

# National Argon Map: an AuScope initiative

## Data Acquisition Project Proposal

This form should be completed and returned to Geoff Fraser ([Geoff.Fraser@ga.gov.au](mailto:Geoff.Fraser@ga.gov.au)) for consideration by the National Argon Map Oversight Panel

### Project Proponent

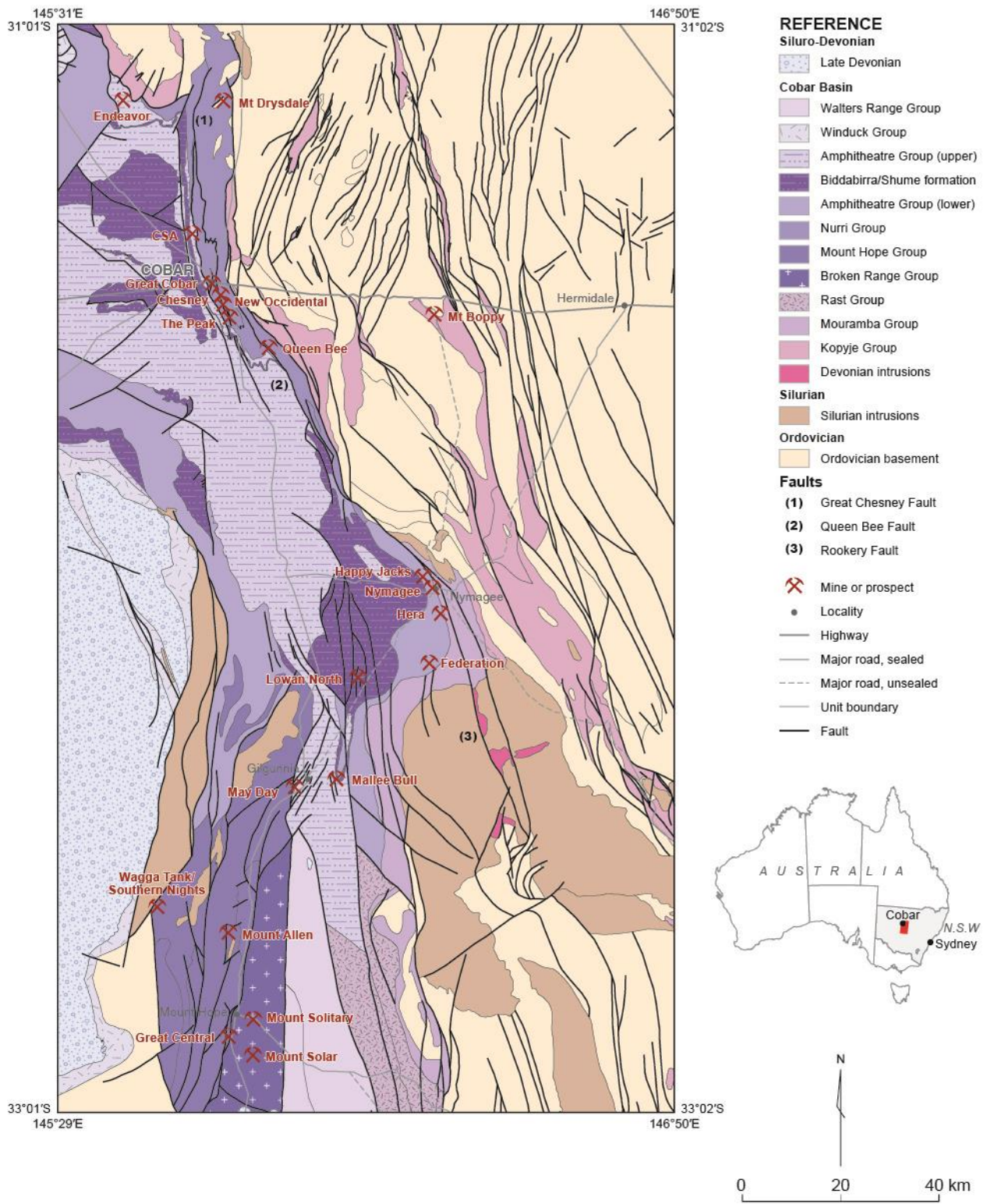
Name: Joel Fitzherbert
Affiliation and position: Senior Geoscientist
Collaborators: Phillip Blevin, Peter Downes, Mark Eastlake, Peel Mining ltd
Project Title: Direct dating of Cobar Basin mineralisation
Geographic Region: Cobar
Geological Province or Tectonic Unit: Cobar Basin

### Brief Project Description:

Recent dating (titanite U-Pb and white mica/biotite Ar-Ar) of mineralisation in the Cobar Basin suggests the eastern Cobar Cu-Zn-Au orebodies formed ca. 412-400 Ma (Fitzherbert et al 2019; Fitzherbert et al submitted). Basin inversion, further mineralisation (Pb-Zn-Ag-rich) and orebody reactivation/deformation occurred ca. 390-380 Ma (e.g. Fitzherbert et al 2019). Zircon U-Pb dating of magmatic rocks in the region (e.g. Waltenberg et al in prep), as well as Ar-Ar dates on major fault systems to the south of the Cobar Basin produced ca. similar 412-410 Ma ages (Waltenberg et al in prep; Foster et al 1999), suggesting Cobar mineralisation is likely part of a larger-scale structural/magmatic system at this time.

The Geological Survey of New South Wales (GSNSW) recently obtained drill core samples from the Mallee Bull, Southern Nights/Wagga Tank and Blue Mountain orebodies of the central and western Cobar Basin (Figure 1). These orebodies are located within the southern **Cobar NDI area** which will be drilled as part of the MinEx-CRC. The age of the allochthonous stratigraphy that hosts these deposits is contentious and has been the subject of recent U-Pb zircon dating (e.g. Waltenberg et al in prep). These orebodies are currently considered VHMS-related and potentially ca. 420 Ma (Waltenberg et al in prep; Edgecombe and Soininen 2019). Alteration associated with these orebodies varies from **sericitic white mica to biotite-rich and less commonly adularia-rich**. The GSNSW has representative, non-confidential samples from all of these alteration types.

The central and western Cobar orebodies have no direct geochronological constraints and to-date no VHMS has been confirmed in the Cobar Basin. More geochronological information is required to place Cobar mineralisation within the currently evolving tectonic framework of the central Lachlan Orogen. Dating of these orebodies may also help resolve discrepancies between ca. **420 Ma volcanic rocks and ca. 408-405 Ma younger limestone olistoliths** (fossil constraints) within the basin sequences. GSNSW is currently reviewing paleontological determination within the relevant stratigraphy.



2020\_019

**Figure 1.** location of the Mallee Bull, Wagga Tank/Southern Nights orebodies with the Cobar Basin.

**References**

Edgecombe, D. and Soinenen. 2019. Wagga Tank/Southern Nights and Mallee Bull, evolving stories. Discoveries in the Tasmanides, AIG Bulletin 96.

*Fitzherbert, J.A., McKinnon, A.R., Blevin, Waltenberg, K., P.L., Downes, P.M., Wall, C., Matchan, E. and Huang, H. Submitted. The Hera orebody: a complex distal (Au-Zn-Pb-Ag-Cu) skarn in the Cobar Basin of central New South Wales, Australia. Resource Geology.*

*Fitzherbert, J.A., Downes, P.M., Blevin, P.L., Norris, E., Huang, H., Matchan, E., Waltenberg, K., Wall, C. and Phillips, D. 2019. Refining the Cobar-type mineral system: new insights spawned from direct dating of mineralisation. Discoveries in the Tasmanides, AIG Bulletin 96.*

*Waltenberg, K., Jones, S.J. and Fitzherbert, J.A. (in prep) New SHRIMP U-Pb zircon, monazite and titanite ages from the Cobar Basin and Broken Hill regions, New South Wales: Mineral Systems Projects July 2018–June 2019. Geoscience Australia Record, Geological Survey of New South Wales Report.*

**Approximate number of samples proposed for  $^{40}\text{Ar}/^{39}\text{Ar}$  analyses:**

We have in possession anything **from 4 to 8 samples** from the three orebodies

**Lithologies and minerals proposed for  $^{40}\text{Ar}/^{39}\text{Ar}$  analyses:**

All rocks are pervasively altered. Primary rock types include volcanics, sandstone and calcareous units. The alteration in all samples is very pervasive and has replaced any primary minerals (micas and feldspar and carbonate in the rocks)

**Do you have a preferred  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  laboratory? (ANU, Curtin, UQ, UMelb):**

Any lab is fine.

## Guidelines and Criteria

*Project Proposals for funding support as part of the AuScope National Argon Map initiative will be assessed on the following criteria.*

**Australian:** Samples must come from Australia (this may include Australian offshore regions)

**Non-confidential:**  $^{40}\text{Ar}/^{39}\text{Ar}$  data must be made publicly-available (ie non-confidential)

**Impact:** to what extent new  $^{40}\text{Ar}/^{39}\text{Ar}$  data from the proposed samples will contribute to geographic data coverage, or address key geological questions

**Feasibility:** whether the nature of the work is tractable via  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology and the scale of the proposal is realistic within the time frame of the National Argon Map initiative (January 2020 – June 2021)?

**Appropriate sample material:** whether the proposed samples are (i) appropriate for  $^{40}\text{Ar}/^{39}\text{Ar}$  analyses, and (ii) available within the time-frames of the National Argon Map initiative?

## Oversight Panel

Dr Geoff Fraser, Geoscience Australia

Professor Zheng-Xiang Li,

Dr Anthony Reid, Geological Survey of South Australia

Peter Rea, MIM/Glencore

Dr Catherine Spaggiari, Geological Survey of Western Australia

Dr David Giles, MinEx CRC

Dr Marnie Forster (observer role as Project Coordinator)

## Expectations

*AuScope funding will cover the costs of sample irradiation and isotopic analyses.*

*Project Proponents will be responsible for:*

- Provision of appropriate sample material. This includes mineral separation, which can be arranged at the relevant  $^{40}\text{Ar}/^{39}\text{Ar}$  laboratories (in many cases this is preferred), but costs of mineral separation will be borne by the project proponent. The relevant laboratory reserves the right not to analyse material if it is deemed unsuitable for  $^{40}\text{Ar}/^{39}\text{Ar}$  analysis.
- Provision of appropriate sample information. A sample submission template will be provided. Information in these sample submission sheets will form the basis of data delivery/publication, and the oversight committee or relevant laboratory reserves the right not to proceed with analyses unless and until appropriate sample details are provided. This includes description and geological context for each sample.
- Leading the preparation of reports and/or publications to deliver  $^{40}\text{Ar}/^{39}\text{Ar}$  results into the public domain within the duration of the National Argon Map initiative (January 2020 – June 2021).
- Project Proponents will be expected to communicate directly with the relevant  $^{40}\text{Ar}/^{39}\text{Ar}$  laboratory once a project has been accepted by the Oversight Committee, in order to clarify project expectations, arrange sample delivery, discuss results, collaborate on reporting and data delivery etc.

*Participating Ar Laboratories will be responsible for:*

- Providing advice to project proponents regarding suitable sample material and feasibility of proposed work
- Irradiation of sample material
- $^{40}\text{Ar}/^{39}\text{Ar}$  isotopic analyses
- Delivery of data tables, and analytical metadata to project proponents

Queries regarding possible projects as part of the National Argon Map initiative can be directed to Marnie Forster ([Marnie.Forster@anu.edu.au](mailto:Marnie.Forster@anu.edu.au)) or Geoff Fraser ([Geoff.Fraser@ga.gov.au](mailto:Geoff.Fraser@ga.gov.au))