



THE GEOLOGY AND GENESIS OF THE POLYMETALLIC

WAGGA TANK PROSPECT, MOUNT HOPE, N. S. W.

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ABSTRACT

The Wagga Tank Prospect is located in Central Western N. S. W., 125 km south of Cobar. The prospect is hosted by the Lower Devonian Mount Hope Group, a complex succession of sedimentary, felsic volcanic and comagmatic intrusive rocks representing the oldest division of the Cobar Supergroup in the Mount Hope area.

The prospect is primarily a Pb and Zn deposit with minor Cu, Ag and significant Au. Gold values are highest within steeply dipping gossan shoots in the oxidised zone, while Pb and Zn values are highest in subvertical shoots of massive sulphide within the primary zone. Cu is concentrated as chalcocite, digenite and malachite at a zone of supergene enrichment.

The primary mineralization occurs within a zone of intense tectonic brecciation and argillic alteration at a pronounced flexure along the steeply dipping contact between the volcanoclastic sequence and siltstone - slate sequence.

The mineralization can be divided into two categories on the basis of textural relationships, ie. fine grained, crudely banded massive type sulphides and coarser grained vein type sulphides. The vein type sulphides are represented by varying proportions of pyrite, chalcopyrite, sphalerite and galena with rare inclusions of cubanite and pyrrhotite. The massive type sulphides show mineral abundances of pyrite > sphalerite > galena >> chalcopyrite.

Fluid inclusion and chlorite data indicate that the mineralizing fluid reached temperatures of about 325°C. Sulphur isotope compositions of the sulphide minerals ($\delta^{34}\text{S} = 10$ per mil) suggest that the sulphur originated from seawater SO_4^{2-} . Reduction of seawater SO_4^{2-} to H_2S was primarily by an inorganic process at elevated temperatures in a heated rock pile. Thermodynamic

calculations suggest possible $\log fO_2$ - pH constraints of about $\log fO_2 = -29.5$ to -31.7 and $pH = 3$ to 4.5 for the mineralizing fluid.

The mineralization is considered to be of epigenetic - hydrothermal origin. The hydrothermal fluid was probably derived from dewatering of the rock pile during metamorphism accompanying the major deformation. Sulphide precipitation occurred along a plane of high permeability produced by folding of adjacent beds with a contrasting competency.

The prospect bears many similarities to the principal deposits in the Cobar area. Those deposits are typically narrow steeply plunging elongate bodies occurring along sheared or brecciated contacts between cleaved turbiditic siltstones and coarser clastic beds or felsic volcanics.