

## **The Jervois Cu-Pb-Zn Deposit—A Hybrid SEDEX-VMS Mineralizing System, Northern Territory, Australia**

Susanne Schmid\* and Peter Schaubs

CSIRO Mineral Resources Flagship, Kensington, Western Australia 6151, Australia

\*E-mail, susanne.schmid@csiro.au

The Jervois Cu-Pb-Zn deposit is situated in the Arunta Region within the southern part of the Northern Territory, approximately 350 km E of Alice Springs, Australia. The Bonya Metamorphics (depositional age 1790–1770 Ma) host Cu-Pb-Zn mineralization and contain a range of rock types, including a metasedimentary sequence of muscovite schist, biotite-muscovite schist (with locally cordierite, sillimanite, garnet and andalusite), calc-silicate rock, marble, and meta-quartzite. The mineralization is typically hosted by garnet-chlorite-magnetite quartzite (Cu) and calc-silicate rocks (Pb, Zn) upper greenschist to middle amphibolite facies metamorphic rocks.

The Jervois deposit has a 12-km strike length and was discovered in 1929. It has been systematically explored since 1961 by a number of companies, resulting in a short-lived open pit mine in 1982 operated by Plenty River Mining. The current tenement holder KGL Resources reported a resource of 25.3 Mt at 1.1% Cu for 280,000 t Cu ore (as of March 2015) with a minimum depth of continuous mineralization of 600 m below surface in nearly vertical dipping metasediments. The complexity of three deformation phases has led to multiple repetitions of the mineralized zone within the deposit.

The metasediments are interpreted to be shallow marine interbedded limestones and argillaceous to arenaceous sediments that have undergone metamorphism and multiple deformation phases. Primary Cu-Pb-Zn mineralization occurs at the contact between meta-carbonates and meta-sandstones. Pb and Zn are hosted by meta-carbonates, whereas the meta-sandstone hosts Cu. The stratiform mineralization is accompanied by magnetite and spessartine, which are interpreted to be metamorphosed Fe-Mn-rich sediments. Distal to the mineralization are thin tourmalinites that are interpreted as metamorphosed exhalites.

The most likely style of mineralization is exhalative diagenetic—SEDEX or VMS. They have the same ore zonation and distal expression of exhalites, but vary in Cu abundance (VMS > SEDEX), shape (VMS vertical metal zonation, SEDEX lateral metal zonation), and host rock (VMS mainly volcanic rocks, SEDEX sedimentary rocks). Alteration indices for SEDEX and VMS were calculated from ~22,000 multi-element geochemical analyses (1 m sample intervals and ~200 drill holes) across several prospects of the Jervois deposit. The majority of the data trend towards the centre of mineralization for both systems, however, there is a subtle spatial variation with a prominent SEDEX affinity in the Marshall-Reward area, while a stronger VMS affinity was found along the 6-km strike-length in the Bellbird area.

The Jervois deposit characteristics are as follows: (1) composed of Cu-Pb-Zn-Au-Ag ore zone, (2) mineralization is stratiform and associated host rocks are metasediments/carbonates, (3) mineralization occurred syngenetically, prior to metamorphism and deformation, and (4) mineralization is accompanied by Fe-Mn-rich rocks and exhalites. The sedimentary host rock and mineral zonation favor a SEDEX deposit, while high Cu grade is more common in VMS deposits. Therefore, the mineralization style is suggested to be a hybrid SEDEX-VMS system.