Innovative Geotechnical Management at the Wira Shaft

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ABSTRACT

The Wira Shaft is a 1330 m deep, 7.55 m diameter, concrete lined haulage shaft located at BHP's Prominent Hill Mine in South Australia. It is being constructed using the strip & line method, with the use of steel fibre reinforced shotcrete (FRS) as the primary means of temporary ground support. Given the economic benefits the shaft provides to Prominent Hill's future, the safe and efficient sinking of the shaft is imperative.

The ground support system for the Wira Shaft has been designed and implemented to consider both safety and efficiency. Permanent support, achieved via a cast in situ concrete liner, is placed approximately 12 m behind the advancing shaft bench. Between the liner and bench, temporary ground support is necessary to ensure the safety of personnel. FRS has largely been used as the primary support element with the required thickness and early strength designed and modified as required to achieve varying levels of support pressure. Where possible, the use of rock bolts and embedded support has been eliminated.

Geotechnical mapping of the shaft walls following firings allows for rock mass classification; this determines the required support pressure and subsequent ground support standard. The continual process of mapping the ground conditions allows for specific support recommendations and removes the needs for a conservative blanket pattern bolting approach.

The specification and application process of the FRS has been optimised for ease of use and to produce the quickest possible re-entry times. With a high reliance on the quality of the FRS, a substantial quality assurance and control process was developed and executed. It includes ongoing workability, thickness and early strength testing.

Prior to and during the sinking process, innovative geotechnical management has enabled safety and operational improvements that have enhanced the shaft's advance rates, to the benefit of the overall project.