BLUE ROSE Au-Cu PROSPECT, SOUTH AUSTRALIA

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LOCATION

The Blue Rose prospect is located about 40 km S of Olary (Figure 1) at 32°38’30.2” 140°14’39.5”; Olary 1:250 000 sheet (SI 54-2).

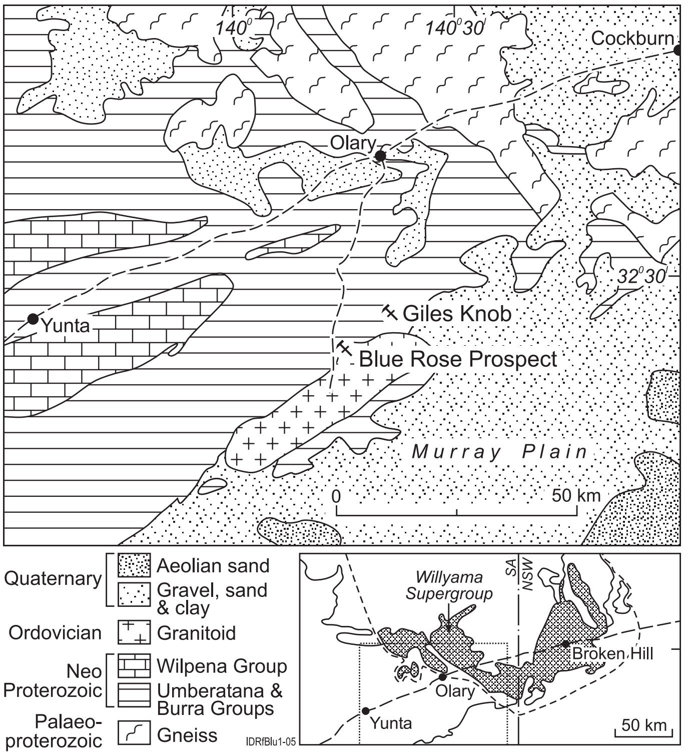

Figure 1. Location map and geological setting (after Cowley and Freeman, 1993).

DISCOVERY HISTORY

The area was selected for exploration because of the coincidence of a prominent aeromagnetic anomaly, thought to be an intrusive rock at depth, with the junction of several faults. Dominion Metals Pty Ltd, investigating magnetic features in the district, drilled several widely-spaced RAB holes in the early 1990s and intersected ‘skarn assemblages and high-level potassic intrusive rocks within Adelaidean metasedimentary rocks’ (Shelton, 1999). Anomalous Cu was intersected in some of the drilling. Lynas Gold Corporation initially drilled RAB and aircore holes in 1998, intersecting anomalous Cu near the magnetic anomaly. Eighteen subsequent RC holes targeted several geochemical and IP anomalies, the best interval being 88 m at 0.39% Cu (Shelton, 1999).

PHYSICAL FEATURES AND ENVIRONMENT

The topography at Blue Rose is flat and there is very little outcrop. The climate is semi-arid to arid with a rainfall of 250 mm per year. Mean minimum and maximum temperature ranges are 17-33ºC (January) and 3-15ºC (July). The vegetation at has been strongly affected by grazing. Currently, a low halophytic shrubland of chenopods, including pearl bluebush (*Maireana sedifolia*), covers most of the area, with creek lines dominated by larger cassia shrubs (*Senna* spp.) and small *Acacia* trees.

GEOLOGICAL SETTING

The Blue Rose prospect occurs on the S limb of the Wadnaminga Anticlinorium in metasedimentary rocks of the Adelaidean Burra Group (Forbes, 1991). To the S, Burra Group rocks have been intruded by the early Ordovician Anabama Granite, composed of coarse-grained anhedral microcline, quartz, orthoclase, oligoclase and biotite (Forbes, 1991). Some associated dykes have undergone high-level hydrothermal alteration to pyrite-quartz-muscovite greisen, with minor chalcopyrite and molybdenite. Greisen also occurs at Giles Nob (about 13 km ENE of Blue Rose) and as narrow veins at Blue Rose. Weathered granitic rocks outcrop on the S side of the major creek in the SE corner of the prospect. It is uncertain whether this outcrop is part of the main Anabama Granite or a dyke related to it.

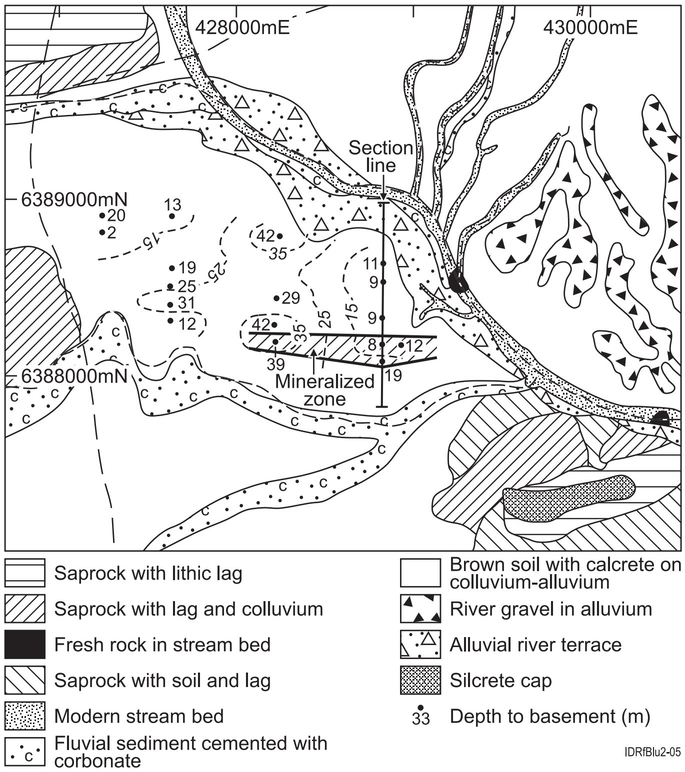

Figure 2. Regolith-landform map showing depths to base of transported cover (in metres) from RC and RAB drilling. Sampling line 428820E (used for detailed study) is shown (after Skwarnecki et al., 2001).

REGOLITH

Most of the area is depositional (Figure 2), although the transported overburden may locally be only 2 m thick. The area is bisected diagonally by a major creek. The presence of bluebush on gentle rises signifies calcrete at relatively shallow depth. Apart from minor outcrops in the creeks in the N and E, erosional areas with highly silicified exposures of saprock and saprolite occur mainly in the SE, on the S side of the major creek. A cross-section through transported and residual regolith is shown in Figure 3.

From the surface, the general stratigraphy of the transported overburden is:

- Calcareous soil (<0.5 m).
- Calcrete and silcrete (up to 5 m).
- Colluvial gravel and clays, cemented by carbonate, silica and chalcedony (up to 6 m).
- Clay with chalcedony veining (up to 6 m).
- Plastic mottled clay, locally with white to grey plastic clays at the base (up to 8 m).
- White clays and quartz gravel (up to 2 m).

The residual regolith consists of interdigitating saprock and saprolite in the N. In the S, the profile is simpler, with saprolite over saprock. Saprolite along the section contains vermiculite-rich clay.

MINERALIZATION

Mineralization occurs in dolomite- and calcite-rich metasedimentary rocks containing disseminated sulphides, biotite, serpentine, tremolite, talc and chlorite. The higher-grade zones contain disseminated chalcopyrite, but not all sulphidic zones are mineralized. Serpentine also appears to be generally indicative of mineralization. In the mineralized zones, rock-forming minerals have been altered along the grain boundaries by reaction with the mineralizing solutions. In fresh bedrock, significant Cu intervals (>1000 ppm) are associated with anomalous Bi (9 ppm), Cs (13 ppm), In (0.3 ppm), K (4.9%), Mo (390 ppm), Rb (260 ppm), S (2.24%), Se (17 ppm) and Tl (1.6 ppm). The correlation between Cu and Au is weak.

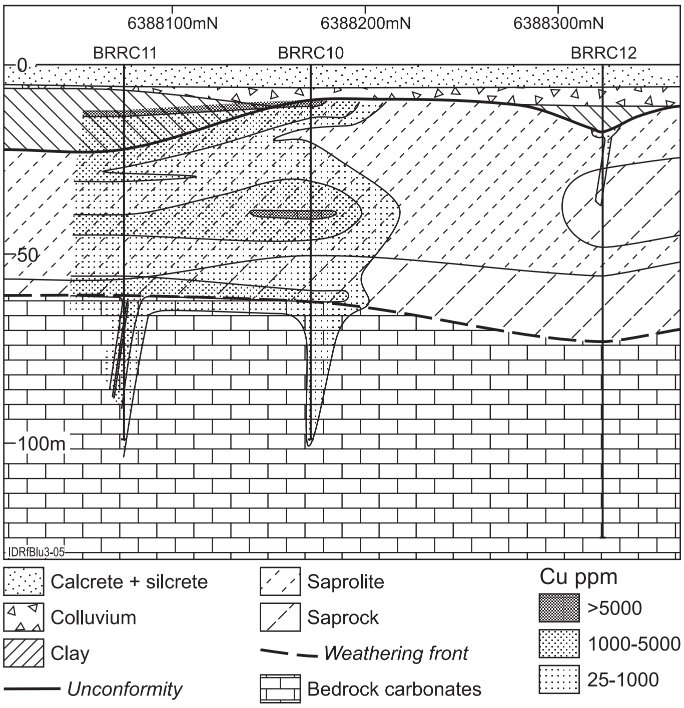

Figure 3. Simplified geological cross-section on line 428220E, showing interpreted distribution of Cu (from Skwarnecki et al., 2001).

REGOLITH EXPRESSION

Mineralized intervals

In regolith, Cu-rich intervals contain higher Al, As, Cr, Fe, Ga, Na, Ni, REE, Ti, V and Y, and lower Cs, K, Mg, Mn, Rb and S concentrations than fresh rock. Copper correlates positively with Co, In, Se and Sn (which are concentrated in chalcopyrite), but not with Au (which correlates positively with Bi and Te) or Mo (which correlates positively with Se). The abundances of most other elements depend on lithology. Elements most abundant in the dolomitic rocks are K, Mn, S, Cs, Rb, Tl and, to a lesser extent, Ba and Ca; those most abundant in silicate rocks are Al, Cr, Na, Ti, V, REE, Y, Ga, Sr, Th and Zr.

Medium-grade Cu zones (1000-5000 ppm) in bedrock (about 10 m wide) have produced a significant dispersion halo, at least 170 m wide in saprolite and saprock, extending into the basal section of transported cover (Figure 3). The upward extent of the anomaly is unclear, as the top few metres of the drilling were not analysed.

Augered soil and calcrete

Samples were collected from 0.2-0.7 m depth, depending on the degree of auger penetration. Augering indicated a soil horizon of variable thickness overlying calcrete (typically nodular). The >6 mm fraction was analysed to enrich the sample with carbonate nodules and reduce the amount of fine wind-blown material.

Element abundances (As, Al, Au, Ba, Co, Cr, Cs, Cu, Fe, Ga, K, Mn, Na, Ni, P, Rb, REE, Sn, Th, Ti, Tl, U, V, W, Y, Zn) are generally greatest where transported cover is thin (<6 m), W of the fence line and in the S (Figure 4). To the E of the fence line, interpretation of the data is hampered by the uncertain thickness of transported overburden. Auger geochemistry failed to provide indications of the mineralized zone intersected by RC drilling. However, at the S end of the far western-most traverse (427250E), there is a multi-sample Au (>6 ppb) and Cu (>40 ppm) anomaly that requires further investigation (Figure 4).

Soil

Soil sampling (<2 mm fraction) over the mineralized zone intersected

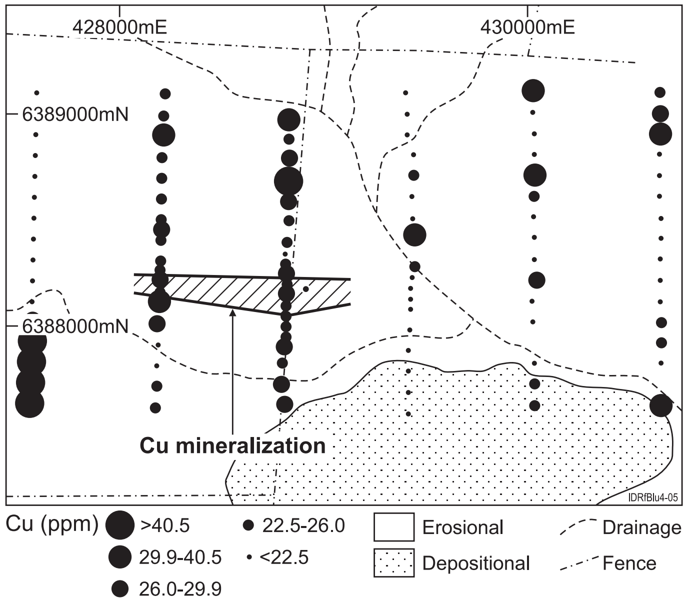

Figure 4. Distribution of Cu in >6 mm augered soil, calcrete and rock chips.

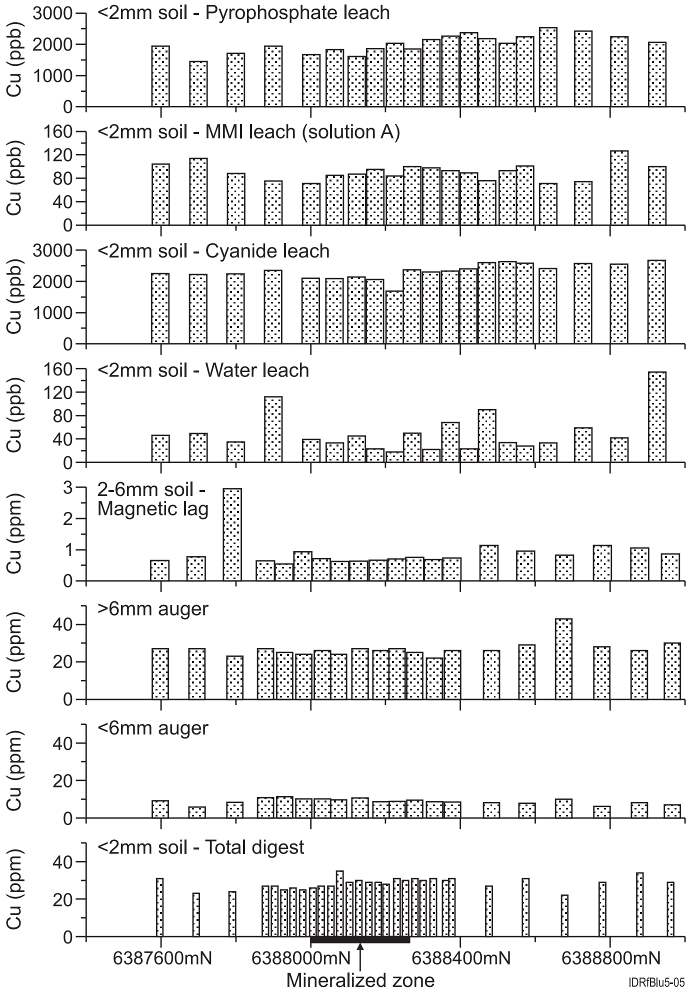

Figure 5 Copper in soil (<2 mm, 0.1-0.2 m depth) along line 428820E showing the responses from various sample media and partial leaches. Mineralization has not been located by the partial leach analyses. Lag, soil and calcretes analyses were by ICP-OES after dissolution by mixed acid digest (Skwarnecki et al., 2001).

by RC drilling on grid line 428820E failed to detect evidence of mineralization (Figure 5). Infill sampling over the Cu anomaly at the S end of grid line 427250E corroborated the earlier auger drilling and indicated a zone up to 125 m wide, with coincident Au-Cu anomalies (up to 280 ppm Cu and 21.5 ppb Au). Thus, there is no advantage in using auger drilling where the transported overburden is thin; soil sampling (0-100 mm depth) is equally effective. Where transported overburden is thick (>6 m) or of unknown thickness, neither soil sampling nor auger drilling are likely to be effective.

A shallow pit was excavated to 0.5 m immediately over mineralization to expose powdery and nodular calcrete below thin soil. Samples were collected over 0.1 m intervals down the profile, to determine element distributions. Most elements (either associated with Fe oxides or diluted by carbonate) are concentrated in the uppermost 100 mm. Copper concentrations decrease slightly down the profile (from 30 to 20 ppm). However, there is little difference between samples from 0-0.1 and 0.1-0.2 m depths, indicating that the depth of soil sampling is not critical. Gold shows little variation with depth (~4 ppb).

Partial leach analysis

Soil samples (<2 mm fraction) were collected at 50 m intervals at 0.1-0.2 m depths along grid line 428820E, over the mineralized zone. The results (Figure 5) for four partial leach solutions (pyrophosphate, MMI-A, cyanide and water) are compared with mixed acid total digestions of <2 mm soil, >6 mm auger, <6 mm auger and 2-6 mm magnetic lag samples. None of the different analyses or sample media indicate the mineralized zone where the thickness of transported overburden exceeds 8 m.

Conclusions

The failure of conventional and partial leach soil analyses to detect Cu mineralization, even where transported cover is only 8-9 m thick, indicates that surficial materials are unlikely to be effective sample media. Drilling to recognizable bedrock (10-45 m) is the only reliable prospecting method here, particularly where transported cover is >6 m thick or of unknown thickness. Broad zones of Cu dispersion in saprolite and the basal parts of the transported overburden provide a larger target than the primary zones themselves and this suggests that interface sampling may be advisable. Where cover is <6 m thick, auger drilling may be a suitable technique; however, for this method to be used with confidence, a much better understanding of the overall nature of the transported cover is required.

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SAMPLE MEDIA – SUMMARY TABLE

Sample medium	Indicator element	Analytical method **	Detection limit (ppm)	Background (50th percentile) (ppm)	Threshold (90th percentile) (ppm)	Maximum anomaly (ppm)	Lateral dispersion distance (m)
Silicified outcrop with disseminated pyrite (n=3)	Au	AAS	0.001	Insufficient data	Insufficient data	0.011	Insufficient data
	Bi	ICP-MS	0.1			3.2	
	Cu	ICP-MS	2			950	
	Mo	ICP-MS	0.1			4.2	
	Pb	ICP-MS	5			360	
	S	ICP-MS	50			13300	
	Se	ICP-MS	0.5			32	
Weathered and fresh bedrock in drill holes with Cu>1000 ppm (n=22)	Ag	ICP-MS	0.1	Insufficient data	Insufficient data	1.8	Uncertain
	Au	AAS	0.001			0.19	
	Bi	ICP-MS	0.1			7.5	
	Cu	ICP-MS	2			12900	
	Mo	ICP-MS	0.1			390	
	Pb	ICP-MS	5			15	
	S	ICP-MS	50			22400	
	Se	ICP-MS	0.5			15.5	
	Zn	ICP-MS	2			700	
Transported material (n=98)***	Au	Not known	0.01	<0.01	0.022	0.08	5
	Cu		1	28	600	11 600	300 (interface)
Saprolite and saprock (n=551)***	Au	Not known	0.01	<0.01	0.015	0.31	5
	Cu		1	87	1190	8650	150
Bedrock (n=608)***	Au	Not known	0.01	<0.01	<0.01	0.18	5
	Cu		1	50	775	9500	20
Augered samples (n=104)	Au	AAS	0.001	0.0018	0.0038	0.008	Uncertain due to variations in thickness of transported regolith
	Bi	ICP-MS	0.1	0.15	0.52	2.2	
	Cu	ICP-MS	2	22.5	29.9	100	
	Mo	ICP-MS	0.1	0.4	0.94	2.7	
	Pb	ICP-MS	5	<5	11.5	40	

* Cu at transported-residual interface, 300 m at >250 ppm; in saprolite, >150 m at >1000 ppm; in bedrock 20 m at >250 ppm and 5 m at >1000 ppm.

** AAS after aqua regia digestion. ICP-MS after nitric-perchloric-hydrofluoric acid digestion.

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