PANGLO GOLD DEPOSIT, WESTERN AUSTRALIA

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INTRODUCTION

The Panglo gold deposit is located 30 km north of Kalgoorlie at 30°30'S, 121°23'E on the KALGOORLIE (SH51-09) 1: 250 000 map sheet. Regolith–landform mapping and regolith characterisation studies of the Kalgoorlie region have been conducted by Craig and Anand (1993).

PHYSICAL SETTING

Geology

The Panglo gold deposit occurs within the major N–S trending Norseman–Wiluna Greenstone Belt. The rocks of the Panglo area are Archaean sediments and mafic to ultramafic volcanic rocks that have been regionally metamorphosed to greenschist grade (Scott and Howard, 2001). The rocks dip at 70° W, and because of intense shearing, lithological variation is common over small distances. Palaeochannel sediments of probable Late Eocene age (Kern and Commander, 1993) occur about the deposit, especially on its western side (Figure 1). Except for a barren quartz blow associated with a shear and an outcrop of turbidites several hundred metres southeast of the deposit, basement exposure within the deposit area is absent. Rather, the deposit is typically overlain by a thin (generally <0.5 m thick) soil. Pedogenic carbonates are present in the soil and underlying mottled saprolite and palaeochannel sediments, generally at a depth of 1–2 m below the land surface (Lintern *et al*., 1997).

Geomorphology

The highest point in the Panglo area occurs above transported gravels occupying the palaeochannel to the southwest of the deposit (Figure 1). From this locality, which lies approximately 4 m above the general surroundings, the land slopes gently toward a playa situated about 0.5 km to the southeast. The deposit itself occurs in an area of salt scalding in a surface drainage system that flows toward the lake. The groundwater is shallow (several metres below ground level), highly saline and also flows toward the lake (Gray, 2001).

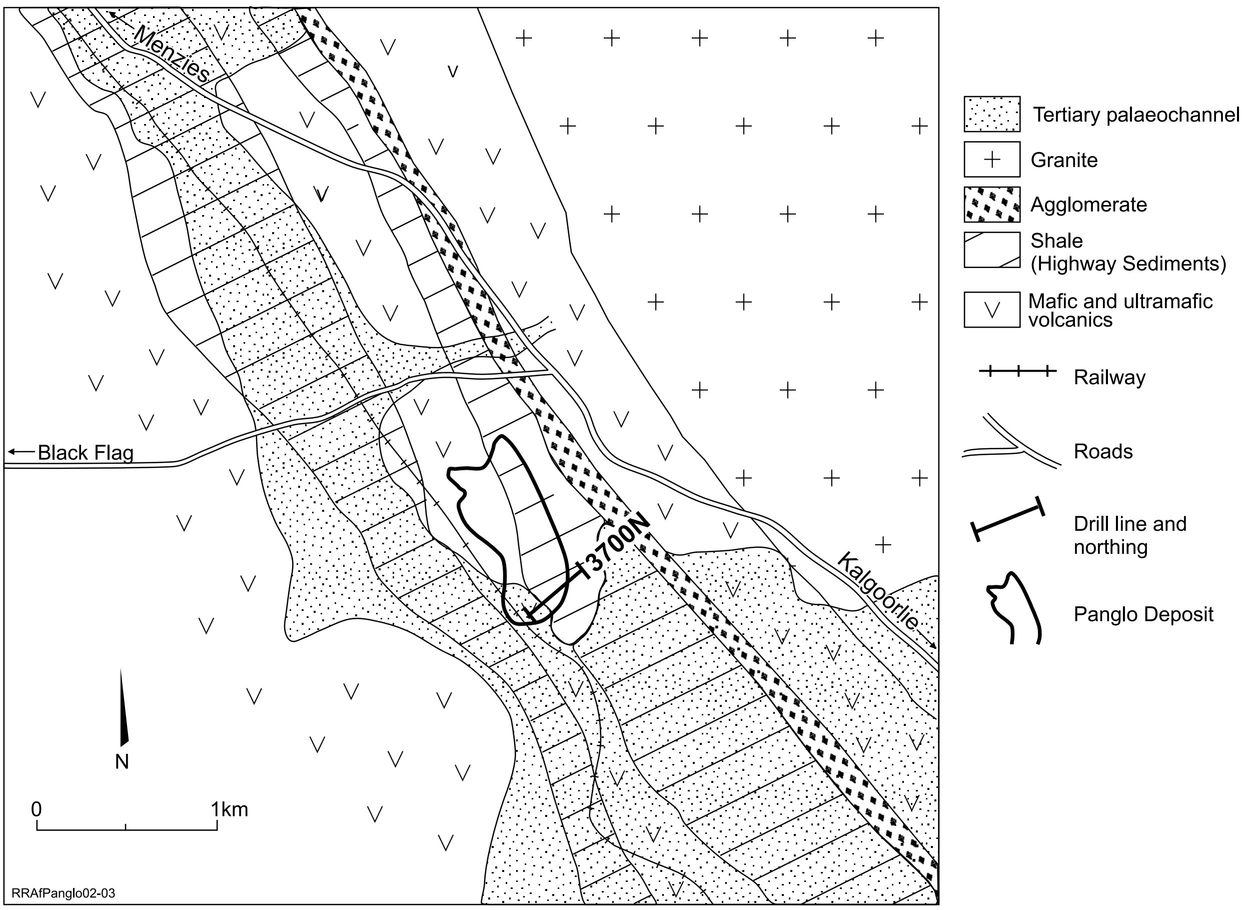

Figure 1. Geology of the Panglo area. (after Scott and Howard, 2001)

CLIMATE AND VEGETATION

The climate is semi-arid with long hot dry summers and short cool winters. The mean annual rainfall of 270 mm falls mainly during winter, with erratic local thunderstorms or rain-bearing depressions derived from tropical cyclones bringing rain during summer. The mean daily maximum and minimum temperatures are 34 and 18°C in January and 17 and 5°C in July. Mean annual evaporation is 2 600 mm, with evaporation usually exceeding rainfall for 10 months of the year. The vegetation of the district is remnant tall eucalypt open woodland vegetation with a saltbush–bluebush understorey on more calcareous soils.

REGOLITH–LANDFORM RELATIONSHIPS

Regolith–landform relationships in the Kalgoorlie region have been mapped at 1: 250 000 scale using aerial photograph interpretation and Landsat TM imagery substantiated by ground traverses and detailed studies of specific sites (see Craig and Anand, 1993). Erosional areas, which comprise 75% of the mapped area, are characterised by subcropping ferruginous and bleached saprolite (pale grey to yellow clay-rich material which often contains lithic fragments) derived from the Archaean sediments and volcanics, covered by a veneer of colluvial sandy loam. Depositional areas (25% of the mapped area) are in the palaeochannels. Sediments within the palaeochannels are gravels (ferruginous pisoliths and nodules and some lithic fragments), locally cemented by calcrete in the top metre. Surficial lag also occurs above the palaeochannel sediments.

REGOLITH CHARACTERISATION

Weathering of mafic volcanic rocks has resulted in the development of ~20 m of khaki-brown saprock overlain by ~60 m of grey-white to yellow-brown and khaki saprolite, in turn overlain by up to 7 m of brown ferruginous calcareous clay and thin soil (Scott and Howard, 2001). Weathering of the ultramafic volcanic rocks has resulted in lesser thicknesses of saprock, saprolite and calcrete-bearing material than in mafic volcanic profiles because talc in ultramafic rocks is less susceptible to weathering than the amphiboles and chlorites in the mafic rocks. Weathered shales comprise ~20 m of black saprock below ~35 m of brown to light grey saprolitic material which may be strongly kaolinitic in its upper 5 m (Scott and Howard, 2001). Calcrete does not generally occur in the upper portions of shale-derived weathering profiles.

REGOLITH EVOLUTION

Weathering in the Panglo area, leading to the development of ferruginous lateritic profiles, has probably occurred since at least the late Mesozoic until the early Tertiary (Scott and Howard, 2001). As a result of tectonic movement during the early Tertiary, the weathered land surface of the Panglo district was incised by a southeast flowing river system. Deposition of sediments derived from the ferruginous capping of lateritic profiles occurred in these valleys during the Late Eocene. Lateritic profiles outside the palaeochannels were stripped to the mottled zone. In the Late Tertiary, another episode of tectonic uplift occurred, and with the palaeochannels full, broad streams were established adjacent to the filled palaeochannels. This led to relief inversion so that the filled palaeochannels commonly now form the highest points in the Panglo area (Figure 2). The climate also changed at this time and the effects of arid conditions have been superimposed on the remnant lateritic profiles. Proximity to a playa resulted in the groundwaters becoming saline and very shallow. These saline waters led to the separation of Ag from Au during the formation of supergene mineralization (Webster and Mann, 1984) at the interface between reduced and oxidised rocks, i.e. at the base of weathering (Scott and Howard, 2001). Under the arid conditions pedogenic carbonate (calcrete) was deposited above the weathered volcanic rocks and in the palaeochannel sediments. Gold was concentrated in the calcrete from residual amounts in the saprolite (Figure 2; Lintern, 2001).

IMPLICATIONS FOR EXPLORATION

The general spatial association between palaeochannel sediments and tectonic zones (which would have been highly susceptible to weathering) appears significant throughout the Yilgarn Craton. In the Panglo district, stripping of the pre-Tertiary landscape has moved lateritic residuum into the palaeochannels and exposed the mottled zone, which has subsequently been covered by a veneer of alluvium/colluvium. Thus although the zone of weathering which provides the best indication of bedrock has been removed, the remaining regolith can still be useful in regional exploration, if the nature of the palaeolandscape is understood.

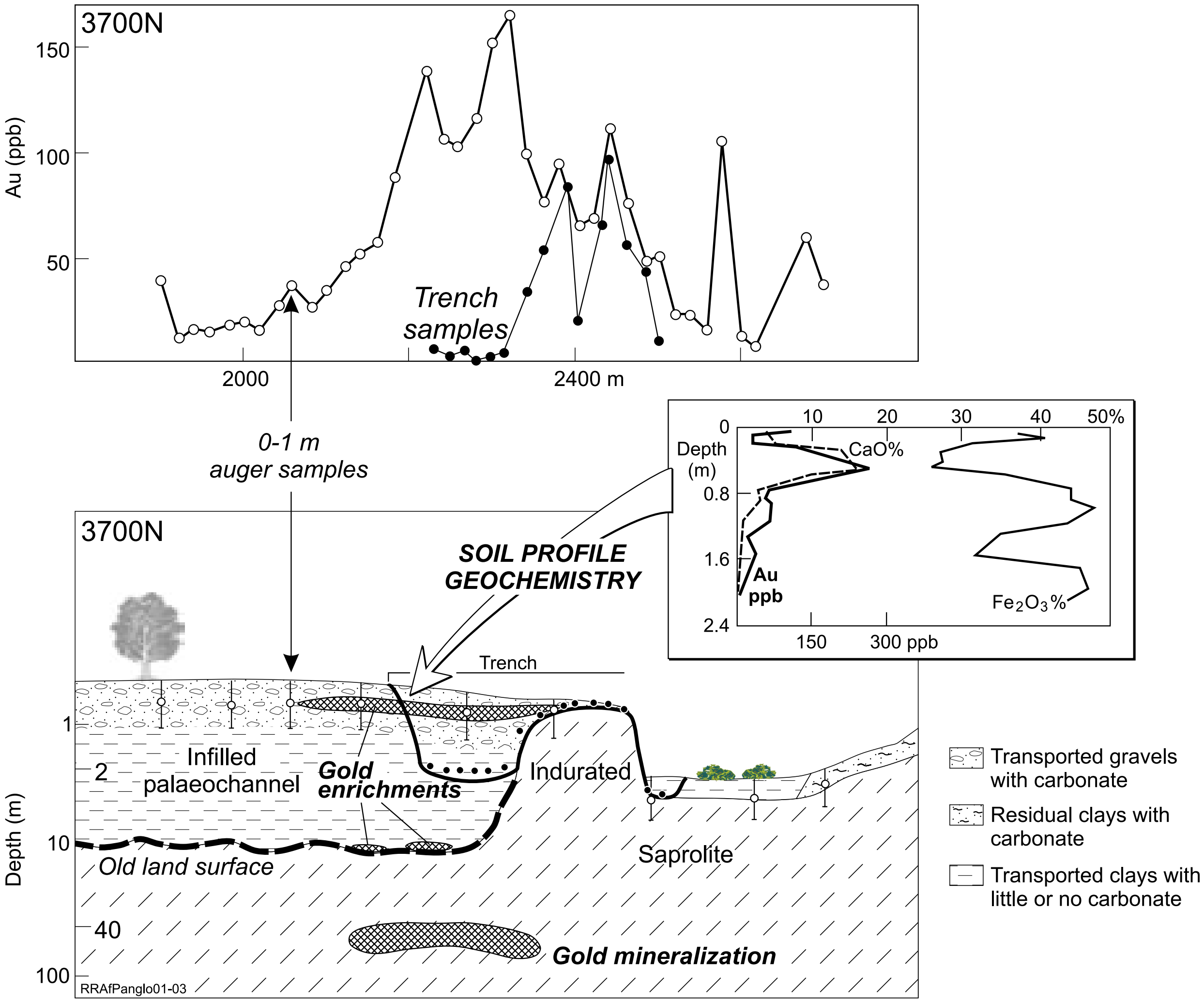

Figure 2. Section through 3700N (see Figure 1) showing topographic relationships and the distribution of calcrete and Au mineralisation. Shallow carbonate-rich samples from the trench give significant response to buried mineralisation, whereas deep, carbonate-poor samples have backgound Au contents. (after Lintern *et al*., 1995)

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