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Stabilising and Filling the Beaconsfield Hart Shaft

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ABSTRACT

Underground mining for gold began in Beaconsfield in 1877 and saw the sinking of multiple shafts, including the Hart shaft over the ensuing 35 years. The mine closed in 1914 at a depth of 455 m due to prevailing economics, eventually reopening in 1999. The modern mine closed in 2012 after extending the mine from a historical depth of 455 m to the exhaustion of the modern Ore Reserve at a depth of 1210 m below surface. West Tamar Council then took over the lease for the immediate area around the Hart shaft as an extension of the adjacent museum. The Hart shaft and above ground structures became a significant drawcard for visitors.

Tasmania was affected by sustained wet weather during May, June and July of 2016 and was affected by severe flooding causing significant Statewide damage. This uncharacteristically intense wet weather caused saturation of the ground surrounding the Hart shaft. Eventual shaft failure was first identified in August 2016.

The failure of the shaft occurred at approximately 50 m below surface and resulted in a plug of material completely blocking the shaft. Significant surface subsidence impacting the surface infrastructure ensued. Due to the unstable nature of the surrounding material, it was assessed addressing the failure above blockage would not provide a permanent solution to prevent continued flow of material into the shaft. Many options to stabilise the shaft were considered, however it was assessed that a concrete plug in the shaft in competent ground at a depth of 100 m below surface and well below the blockage would provide the only long term solution.

Man-entry was considered unsafe. The solution to access ultimately entailed filling the entire shaft with granular fill up to 100 m depth to act as formwork for the concrete plug; the rising mains at 400 mm and 250 mm diameter, which remained in place in the shaft, provided the avenue for placing the fill and ultimately, the concrete plug. Once the plug was in place, the remainder of the shaft up to the underside of the blockage and over the top of the blockage to the surface, was successfully filled with a combination of more granular fill and flowable cement stabilised sand.

The Hart shaft and surrounding above ground infrastructure was successfully stabilised and re-opened to tourist access. This paper outlines the geotechnical and structural challenges of that outcome.