

VMS DEPOSITS

Abra Lead-Silver-Copper-Gold Deposit, Western Australia: A Geophysical Case History

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Abstract

The Abra base-metal deposit is a large, deeply buried, low-grade mineralised body located in the Jilawarra mineralised belt in the Bangemall Basin, Western Australia. It has no surface geological or geochemical expression. The deposit was discovered in 1981 by drill testing a 270 m deep target, based on the detailed modelling of a 400 nT bullseye magnetic anomaly which had a coincident weak residual gravity anomaly. Follow-up drilling broadly confirmed the original magnetic interpretation, and outlined an estimated 200 Mt of low-grade iron-barium-lead-silver-copper-gold mineralisation.

Both moving-loop and large fixed-loop time-domain electromagnetic surveys recorded a broad anomaly over the Abra mineralised system. The anomalous time-domain electromagnetic transients have an exponential decay with a time constant of about 1.3 ms, indicative of low conductance. Downhole time-domain electromagnetic and mise-a-la-masse surveying confirms that the whole of the mineralised system, including both the stratiform zone and the underlying stringer zone, is weakly and uniformly conductive. No specific zones of locally greater conductance, which might be indicative of higher-grade mineralisation, were detected in the surface time-domain electromagnetic work. In the downhole time-domain electromagnetic surveying, the broad response to the bulk mineralised body is complicated by the use of relatively small transmitter loops which have 'selectively' energised portions of the large conductive body, resulting in both 'in-hole' and 'off-hole' responses being recorded, depending upon the relative transmitter loop-conductor-drillhole geometry. Several localised secondary conductor responses (both in-hole and off-hole) were also detected but, to date, this work has not successfully demonstrated the presence of discrete high-grade zones of significant dimensions within the overall system.

Geophysical Responses Over the Scuddles VMS Deposit

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Abstract

The Scuddles copper-zinc deposit was discovered in 1979. Before mining commenced in 1990, many exploration techniques were tested over the deposit. Of the geophysical techniques, aeromagnetism and gravity have proved the best regional mapping tools. For direct detection of the mineralisation, time-domain electromagnetics from both surface and drillhole has been the most effective. Mise-a-la-masse successfully outlined the limits of the mineralisation whereas IP responded to shallow mineralisation only.

Several airborne electromagnetic surveys have been flown over the nearby Gossan Hill deposit, which has similar

characteristics to Scuddles but is considerably shallower. All have failed to produce anomalies which would warrant follow up on a regional exploration survey.

Geophysical Signature of the Mons Cupri VMS Deposit, Western Australia

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Abstract

Mons Cupri is an Archaean proximal, volcanogenic massive-sulphide deposit in the west Pilbara of Western Australia. Mineralisation occurs in the Mons Cupri Volcanics of the Whim Creek Belt. Stockwork copper-sulphides in altered Mount Brown Rhyolite are overlain by shallowly dipping, massive, copper-lead-zinc sulphides in volcanoclastic sedimentary rocks.

Two airborne magnetic surveys detected a 70 nT anomaly in broad correlation with the outline of the mineralisation. The likely source of this anomaly is magnetite within a chlorite alteration pipe. One trial and two surveys with airborne electromagnetics have been conducted. None of the systems, including GEOTEM II, yielded anomalies over Mons Cupri itself.

Seven trials and one survey with ground electromagnetics were also completed. Again, none produced anomalous results attributable to the mineralisation.

Two induced polarisation surveys detected slightly lower resistivities over the stockwork mineralisation; a magnetic induced polarisation survey obtained the opposite result. However, higher percentage frequency effects, chargeabilities, and relative phase shifts clearly coincided with the stockwork mineralisation. None of the systems unequivocally detected the massive sulphides at depth.

Mons Cupri is a difficult geophysical target. Low total-sulphide content, deep massive sulphides and a lack of electrical continuity combine to produce an enigmatic response and to defeat detection by electromagnetic systems.

NICKEL

Geophysical Signature of the Sally Malay Nickel Deposit, Western Australia

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Abstract

The Sally Malay nickel deposit has clear physical property contrasts with its host rocks and therefore lends itself to detection and mapping by geophysical methods. Conductivities as high as 30,000 S/m compared to the resistive country rock mean that electromagnetics is the best method for locating and mapping such a deposit. The magnetic susceptibility and chargeability are two orders of magnitude higher than