The Boolgeeda Iron Formation: A Strategic Resource Potential

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Historically, bedded iron ore exploration has been focussed on the Marra Mamba and Brockman Iron Formations as these are host to some of the largest, high-quality iron ore deposits in the world. These deposits have been one of the major drivers of the recent resource boom in Australia and significant effort has gone into understanding their geology. In a world of finite resources, alternatives such as the Boolgeeda Iron Formation must eventually be considered; however, to successfully explore the formation to its full potential significant work is still required.

The Boolgeeda Iron Formation is the uppermost formation of the Archean to Paleoproterozoic Hamersley Group. Located within the world-class Pilbara iron ore province, it is one of the more poorly understood iron formations in the region with an as yet unknown resource potential. The Boolgeeda Iron Formation is generally not as well mineralized as the other iron formations in the Hamersley Group, which raises questions that need to be answered if the unit is to become a significant a source of iron ore.

The link between metamorphism and iron enrichment has long been known. Previous studies of the Boolgeeda suggest that a lower metamorphic grade, due to the formations placement at the top of the Hamersley Group, could be a reason why the mineralization is not as wide spread compared to that of the other Hamersley iron formations.

Stratigraphic correlation suggests the Boolgeeda in the northwest of the basin is coeval with the overlying Turee Creek (Kungarra Formation) at the Hardey Syncline, as evidenced by glacial erratics in the Boolgeeda and glacial diamictites of the Three Corner Bore (Turee Creek). This co-existence with the Turee Creek Group places the Boolgeeda deposition with the onset of the Ophthalmian Orogeny, which likely had a great effect on lowering the metamorphic grade relative to the older BIFs and limiting the number of structural traps for ore formation.

Mineralogical studies by BHP in the 1970s identified several properties of the Boolgeeda that sets it aside from the other Hamersley Group BIFs; namely, the abundance of significant clay in the form of montmorillonite and that the iron oxide bands contain lower concentrations of magnetite. La Berge (1966) details the conversion of tuffaceous shales to montmorillonite with subsequent alteration to stilpnomelane under weak metamorphic conditions. The abundant montmorillonite with subordinate stilpnomelane discovered in the Boolgeeda is evidence for a lower metamorphic grade, which appears to have inhibited the formation of vital metamorphic minerals (magnetite and iron carbonates) required for M-G supergene mineralization. What effect magnetite content has on mineralization is not well understood, but it is an important question to answer if the formation is to be successfully targeted and explored for future iron ore resources.

Discoveries made in the last decade have shown that the Boolgeeda Iron Formation has potential to contribute valuable iron ore resources; however, to unlock this potential significant work is still required to understand the Boolgeeda's stratigraphy, structure, geochemistry, mineralogy, and metallurgical properties.