

BRAHMAN GOLD PROSPECT, CHARTERS TOWERS REGION, QUEENSLAND

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LOCATION

The Brahman Au Prospect is located 37 km WSW of Charters Towers at 20°09'S, 145°58'E; Charters Towers 1:250 000 map sheet (SF 55-02).

DISCOVERY HISTORY

Gold was discovered in the Charters Towers district in 1871, with two main periods of lode mining during 1880-1910 and 1931-1951. Until 1986, nearly 7 Moz of Au were produced from structurally controlled lodes, containing Au with quartz, pyrite, galena and sphalerite, within the Ravenswood Granodiorite Complex (Clarke and Paine, 1970). In the 1980s, the discovery of high-grade epithermal Au mineralization at Pajingo (Cornwell and Treddinnik, 1995) and the recognition of the potential of the bulk, low-grade porphyry breccias at Mt Leyshon (Orr, 1995) led to substantial exploration S and SW of Charters Towers, where cover is generally thin. In 1995, Mt Leyshon Gold Mines commenced a program of exploratory air core drilling in a 12 500 km² area of generally deep cover and Tertiary basalt cover to the N and W of Charters Towers (Figure 1; Orr, 1995). In 1996, the company intersected 4 m of 1.5 g/t Au associated with quartz veins in granitic material at the Brahman prospect, 1.5 km SE of the shallow Powthalanga Au workings. Follow up work in 1997 found anomalous Au concentrations in saprolite over a 700 x 700 m area, but no economic resource.

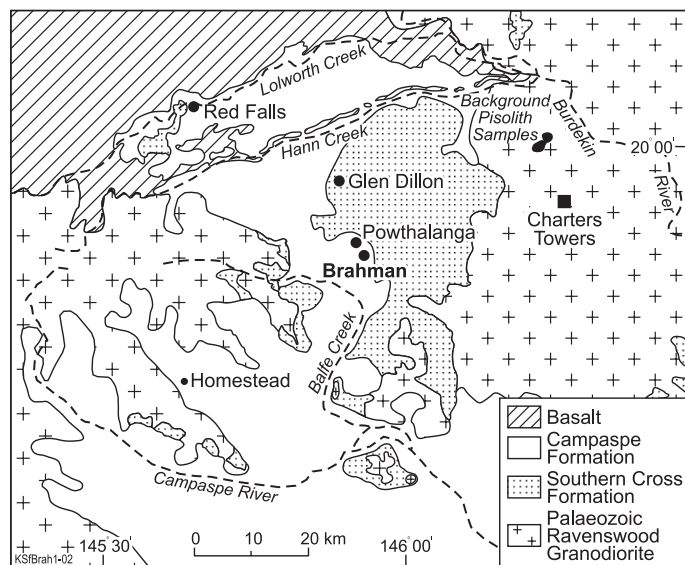


Figure 1. Distribution of Cainozoic units of the Charters Towers area, in relation to the Brahman Prospect (after Henderson and Nind, 1994).

PHYSICAL FEATURES AND ENVIRONMENT

The prospect is located on a broad plain at about 350 m ASL, with the nearest significant hills 20 km to the W. Although the area is essentially flat, it is incised by shallow (<0.5 m) erosion gullies generally sufficiently deep to expose the ferruginous top of the Campaspe Formation. The prospect itself occurs on a subtle topographic rise but has no outcrop. The Charters Towers area lies within the catchment of the Burdekin River, which is reduced to a string of waterholes during the dry season. Smaller streams in the area are ephemeral (Clarke and Paine, 1970). The climate is tropical, with hot, wet summers and warm, dry winters with occasional frost. The mean annual rainfall is 660 mm, mainly during December-March and associated with local thunderstorms or rain-bearing depressions. The mean daily maximum and minimum temperatures are 35°C and 21°C in December; 25°C and 11°C in July. The vegetation is eucalypt woodland and savanna. The Brahman area has been cleared for cattle grazing and is now dominated by spear grass.

GEOLOGICAL SETTING

Basement geology consists of Ordovician-Devonian magnetite-bearing and non-magnetite-bearing granites intruding Cambrian-Ordovician biotite schists of the Charters Towers Metamorphic Complex. Mesothermal vein mineralization, of the Charters Towers style, occurs at the intrusive boundary of magnetite-bearing granitoids and schists. The mineralization consists of Au in quartz veins with some pyrite, galena and sphalerite (Clarke and Paine, 1970). The Palaeozoic rocks are overlain unconformably by flat-lying Late Tertiary Campaspe Formation sediments and Quaternary alluvium. Sediments of the Early Tertiary Southern Cross Formation occur several kilometres to the E (Figure 1).

REGOLITH

The regolith at the prospect is composed of weathered granitoids overlain by weathered sediments of the flat lying Campaspe Formation. The latter is mottled, generally 5-20 m thick and consists of components derived from local granitoids. Below, at 10-15 m depth, the magnetic granodiorite consists of quartz, muscovite, orthoclase, plagioclase, amphibole, calcite and chlorite. These minerals are partly weathered to smectites, kaolinite and Fe oxides to depths of about 40 m (Scott and Fraser, 1997), although relicts of the silicates persist in the granodioritic saprolite and overlying sandy and puggy clay. Kaolinite and Fe oxides are less abundant and orthoclase, muscovite and smectites are more abundant than in the Campaspe Formation.

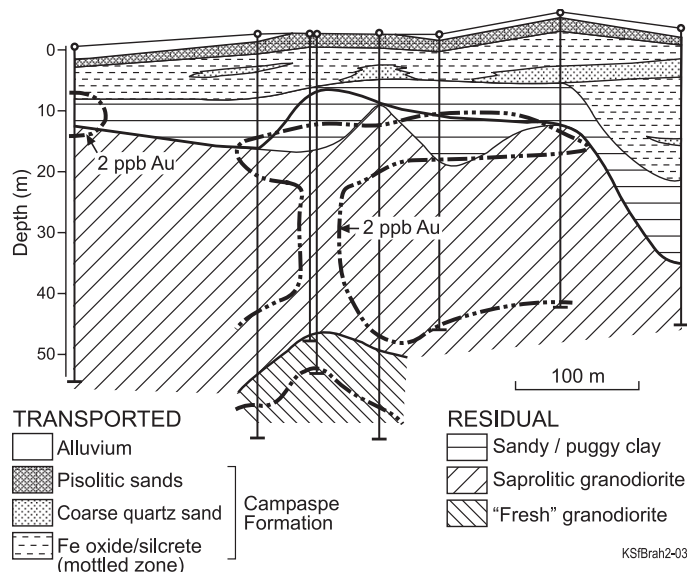


Figure 2. Section through the regolith of the Brahman Prospect on line 7778800N.

The top few metres of the thicker sections of the Campaspe Formation are pisolitic and this pisolitic horizon is exposed in shallow erosion gullies that cut 1-2 m through recent alluvium. These relationships are shown in Figure 2. Calcrite occurs in both the alluvium and the underlying pisolitic horizon.

Infrared spectral analyses indicate that the smectite around the unconformity is Fe-rich and that ferruginization of the upper portion of the saprolite occurred prior to deposition of the Campaspe Formation (Scott and Fraser, 1997). Ferruginous mottles and pisoliths in the Campaspe Formation reflect more recent weathering. Thus, several weathering events have affected the Brahman area.

MINERALIZATION

At Brahman, an intersection of 1.5 g/t Au over 4 m has been recorded at the intrusive boundary between the magnetic Ordovician-Devonian granodiorite and the schists of the Charters Towers Metamorphic

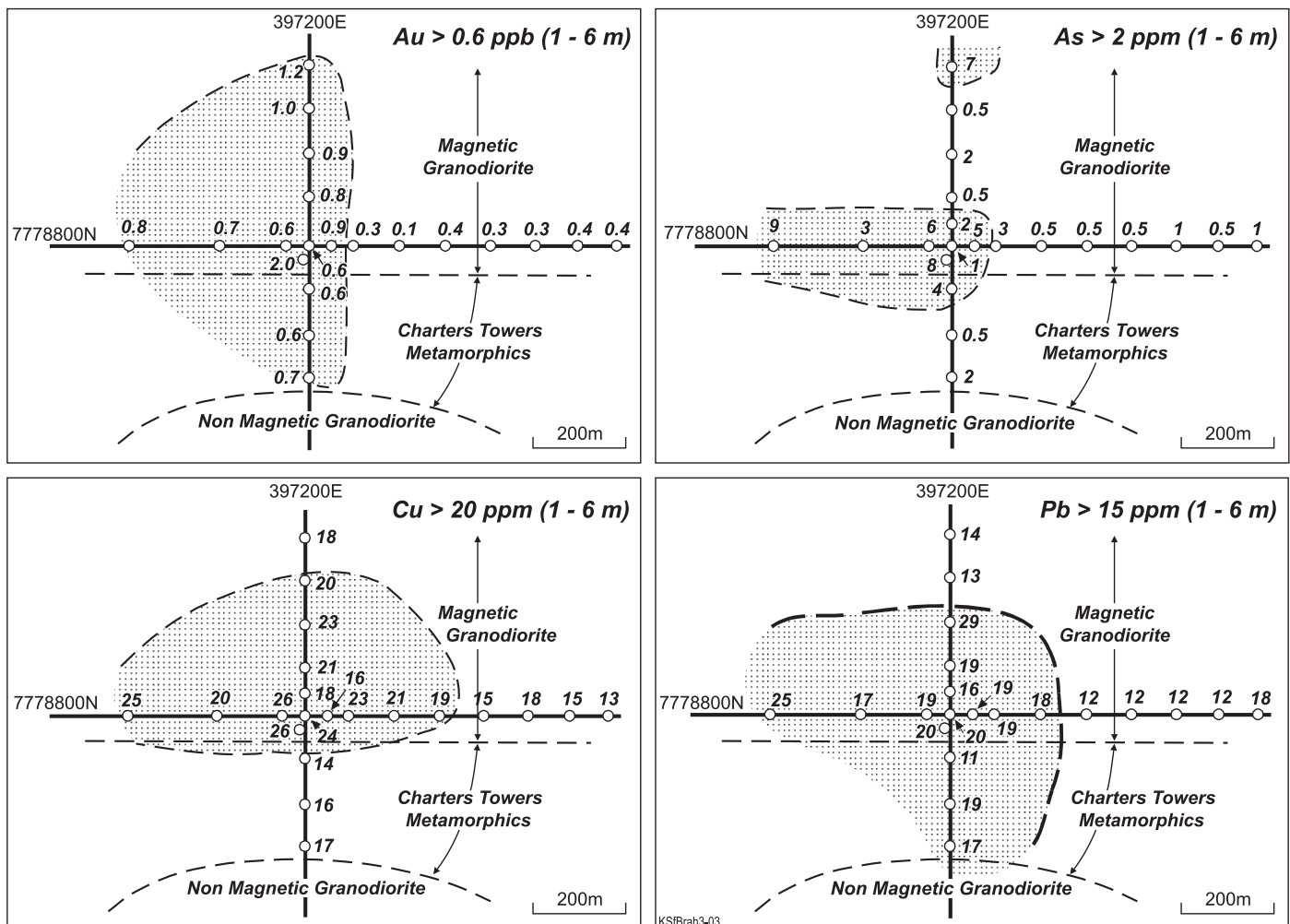


Figure 3. Distribution of Au, As, Cu and Pb in pisolith-rich material from 1-6 m in drill holes (data from Mt Leyshon Gold Mines Ltd).

Complex. The mineralization is associated with mesothermal quartz veins of the Charters Towers-style. However, the mineralization at Brahma, and at the shallow Powthlanga Au workings in granite about 1.5 km NW, lack the significant base metal contents generally associated with Charters Towers style mineralization.

REGOLITH EXPRESSION

Mineralization in fresh magnetic granodiorite at Brahma only attains a grade of 0.04 g/t Au. However, a low grade Au anomaly (>2 ppb) forms a 700 x 700 m, 10 m thick horizontal blanket at approximately 15-20 m depth within the saprolite and into the overlying residual clay zone. It is centred about the 4 m intersection of 1.5 g/t Au in saprolite. Similar dispersion occurs at the base of the saprolite (Figure 2). Anomalous Au, As, Cu and Pb are also associated with pisolith-rich (Fe-rich) samples from the top 6 m of drilling (Figure 3) and suggest that pisolith sampling would have identified the anomaly. The distribution of Au through the regolith profile at Brahma is similar to that found in the Yilgarn Craton of Western Australia. Here, anomalous Au may be found in the ferruginous, lateritic duricrust and at several horizons within the saprolite (including, at its base) with a zone of depletion between the lateritic and upper saprolitic enrichments (Butt, 1988). However, at Brahma, abundances are 2-3 orders of magnitude less than in the Au deposits of the Yilgarn Craton and all the material above the enrichment in the upper saprolitic zone is transported. Thus, at Brahma, the Au anomaly in the pisolitic horizon of the Tertiary Campaspe Formation implies that Au has been hydromorphically dispersed.

ACKNOWLEDGEMENTS

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REFERENCES

- Butt, C.R.M., 1988. Genesis of supergene gold deposits in the lateritic regolith of the Yilgarn Block, Western Australia In: R.R. Keays, W.R.H. Ramsay and D.I. Groves (Editors), The geology of gold deposits: the perspective in 1988. Economic Geology Monograph 8: 460-470.
- Clarke, D.E. and Paine, A.G.L., 1970. Explanatory notes on the Charters Towers Geological Sheet, Queensland. Bureau of Mineral Resources, Geology and Geophysics, Canberra. 34 pp. (Re-issued by the Geological Survey of Queensland, 1982)
- Cornwell, J. and Treddinnik, I., 1995. Geology and geochemistry and mining of the Pajingo epithermal vein system. In: S.D. Beams (Editor), Mineral Deposits of Northeast Queensland: Geology and Geochemistry. Economic Geology Research Unit, James Cook University, Townsville and Association of Exploration Geochemists, pp. 54-68.
- Orr, T.H., 1995. The Mt Leyshon Gold Mine: Geology and Mineralisation. In: S.D. Beams (Editor), Mineral Deposits of Northeast Queensland: Geology and Geochemistry. Economic Geology Research Unit, James Cook University, Townsville and Association of Exploration Geochemists, pp. 116-135.
- Henderson, R.A. and Nind, M.A.P., 1994. Tertiary units, landscape and regolith of the Charters Towers region. In: R.A. Henderson and B.K. Davis (Editors), New development in geology and metallogeny: Northern Tasman Orogenic Zone. Economic Geology Research Unit, James Cook University of North Queensland, Contribution 50: 17-21.

Scott, K.M. and Fraser, S.J., 1997. Mineralogical and geochemical aspects of the regolith at the Brahman Au prospect, Charters Towers area, N.E. Queensland. CSIRO Exploration and Mining Report 434R. (Reissued as CRC LEME Open File Report 143, CRC LEME, Perth, 2002. 36pp.)

SAMPLE MEDIA - SUMMARY TABLE

Sample medium	Indicator elements	Analytical methods	Detection limits (ppm)	Background (ppm)	Maximum anomaly (ppm)	Dispersion distance (m)
Primary mineralization	Au	GFAAS	0.0001	<0.0001	0.040	<5
Saprolite	Au	GFAAS	0.0001	<0.0001	1.460	400
Pisolith- rich 5 m composite sample	Au	GFAAS	0.0001	0.0003	0.0012	400
	As	ICP	1	<1	9	400
	Cu	ICP	1	15	26	400
	Pb	ICP	1	12	29	400

GFAAS = Graphite furnace AAS after aqua regia digest

ICP determination after treatment with HCl, oxidant and solvent extraction