CENTRAL AUSTRALIAN PHOSPHATE LTD

ABN: 91 120 787 859

EL 26375 Chianina

ANNUAL and FINAL REPORT

16/04/2008 to 29/04/2013

Operator: CENTRAL AUSTRALIAN PHOSPHATE LTD

Author: Grant Davey
Date: 3 May 2013

Map Sheets

1:100,000 Alcoota 5752
1:100,000 Bushy Park 5652
1:100,000 Woodgreen 5753
1:100,000 Woolla 5653

1:250,000 Alcoota SF53-10
GDA94, Zone 53

Distribution:
Department of Resources
Central Australian Phosphate Ltd Sydney office
Table of Contents

SUMMARY ........................................................................................................................................... 3
INTRODUCTION ..................................................................................................................................... 5
LOCATION AND ACCESS ......................................................................................................................... 5
CLIMATE AND VEGETATION .................................................................................................................. 7
TOPOGRAPHY AND DRAINAGE ................................................................................................................. 7
LOGISTICS ............................................................................................................................................... 9
TENURE AND RELINQUISHMENT ........................................................................................................... 9
NATIVE TITLE AND SACRED SITES ......................................................................................................... 13
REGIONAL GEOLOGY ............................................................................................................................... 13
LOCAL GEOLOGY .................................................................................................................................... 15
  Pre-Cambrian-Proterozoic ....................................................................................................................... 15
  Proterozoic-Palaeozoic ............................................................................................................................. 17
  Cainozoic ................................................................................................................................................ 17
PREVIOUS EXPLORATION ....................................................................................................................... 21
  26BCR1978-0143 ................................................................................................................................... 21
  CR2004-0051 (Alcoota Project – Tenements EL9801-9806, EL9836, EL22916, EL22924) ................. 22
  CR2004-0689 (Alcoota Project – Tenements EL9801-9806, EL9836, EL22924) ............................... 22
  CR2005-0378 (Alcoota Project – Tenements EL9801, EL9802, EL-9805) ..................................... 22
  CR2005-0590 (Alcoota Project – Tenements EL9801-9806, EL9836, EL22924) ........................... 22
EXPLORATION BY NuPower .................................................................................................................. 23
  AIRBORNE ELECTROMAGNETIC (AEM) SURVEY ........................................................................... 23
  AIRBORNE REGIONAL GRAVITY SURVEY ....................................................................................... 23
  STATION BORE GROUND WATER SAMPLING ................................................................................... 23
REFERENCES ......................................................................................................................................... 25

List of Figures

Figure 1 Chianina (EL26375) Tenement and Pastoral Leases Location Plan .............................................. 6
Figure 2 – Chianina (EL26375) – prior to relinquishment Topography Plan ............................................... 8
Figure 3 – Chianina (EL26375), Granted Area ......................................................................................... 10
Figure 4 – Chianina (EL26375), Partial Reduction, 2010 ...................................................................... 11
Figure 5 – Chianina (EL26375), Relinquished Area 2011 ..................................................................... 12
Figure 6 – Geological Regions of the Northern Territory, Location of EL26375 ................................. 14
Figure 7 – Basement Geology of the Aileron Region ............................................................................ 16
Figure 8 – Geology of the Aileron Region ............................................................................................ 18
Figure 9 – Tertiary Basins (shown in yellow) in the Aileron area ............................................................ 20

List of Tables

Table 1 - Chianina (EL26375) Historic Exploration ................................................................................. 21
SUMMARY

Chianina, EL26375, was granted to NuPower on 16 April 2008.

There are no known mineral occurrences in the area, or within 20 km of the tenement.

The area covered by EL26375 was selected by NuPower Resources Limited because of the potential for secondary uranium mineralisation, derived by erosion of adjacent uraniferous basement granites and gneisses, in unconsolidated Tertiary basin sediments of the Ti-Tree Basin.

There is little primary uranium potential. Highly weathered basement rocks that outcrop sparsely in the eastern part of the area exhibit no airborne uranium radiometric anomalies and only subtle thorium anomalies.

The basement of the Aileron region comprises rocks of the Arunta Region, a complex basement inlier in central Australia that has undergone a prolonged history of sedimentation, magmatism, and tectonism extending from the Palaeoproterozoic to the Palaeozoic that is subdivided into three, largely fault bounded terranes with distinct geological histories; the Aileron, Warumpi and Irindina Provinces. The basement geology of Chianina area is assumed to comprise units of the Aileron Province that consists of greenschist to granulite facies metamorphic rocks with protolith ages in the range 1865-1710 Ma. It forms part of the North Australian Craton and is geologically continuous with the gold-bearing Tanami and Tennant Regions to the North.

Because of the high grade of metamorphism and the relative paucity of continuous outcrop across the Arunta Province, a reliable stratigraphy has not yet been constructed for the metasedimentary sequences. Instead, the Early-Mid Proterozoic metamorphosed rocks of the area have been subdivided by Stewart (1981) into three “Divisions”, intruded by granites, on the basis of “broad lithological correlations”, Division 1 being regarded as the oldest and Division 3 as the youngest. The rock units within each division may be chronostratigraphic correlates but there is no evidence yet to support this.

The Arunta Block is traversed by a series of WNE-NW trending faults that locally widen into extensive zones of shearing and retrogression comprising muscovite-quartz schist with extensive quartz veins and epidote-bearing rocks. There is evidence for these here in the regional airborne magnetic data.

Basement rocks of probable Division 1 group are limited to areas of highly weathered rocks in the eastern part of the tenement Pre-Cambrian rocks outcrop east of the tenement and include the Delny Gneiss comprising biotite-microcline-muscovite-quartz gneiss, biotite-muscovite schist, metapsammitic, amphibolite and minor calc-silicate gneiss and the Chiripee Gneiss of the Strangways Metamorphic complex consisting of migmatitic garnet-biotite-feldspar gneiss, amphibolite, calc-silicates and quartzite. These are intruded by Proterozoic gneissic biotite and hornblende granite of the Crooked Hole Granite and porphyritic biotite gneissic granite, biotite and hornblende adamellite, and garnet-bearing granite of the Woodgreen Granite Complex. To the west of Chianina outcrop includes Proterozoic undifferentiated granite, diorite and tonalite and Woolla Gneiss comprising quartz-biotite-feldspar gneiss, muscovite-biotite-quartz schist and garnet-biotite-quartz-feldspar gneiss.

Northeast of Chianina the Arunta Inlier is stratigraphically unconformably overlain by Neoproterozoic and early Palaeozoic sediments of the Georgina Basin and outliers may underlie Chianina. The stratigraphy if this basin comprises basal quartz sandstones, quartzites and conglomerates of the Grant Bluff Formation overlain by transitional marine/continental and glacial red and white sandstones and siltstones, quartzite, arkose, shale, conglomerate with basal tillites, boulder beds and ferruginous pebbly sandstones of the Central Mount Stuart Formation. These in turn are unconformably overlain by Cambrian and Ordovician sandstones, siltstones dolomite and chert of the Tomahawk Beds. The youngest rocks in the basin are of Devonian age and consist of cross-bedded sandstone, siltstone and conglomerate of the Dulcie Sandstone.

The southern NT forms a ‘basin and range’ province in which Proterozoic and Palaeozoic rocks form prominent ranges separated by broad valleys in which at least twenty major Cainozoic sedimentary basins have developed, of which the Ti Tree Basin underlies the western two thirds of the license area. The stratigraphy of these basins is generally poorly known due to a lack of outcrop, strong weathering overprints, the paucity of drillholes and a lack of attention paid to the ‘cover’ overlaying crystalline basement. Limited stratigraphic drilling by both the BMR and the NTGS during the 1960’s and 1970’s provides much of the regional stratigraphic information of the Cainozoic Basins.

During the late 1970’s and early 1980’s the Hale Basin southeast of Chianina was explored extensively for coal and sedimentary uranium and has therefore become the best known Cainozoic Basin in the NT and
although the succession is relatively thin it is considered to represent a generalised Tertiary stratigraphy for the region. Here a broad two-fold stratigraphic subdivision comprises a restricted, fluvial palaeochannel dominated Palaeogene succession (Hale Formation) overlain by a more widespread, dominantly lacustrine Neogene succession (Waite Formation). Although the Cainozoic stratigraphic units were initially defined in separate small and isolated Tertiary Basins, these units are now recognised as components of a much larger Tertiary palaeodrainage system, the extent and size of which has until now been vastly underappreciated.

Elsewhere historic and recent drilling results indicate that the basins may contain very thick sedimentary packages. The Cainozoic fill of the Burt Basin exceeds 200m and the Sixteen-Mile Basin contains at least 180m of sediment. Similarly, the Whitcherry Basin and Waite Basins are known to exceed 250m in thickness in some locations, whilst minor tributaries feeding the Ti-Tree Basin contain up to 140m of sediments. The maximum thickness of the Cainozoic sediments in the Ti-Tree Basin is not currently known as exploration drillholes to date by NuPower after drilling though a minimum of 320m of sediment south of Chianina, have locally failed to penetrate to basement and thicknesses of 400-500m of sediments are considered to be likely in the deeper portions of the basin.

Deposition of Cainozoic sediments was episodic and punctuated by hiatuses during which prolonged periods of weathering resulted in the formation of well-developed weathered profiles (palaeosols and duricrusts). Deep weathering was an ongoing process during the Tertiary but was enhanced at particular times during this time by the combination of periods of warm, humid climates, non-deposition and surface exposure. Three Palaeogene weathering events affecting the Arunta igneous and metamorphic basement rocks and the overlying Tertiary successions and two weathering events affecting the overlying Neogene successions have been recognised. Sediments of the Waite Formation comprising calcrete, silty sandstone and minor pebble and granule conglomerate and mudstone outcrop extensively in the centre of Chianina.

Overlying these sediments are unconsolidated Quaternary sediments including quartz sands, silts, red earths and claying and sandy soils that record a complex history of deposition, erosion and redeposition due to climate changes and gentle tilting. The formation of calcrites, particularly within drainage channels overlying the Waite Formation, was also widespread during the Quaternary.

NuPower carried out an airborne electromagnetic (AEM) survey in 2008 during the first year that covered the area, including the relinquishment block, as part of a larger survey of NuPower's tenements in the Aileron region, designed to explore for buried palaeochannels at the base of and within the Cainozoic sedimentary package as potential hosts for secondary uranium. A total of 1204.5 line kilometres was flown here at 1km line spacing at a nominal terrain clearance of 120m over the areas relinquished. Concurrently, groundwater from station water bores was sampled and assayed for a suite of major and trace elements the results of which were expected to assist with targeting potential sites of uranium accumulation within the palaeochannel systems.

The AEM survey results indicated that the technique was very successful, revealing that the Tertiary palaeodrainage system is far more extensive and better developed than previously thought. It indicates that the Ti-Tree Basin infills a deep structural feature developed in two NW-SE trending grabens immediately to the north of the Ti-Tree Fault and that part of these structures lies beneath the southern part of Chianina. The southern part is therefore considered prospective for secondary uranium mineralisation because reduced sediments, required for the precipitation of uranium from groundwater, are likely to be present here. NuPower also contributed to the NTGS Central Australia Gravity Survey (CAGS) over the Central Arunta region that included EL26375 to acquire higher quality data for regional basement interpretation.

There was no on-ground exploration work during Year 2.

There was no on-ground exploration during Year 3. Assay results from 9 groundwater samples collected in 2007 and 2008 were found to be erroneous due to laboratory problems. Samples were re-assayed and results reported.

There was no on-ground exploration during Year 4.

No work was done in Year 5 and the decision was made to relinquish the area because the company is now concentrating on phosphate exploration.
INTRODUCTION

Basement rocks of the Reynolds, Yalyirimb, Anmatjira and Strangways Ranges contain elevated background levels of uranium and thorium. As far back as 1972 it was recognised that whilst these uraniferous crystalline basement rocks may host primary deposits of uranium they also provide a potential source of uranium for secondary uranium mineralisation derived from weathering and dissolution of the uranium by meteoric groundwaters.

The products of the weathering and erosion of the crystalline basement throughout the Cainozoic have accumulated as thick sequences of unconsolidated material in flanking Cainozoic depocentres where they have the potential to host sedimentary uranium mineralisation.

Recognising this potential, NuPower applied for and was granted a number of exploration licenses, including Chianina (EL26375) that covers part of the Cainozoic Ti-Tree Basin.

Exploration completed on the tenement during the first year of tenure included 1204.5 line kilometres of airborne electromagnetic (AEM) surveys (as part of a larger survey in the Aileron Province), that included the areas relinquished, the collection of ground water samples from station water bores and the contribution to the NTGS helicopter-borne regional gravity survey (CAGS) over the central Arunta Region in order to obtain more detailed, 2km spaced data, over its Aileron Project tenements.

LOCATION AND ACCESS

Chianina tenement EL26375 is located approximately 125 kilometres north of Alice Springs within the Alcoota (5752), Bushy Park (5652), Woodgreen (5753) and Woolla (5653) 1:100,000 and Alcoota (SF53-10) 1:250,000 map sheets (Figure 1). The tenement occurs on vacant crown land and surrounds but excludes a small portion of Woodgreen Station (NT Portion 2673, PPL 972).

The Adelaide – Darwin Railway transects the tenement, whilst the Sandover highway passes through the south east corner of the tenement.

From Alice Springs, access to the tenement is gained by travelling approximately 70km north on the Stuart Highway, 27km east on the Plenty Highway then north 54km on the Sandover Highway into the south eastern corner of the tenement. A network of station roads and tracks linking the water bores provides access to the remainder of the tenement. It is also possible to access the tenement by travelling east from Ti Tree Roadhouse, past Woolla Downs homestead then south on station tracks and west on the Sandover Highway, again into the south eastern corner of the tenement.
Figure 1 Chianina (EL26375) Tenement and Pastoral Leases Location Plan
CLIMATE AND VEGETATION

The region has a semi-arid continental climate, characterised by long hot summers when temperatures regularly exceed 40°C, and short mild winters. Average annual rainfall for the Chianina region taken from the Territory Grape Farm Bureau of Meteorology weather station is 305.4mm, most of which falls in the November to February period. Average minimum and maximum temperatures in summer are 21.7°C and 37.6°C while the corresponding winter average temperatures are 4.9°C and 22.3°C.

The Chianina tenement occurs in the Burt Plain bioregion. Broad vegetation types within the Burt Plain bioregion include Eucalyptus low woodland with tussock grass understorey, Eucalyptus woodland with hummock grass understorey, Acacia woodland, hummock grassland and tussock grassland (Wilson et. al. 1991 as cited by Baker et al., 2005).

TOPOGRAPHY AND DRAINAGE

Chianina EL26375 is situated in an area where the landscape over the Ti-Tree Basin consists of a flat, featureless sand-plain that is mostly devoid of drainage. Elevations range from 536m to 575m ASL, (Figure 2).
Figure 2 - Chianina (EL26375 – prior to relinquishment) Topography Plan
LOGISTICS

Alice Springs (pop. 27,000) is serviced daily by jet aircraft from several Australian capital cities (Sydney, Adelaide, Perth and Darwin) and less regularly from Brisbane, Cairns and Broome. Because of its location mid-way between Adelaide and Darwin the town is also well serviced by road transport and interstate bus services.

The Adelaide – Darwin Railway transects EL26375, whilst the Sandover Highway passes through the south east corner. At its closest point, the Stuart Highway is 33km west of the tenement.

Service station and accommodation facilities are available at the small township of Ti-Tree where there is a medical centre, school and police station. The nearest station homestead is Woodgreen, approximately 6.5km east of the tenement.

The nearest medical facilities are located at Ti-Tree and Alice Springs.

TENURE AND RELINQUISHMENT

Chianina, which currently comprises 405 graticular blocks covering 1036 km² (Figure 3), was granted to NuPower Resources Ltd (ABN 91 120 787 859) on 16 April, 2008 for a period of 6 years.

An application for a partial waiver of reduction of 144 blocks was submitted on 8th April 2010, that was confirmed on 25th August 2010 reducing the area to 255 blocks, covering 654.18sqkm, (Figure 4).

A further application for a reduction of 175 blocks representing 68% of the tenement area was submitted on 9th March 2011 (Figure 5) This is the most recent relinquishment.

On 31 January 2013 the name of NuPower Resources Ltd was changed to Central Australian Phosphate Ltd.
Figure 3 - Chianina (EL26375), Granted Area
Figure 4 - Chianina (EL26375), Partial Reduction, 2010
Figure 5 - Chianina (EL26375), Relinquished Area 2011
NATIVE TITLE AND SACRED SITES

An inspection of the Register of Sacred Sites held by the Aboriginal Areas Protection Authority identified nine recorded sites in the southern part of the tenement in the vicinity of the rail corridor. Exploration activities are planned to avoid these areas.

There are no registered native title applications or determinations over any portion of the Chianina tenement.

There are no ILUA’s registered against the area of the tenement.

There is no Exploration Agreement in place between NuPower and the Central Land Council on behalf of the Traditional Owners.

REGIONAL GEOLOGY

Chianina is situated in the Aileron Province of the Arunta Region in the southern part of the Northern Territory (Figure 6) in parts of the eastern part of the Ti Tree Basin.

Deformed and metamorphosed Palaeoproterozoic orogenic rocks older than 1800 million years outcrop as major tectonic units surrounded by younger rocks and essentially form the recognisable and inferred basement to the North Australian Craton. These Palaeoproterozoic rocks form the Pine Creek Orogen, Tanami Region, northern Arunta Province, and Tennant, Murphy and Arnhem Inliers. They include remnants of Achaean rocks, which have been dated at 2500 million years.

To the south, the rocks of the North Australian Craton pass into the Central Australian Mobile Belts of the Proterozoic Orogens of the Arunta Region and Musgrave Block, consisting of granulate and amphibolite facies, metamorphosed sediments and mafic volcanics intruded by granitoids. In the southern Arunta Province, episodic igneous activity took place between 1880-1050 million years and deformation included a series of major tectonic events, including retrogressive metamorphism in the Proterozoic and Palaeozoic.

A system of major WNW-ENE trending and north-northeast dipping thrust and reverse faults and shear zones affects the Arunta Region and the southern margin of the Ti Tree Basin. The associated shear zones can be up to hundreds of meters in width and extend for several kilometres, and are thought to have formed during the 400-300 Ma Alice Springs Orogeny (Cartwright et al., 1999). A major fault, informally referred to as the Ti-Tree Fault, runs along the northern boundary of the Reynolds Range (and its continuation to the southeast) and forms part of this set of structures.

Cainozoic palaeodrainage systems are interpreted to be the remnants of the Mesozoic drainage system that once flowed into the Eromanga Basin in the southeast of the Northern Territory. Whilst the modern drainage flows north off the Reynolds Range, geological evidence strongly suggests that the Cainozoic palaeodrainage systems generally flowed towards the south and southeast. Evidence suggests a significant reactivation of structures created during Alice Springs Orogeny occurred during the early Tertiary and acted to deepen and create and rejuvenate the Cainozoic palaeodrainage systems. Southwards flowing palaeodrainage systems appear to have been dammed, diverted (generally to the east) and even reversed by this neotectonic event that also affected the MacDonnell Ranges to the south. This event is also interpreted to have been responsible for incision of meandering drainage systems through the MacDonnell (and other) Ranges. Similar drainage incision in response to early Tertiary neotectonism is also found in the Neoproterozoic Flinders Ranges (South Australia). In the Ti-Tree region, the creation of a minimum of 320m of structural relief (accommodation space) is indicated by the thickness of the preserved Cainozoic sedimentary package within the Ti-Tree Basin.
Figure 6 - Geological Regions of the Northern Territory, Location of EL26375
LOCAL GEOLOGY

Pre-Cambrian-Proterozoic

According to the web-site of the NTGS (December, 2004) basement rocks in the Aileron region comprise part of:

“... the Arunta Region, a complex basement inlier in central Australia that has undergone a prolonged history of sedimentation, magmatism and tectonism extending from the Palaeoproterozoic to the Palaeozoic. The Arunta Region can be subdivided into the three, largely fault bounded terranes with distinct geological histories: the Aileron, Warumpi and Irindina Provinces.

The Aileron Province comprises greenschist to granulite facies metamorphic rocks with protolith ages in the range 1865-1710 Ma. It forms part of the North Australian Craton and is geologically continuous with the gold-bearing Tanami and Tennant Regions to the north.

In contrast, the Warumpi Province comprises amphibolite to granulite facies rocks with protolith ages in the range 1690-1600 Ma, and is interpreted to be an exotic terrane that accreted to the southern margin of the North Australian Craton at 1640 Ma.

The Irindina Province in the Harts Range region comprises Neoproterozoic to Cambrian metasediments that formed in a major depocentre within the Centralian Superbasin and underwent high-grade metamorphism and deformation during Ordovician (480 - 450 Ma)

Chianina is underlain by basement rocks of the Aileron Province (Figure 7).

Because of the high grade of metamorphism and the relative paucity of continuous outcrop across the Arunta Province, a reliable stratigraphy has not yet been constructed for the metasedimentary sequences. Instead, the Early–Mid Proterozoic metamorphosed rocks of the area have been subdivided by Stewart (1981) into three “Divisions”, intruded by granites, on the basis of “broad lithological correlations”, Division 1 being regarded as the oldest and Division 3 as the youngest. The rock units within each division may be chronostratigraphic correlatives but there is no evidence yet to support this.

Pre-Cambrian rocks outcrop east of the tenement and include the Delny Gneiss comprising biotite-microcline-muscovite-quartz gneiss, biotite-muscovite schist, metapsammite, amphibolite and minor calc-silicate gneiss and the Chiripee Gneiss of the Strangways Metamorphic complex consisting of migmatitic garnet-biotite-feldspar gneiss, amphibolite, calc-silicates and quartzite. These are intruded by Proterozoic gneissic biotite and hornblende granite of the Crooked Hole Granite and porphyritic biotite gneissic granite, biotite and hornblende adamellite, and garnet-bearing granite of the Woodgreen Granite Complex.

To the west of Chianina outcrop includes Proterozoic undifferentiated granite, diorite and tonalite and Woolla Gneiss comprising quartz-biotite-feldspar gneiss, muscovite-biotite-quartz schist and garnet-biotite-quartz-feldspar gneiss.

Similar rocks are expected to form the basement of EL26375.
Figure 7 - Basement Geology of the Aileron Region
Proterozoic-Palaeozoic

Northeast of Chianina the Arunta Inlier is stratigraphically unconformably overlain by Neoproterozoic and early Palaeozoic sediments of the Georgina Basin and outliers may underlie Chianina. The stratigraphy of this basin comprises basal quartz sandstones, quartzites and conglomerates of the Grant Bluff Formation overlain by transitional marine/continental and glacial red and white sandstones and siltstones, quartzite, arkose, shale, conglomerate with basal tillites, boulder beds and ferruginous pebbly sandstones of the Central Mount Stuart Formation. These in turn are unconformably overlain by Cambrian and Ordovician sandstones, siltstones dolomite and chert of the Tomahawk Beds. The youngest rocks in the basin are of Devonian age and consist of cross-bedded sandstone, siltstone and conglomerate of the Dulcie Sandstone.

Cainozoic

Pre-Cambrian-Proterozoic basement rocks and Proterozoic-Palaeozoic basinal sediments in the Chianina license are largely covered by unconsolidated Cainozoic sediments derived by weathering of the surrounding basement terrains, (Figure 8).

The southern NT forms a ‘basin and range’ province with Proterozoic and Palaeozoic forming prominent mountain ranges separated by broad valleys. Cainozoic sedimentary basins are widespread and well-developed within these intervening topographic depressions with at least twenty major basins outlined by Senior et al., 1995.

The Chianina tenement lies in the southeastern part of the Ti-Tree Basin (Figure 9) that is known to be one of the best developed Cainozoic basin in the southern NT containing a sedimentary fill in excess of 300m thick, according to work carried out by NT Department of Water Resources/NRETA.

The stratigraphy of the intermontane Cainozoic basins of the southern NT region is generally poorly known. This can be attributed to a lack of outcrop and strong weathering overprints, paucity of drillholes and a lack of attention paid to the ‘cover’ overlying crystalline basement and knowledge of the distribution and extent of the Cainozoic has been largely gained through accidental intersections in water bores or in drillholes seeking mineralisation under cover.

Limited stratigraphic drilling undertaken in the southern NT region by both the BMR (now Geoscience Australia) and the NTGS during the late 1970’s and early 1980’s has provided the majority of the stratigraphic information on the Cainozoic succession. Senior et al. (1995) compiled a summary of the available information and defined a two-fold stratigraphic subdivision that broadly corresponds with the observed pattern of Cainozoic sedimentation elsewhere in southern Australia.

Broadly speaking the Cainozoic can be subdivided into a restricted, fluvial palaeochannel dominated Palaeogene succession (Hale Formation) and a more widespread, dominantly lacustrine Neogene succession (Waite Formation).

The Hale Basin was explored extensively for coal (lignite) and sedimentary uranium during the late 1970’s and early 1980’s and is considered to be the best known Cainozoic in the NT. Whilst initially defined in individual Tertiary Basins, the Hale and Waite Formations are components of a much larger Tertiary palaeodrainage system, the extent and size of which has until now been vastly underappreciated. The Waite Basin forms a tributary to the Ti-Tree Basin whilst the Hale Basin can essentially be considered to be an isolated outlier of the Ti-Tree Basin that lies further to the southeast along the extension of the Ti-Tree Fault (informal name). Application of these Formation names is particularly useful in understanding the regional geological framework.

Deposition of Cainozoic sediments was episodic and punctuated by hiatuses during which prolonged periods of weathering resulted in the formation of well-developed weathered profiles (palaeosols and duricrusts). Senior et al. (1995) defined three weathering events which affected Arunta igneous and metamorphic basement rocks and the overlying Tertiary succession:
Figure 8 - Geology of the Aileron Region
Senior et al.’s (1995) Weathering Event A occurred during the Late Cretaceous to Early Tertiary (Palaeocene). A trizonal profile was developed in basement rocks over a widespread area of the Arunta Region and at the base of surrounding Tertiary basins. The trizonal profile consists of a basal kaolinitic zone up to 10 meters thick that grades into a multicoloured mottled zone up to 10 meters thick. The mottled zone is overlain by a ferruginous (ferricrete) zone up to 8 meters thick (Senior et al., 1995).

Following uplift and partial truncation of the deeply weathered basement rocks, sedimentation began in the surrounding Tertiary basins in the Palaeocene with thick colluvium including fanglomerates flanking the ranges, followed by deposition during the Early to Middle Eocene of alluvial and lacustrine sand, silt and clay (locally carbonaceous) and lignite of the Lower Hale Formation in the Ti-Tree and Burt Basins. Locally this includes a basal lacustrine green and grey pyritic mudstone, white mudstone and siltstone, and red iron oxide stained siltstone and siltstone.

Weathering Event B, recorded in the Hale Basin in the eastern part of the ALICE SPRINGS 1:250,000 Geology Map Sheet, occurred prior to the Middle Eocene, although there is little evidence elsewhere for this weathering event (Senior et al., 1995). This resulted in formation of a second ferricrete and lithification of colluvium to fanglomerate.

Deposition of sandstones of the Upper Hale Formation took place during the Late Eocene and these sediments were subsequently overprinted by Weathering Event C which marking widespread exposure and surficial weathering in response to a prolonged period of non-deposition during the Oligocene.

Climatic amelioration during the Early Miocene rejuvenated the palaeodrainage systems and led to the deposition of fluvial sands at the base of the Waite Formation. A change from fluvial to lacustrine sedimentation followed during the Middle to Late Miocene and resulted in the accumulations of over 300 meters of fluviatile and lacustrine chalcedonic limestone, sands, muds, and sandy conglomerate in localised depocentres.

The upper portions of the Waite Formation are dominated by regionally widespread dolomitic clays and clays that reflect the extensive development of broad, shallow evaporitic lakes throughout southern Australia as the continent drifted further northwards and became progressively more arid and seasonal.

The Waite Formation interfingers with and is conformably overlain by a moderately thick (<60m) succession of oxidised colluvial material shed of the ranges in response to neotectonism during the (?Late) Pliocene. A broadly coarsening upwards alluvial fan succession was eroded off the rejuvenated ranges and can be recognised throughout the region. This unit is informally referred to as the Napperby Formation and comprises a succession of oxidised and haematitic, clayey sands, sandy clays and minor conglomerates.

The Napperby Formation is capped by Quaternary red earth, alluvial sands and gravels and aeolian sand accumulated downslope from the uplifted areas. Calcrite precipitated along stream channels, evaporites formed in playa lakes, and sand plains and aeolian dunes developed in low lying areas (Stewart, 1981).

Chianina is almost completely covered with Quaternary sediments, (Figure 9).
Figure 9 - Tertiary Basins (shown in yellow) in the Aileron area
**PREVIOUS EXPLORATION**

<table>
<thead>
<tr>
<th>Open File Report Number</th>
<th>Dates</th>
<th>Company</th>
<th>Commodity</th>
<th>Tenement</th>
<th>Work Completed</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR1978-0143</td>
<td>08/1978</td>
<td>Otter Exploration N.L.</td>
<td>U, (Cu, Pb, Zn, Ag, Au)</td>
<td>EL1456</td>
<td>Field recon, Field radiometrics, Rock chip sampling</td>
<td>8 radiometric anomalies evaluated. Two anomalous hot spots attributed to garnet granite, however too small. Not digitised but thought to be to the SE of current tenement EL26375.</td>
</tr>
<tr>
<td>CR2004-0051</td>
<td>23/12/2002 - 22/12/2003</td>
<td>Tanami Gold NL</td>
<td>Au, Cu, (Ag, Pb, Zn)</td>
<td>EL9802</td>
<td>Aircore Drilling, Rock chips, Lag sampling.</td>
<td>15 holes within EL9803 (ie outside to east of EL26375). No work over current tenement EL26375.</td>
</tr>
<tr>
<td>CR2004-0689</td>
<td>23/12/2003 - 22/12/2004</td>
<td>Tanami Gold NL</td>
<td>Cu, Au</td>
<td>EL9801-9806, EL9836, EL22924</td>
<td>Geological Review and Interpretation.</td>
<td>No physical exploration work on the ground as agreements being negotiated with the CLC.</td>
</tr>
<tr>
<td>CR2005-0590</td>
<td>23/12/2004 - 22/12/2005</td>
<td>Tanami Gold N.L.</td>
<td>Cu, Au</td>
<td>EL9801-9806, EL9836, EL22924</td>
<td>-</td>
<td>No physical exploration work on the ground</td>
</tr>
</tbody>
</table>

Table 1 - Chianina (EL26375) Historic Exploration

Open file records held by the NTGS indicate that very little exploration has taken place at Chianina and just two companies have conducted exploration in the Chianina tenement area in the past. Tanami Gold NL explored for Cu/Au deposits in the 2000’s, and Otter Exploration had previously explored for uranium and base metals in the late 1970’s.

The only uranium exploration documented, by Otter exploration, involved evaluating eight radiometric anomalies. Two anomalous hot spots were attributed to garnet granite, however they were considered too small to be of interest. This work is believed to be south of the current Chianina tenement.

**CR1978-0143**

Author: Kojan, C. J. 1978  
Company: Otter Exploration NL  
Commodity: U, Base Metals  
Dates: August 1978

8 radiometric anomalies (3 x BMR, + 5 x anomalies from June ‘77 survey) investigated in field. Hand held U, Th, K values. Rock chip samples assayed for U (and some base metals). Geochemically anomalous U concentrations at two anomalies only.

Anomaly RCA1: 50ppm U  
Anomaly RCA2: 80ppm U.

Both attributed to Garnet granite. Isolated hot spot on west end of Red Cliff dome. These anomalous hot spots very limited dimensions (1-2 square m). No scheelite found in samples of basic granulite from RCA1 and RCA 3. No further work recommended.
Not digitised but thought to be to the SE of current tenement EL26375.

**CR2004-0051 (Alcoota Project – Tenements EL9801-9806, EL9836, EL22916, EL22924)**

*Author*: Rohde, C. 2004  
*Company*: Tanami Gold NL  
*Commodity*: Cu, Au  

Focus on Tanami-style Au, IOCG, and Tennant Creek style Cu-Au.

Regional Assessment,  
Rock chip sampling, 77 samples  
Lag sampling, 14 samples  
Aircore drilling [15 holes for 1327m] within EL9803 SE of current tenement EL26375.

Drilling tested Iron-Ore, Copper Gold targets generated from gravity and aeromagnetic data. No work was conducted on EL9803 (Kuraljin Bore) which overlaps the current tenement EL26375.

**CR2004-0689 (Alcoota Project – Tenements EL9801-9806, EL9836, EL22924)**

*Company*: Tanami Gold NL  
*Commodity*: Cu, Au  

Annual Report by way of letter only. Geological review and interpretation was undertaken although outcomes are not mentioned. No on the ground exploration was undertaken due to protracted negotiations and failure to reach agreements with the CLC.

Reference to rock chip sampling having been undertaken on EL22924 in November 2003, although no results are included.

**CR2005-0378 (Alcoota Project – Tenements EL9801, EL9802, EL-9805)**

*Author*: Rhodes, C. 2005.  
*Company*: Tanami Exploration NL  
*Commodity*: Cu, Au  

Final Report EL9801 and EL9805. Second Year Partial Relinquishment Report EL9802.

Exploration focussed on Tanami style gold only, iron oxide copper-gold and Tennant Creek style copper gold. Exploration consisted of a regional assessment and a single field reconnaissance trio in November – December 2003.

EL9801 – 10 rock chip samples  
EL9805 – 16 rock chip samples

No significant assays returned and ground was dropped. No physical exploration undertaken on the portion of EL9802 relinquished.

**CR2005-0590 (Alcoota Project – Tenements EL9801-9806, EL9836, EL22924)**

*Company*: Tanami Gold NL  
*Commodity*: Cu, Au  
*Dates*: 23/12/2004 – 22/12/2005

Annual Report by way of letter only. EL9801, 9803 and 9805 dropped during the year and substantial portions of EL9802, EL9804 and EL9836 were surrendered in July/October 2005. No field work was undertaken during the year.
EXPLORATION BY NUPOWER


Exploration completed on Chianina tenement EL26375 during Year 1 included the completion of 1204.5 line kilometres of airborne electromagnetic surveys as part of a larger survey conducted in 2008, the contribution to a helicopter-borne regional gravity survey (CAGS) conducted by the NTGS over the central Arunta Region for NuPower in order to obtain more detailed, 2km spaced data, over its Aileron Project tenements and the sampling of ground water from fourteen station water bores for major and trace element analysis. The results of this work have been reported previously, (Blair, 2009).

AIRBORNE ELECTROMAGNETIC (AEM) SURVEY

A total of 1024.5 line kilometres of AEM was flown over Chianina at a flight line spacing of 1km and nominal height of 120m as part of the 2008 survey.

The tenement lies over parts of the eastern part of the Ti Tree Basin. The broader survey showed that the southern part of the Ti Tree Basin infills a deep structural feature developed in two NW-SE trending grabens immediately north of the Ti Tree Fault. The southern part of EL26375 covers part of the northern graben and 3 shallower palaeo-tributaries that drain southwards into the graben from shallowly buried basement to the north. While the palaeo-tributaries may contain reduced sediments, the deeper section of the northern graben beneath EL26375 may be more prospective for secondary uranium mineralisation where reduced sediments, necessary for the precipitation of uranium from oxidised ground water, are more likely to be preserved.

AIRBORNE REGIONAL GRAVITY SURVEY

During 2008 the NTGS conducted a helicopter-borne regional gravity survey (CAGS) over the central Arunta Region with survey points spaced 4km apart. NuPower contributed to the program in order to obtain more detailed, 2km spaced data, over its Aileron Project tenements, that included most of EL26375.

The results of this survey will be useful in modelling of the basement and the exploration for structurally controlled mineralisation beneath the Cainozoic Basin fill.

STATION BORE GROUND WATER SAMPLING

Concurrent with the AEM survey NuPower collected ground water samples from station bores that included 14 bores from EL26375 and assayed them for a broad range of major and trace elements. The results are intended to assist with the exploration for secondary uranium mineralisation in the Cainozoic succession. Their interpretation is in progress.


There was no on-ground exploration of EL26375 during Year 2.


There was no on-ground exploration during Year 3. Assay results for ground water samples reported previously (Blair, 2009) were found to be erroneous due to laboratory problems. The samples were reassayed and the new results are reported.


There was no on-ground exploration of EL26375 during Year 4.

YEAR 4 (16/4/2012 – RELINQUISHMENT DATE)

There was no work done during this period.
The decision was made to relinquish the entire tenement as NuPower is now concentrating on phosphate exploration and does not have the funds for uranium exploration in this area.
REFERENCES


WYCHE S. 1983 Coal and Lignite Occurrences in the Southern part of the Northern Territory. NTGS Tech Report GS83/1.