

# ASX announcement

7 December 2023

## Mundaerno and Radium Hill South Projects granted, Sentinel-2 satellite imagery and thermal studies underway

Argonaut Resources NL (ASX: ARE) (*Argonaut* or the *Company*), to be renamed Orpheus Uranium Limited, is pleased to announce the formal grant of two projects highly prospective for sedimentary-hosted roll-front and tabular-style uranium mineralisation, located within proximity to the Company's Frome project in the Frome Embayment, in the Southern Curnamona Region and Murray-Darling Basin of South Australia (Figure 1).

### Highlights

#### URANIUM PROJECTS GRANTED

##### Mundaerno Project – Exploration licence granted

- EL 6958 Mundaerno project is located approximately 12 kilometres south of the Honeymoon Uranium Mine, comprises a portion of the headwaters of the highly prospective Yarramba Palaeochannel and is positioned directly on top of Mesoproterozoic granitic rocks that are potential source rocks of the uranium.
- The Yarramba Palaeochannel hosts significant sedimentary-hosted uranium deposits, including: Honeymoon Uranium Mine (36 Mlbs contained  $U_3O_8$ )<sup>1</sup>, Yarramba (Jasons) deposit (11 Mlbs contained  $U_3O_8$ )<sup>2</sup>; held by Boss Energy Ltd (ASX: BOE), as well as a number of uranium occurrences.
- Limited historic drilling during 2011 intercepted Tertiary sequence sediments of the Yarramba Palaeochannel and confirmed uranium mineralisation in weathered basement which yielded a peak uranium value of 130 ppm U.

##### Radium Hill South Project – Competitive exploration licence granted

- EL 6960 Radium Hill South project was awarded to Orpheus by the Government of South Australia via a competitive application process.
- The Radium Hill South project contains five (5) exceptional uranium prospects with drill ready targets, located within the Olary Palaeovalley System containing up to five kilometres strike length of Tertiary palaeochannels prioritised for geophysical targeting and drilling.
- Key historic drill results for immediate follow-up include:
  - Gairloch: 400 ppm  $U_3O_8$  over 1.9m from 103.8m at the contact between the base of a sand channel and underlying black carbonaceous clay;
  - Jones Dam: 401 ppm  $U_3O_8$  over 2m from 86m in drillhole 06RMCD040 in a strongly anomalous zone over 5.1m, within steely grey sand; and
  - Kinloch Dam: 507 ppm  $U_3O_8$  over 3m from 105m in M64 in sand below a silcrete layer.

---

<sup>1</sup> Source: <https://bossenergy.com/honeymoon-project>

<sup>2</sup> Source: <https://bossenergy.com/honeymoon-project/exploration>

## NEXT STEPS

- Orpheus has commenced a Satellite Imagery Gas Study using Sentinel-2 Satellite Imagery and Thermal Imagery to determine whether spectral signatures can identify gasses emanating from the earth's surface, to detect helium (potential pathfinder of uranium mineralisation), hydrogen, methane and other gasses.
- Stakeholder engagement has commenced to obtain land access for on-ground exploration activities.
- Review of historical datasets advanced to define targets for immediate drill testing.

Executive Chairman, Mick Billing states: *"We are very pleased with the grant of these two applications which significantly expand our foothold of prospective palaeochannels in South Australia's leading uranium province. Mundaerno is located south of the Honeymoon Uranium Mine and hosts the Yarramba Palaeochannel, while Radium Hill South is an exciting exploration project with robust 'walk up' drill targets. We look forward to advancing both assets to a maiden drill campaign."*

## Satellite imagery analysis and thermal modelling

Orpheus has commissioned independent consultant Dr. Neil Pendock who specialises in remote sensing exploration, to conduct a Satellite Imagery Gas Study and Thermal Imaging Analysis using Sentinel-2 satellite imagery with the objective to detect helium, hydrogen, methane and other gasses emanating at surface that may encourage exploration to assist with possible identification of uranium mineralisation at depth.

Specifically, the study will determine whether Sentinel-2 satellite imagery can identify helium anomalism that may be stronger than background atmospheric helium concentrations. Helium is a gas that largely forms via natural radioactive decay of uranium and thorium. Lighter than air, and defies gravity, helium is liberated from source rocks and rises towards the surface in porosity associated with faults and fractures as well as through porous sedimentary cover. The constant generation of helium gas from the radioactive decay of uranium and its daughter products indicates helium may be considered a potential pathfinder in the detection of uranium mineralisation.

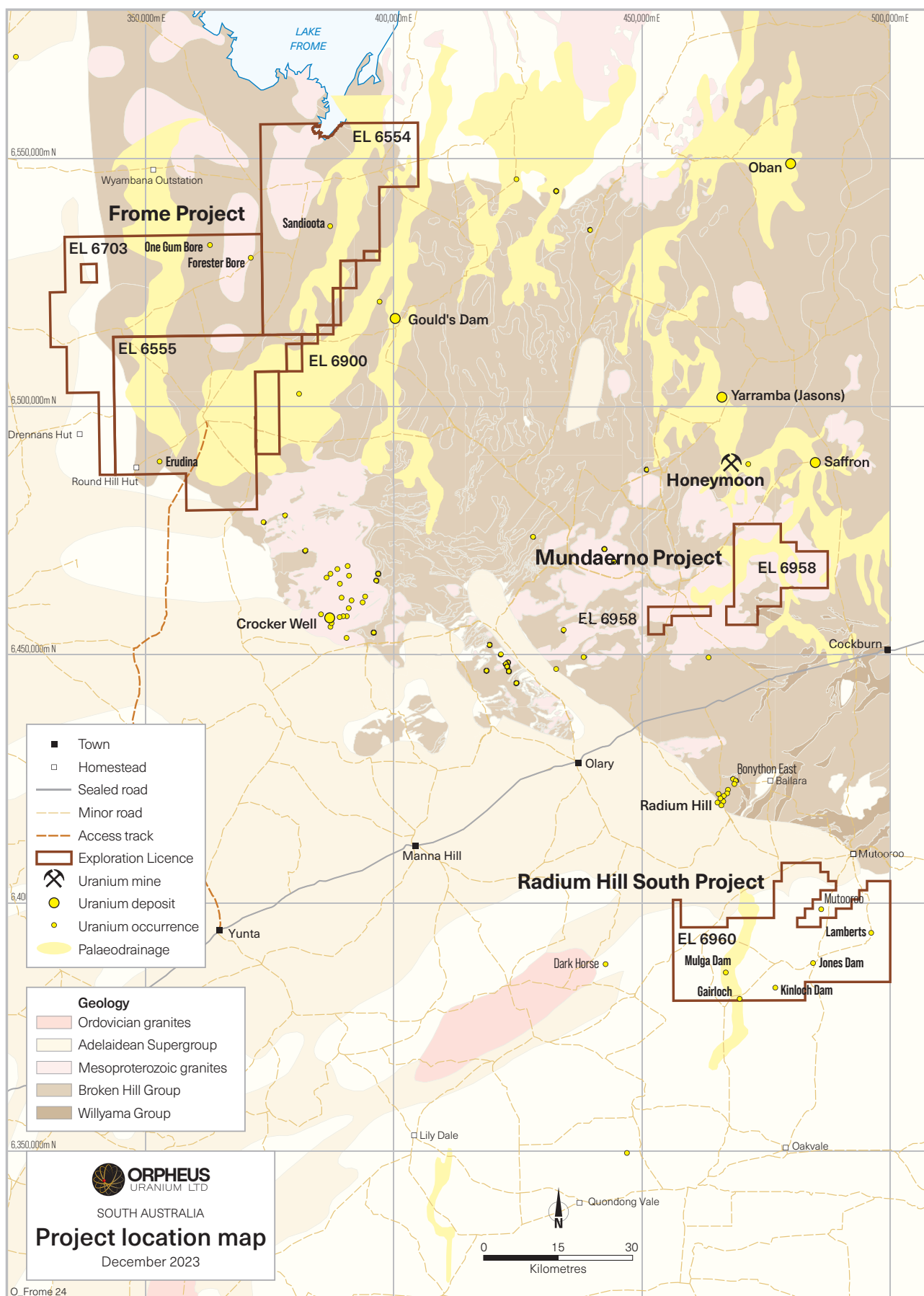
Hydrogen, methane and other gasses may indicate gas migration along structures that may provide a reducing environment for uranium precipitation and are therefore also considered pathfinder gasses in the exploration for uranium mineralisation.

The Sentinel-2 Satellite Imagery provides data in the Visible-Near Infra-Red (VNIR) and Short-Wave Infra-Red (SWIR) wavelengths which are the wavelengths where these gasses are visible. Dr. Pendock has developed a unique algorithmic method for analysing the data to remove background spectral noise from the imagery.

This technique has been applied by Adavale Resources (ASX: ADD) at their Lake Surprise project, where several helium anomalies coincident with gamma anomalies were evident – refer to ADD announcement 8 November 2021.

In addition, Thermal Imaging will be conducted to possibly detect palaeochannel features that have different thermal characteristics to surrounding regolith. Thermal imaging from satellite imagery measures the amount of infrared radiation emanating from the earth's surface.

In the event helium anomalies are identified, radon sampling will be conducted. Radon sampling is considered to be a direct measure of uranium, areas will then be selected for drill testing.



**Figure 1** Project locations and uranium occurrences in the highly prospective region of the Frome Embayment and to the south, the northern margin of the Murray-Darling Basin.

## Mundaerno Project

The Mundaerno project is considered highly prospective for sedimentary-hosted roll-front and/or tabular-style uranium mineralisation associated with Tertiary palaeochannels. The project is situated approximately 12 km south of the Honeymoon Uranium Mine and has the same palaeochannel feature, the Yarramba Palaeochannel that hosts the Honeymoon Uranium Mine (36 Mlbs contained  $U_3O_8$ ), Yarramba (Jasons) deposit (11 Mlbs contained  $U_3O_8$ ) held by Boss Energy Ltd (ASX: BOE) and the Saffron deposit (5.4 Mlbs contained  $U_3O_8$ ) held by Marmota Limited (ASX: MEU) as well as other uranium occurrences (Figure 2).

### Prospectivity

Previous exploration for uranium was limited to six wide-spaced drillholes in the 1970s that intersected weathered basement granite followed by a regional drilling campaign in 2011 which consisted of 14 vertical Aircore holes drilled ~500 m apart along several very widely spaced traverses. Drillholes were sited to test an interpreted extension of the Yarramba Palaeochannel and intersected sand, silt and clay beds of the prospective cover sequence, including a basal sandy unit, into weathered basement which yielded a peak uranium value of 130 ppm U. A number of drillholes proposed, to target radiometric anomalies across palaeochannel features remain undrilled due to a downturn in the uranium market at that time.

### Geology

The Mundaerno project is situated in the Southern Curnamona Province comprising Proterozoic metasediment and metavolcanic units of the Willyama Supergroup and Mesoproterozoic granites of the Bimbowrie Suite, including the Mundaerno Suite. Tertiary and Quaternary sediments lie directly on top of gneissic and granitic basement rocks with varying thickness.

### Exploration program

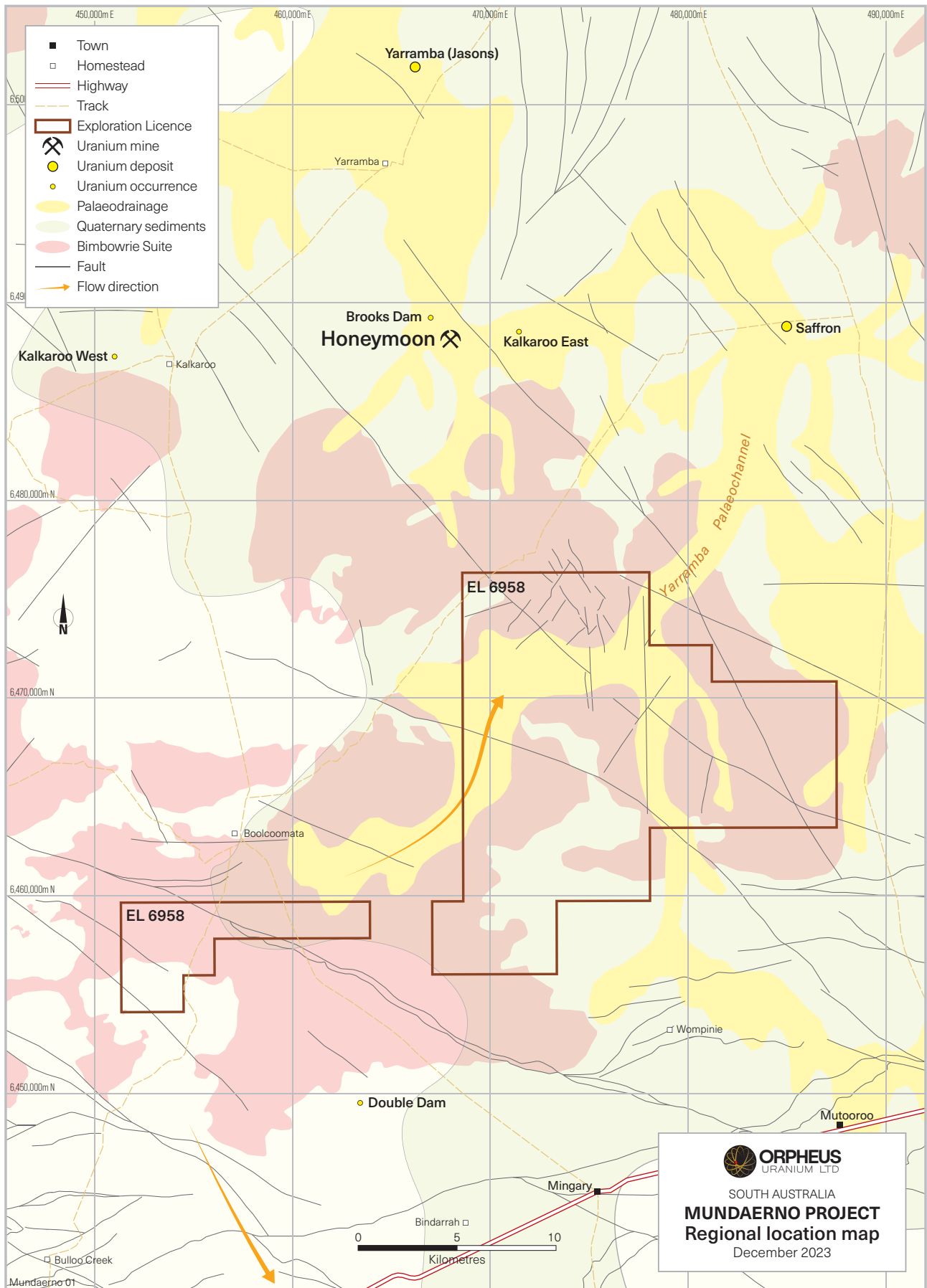
Orpheus' exploration objective is to delineate the margins of the Yarramba Palaeochannel via geomorphological reconstruction of the palaeochannel and palaeovalley surface, to locate suitable trap sites for sedimentary-hosted roll-front and/or tabular-style uranium mineralisation. The work program proposed for the Mundaerno project includes:

- Map the palaeosurface via acquisition of passive seismic, detailed ground gravity and electrical methods;
- Prospect scale geochemical sampling via direct measures of uranium (radon sampling, surface geochemical sampling); and
- Drilling of high priority targets within the Yarramba Palaeochannel.

Orpheus has commenced compiling and interpreting all existing datasets.

### Tenure

Orpheus holds a 100% interest in EL 6958 Mundaerno project that comprises two Blocks for a combined area of 294 km<sup>2</sup>. The licence is contiguous with Boss Energy Ltd exploration licence, that hosts the Honeymoon Uranium Mine, situated 12 km to the north of the Mundaerno project (Figure 2).



**Figure 2** Mundaerno project location and nearby uranium occurrences, highlighting the headwaters of the Yarramba Palaeochannel directly underlain by Mesoproterozoic granitic basement, located just 12 km south of the Honeymoon Uranium Mine.

## Radium Hill South Project

The Radium Hill South project is considered highly prospective for roll-front and/or tabular-style, sedimentary-hosted uranium mineralisation associated with Tertiary palaeochannels. The region is situated approximately 20 kilometres south of the radiogenic region of the Radium Hill Uranium Field and 100 km southeast of the Crocker Well Uranium Field host to the hard rock uranium deposits and further to the north, the Honeymoon and Goulds Dam sediment-hosted Tertiary palaeochannel uranium deposits (Figures 1 and 4).

### Prospectivity

The mineralisation model at the Radium Hill South project comprises both sediment-hosted and silcrete-hosted uranium mineralisation within Neogene sediments including the Geera Clay, and Paleogene channel sands including the Warrina Sand of the Olary Palaeovalley System known to host uranium mineralisation at the uranium occurrences; Mulga Dam, Gairloch, Kinloch Dam, Jones Dam and Lamberts, at depths of approximately 80m-110m located within, sedimentary and structurally-controlled palaeochannel features.

Previous explorer, Mega Hindmarsh Pty Ltd (2005–2014) analysis of its drillhole geophysical logs revealed the presence of previously undetected, north-south trending sedimentary channels and deltaic sequences, which overlie reducing carbonaceous mudstone. These sedimentary facies were found to be very anomalous in uranium, yielding significant gamma log intercept thicknesses of up to 10.7m at Jones Dam and 8m at Gairloch Dam. The channels were interpreted to be at least 5 km in length, and Mega Hindmarsh Pty Ltd was confident that they offer an excellent target for future investigation.

Historic significant intercepts from the existing five uranium occurrences located within EL 6960 Radium Hill South project and reported by Mega Hindmarsh Pty Ltd<sup>3</sup> include:

- **Mulga Dam**
  - ↪ 1,350 cps at 95m depth in fluvialite, Lower Miocene carbonaceous clays.
- **Gairloch**
  - ↪ 2,266 cps at 104.1m at the contact between the base of a sand channel and underlying black carbonaceous clay, assay grade obtained by analysis of the drill cuttings from this interval was 400 ppm  $U_3O_8$  over 1.9m from 103.8m.
- **Kinloch Dam**
  - ↪ 507 ppm  $U_3O_8$  over 3m from 105m in M64 in sand below a silcrete layer;
  - ↪ 23m averaging 129 cps of radiometrically anomalous sand and clay.
- **Jones Dam**
  - ↪ 401 ppm  $U_3O_8$  over 2m from 86m in drillhole 06RMCD040 in a strongly anomalous zone over 5.1m, within steely grey sand;
  - ↪ 10.7m of radiometrically anomalous sand from 82.7m in drill hole 06RMCD048, associated with peak gamma values of 1,041cps, or 263 ppm  $eU_3O_8$ ;
  - ↪ 3.6m of radiometrically anomalous sand from 98.9m in drill hole 06RMCD034, with a gamma maximum of 1,056 cps at 265 ppm  $eU_3O_8$ ;
  - ↪ 3.4m of radiometrically anomalous oxidised sand and reduced sand with wood fragments in drill hole 07RMCD026 from 91.5m, includes 0.25m at 382 ppm  $eU_3O_8$ .
- **Lamberts**
  - ↪ Best intercept was 0.7m at 0.073%  $U_3O_8$  at 102.2m in drillhole WE1.

Mega Hindmarsh Pty Ltd worked with CSIRO in 2010 developing the sequence stratigraphy, palynology, spectral mineralogy, geochemistry and structure to provide vectors to channels of uranium transport and to depositional sites for drilling by understanding the sedimentation architecture of the region through implementing the SEDSIM flow and sedimentation program (Figure 3). The results provide excellent indication of alternating lignite, sand depositional environments that warrant further investigation.

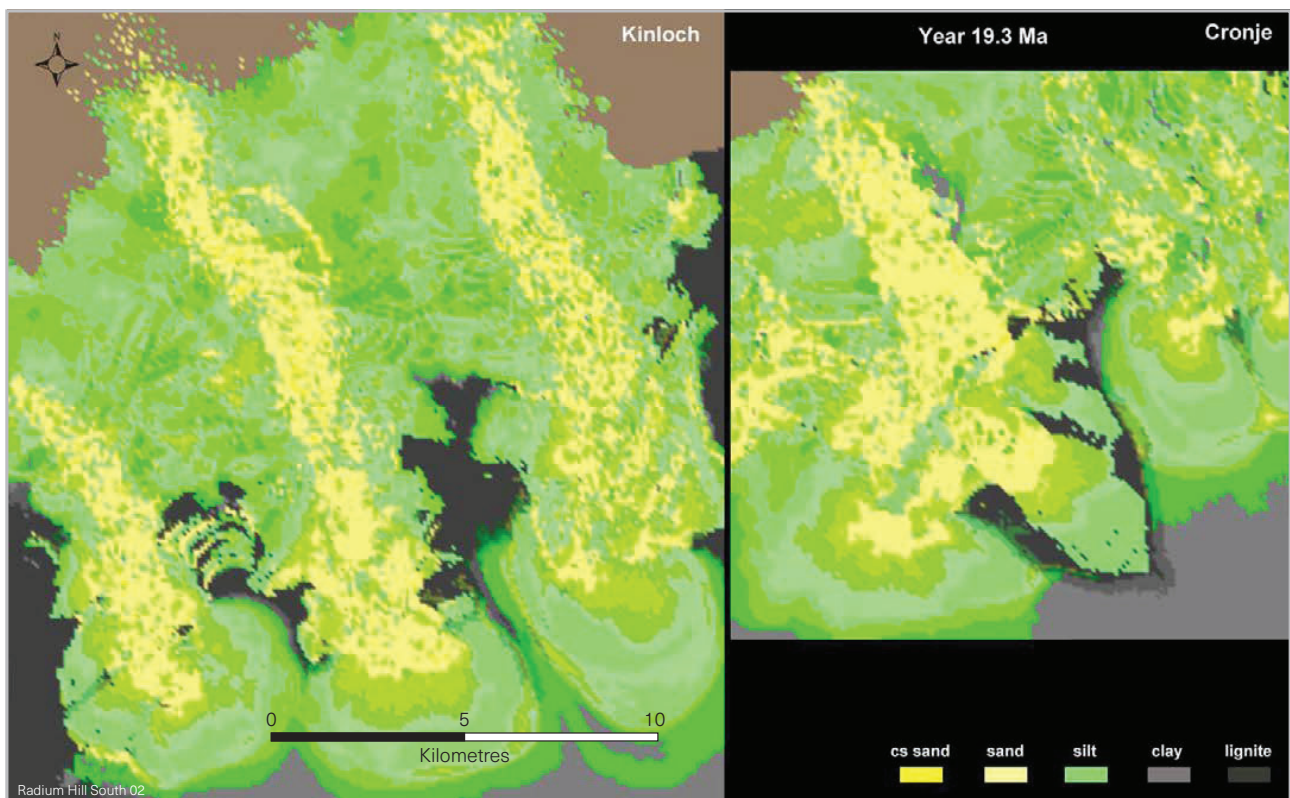
---

<sup>3</sup> Source: Uranium grades extracted from Open File Report, Envelope 11421 compiled by Mega Hindmarsh Pty Ltd during the period 2005 to 2014, Cronje Dam Project.

Results presented as extracted from the CSIRO report<sup>4</sup> includes the following:

- The implications for uranium enrichment are:
  - If uranium-bearing fluids were carried in the river water at all times, then all fluvial sediments may have been favourable for uranium enrichment.
  - The reductant in the area may have been organic clays or lignite or carried organics in the fluvial channels.
  - The interface between clay/lignite and fluvial sediment may provide a potential trap site.
  - The SEDSIM model shows potential for trap sites throughout the project area because of the migrating nature of the alluvial fan.
- The trap sites also act if lignite is the source of uranium.
- Any sediment that was eroded and may have had a uranium accumulation would have been transported towards the southern areas onto the floodplain.

Importantly, this study was completed in 2010, at a time when Mega Hindmarsh Pty Ltd changed exploration focus from uranium to iron ore (magnetite) of the Braemar Iron Formation. Orpheus intends to revisit the study to review sedimentation anomalies and to further define regional features to channel scale through geophysical methods (passive seismic, ground gravity, electrical methods) to assist with identifying roll-front environments and locating drillholes.



**Figure 3** Mega Hindmarsh Pty Ltd / CSIRO plan image from the SEDSIM flow and sedimentation program showing alluvial fan deposition, cutting deep into underlying sediments forming unconformities, source CSIRO, (Johns, et al., 2010).

<sup>4</sup> Johns, S., Schmid, S., Dyt, C., Annetts, D., Fisher, L., Robinson, J., & Hill, J. (2010). JSU - Mega Hindmarsh Pty Ltd, Cronje Dam Project, Final Report, Envelope 11421. CSIRO.

## Geology

The Radium Hill South project lies approximately 20 km south of the Radium Hill Uranium Field that comprises Willyama Supergroup basement rocks. Epigenetic-style uranium mineralisation occurs in the form of davidite as vein 'lodes' within intensely altered shear zones hosted by high metamorphic grade quartzo-feldspathic paragneiss and amphibolite over a strike length of >7 km which has historically been mined to a depth of 290m on nine levels over a strike length of 1,400m<sup>5</sup>. Drainage patterns have formed in a southerly direction toward the Murray-Darling Basin as part of the Olary Palaeochannel System. Sediment-hosted uranium mineralisation is believed to have formed from oxidised groundwaters draining from the Willyama Supergroup basement rocks from the Radium Hill Region. The Tertiary sediments comprise carbonaceous clays and sands suitable for uranium to form sedimentary and/or tabular redox fronts.

Reducing host rocks within the project area where uranium mineralisation has been identified include units of the Renmark Group:

- a. Lower Miocene carbonaceous clays with associated sands of the Geera Clay (equivalent unit to the Namba Formation of the Frome Embayment) within palaeodrainage features of the Olary Palaeovalley System along the northern margin of the Murray-Darling Basin in the vicinity of the Anabama-Redan Fault Zone.
- b. Lower Eocene sands remain a uranium target to be further explored within palaeochannel features and comprises the Upper Sand and Lower Sand units of the Warina Sand (equivalent unit to the Eyre Formation of the Frome Embayment).

Uranium enriched source rocks proximal and probable to the project area include:

- Hydrothermal vein uranium mineralisation within gneisses of the Willyama Supergroup, where uranium minerals are present as structurally-controlled uraniferous lodes within foliated migmatitic gneiss such as Radium Hill Uranium Field and the Victoria Hut uranium occurrence;
- Radiogenic granites from the Olary Domain where uranium minerals are present within veins and breccia veins within host Mesoproterozoic granites such as Crocker Well and Mount Victoria uranium deposits;
- Ordovician granites intruding the Adelaidean metasediments where uranium has been identified proximal to the granite margins of the Anabama Granite pluton and the Cromwell Granite, such as the Dark Horse uranium occurrence;
- Influence from hydrothermal, basement-derived, fault-localised, fluids during uranium precipitation in the sediments proximal to the Anabama-Redan Fault Zone/Escarpment.

## Exploration program

Orpheus' exploration objective is to target sedimentary-hosted roll-front and/or tabular-style uranium mineralisation located within palaeochannel drainage features and along the buried escarpment of the northeast-southwest trending Anabama-Redan Fault.

- Orpheus will acquire passive seismic, ground gravity and electrical method surveys to constrain palaeochannel margins, map structures, determine the effects of faulting, and basement topography.
- Drilling of high priority targets at the existing five uranium occurrences located within EL 6960 Radium Hill South project; Mulga Dam, Gairloch, Kinloch Dam, Jones Dam and Lamberts.

Orpheus has commenced compiling existing datasets of the five uranium prospects: Mulga Dam, Gairloch, Kinloch Dam, Jones Dam and Lamberts, in preparation toward drilling.

## Tenure

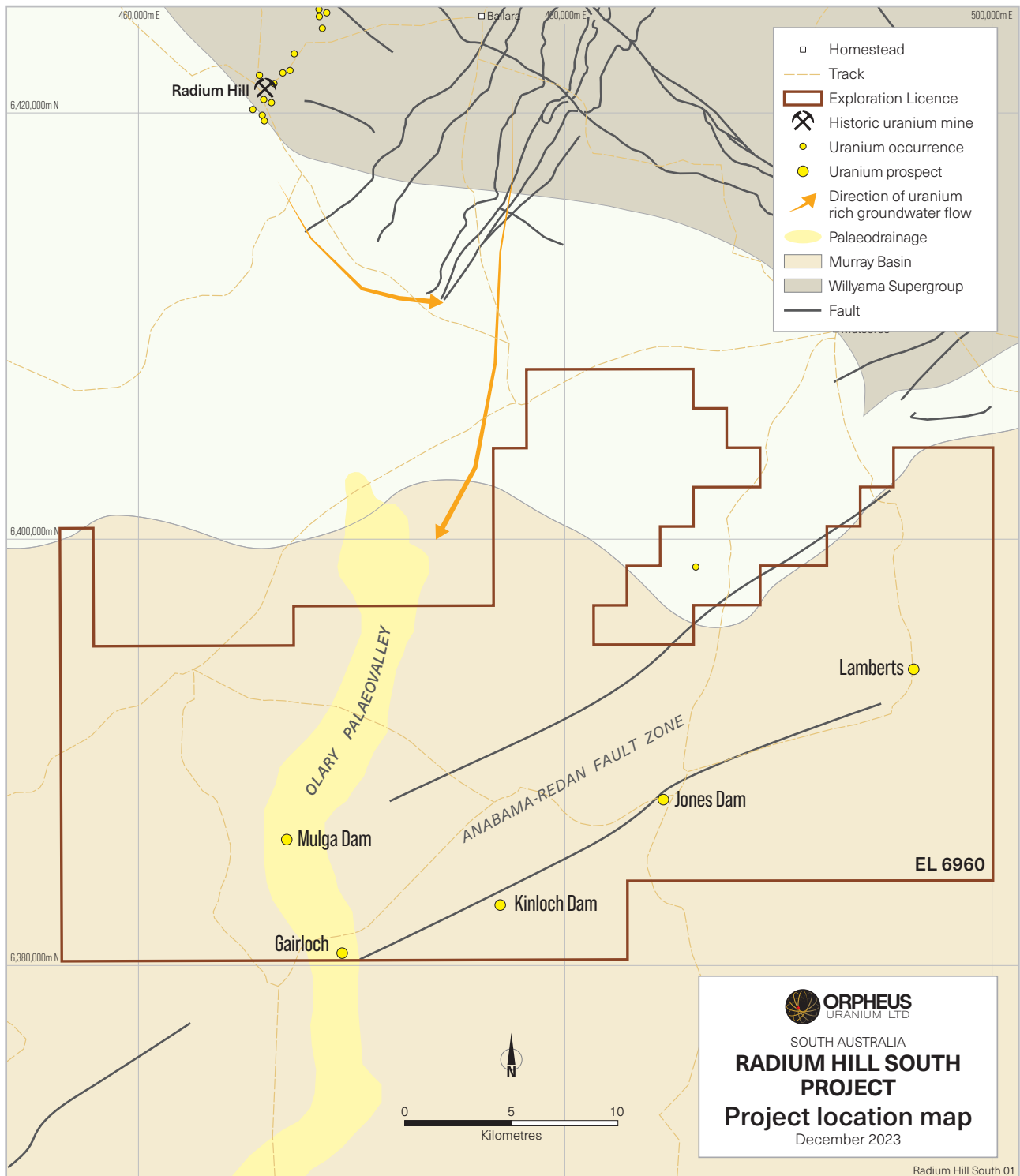
Orpheus holds a 100% interest in EL 6960 Radium Hill South project that covers an area of 797 km<sup>2</sup>.

In June 2023, Orpheus submitted an application for an Exploration Release Area (ERA) via a competitive application process for ERA 001240 to the Government of South Australia. In September 2023, Orpheus received confirmation from the Government that it was successful in the competitive application and the ERA was converted into an Exploration Licence Application and has subsequently been granted.

EL 6960 Radium Hill South project is located approximately 20 km south of the Radium Hill Uranium Field.

---

<sup>5</sup> Source: [https://minerals.sarig.sa.gov.au/MineralDepositDetails.aspx?DEPOSIT\\_NO=962](https://minerals.sarig.sa.gov.au/MineralDepositDetails.aspx?DEPOSIT_NO=962).



**Figure 4** Radium Hill South project location and uranium occurrences, highlighting the five uranium occurrences located within the competitive licence application that was granted to Orpheus, located 20 km south of the Radium Hill Uranium Field.



**Figure 5** Location map of uranium assets owned by Orpheus located in South Australia and Northern Territory.

## About Argonaut

Argonaut Resources NL is an Australian Securities Exchange listed exploration company which has received shareholder approval to be renamed Orpheus Uranium Limited. The name change is estimated to be complete in January 2024. The Company has elected to shift its strategic direction to focus principally on its Australian uranium assets, and has acquired and commenced activities on an extensive suite of highly prospective uranium licences in South Australia and the Northern Territory, both jurisdictions which allow uranium mining and processing.

This report is authorised for release by:

### Mick Billing

Executive Chairman

Argonaut Resources NL

### Competent Person Statement

Sections of information contained in this report that relate to Exploration Results were compiled or reviewed by Miss Bethany Lawrence BScAppGeol(Hons), MAIG, GIA(Aff), CG(Aff) who is a Member of the Australian Institute of Geoscientists and is a full-time employee of Argonaut Resources NL and Orpheus Uranium Limited. Miss Lawrence holds shares in Argonaut Resources NL. Miss Lawrence has sufficient experience which is relevant to the style of mineral deposits under consideration and to the activity which she is undertaking to qualify as a Competent Person as defined in the 2012 edition of the "Australasian Code for Reporting of Mineral Resources and Ore Reserves". Miss Lawrence consents to the inclusion in this report of the matters based on this information in the form and context in which it appears.