

Multi-scale analysis of the Mt Isa region and its metallogenic potential

Project Code: I7

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I7 will build on the outcomes of Stage 1 research projects in the Mt Isa Region (I1, I2 & I4).

A primary goal of the I7 project is to build a fully integrated, coherent crustal architecture and determine how this relates to the region's metallogenic history.

In order to have a major impact on predictive mineral discovery, the project will capture and constrain the 3D architecture and 4D geodynamic history of the region, extending to the McArthur Basin, and provide an integrated understanding of the '5 Questions' of mineral system processes.

What are the 5 Questions?

- 1. What is the geodynamic setting and PT history of the system?*
- 2. What is the architecture of the system?*
- 3. What are the fluids, their sources and/or reservoirs?*
- 4. What are the fluid flow drivers and pathways?*
- 5. What are the metal transport and deposition pathways?*

Integrating 3D architecture

To build a series of well-constrained 3D maps at a variety of scales that integrate:

- + Lawn Hill
- + Isa Valley
- + Eastern Succession
- + Western Succession
- + McArthur Basin.

Outputs will incorporate:

- + Digital map (GIS) layers of potential field worms and metal distributions.
- + Serial sections, constrained inversions, seismic interpretations and petrophysical data.
- + Documentation of structural architecture of camps and deposits with a focus on fault dimensions, intersections and sealing/fluid flow potential at the time of mineralisation.

Synthesis of Geodynamic Setting

- + Regional tectonics and geodynamic evolution including basement control on upper crustal architecture.
- + Investigation of thermal and magmatic history of the Western Succession and integrating this with the Eastern Succession.
- + Database of ages of mineralisation and related alteration.
- + Updated time-space correlation chart.

Fluid Sources and Reservoirs

- + Assessment of hydrocarbon source and genesis with links to mineralisation.
- + Comprehensive database of isotope, trace element and fluid inclusion data for key deposits.

Pathways and Fluid Flow Drivers

- + Investigation of regional permeability structure and mechanical properties, linked to 3D architecture and numerical

modelling scenarios.

- + Synthesis of concepts on structural controls on fluid flow and alteration.

Depositional Mechanisms

- + Evaluation of single and multiple fluid models for Pb/Zn systems in the Isa Inlier.
- + Comparative analysis of Isa Cu with Western and Eastern Succession and IOCGs.
- + Geochemical models of alternate depositional hypotheses using HCh and reactive transport simulations.

Synthesis

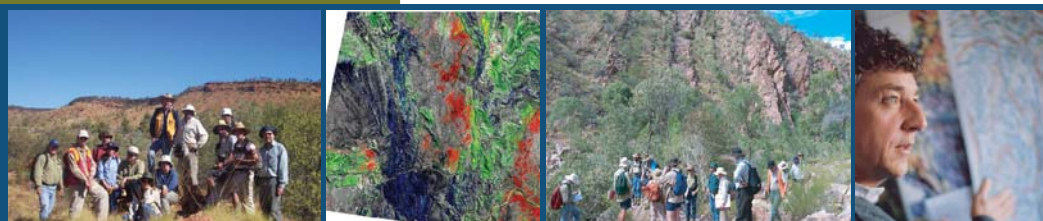
A Final report pulling all aspects of the 5 Question approach for the Isa region into a coherent view.

Partnership with Industry

The project team will work closely with industry sponsors to ensure that research is closely aligned with industry needs and delivers value.

Application of Enabling Technologies

The project team has a number of new technologies at their disposal to help solve some of the critical questions. New techniques and technologies that were developed in Stage 1 of the *pmd* CRC*, including a suite of novel geochronology tools will be utilised to constrain the timing of mineralisation ($^{40}\text{Ar}/^{39}\text{Ar}$, Pb-Pb step leaching) and the sources and composition of mineralising fluids (Re/Os isotopic signatures, and halogen and noble gases in fluid inclusions).



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