DISTRICT OVERVIEW

Hamersley Basin - Western Australia

The main iron ores of the Hamersley province are hosted within the Archaean to Palaeoproterozoic volcanic and sedimentary sequence Mount Bruce Supergroup which spans a time interval of over 400 Ma, from greater than 2770 Ma to near 2350 Ma. It rests unconformably on pre-2800 Ma granitoids and greenstones of the Archaean Pilbara Block in the far north-west of the state of Western Australia, and is overlain by the Wyloo Group sediments which comprise the remainder of the Hamersley province sequence continuing to near 1800 Ma.

The Mount Bruce Supergroup is in turn sub-divided into three Groups. The lowermost of these, the Fortescue Group, commences with an early phase of clastic sediments and mafic volcanism in localised grabens (the around 2770 Ma Bellary Formation), followed by extensive sandstones and conglomerates (the 500 to 2000 m thick, 2750 Ma Hardy Sandstone) which thicken markedly from north to south, with near 50% of the thickness in the south being mafic sills. These sediments are unconformably overlain by the volcanics and sediments of the Tumbiana Formation, with similar thickness and mafic sill percentage increases from north to south. The uppermost unit is the 2690-2630 Ma, 100 to 150 m thick organic and sulphide rich fine clastics of the Jeerinah Formation, with mafic volcanics and sills increasing southwards. The Fortescue Group is conformably overlain by the 2500 m thick Hamersley Group which hosts most of the main iron ore deposits of Western Australia. It is characterised by around 1000 m of laterally extensive banded iron formation representing three major episodes.

The basal Marra Mamba (2600 Ma) and the medial Brockman Iron Formations are separated by the carbonate, shale and minor chert of the Wittenoom, Mount Sylvia and Mount McRea Shale Formations (2600 to 2480 Ma). This passive sequence is followed after the Brockman Iron Formation by the third phase of iron formation deposition (the Weeli Wolli Iron Formation) which was accompanied by intense 2450 Ma bimodal volcanism and mafic sills (which locally account for up to 80% of the sequence), overlain by the felsic volcanics of the Woongarra Formation . Thickness variations in the Hamersley Group are only minor.

The Turee Creek Group is the youngest unit of the Mt Bruce Supergroup. The uppermost unit of the Hamersley Group, the Boolgeeda Iron Formation passes conformably upwards into the thick basal Kungarra Shale of the 3000 to 5000 m thick Turee Creek Group which is basically a coarsening upwards clastic sequence in a choked basin - marking a major change from the starved basin of the Hamersley Group. The southern half of the Hamersley Group was deformed by the Ophthalmia orogeny into an east west trending fold belt that decreases in intensity to the north and records north-south compression. The top of the Mount Bruce Supergroup is separated from the overlying Lower Wyloo Group, Beasley River Quartzites by a first order unconformity. The basal conglomerate includes clasts of Hamersley Group banded iron formations and very rare hematite. These coarse sediments pass upwards into finer clastics and mafic volcanics to the 2000 m thick 2209 Ma Cheela Springs Basalt which are followed by dolomites to the west, but are cut by the major unconformity that separates the Lower and Upper Wyloo Groups which cuts down as far as the Fortescue Group. A generation of NW trending folds developed at the close of the Lower Wyloo Group interacted with the Ophthalmia orogeny structures to form a series of domes and basins.

The Upper Wyloo Group was deposited above a major unconformity It was formed in an extensional basin and comprise up to 12 km of sediments which are overlain to the south by the poorly sorted clastics of the Ashburton Formation which includes bimodal volcanics dated at 1842 to 1828 Ma. The Upper Wyloo Group was terminated at the time of the intrusion of the 1790 Ma Boolaloo Granite.

Ores mined in the Hamersley province may be divided into (1) enriched, bedded ores and (2) goethitic pisolitic accumulations within extensive palaeo-channels tens of kilometres in length, now largely preserved as mesas. The bedded ores are sub-divided into (a) extensive flat lying martite-goethite ores developed from both Marra Mamba and Brockman Iron Formations by deep supergene enrichment of precursor banded iron formations, and (b) high grade hematite, often with martite and microplaty hematite, but little goethite, and almost invariably developed within the Brockman Iron Formation. The latter commonly occur to much greater depths (to more than 400 m) and account for the largest high grade deposits of the province, including Mt Tom Price and Mt Whaleback.

The description is based on information available in 2002, at the time of writing; it is a summary of published sources, the chief of which are listed below.

Selected references

Morris R C 1980 - A textural and mineralogical study of the relationship of iron ore to banded iron-formation in the Hamersley Iron Province of Western Australia : *in Econ. Geol.* v75 pp 184-209

Martin D McB, Li Z X, Nemchin A A, Powell C McA 1998 - A pre-2.2 ga age for giant Hematite ores of the Hamersley Province, Australia: *in Econ. Geol.* v93 pp 1084-1090

References and further information may be obtained from Porter Geoconsultancy *www.portergeo.com.au*