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Hellyer Tailings – Complex Mineralogy but Higher Grade Than Many Ore Bodies

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ABSTRACT

NQ Minerals PLC, through Hellyer Gold Mines Pty Ltd, plans to reprocess the contents of the Hellyer tailings dam to produce lead/silver concentrate, zinc concentrate and pyrite concentrate (containing Au and Ag). This paper discusses the project development, mineralogy, metallurgy and chemistry of processing Hellyer tailings and the associated environmental benefits.

Hellyer and Fossey orebodies were volcanic hosted polymetallic massive sulphide deposits located within the Mount Read volcanic arc of western Tasmania. Mineralisation was massive sulphide (pyrite) hosted and comprised predominantly of sphalerite, with lesser galena and arsenopyrite. The Hellyer orebody was a mineralogically complex high grade precious/base metals deposit that was treated through deferential flotation. Fossey ore processing characteristics were similar to Que River ore and simpler than Hellyer but treatment still resulted in significant grades in flotation tailings.

Aberfoyle Ltd ran the Hellyer concentrator from 1989 to 2001 and produced separate copper/silver, lead, zinc and bulk (lead & zinc) concentrates leaving about 11 Mt of tailings containing approximately 2.6 g/t Au, 85 g/t Ag, 2.5% Zn and 2.6% Pb with the majority of the remaining material as pyrite. The plant was state-of-art in 1989 and is still a relatively modern base metals processing plant designed to treat the complex Hellyer fine grained copper-silver-lead-zinc orebody. The plant was expanded from 1 to 1.25 Mt/y in early 1990. Due to the complex mineralisation and process chemistry, early processing performance was typified by low metal recoveries to concentrates, but these improved during subsequent operation.

The Fossey deposit extended down plunge from the Hellyer deposit and was mined at a low throughput rate by Bass Metals between 2010 and 2012 prior to closing due to the mine flooding and cash flow issues.

Tailings from the mill were deposited in a depression approximately 1 km to the west of the Hellyer mill. The tails were partially dredged (2 Mt) by Polymetals and re-treated between 2006 and 2008, with the reprocessing producing a bulk Zn/Pb concentrate (35% Zn and 15% Pb). Processing ceased due to low metal prices.

NQ Minerals has updated the ore reserve, conducted test work on vibracore samples to established the expected plant performance and completed extensive concentrate marketing investigations in order to progress the project. Commissioning is expected in mid to late 2018. The complexity of the mineralogy and metallurgy will be the focus of the paper.