Geology and Geochemistry of the Que River Shale, Western Tasmania

by

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Abstract

The Que River Shale Formation overlies the Que-Hellyer Volcanics, which are the host sequence to the Hellyer and Que River massive sulphide deposits, western Tasmania.

The Que River Shale is a homogeneous unit of finely laminated, fine grained (<100μm) quartz, muscovite and calcite grains in a dirty brown chloritic matrix. The shale contains intercalated resedimented volcaniclatic sandstones at the top and base of the unit. Shale composition varies by less than 5 wt % with regards to major elements.

Deposition of the Que River Shale began after the formation of the Hellyer Massive sulfide deposit but contemporaneous with the mixed sequence. Shale deposition extended throughout the end of deposition of the Mount Charter group, synchronous with the Southwell Subgroup volcanism. However the erruption of Upper Basalts and Andesites and the influx of predominantly rhyolitic volcaniclastic mass-flows and turbidites associated with the Southwell Subgroup restricted the finely laminated shale mostly to a period of quiesence between the two styles of volcanism.

The depositional environment of the Que River Shale is interpreted to represent quiet, reducing bottom waters, due to a high proportion of complete agnostid trilobite specimems along with the presence of carbonaceous material and pyrite nodules. Geochemical techniques have been used to further define the basin as inhospitable (little or no oxygen present) to euxinic (free H_2S). While S-isotopes range from $\delta^{34}S$ +17 to +43 suggesting that the sediment may have been a closed system with respect to SO_4^{2-} ans H_2S.

The Que River Shale has an andesitic provenance suggesting a local source for the shale. However, the Que River Shale cannot be derived directly from any one source, or combination of sources in the Mount Read Volcanics without significant modification. The only quantification that can be placed on the source rocks is that the Que River Shale must contain 20-25 % Hellyer Basalt, to obtain the high Cr values observed (up to 1.3 wt % Cr_2O_3). The Que River shale must havebeen well homogenised by sedimentary processes to account for its restricted range in chemical composition.

The Que River shale does not show an extensive alteration plume unlike the underlying basalts. Alteration in the suite therefore cannot be used as an exploration indicator. However, anomalous base metal values (up to 400 ppm Pb and 938 ppm Zn) are spatially association to the orebody and may be useful as vectors to mineralisation.

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