB drilling traverses were conducted with one kilometre spaced drill holes.

Specific traverses were completed at the following locations:
- NIM6 anomaly, 1km east of Cobourg Road
- Fishtail regional traverses
- Maningrida Road, Nimbuwah Rock to tenement boundary

RAB drilling traverses comprised 153 holes for a total of 3224 metres, all RAB holes were located by differential GPS.

Both the top and bottom of each hole were sampled for geochemical analysis. Selected holes from Fishtail lines were sampled in their entirety to obtain data on variation of geochemistry with depth. Elements analysed for were Au, Al, As, Ba, Ca, Ce, Co, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Rb, Sr, Th, Ti, U, Y, Zn, Zr by ICP-MS on a total of 257 samples.

GR256 spectrometer data were collected from drill cuttings, usually every two metres. Additional geochemical samples were collected where spectrometrics indicated a higher than background response.

Each two metre interval was logged and representative samples placed into storage trays for future reference. PIMA clay determinations were conducted on the two metre intervals for selected holes held in storage trays. In addition samples from the bottom of each hole were collected for PIMA clay determination. A total of 661 PIMA spectra readings of RAB cuttings were obtained.
2.4 PETROLOGY

Five (5) RAB chip samples were collected from specific holes at NIM6 airborne anomaly and forwarded to Pontifex & Associates for thin sectioning and petrographic description.

2.5 MAGNETIC SURVEYS

Magnetometer surveys were conducted at Fishtail (Figure 3) on 10 metre north-south, 100 metre east-west spaced grid. A total of 12.9 line kilometres was surveyed.

The Fishtail survey was conducted over the known anomaly utilising the 1997 Fishtail grid and extended to delineate the north bounding dolerite.

![Ground Magnetic Survey Area](image)

**Figure 3**

2.6 DC RESISTIVITY SOUNDINGS

DC resistivity soundings were conducted to help define the postulated Cretaceous palaeochannel immediately south of Fishtail. A total of 9 soundings were conducted (Figure 4).

2.7 XRD

No samples were collected for XRD analysis as part of prospect evaluation. However 5 samples were taken from DDH252 (1997) for XRD work by Tono Geoscience Centre.
3.0 EXPLORATION RESULTS

3.1 GEOLOGICAL MAPPING

Distribution of tectonostratigraphic subdivisions for the Nimbuwah Complex and Myra Falls Metamorphics have been refined by this year's program (Plan 1). The principal diagnostic features as outlined in the 1997 Annual Report (Melville et al, 1998) remain unchanged.

Fishtail
RAB drilling in association with creek traverse mapping has provided substantial geological data, however correlation on a more regional scale still remains problematical. Saprock or weathered bedrock locations corresponding to the lower metasedimentary unit are as follows:

- 312700mE / 8654830mN - foliated coarse grained white quartzo-feldspathic rock, foliated greenish finer grained mica schist, foliations strike north west and dip east;
- 312650mE / 8655390mN - medium to coarse grained light grey to white quartzo-feldspathic rock interlayered with reddish clays, weak foliation;
- 311890mE / 8657760mN - light coloured fine to medium grained quartz-feldspar-mica rocks, foliation striking 330° and dipping moderately east;
- 311078mE / 8658210mN - very fine grained light to red brown micaceous / schistose quartz-feldspar gneiss, striking 010°, dipping 40° east, fresh float downstream comprises a hard, grey, quartz-rich quartz-feldspar-biotite gneiss;
- 310368mE / 8658455mN - cover of thick ferricrete, pistachio green and cream clays;
- 315010mE / 8649412mN - highly weathered saprock, relict foliation, north-south strike, dipping 40° east;
- 316500mE / 8649680mN Pink/white/red-brown micaceous clays;
• 314400mE / 8650320mN Sub-cropping quartz vein;
• 316245mE / 8651000mN Light grey to cream medium to coarse grained micaceous quartz-feldspar gneiss, striking 315° and dipping east at 40°, several centimetre quartz vein striking at 300°, dip vertical;
• 312836mE / 8651090mN - quartzite (UCEX - Kudjumarndi Quartzite), poorly defined foliation dipping −30° north east, strongly fractured parallel to the strike of intense quartz veining; quartz veining strikes 310°.

3.2 GEOCHEMICAL SAMPLING

Stream Sediment
The regional -80 mesh sampling was generally unsuccessful in attempting to trace anomalous labile U and Pb (data file EL734_1998_StrmSed.xls). All samples were located within the basement Nimbuawah Complex in the north eastern portion of the tenement where high radiometric granites and/or gneisses crop out.

An anomalous gold value in the range 6 ppb to 16 ppb was noted to lie on the boundary with an intrusive dolerite (Figure 5)

![Stream Sediment Gold Assays](image)

Figure 5

A preliminary examination of the metals values indicates a higher metals concentration association with the Nimbuawah Complex and dolerite intrusions.
Auger

Fishtail
Ferruginous and fines (soil) auger samples results indicate that no anomalies were located (data files EL734_1998_Auger.xls and EL734_1998_Soil.xls).

Auger assay data in conjunction with RAB assays, similarly to the Lower Pelite Zone in EL5890, suggest a geochemical variation due to lithology. This extends the ‘Lower Pelite Zone’ type lithologies into the Fishtail area.

3.3 RAB DRILLING

Fishtail

The Fishtail drilling was subdivided into prospect (grid-based) and regional programs. The latter included fairly detailed traversing north of the Fishtail grid and some limited work southwards between the Maningrida road and the escarpment. A total of 130 holes were drilled, numbered RAB415 to RAB463 and RAB475 to RAB556 (data file EL734_1998_RAB.xls).

The main aims of the program were to:
- locate any further indications of mineralisation associated with the dolerite and/or the structural magnetic feature;
- define in more detail the geology of the prospect particularly that part covered by sand and rubble;
- attempt to drill through the interpreted Cretaceous channel;
- map the region to the north where the geology was poorly known; and
- map the sand covered area between the Maningrida road and the Kombolgie escarpment.

The main results are as follows:
- no significant U results regionally (data file EL734_1998_RAB.xls);
- definition of the eastern extent of the Fishtail prospect dolerite and alteration (data files EL734_1998_RAB.xls, EL734_1998_Mag.xls and data set EL734_1998_RAB_PIMA);
- LPZ equivalents comprising garnetiferous metapelites were found to continue south eastwards (data file EL734_1998_RAB.xls) from the previously interpreted limit - the extension can now be traced continuously from north of Fishtail, wrapping around the eastern side of the prospect area and abutting the Nimbuwah complex, potentially providing additional prospective ground;
- dolerite is confirmed to be present adjacent to the escarpment intruding quartz-feldspar-biotite gneiss basement;
- thick sands and pebble deposits were found to infill the interpreted channel which bisects the Fishtail grid; and
- similarly, thick outwash sands adjacent to the escarpment caused some holes on that traverse to be abandoned.

A summary of intersected lithologies is set out below. Subdivision is based on grid and regional drilling. Traverses on the grid are described from south progressing north.
**RAB Traverse One, 49600N**
Quartz-feldspar-biotite-garnet gneiss was intersected in holes RAB418 to RAB421 and RAB427. Other holes which reached bedrock contained non-garnet-bearing gneiss. Hole RAB428 was sited within the boundaries of the interpreted Cretaceous channel and intersected 30 metres of micaceous sand and pebbles.

**RAB Traverse Two, 50200mN**
Six holes were initially drilled commencing from the western end with severe drilling difficulties being encountered. Up to 35 metres of loose pebbly sands and clay were intersected. Three holes however managed to reach bedrock (RAB431, RAB432 and RAB433), the latter being described as biotite-rich garnet gneiss. The remainder of the traverse was drilled at a later date from the eastern end commencing with RAB515. The majority of these holes intersected dark coloured biotite-rich garnet gneiss beneath a deep weathered zone. Possible dolerite occurs in hole RAB522 adjacent to the channel.

**RAB Traverse Three, 51000mN**
Variable drilling conditions with seven holes not penetrating to bedrock. Lithologies described as quartz-feldspar and quartz-feldspar-biotite gneiss. An unusual bluish-coloured clay was intersected in hole RAB511. Pima spectrometry identified this clay as a montmorillonite and nontronite mix.

**RAB Traverse Four, 51800mN**
Described throughout as mafic gneiss (biotite-rich quartz-feldspar gneiss) from the eastern end of the traverse extending to between holes RAB458 and RAB504. The latter on the short north-south line, intersected the Fishtail dolerite.

**RAB Traverse Five, 52600mN**
Western and eastern contacts of the Fishtail dolerite established on the line with enclosing quartz-feldspar-biotite gneiss.

**RAB Traverse Six, 53400mN**
The most northerly RAB line. Dark coloured quartz-feldspar-biotite gneiss. Garnet identified in one hole (RAB442). Some chlorite alteration noted in holes on the eastern side.

**North-South Traverse**
Dolerite intersected in the top two drill holes only (RAB503) confirming the northern contact. Elsewhere quartzo-feldspathic gneiss was intersected.

Regional drilling to the north and east of the grid established the contact of garnet-bearing gneissses with probable transitional gneisses (migmatites) bordering the Nimbuwah Complex. The latter were noted as being coarser grained with distinctive red and lesser green alteration. The former, that is the LPZ - type gneisses, tend to be finer grained, finely layered with greenish feldspar alteration. Saprolite outcrops mapped in the area comprised pale green clays and/or finely banded micaceous gneisses confirming the drill hole intersections.

Drilling south of the Maningrida Road comprised a loop of approximately seven kilometres which paralleled the sandstone escarpment. An offshoot traverse 3km long headed south-east
from the main loop. Twenty-five sites were planned, many holes failed to penetrate the thick sand. Dolerite was confirmed in several holes over a wide area.

NIM 6

Eleven holes were drilled in a north south grid pattern to cover the airborne anomaly. Bedrock was reached in most holes with quartz-feldspar-biotite gneisses being identified. Petrography confirms the identification (document file EL734_1998 Petrology.doc) with quartz-rich and biotite-rich lithologies being described. The suggestion is that the rocks are of metasedimentary origin.

Samples collected from the top and bottom of holes indicate anomalous uranium to be in both ferricrete and bedrock. Some holes are anomalous throughout whereas others are anomalous in either surficial material or bedrock.

The higher values are confined to holes RAB381 and RAB382 on the north western side of the grid and adjacent holes sited on the centre line, RAB383 and RAB384. These range between 12.5 ppm U and 46.7 ppm U. Other holes have uranium values in the 10-20 ppm range (data file EL734_1998 RAB.xls).

Maningrida Road

A regional traverse was conducted along the main road from Fishtail to the eastern boundary of the tenement. Eleven holes were drilled at approximately two kilometre intervals (RAB464 to RAB474).

Quartz-feldspar-biotite gneisses (Nimbuwah) were intersected mainly in the western most holes. Cretaceous sediments exist over much of the remaining ground with water-logged unconsolidated sands and clays providing the usual drilling problems. One hole, RAB465, managed to penetrate and reach quartz-feldspar-biotite gneiss bedrock.

Distinctive pink and green alteration was noted in the basement rocks. No anomalous elements are present.

3.4 PETROLOGY

Petrographic descriptions are contained in document file EL734_1998 Petrology.doc. Petrophysical studies confirmed that all rock types tend to be highly resistive quartzofeldspathic gneisses with thin (<1 metre) interlayered quartz rich schistose units. Data for this study are contained in data file EL734_1998 Petrology.xls.

3.5 MAGNETIC SURVEYS

Trial ground based magnetic field surveys over Fishtail were successful in locating the alteration zones as delineated from RAB drilling. The Fishtail survey defined the alteration zone as a distinct flat region of magnetic depletion as depicted in the 3D wire diagram (Figure 6) of the magnetic data presented below (data file EL734_1998 Mag.xls).
3.6 DC RESISTIVITY SOUNDINGS

Results conform well with drilling with the following conclusions:

- the Cretaceous sediments have a resistivity range of 1500 ohm-m in the upper parts (weathered) to 500 ohm-m in the lower parts;
- the gneissic basement underlying the DIGHEM feature has a resistivity of the order of one tenth that of the overlying Cretaceous.

3.7 XRD

Results are not yet available.

4.0 ENVIRONMENTAL IMPACT

Cultural impact

Site surveys were conducted by an NLC contracted archaeologist on and in the vicinity of all proposed drill sites within the three tenements. The archaeologist was accompanied by
traditional owners Wirrdup Nabulwad. The surveys were completed to the satisfaction of the archaeologist however not all sites/traverses were inspected.

All east-west traverses adjacent to and within the gridded area of Fishtail were surveyed. Only one site near RAB location 312000 / 8653400 was declared restricted. This is an area of quartz outcrop and is considered a probable stone artefact quarry and a 50 metre restricted zone surrounding the outcrop was implemented.

The more regional traverses to the north and south of Fishtail were not investigated due to time limitations. The archaeologist was satisfied that a representative area within the region had been inspected. From which it was concluded that there would be little or no sites of significance that would be disturbed.

All RAB locations inspected on the Maningrida Road traverse were found to have no sites of significance. No sites of significance were found at NIM6.

**Physical impact**

Several tracks were constructed to allow normal vehicular and drill rig access into the greater Fishtail prospect area, south of Maningrida Road and the regional RAB traverses north of Fishtail prospect. Only minimal disturbance to the topsoil was caused and destruction of mature trees was avoided. Traditional owners were informed prior to any track construction.

Most regional work was assisted by helicopter although four-wheel-drive vehicles were utilised where access allowed. In this case existing roads and tracks were used for the most part but some cross country travel was necessary.

All drill holes within the tenement were capped and filled after use. The only remaining evidence being the drill cuttings beside each RAB hole. Sampling of drainages and rock chip sampling have no lasting environmental impact.

The base camp for exploration activities was located outside the tenement.

There were no environmental incidents to report.

**5.0 REFERENCES**


