ARAFURA
RESOURCES LIMITED

Level 3, 263 Adelaide Terrace

Perth WA 6000

Australia

AILERON REYNOLDS PROJECT AREA

ARU REPORT 19/001

Annual report for the year ending 14 December 2018, EL 31284 (Reaphook),

Northern Territory, Australia.

by

KJ Hussey BSc(Hons), MAIG, FGS.

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2. REPORTING DETAILS

Titleholder	Arafura Resources Limited
Operator (if different from above)	as above
Titles/tenements	EL 31284
Tenement Manager	as above
Mine/Project Name	Reaphook
Report Title	Annual for year ending 14 December 2018, EL 31284 (Reaphook), Northern Territory, Australia.
Personal author(s)	Kelvin James Hussey BSc(Hons), MAIG, FSG
Corporate author(s)	Arafura Resources Limited
Target commodities	Rare Earth Elements
Date of report	14/12/2018
Datum/zone	GDA94/Zone 53
1:250 000 mapsheets	Napperby (SF53-9)
1:100 000 mapsheets	Aileron (5552) Napperby (5452)
Contact details	Kelvin Hussey khussey@arultd.com

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3. ABSTRACT

EL 31284 was granted to Arafura Resources on 15 December 2016 for a period of six years. The tenement covers 73 blocks or 231.23km^2 and is located on the NAPPERBY 1:250,000 geological map sheet, about 30km southwest of Aileron and 140 km northwest of Alice Springs in the Northern Territory. EL 31284 is mostly covered by unconsolidated Quaternary units overlying the Cainozoic Whitcherry Basin and Palaeoproterozoic Arunta Region rocks.

EL 31284 contains low-order airborne radiometric Th targets worthy first-pass exploration. The elevated Th radiometric signature suggests a greater concentration of REE-enriched heavy minerals (*e.g.* monazite) may occur within the palaeochannels shedding off the nearby Reynolds Ranges. HM sampling and analysis is planned to test for the presence of monazite-enriched sediments. No on-ground exploration fieldwork occurred on EL31284 because the company has been focussed on the Nolans project EIS and DFS and higher priority exploration targets.

Arafura has placed data loggers in eight of its water investigation bores on EL 31284. These will provide baseline data for the Nolans Project. The company also gathered baseline groundwater geochemistry and Sr isotopes from bores on EL 31284 in 2018.

4. LOCATION AND ACCESS

The tenement is located about 30km southwest of Aileron, and 140 km northwest of Alice Springs in the Northern Territory.

The nearest areas of occupation are Napperby, Laramba, Aileron and Alyuen (Figure 1). The Aileron Roadhouse is located just off the Stuart Highway and provides limited services. Alice Springs is the major population centre of the region and provides most services.

The tenement can be reached by a well-formed gravel road which passes through the centre of the tenement and links Napperby Station to the Stuart Highway. The area contains a few tracks and fence lines though access along these can be rendered impassable after periods of heavy rain.

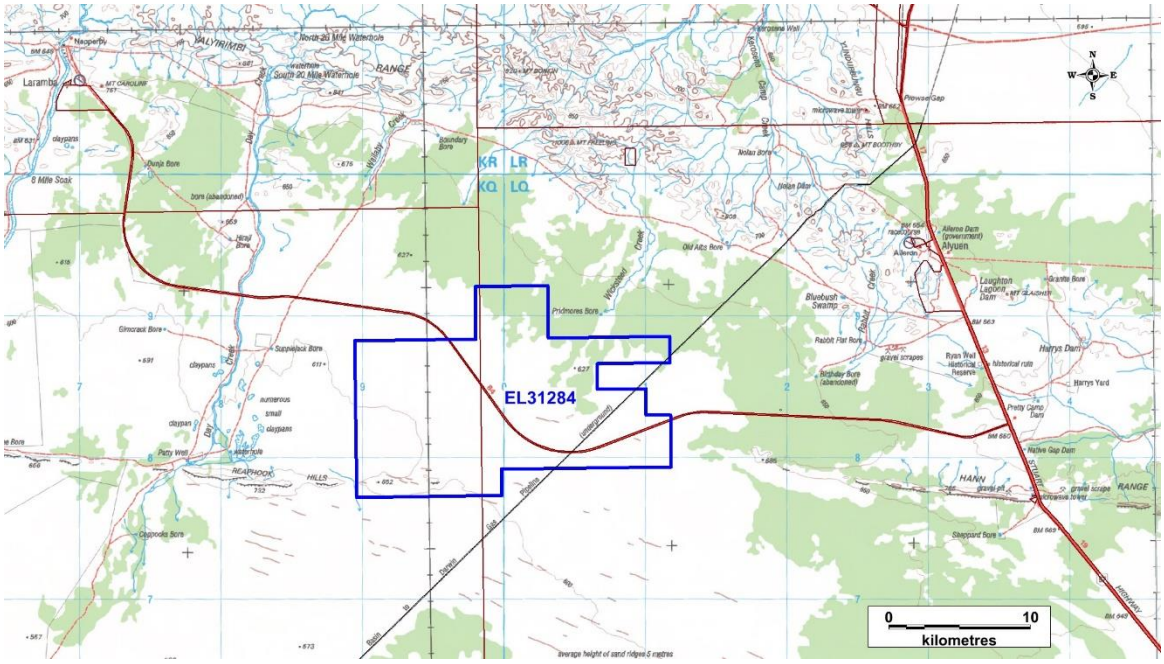

Figure 1: Location of EL 31284.

4.1.1 CLIMATE AND VEGETATION

The climate is arid with predominantly summer rainfall. It is characterised by long hot summers, when temperatures regularly exceed 40°C, and short mild winters. Frosts are occasionally experienced.

Official observations have been recorded at Aileron Station (Bureau of Meteorology Station 15543) from 1949-2009 but there are gaps and basically no data after April 2005. The Bureau of Meteorology reports a mean and median annual rainfall at Aileron Station of 297 and 244 mm for that period. The mean and median rainfall at Territory Grape (Bureau of Metrology Station 15643) about 70 km northeast, is about 323 and 298 mm, respectively, for 1987-present. A variety of other observations have also been recorded at the Territory Grape Farm. The mean maximum daily temperature exceeds 35°C for November to February inclusive, with January being the hottest month at 37.5°C. The lowest mean daily minimum temperature is 5.1°C in July. The highest and lowest temperatures recorded at Territory Grape are 46.2°C and -4°C, respectively. The mean monthly 9 am wind speed ranges from 13 to 20 km/hr and averages 15 km/hr. Winds are predominantly from the east and southeast with a maximum recorded wind speed of 91 km/hr. Arafura established an automated weather station at Nolans Bore in September 2008. The results of this station are generally consistent with the Ti Tree Farm measurements although the readings do vary given the distance and the scattered nature of storms in this region.

4.1.2 TOPOGRAPHY

The tenement is situated on a gently sloping sand plain on the southern side of the Reynolds Range (Figure 1 and 2). Creeks and drainages shedding off the Reynolds Range disappear into the sand plain along the northern margin of the tenement. Small stabilised linear sand dunes occur near the Reaphook Range in the southwest part of the tenement but are more common further south. Isolated rocky outcrops occur in the southwestern, central-eastern, and northern parts of this tenement.

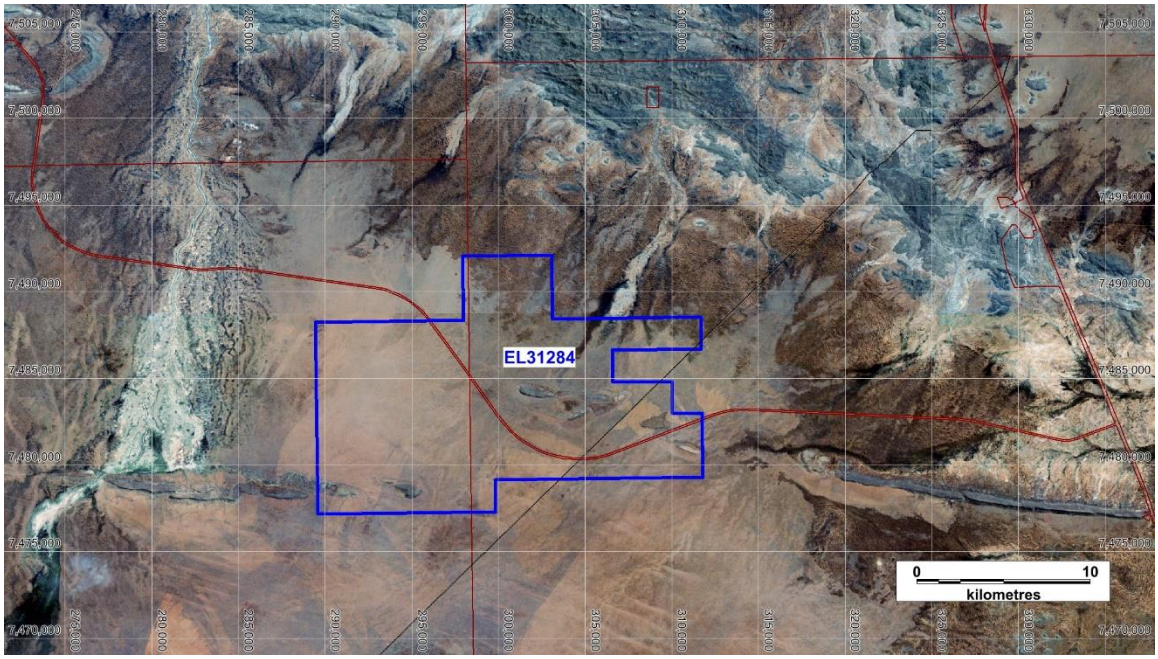

Figure 2: Landsat7TM image (bands 123 as RGB) showing the location of EL31284.

4.1.3 LOGISTICS

Alice Springs (pop. 27,000) is serviced daily by jet aircraft from several Australian capital cities. The town is also well serviced by road and rail transport and interstate buses. The Stuart Highway passes the Aileron Roadhouse which is about 30 kilometres northeast of the project area.

A standard gauge railway line joins Alice Springs to Port Augusta and Adelaide to the south and Darwin in the north. The railway line is about 80 km east of the project area. An existing natural gas pipeline passes through the tenement area, linking the Mereenie Field in the Amadeus Basin (west of Alice Springs) to Darwin.

5. TENURE AND LAND USE

Exploration Licence 31284 was granted 100% to Arafura Resources Limited (ACN 080 933 455) on 15 December 2016 for a period of six years. The tenement covers 73 blocks or 231.23km^2 (Table 1 and Figure 3).

Table 1: Tenure and land use.

Licence	Titleholder	Grant Date	Area (km2)	Cadastre
EL31284	Arafura Resources Limited (100%)	15/12/2016	231.23	NT Portion 703, PPL Aileron Station NT Portion 747 PPL Napperby Station

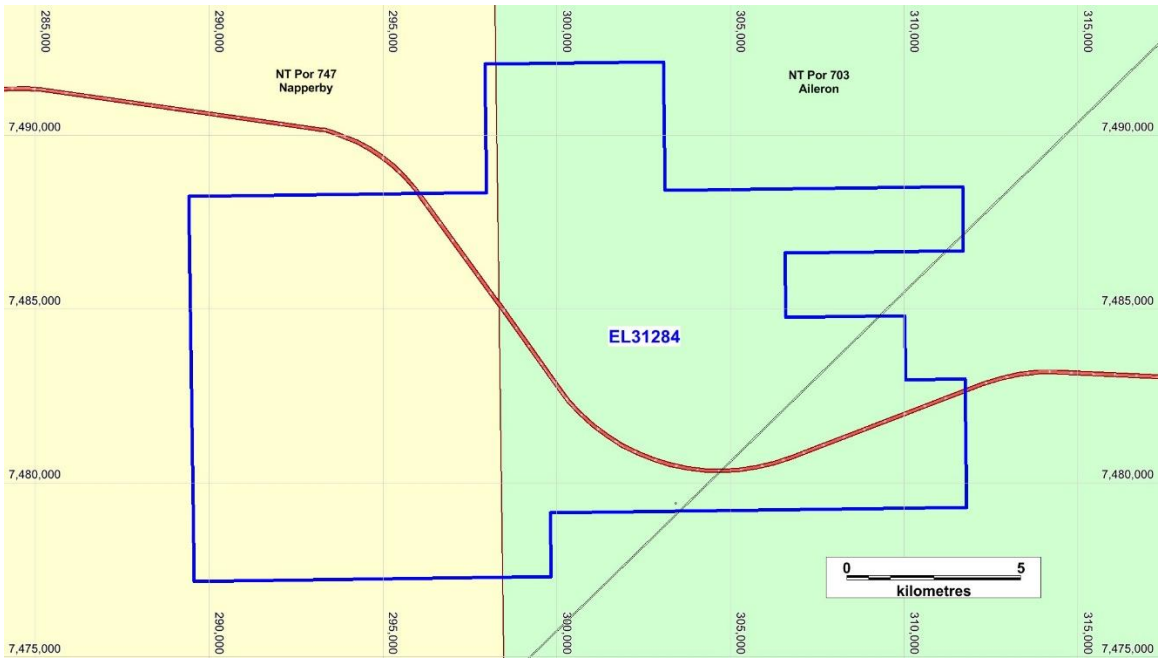

Figure 3: Location of EL 31284 and land use.

6. GEOLOGY

6.1 REGIONAL SETTING

The Aileron-Reynolds project area is in the Aileron Province of the Arunta Region and includes part of the Ngalia Basin in the central-southern Northern Territory (Figure 4). A veneer of Cainozoic sediments covers part of the project area.

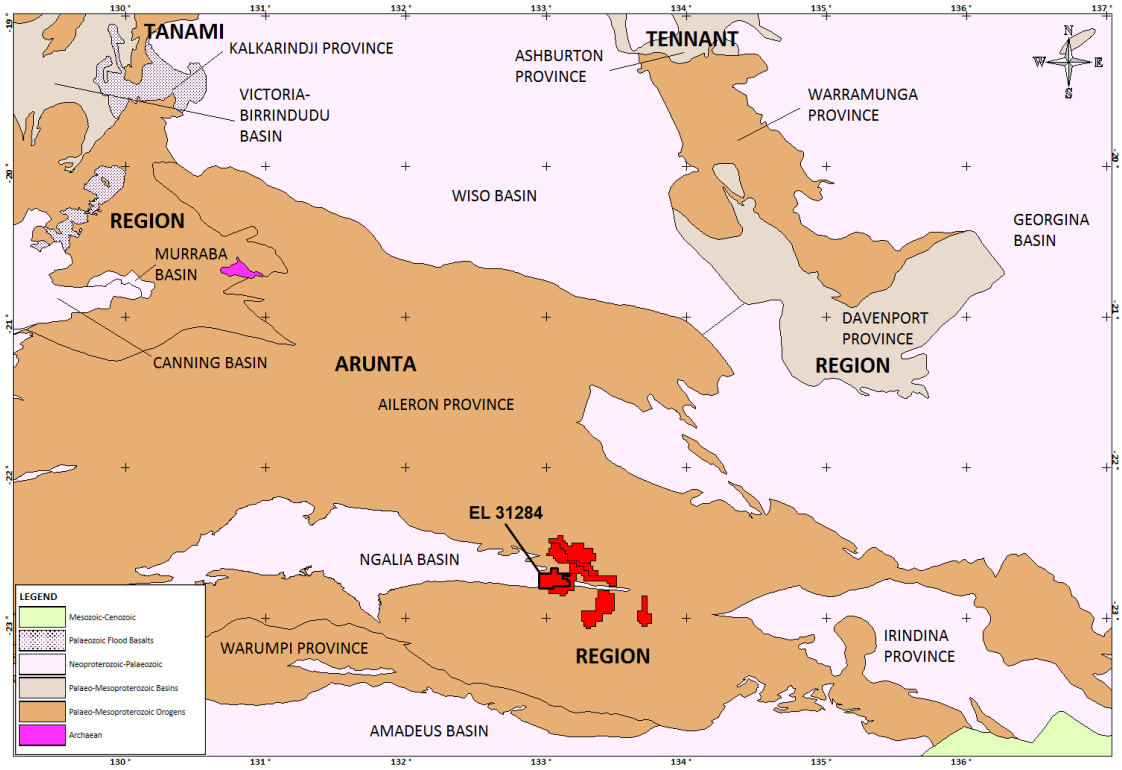

Figure 4. Gelogical provinces of the central-southern Northern Territory showing the location of Arafura's tenements in the Aileron-Reynolds project region.

The Proterozoic rocks of the Aileron Province host the world-class Nolans Bore REE-P-U deposit and are considered prospective for additional REE resources. This region consists of variably exposed, greenschist to granulite facies metamorphosed sedimentary and igneous rocks. Cainozoic sedimentary units are deposited in localised depocentres across the region (palaeovalleys). These are of geological interest, as a long-term sustainable water supply is required to support the development of the Nolans Bore REE mine and processing plant. Some of the Arunta basement rocks in this region have elevated Th and U contents, meaning there is a potential to accumulate REE-enriched heavy minerals in alluvial deposits derived from these rocks.

The regional geology for the project area is illustrated in Figure 4. Figure 5 is derived from digital copies of the Napperby (Stewart 1982), Alcoota (Shaw and Warren 1975), Hermannsburg (Warren and Shaw 1995) and Alice Springs (Shaw and Wells 1983) 1:250,000 Geological Map Series. Most of Arafura's tenements in the general project area are located on Napperby and the reader is referred to the various published geological maps, legends and explanatory notes for the map sheets noted above. The Reynolds Range Region 1:100,000 Geology Map is also available (Stewart and Pillinger 1981) and provides more detailed geology for the north western parts of the general project area. Stewart *et al* (1980) provides detailed geological descriptions and definitions for all mapped units in the project area. Shaw *et al* (1975, 1979) provides a similar level of detail for all mapped units in the areas surrounding the tenements in Figure 5. Images of the airborne radiometric, magnetic and electromagnetic surveys covering the same area are presented in Figures 6-8, respectively. These geophysical images were derived by reprocessing and merging all available open-file and NTGS datasets together with Arafura's dataset.

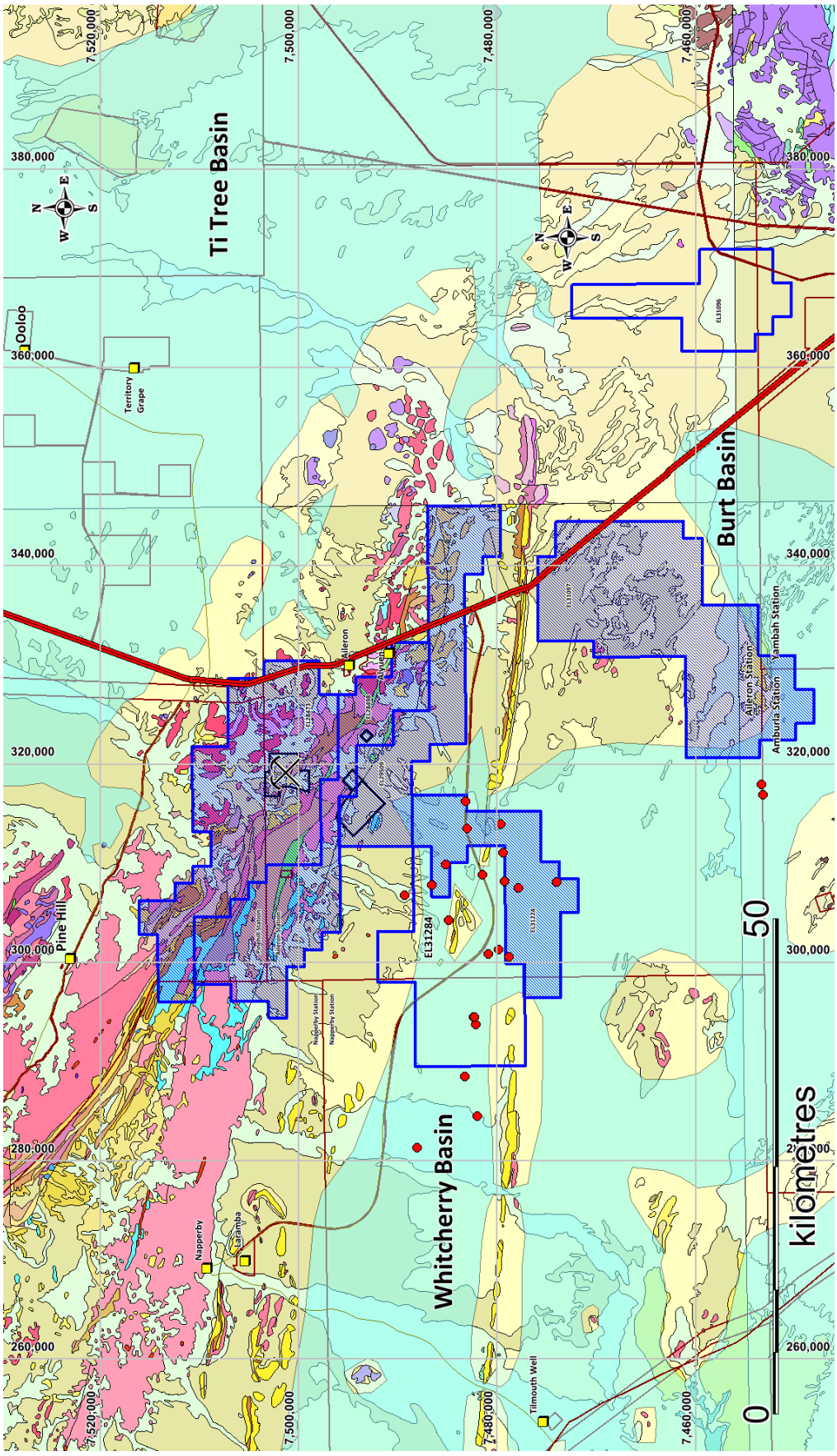

Figure 5. Regional geology of project area based on digital copies of published maps. The geology has been modified to show the approximate distribution of the concealed Cainozoic basins (pale blue-green overlay).

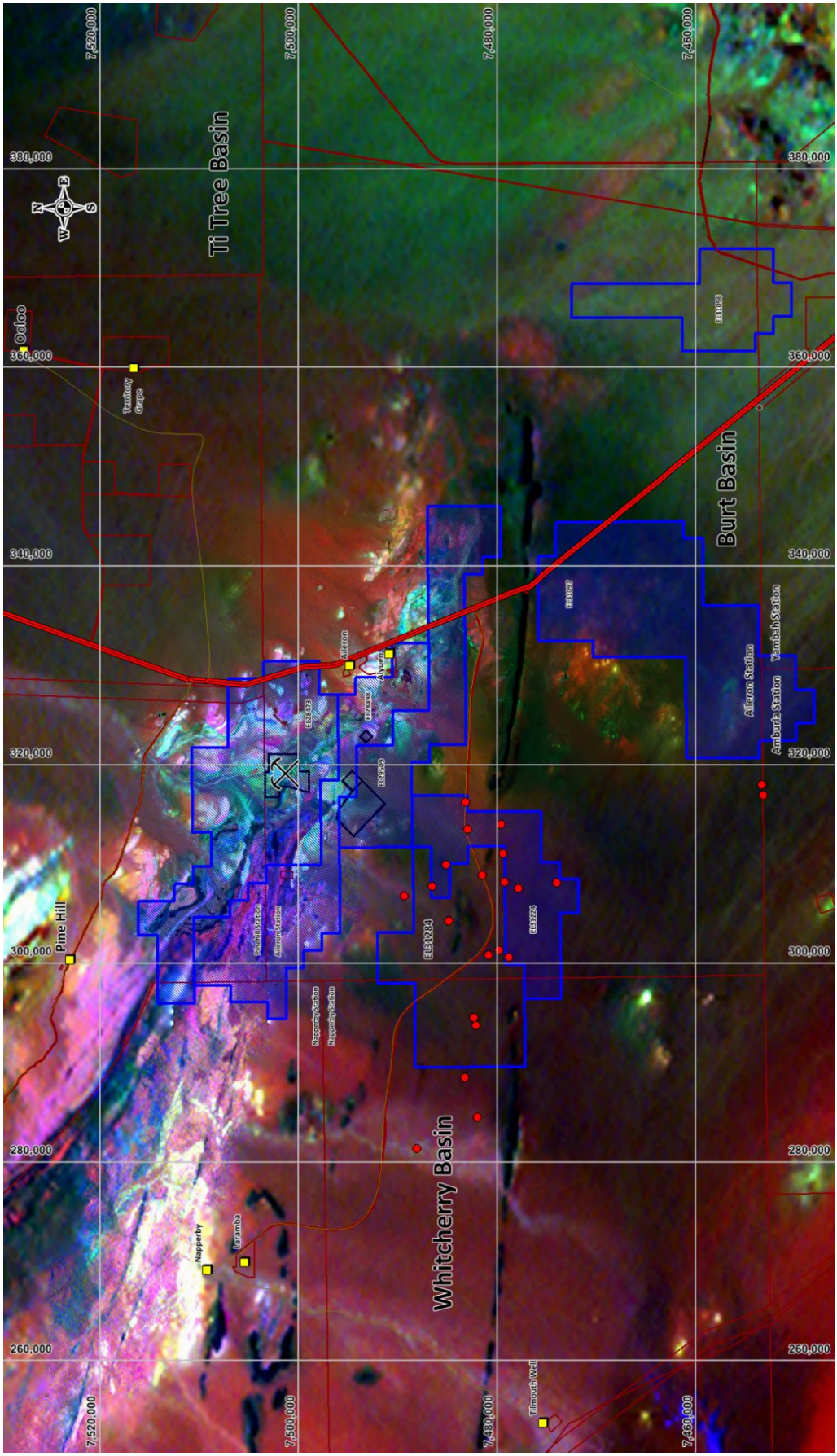

Figure 6. Regional airborne ternary radiometric image with K, U and Th shown in RGB.

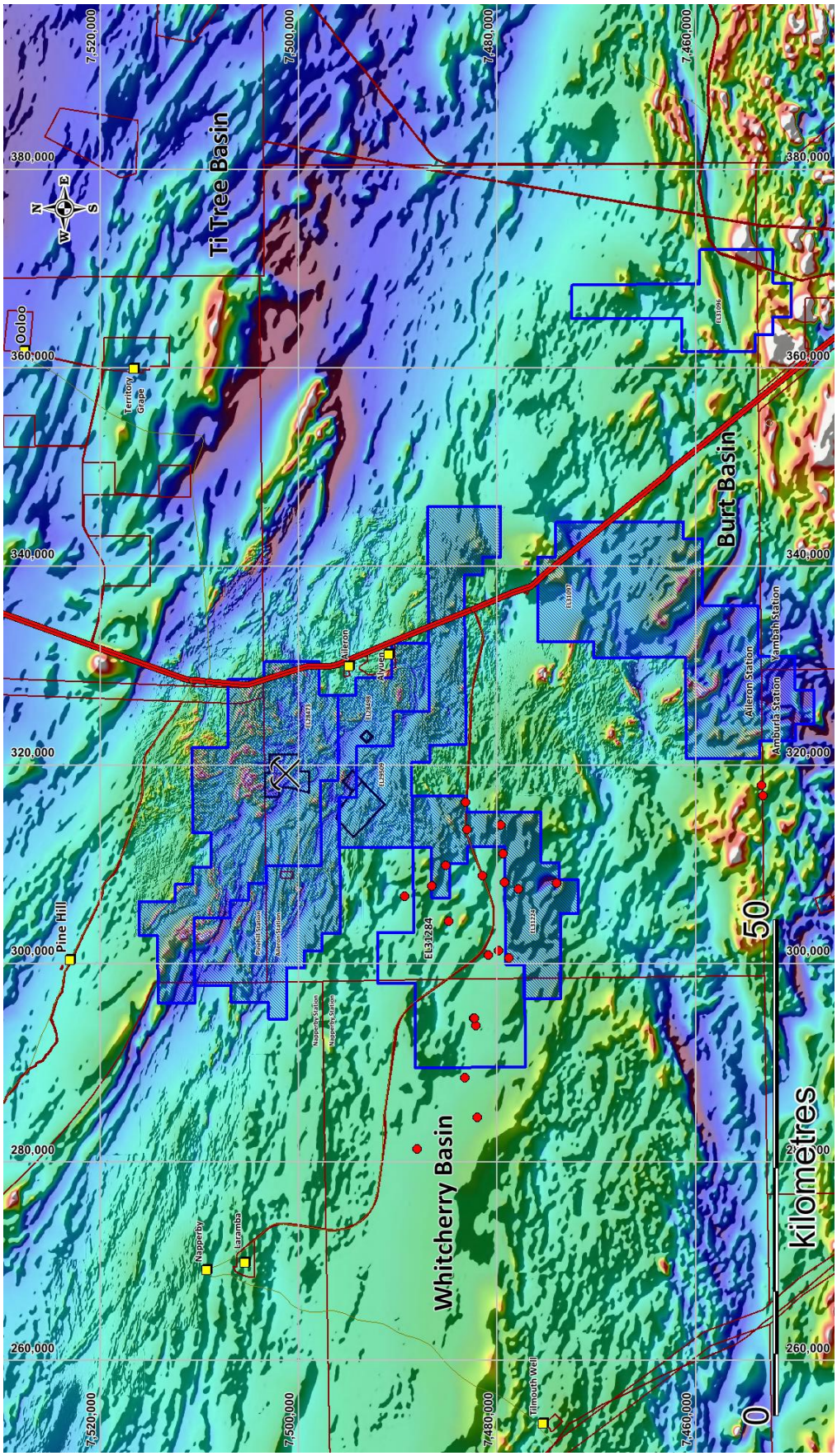

Figure 7: Regional airborne magnetics showing TMI enhanced using a NE shade angle.

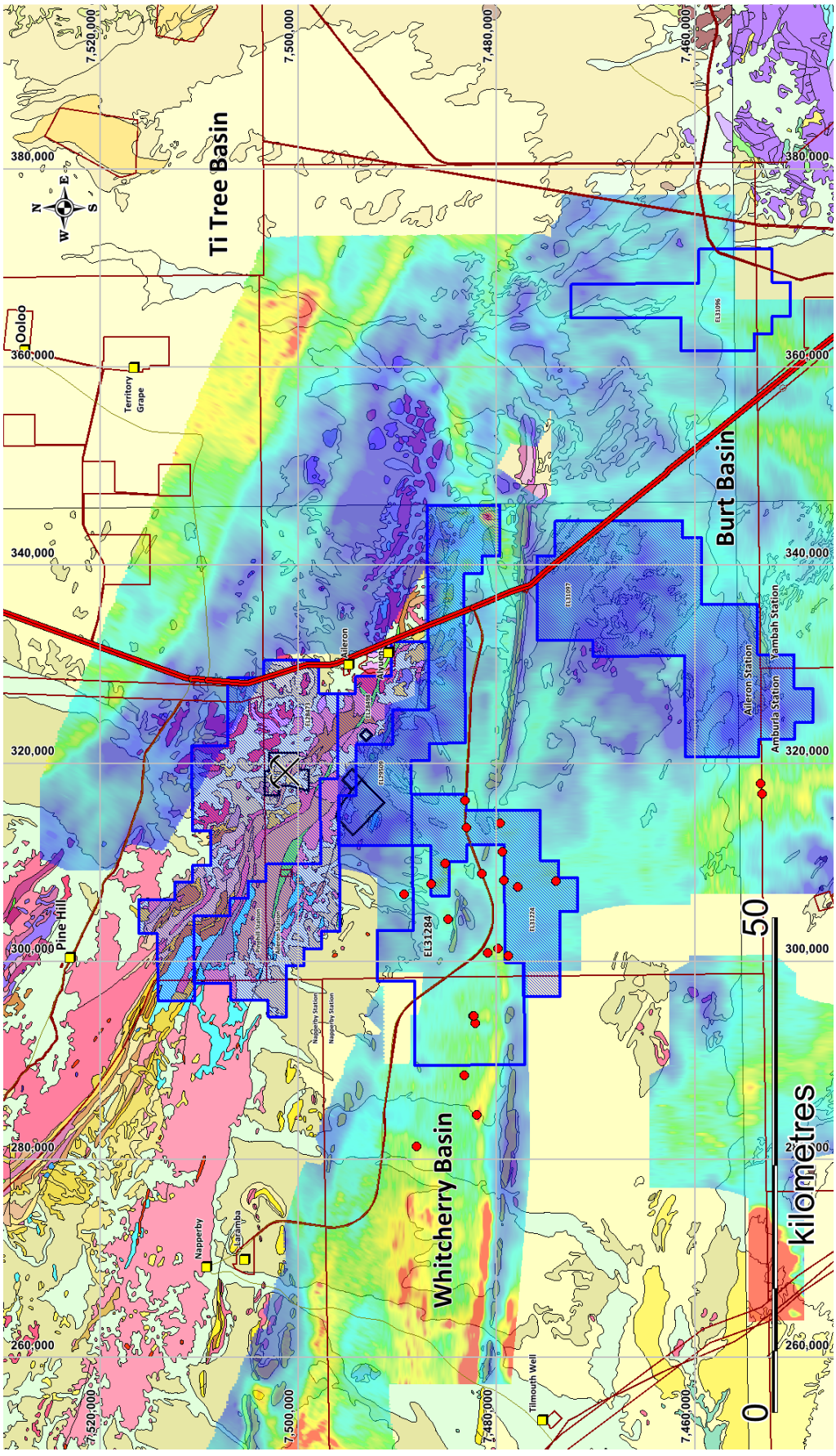

Figure 8: Reprocessed regional AEM conductance image draped on the regional geology.

Figure 5 shows that unconsolidated Quaternary sand, soil, alluvium and colluvium which is mapped Qs, Qr, Qa (yellow, pale green and light blue, respectively) blankets much of the area surrounding the Reynolds Range and covers most of the tenement area. The geophysical data indicates areas of shallowly buried “explorable” basement occurs throughout the region in places. The unconsolidated transported cover conceals underlying Tertiary Basins with their historically interpreted distribution shown in Figure 5. A more refined distribution of these Tertiary units can be interpreted using regional AEM (Figure 8). Arafura used this AEM survey data to devise a groundwater investigation programme with the drill holes, shown as red dots on Figures 5-8, intersecting significant thicknesses of Tertiary sedimentary units. The results of these investigations and ongoing monitoring are reported in Arafura’s EIS for the Nolans Project.

7. PREVIOUS INVESTIGATIONS

7.1 REGIONAL

Records of systematic exploration in the Reynolds Range region date back as early as 1948 (Thevissen 1995) but most investigations date from about 1965 (Stewart 1982). Exploration beneath the surrounding sand plains has been limited. The historic exploration activities overlapping EL 31284 have been researched using NTGS's STRIKE and is summarised in Table 2 below.

Table 2: Summary of historic exploration

Term of Grant	Tenement	Exploration Company	Exploration Targets/Commodities	NTGS Open File Company Report(s)
14/05/1972-13/05/1974	EL256	CENTRAL PACIFIC MINERALS	U	CR1974-0080, CR1974-0035, CR1973-0137
31/10/1977-30/10/1978	EL1658	CENTRAL PACIFIC MINERALS	U	CR1978-0097
24/01/1981-23/01/1982	EL2066	AGIP AUSTRALIA PTY LTD	U	CR1982-0007
25/03/1983-24/03/1989	EL3003	YUENDUMU MINING COMPANY	Cu, Pb, Zn, Co, Ni, Sn, Ag, Cr, W	CR1984-0258
19/11/1987-19/02/1990	EL5511	COLCHIS MINING CORPORATION	Au, Cu, Pb, Zn, Ag	CR1990-0366, CR1989-0020
15/03/1994-14/03/2000	EL8411	PNC EXPLORATION (AUSTRALIA) PTY LTD	U	CR1996-0187, CR1995-0266
28/03/2001-23/07/2003	EL10251	HAWTHORN RESOURCES LIMITED (GUTNIK RESOURCES)	Au	CR2004-0166, CR2003-0351
19/12/2005-27/02/2013	EL24625	CAULDRON ENERGY LIMITED	U, Fe	CR2013-0350, CR2012-1144, CR2012-0063, CR2011-1072, CR2010-0950, CR2009-1106, CR2009-0984, CR2008-0926, CR2007-0625, CR2006-0645
13/04/2006-3/07/2013	EL24746	NORTHERN MINING LIMITED	U, Cu, Ni, Co, and PGE	CR2013-0833, CR2013-0412, CR2012-0394, CR2012-0393, CR2011-0431, CR2011-0265, CR2010-0306, CR2009-0694, CR2009-0693, CR2008-0165, CR2007-0149
2/01/2013-16/01/2014	EL29503	ARAFURA RESOURCES LIMITED	REE	CR2014-0091

All historic mineral exploration has largely focussed elsewhere within the boundaries of overlapping historic tenements.

Searches of the historic exploration activity in this area indicate there have been airborne geophysical surveys covering the tenement area (*e.g*. AEM shown in Figure 8). However there has been no on-ground mineral exploration sampling activity or drilling within the tenement area.

Arafura reprocessed the historic open-file AEM datasets covering this region and then used them to devise and complete two drilling programs in 2012-14 as part of groundwater investigations to support the development of the Nolans Project. These groundwater investigations have been reported in Arafura's Draft EIS and Supplemental Reports. The work by Arafura demonstrates considerable groundwater is present within the Tertiary units. Groundwater investigations demonstrate the Tertiary units are up to about 200m thick in the western parts of the tenement area but clearly there are areas of shallow cover with near-surface Arunta basement rocks in the north. Arafura's studies and modelling of the groundwater within these Tertiary units indicates there is an adequate brackish water supply to support the development of the Nolans Project.

8. INVESTIGATIONS BY ARAFURA

EL 31284 contains a palaeochannel system with some anomalous airborne Th signatures. The more significant Th targets mostly occur north of the Napperby access road and are considered worthy first-pass exploration targets given the geological setting and the surrounding metamorphic rocks in the drainage catchment. A higher Th radiometric signature suggests a greater concentration of REE-enriched heavy minerals (*e.g.* monazite) within the palaeochannels shedding off the nearby Reynolds Ranges. HM sampling and analysis is planned to test for the presence of monazite-enriched sediments.

8.1 YEAR 1, 15 DECEMBER 2016 – 14 DECEMBER 2017.

During the reporting period, Arafura Resources did not conduct exploration on the licence area, however, three field trips to the licence were conducted to carry out groundwater monitoring, as part of the regional baseline studies for the Nolans Bore Project Environmental Impact Statement (EIS). This data is provided in the Nolans project EIS, and was submitted to the NT Environmental Protection Authority (EPA) for consideration.

8.2 YEAR 2, 15 DECEMBER 2017 – 14 DECEMBER 2018.

No heavy mineral targets were explored on EL31284 in the last reporting period. Field work activities for 2018 focussed on sampling higher priority radiometric targets on adjacent tenements and geotechnical work programmes associated with the Nolans Project.

8.2.1 Baseline Groundwater Data

Arafura announced on 5 January 2018 that the NT EPA had approved the Nolans Project subject to a number of operational conditions.

Groundwater was extracted from 21 bores across the Nolans Project area in August 2018 as part of ongoing baseline studies for the Nolans Project. These were collected as representative water samples following standard sampling guidelines. The assays are presented in the Digital Appendix. A total of eight water samples were collected from six bores within EL 31284. The remainder are from bores related to ongoing monitoring and the development of the Nolans Project. During data collation for another report it was realized that the water chemistry of sample RC18180 was very different other samples from this bore (PB1) and all others in the general area. The sampling records are being investigated and it is likely that this assay result is a poor sample.

A preliminary background Sr isotope study was also done on some of these water samples and included six from EL 31284. The water samples were tested to establish a background regional understanding prior to environmental monitoring associated with the Nolans Project. Groundwater is to be extracted from the southern basins and used in the Nolans Project area. The author has proposed Sr isotopes as a possible method to track possible environmental contamination in the region. This was proposed because Nolans Bore mineralisation itself has a distinct Sr isotope signature.

Representative water samples (1 litre) were sent to David Bruce at The University of Adelaide for high precision Sr isotope analysis. The analytical procedure was as follows:

- Sample preparation
  - 20mL water samples evaporated to dryness in Savillex PFA vials on hotplate at 140°C.
- Sr separation by column chromatography.
  - Samples redissolved in 8M nitric acid.
  - Sr extraction chromatography using 50-100u eichrom Sr resin in Biospin micro columns.
  - Following modified method of Krabbenhoft et al 2009
- 87/86 Sr measurement.
  - 100 x 8 second Multidynamic Sr measurements carried out on ISOTOPX Phoenix Thermal Ionization Mass Spectrometer (TIMS).
  - Normalization to 86/88Sr = 0.1194, using exponential mass fractionation correction.
- Reagents
  - Nitric acid distilled in Savillex DST-1000 PFA still.
  - Ultrapure (Type 1) deionised water produced using a Millipore Direct-Q 3 system.

The results of the initial regional Sr isotope groundwater study are presented in Table 3 below.

Table 3: Baseline Sr isotope analyses.

Ride's SampleID	MGA94E	MGA94N	Tenement	Dated sample collected	Comment	87/86Sr	2se
RC18187	318757	7502089	EL28473	19/08/2018	Nolans Dewatering Bore 2011	0.733481	0.000004
RC18193	317939	7499860	EL28473	19/08/2018	New Nolan Monitoring 2011 (M3C)	0.778150	0.000004
RC18182	308088	7479246	EL31224	16/08/2018	ARU Production Bore (PB 2)	0.749156	0.000004
RC18189	307738	7486581	EL31224	20/08/2018	ARU Baseline Monitoring Bore (K2)	0.745273	0.000003
RC18181	310997	7479439	EL31284	16/08/2018	ARU Baseline Monitoring Bore (A0)	0.748203	0.000004
RC18183	294452	7482351	EL31284	17/08/2018	ARU Production Bore (PB 6)	0.736107	0.000004
RC18188	301281	7479847	EL31284	18/08/2018	ARU Production Bore (PB 1)	0.736117	0.000004
RC18194	301281	7479847	EL31284	19/08/2018	ARU Production Bore (PB 1)	0.736060	0.000003
RC18190	304179	7484916	EL31284	20/08/2018	ARU Production Bore (PB 8)	0.743081	0.000003
RC18186	308822	7481504	EL31284	18/08/2018	NTG Laramba Roads Bore	0.752272	0.000003
RC18184	288452	7483299	EL31957	17/08/2018	ARU Production Bore (PB 7)	0.751000	0.000003
RC18185	281280	7488097	EL31957	17/08/2018	ARU Production Bore (PB 4)	0.763193	0.000003
RC18192	277648	7479663	EL31957	17/08/2018	Pattys Well Production Bore 1981	0.731336	0.000004
RC18191	319167	7481604		20/08/2018	Alyuen Production Bore	0.734610	0.000004
RC18195	316904	7453297		18/08/2018	ARU Baseline Monitoring Bore (G4)	0.728781	0.000003
					IAPSO (seawater)	0.709176	0.000003
					IAPSO (seawater)	0.709175	0.000003

SRM987 (500ng) 87/86Sr = 0.710246 ± .000009 (2sd) 11 Phoenix TIMS reference measurements 2/9/2018 to 20/9/2018

Certified value for SRM 987 (highly purified SrCO3) 87/86Sr = 0.71034 ± 0.00026

Krabbenhoft et al (2009) TIMS value for IAPSO 87/86Sr = 0.709173 ± 0.000040

Liu et al (2012) MC-ICPMS value for IAPSO 87/86Sr = 0.709161 ± 0.000018

The data presented in Table 3 demonstrates there is a range of groundwater Sr isotope compositions. The data is clearly well constrained using standards and two water samples from the same bore (RC18188 and RC18194) demonstrate that field results are repeatable. The Sr isotopic ratio of groundwater at Nolans Bore is similar to or has a slightly lower ratio than the groundwater in the southern basins but it has a much higher Sr content. There is a substantial drop in the Sr isotopic ratio from sample RC18193 to RC18187. This decrease in $^{87}Sr/^{86}Sr$ and an increase in dissolved Sr is evidence for a marked change at Nolans Bore and indicates that Sr isotopes are likely to be useful in environmental monitoring. This might be due to infiltration of rainwater or interaction within Nolans Bore mineralisation or both. A similar study should be repeated to investigate possible temporal/seasonal changes and next time must include at least one water sample downstream of the deposit, as well as rainwater.

As recommended by the NT EPA, Arafura purchased and set up data loggers in 2018 to provide a continuous record of groundwater levels across the project area. A record of the bores and data loggers is provided in the Appendix. Eight of these data loggers were placed in bores on EL 31284. Unfortunately, Arafura has been unable to equip three of its important groundwater investigation bores due to the presence of Aileron Station equipment. The Department has been advised of the situation with respect to Aileron Station.

Core drilling has been proposed to better understand the stratigraphy, porosity and groundwater transmittivity of the Cenozoic strata in the southern basins area. It is likely that this will be done in the next period as it will aid groundwater modelling.

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