Abracadabra! Another Jillawarra-style sub-basin in the Bangemall Supergroup

by

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The Jillawarra sub-basin is the only area where significant base metal mineralization has been found in the Mesoproterozoic Bangemall Supergroup. The Abra deposit (Pb–Cu–Ba) is located at the eastern end of the east–west trending sub-basin, and is one of the largest (low-grade) base metal deposits in Australia. The Jillawarra sub-basin is largely fault bounded with granitic inliers at the eastern and western ends. The lower Bangemall Supergroup in the Jillawarra area includes the arenaceous Coobarra Formation, which contains 1.63 Ga rhyolite bodies (Collins and McDonald, 1994). Abra is hosted within dolomitic siltstone and shale of the upper Gap Well Formation, near the base of the Jillawarra succession. The interpreted syngenetic hydrothermal mineralization is disconformably overlain by siliciclastic rocks of the West Creek Formation (Boddington, 1990; Vogt, 1995). Recent GSWA mapping suggests that another Jillawarra-style sub-basin developed on EDMUND*, 250 km to the northwest of Abra.

Martin et al. (1999) proposed a two-fold subdivision of the Bangemall Supergroup into an older EDMUND Group overlain by the Collier Group. The EDMUND Group unconformably overlies Palaeoproterozoic rocks of the Ashburton and Capricorn Formations to the north, and the Gascoyne Complex to the south. Initial basin subsidence was controlled by extension and growth faulting (Chuck, 1984; Muhling and Brakel, 1985), which is reflected in the distribution and thickness of the basal units, and the style of later deformation of the Bangemall Supergroup. On EDMUND, the originally synsedimentary Talga Fault was re-activated as a reverse fault. This fault separates relatively undeformed rocks deposited on the Pingandy Shelf from those deposited in an adjacent graben that are deformed by upright open to tight folds of the EDMUND fold belt (Muhling and Brakel, 1985). The Jillawarra sub-basin is an example of one of these early grabens that was filled with a mixed siliciclastic–carbonate succession (Vogt, 1995). No other grabens have been described previously from the region.

Facies distribution and thickness in the basal Bangemall Supergroup on EDMUND are strongly controlled by the synsedimentary Talga Fault. North of the fault, the Yilgatherra Formation generally consists of a few metres of fluvial sandstone, with palaeocurrents directed towards the south. South of the fault these sandstones are considerably thicker (tens of metres) and are overlain by, or interbedded with, siltstone. Palaeocurrent directions in this area are highly variable and suggest that rapid erosion of granitic uplands, now represented by the Henry–Telfer granite and Gifford Creek Complex, produced immature arenaceous and rudaceous successions in what were adjacent grabens. A granophyric plug intrudes the Yilgatherra Formation on the western flank of the Henry–Telfer granite.

North of the Talga Fault, the Irregully Formation consists largely of peritidal dolostone and sandstone with minor siltstone. The peritidal facies consists mainly of thin cycles of intraclast breccia overlain by stromatolitic dolomite. Two thin sandstone horizons are present in the lower Irregully Formation, which also contains local evaporite pseudomorphs. South of the Talga Fault, the Irregully Formation thickens considerably, and is dominated by thick subtidal cycles of intraclast breccia and dololutite, with rare stromatolites. This facies passes southward into interbedded dololutite, dolomitic siltstone, and sandstone. The upper Irregully Formation is characterized by interbedded shallow-marine sandstone and stromatolitic dolomite on southern EDMUND. Fluvial to shallow-marine siliciclastic facies, with minor dololutite, dominate the Irregully Formation around the western margin of the Gifford Creek Complex.

Gross similarities in stratigraphy, structure, and regional geology between the Jillawarra sub-basin and southwest EDMUND (Table 1) suggest that the latter area has potential for Abra-style polymetallic mineralization. Facies and thickness changes within the Irregully Formation in this area suggest the presence of a fault-bounded sub-basin north of the Mangaroon Syncline and south of the Talga Fault. Sedimentation within this sub-basin was strongly controlled by uplift of adjacent basement inliers, and coincided with minor felsic and carbonatite magmatism within them.

* Capitalized names refer to standard 1:250 000 map sheets

Table 1: Comparison between ore controls in the Jillawarra sub-basin and equivalent areas on southwest EDMUND

Geological control	*Jillawarra sub-basin*	*Southwest EDMUND*
lithostratigraphic units	Gap Well and West Creek Formations	Irregully Formation
lithology	mixed siliciclastic–carbonate succession	mixed siliciclastic–carbonate succession
faulting	Quartzite Well and West Creek Faults, east–west graben	Talga Fault, possible northwest–southeast graben
associated basement highs	Woodlands and Coobarra Domes	Henry–Telfer dome and Gifford Creek Complex
syndepositional magmatism	Tangadee rhyolite	granophyre plugs and alkaline intrusives
potential source rock	arkose (Tringadee Formation)	immature sandstone (basal Yilgatherra Formation)
alteration	chlorite–siderite	?
ore minerals	galena, chalcopyrite, barite, tetrahedrite, sphalerite	?
gangue minerals	hematite, magnetite, carbonate, pyrite, quartz, jaspilite	?

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