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SUPERGENE GOLD DISPERSION AT THE PANGLO GOLD DEPOSIT, WESTERN AUSTRALIA

D.J. Gray

CRC LEME OPEN FILE REPORT 221

November 2008

(CRC LEME Restricted Report 118R / E&M Report 649R, 1999
2nd Impression 2008)

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CRC LEME is an unincorporated joint venture between CSIRO-Exploration & Mining, and Land & Water, The Australian National University, Curtin University of Technology, University of Adelaide, Geoscience Australia, Primary Industries and Resources SA, NSW Department of Primary Industries and Minerals Council of Australia.

Headquarters: CRC LEME c/o CSIRO Exploration and Mining, PO Box 1130, Bentley WA 6102, Australia

The CRC LEME–AMIRA Project 504 "**SUPERGENE MOBILIZATION OF GOLD IN THE YILGARN CRATON"** was carried out over the period 1998 to 2001. Twelve reports resulted from this collaborative project.

CRC LEME acknowledges the support of companies associated with and represented by the Australian Mineral Industries Research Association (AMIRA), and the major contribution of researchers from CSIRO Exploration and Mining.

Although the confidentiality periods of the research reports have expired, the last in July 2002, they have not been made public until now. In line with CRC LEME technology transfer goals, re-releasing the reports through the **CRC LEME Open File Report (OFR) Series** is seen as an appropriate means of making available to the mineral exploration industry, the results of the research and the authors' interpretations. It is hoped that the reports will provide a source for reference and be useful for teaching.

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OFR 228 – Supergene mobilization of gold and other elements in the Yilgarn Craton, *Western Australia* – ***FINAL REPORT*** – DJ Gray, NB Sergeev, CG Porto and AF Britt

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Addresses and affiliations of Authors:

D.J. Gray
CRC LEME
c/o CSIRO Exploration and Mining
PO Box 1130, Bentley,
Western Australia 6102.

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c/o CSIRO Exploration and Mining
PO Box 1130, Bentley, Western Australia 6102.

PREFACE

The principal objective of CRC LEME-AMIRA Project 504, *Supergene mobilization of gold and other elements in the Yilgarn Craton*, is to determine the mechanisms of supergene/secondary depletion, enrichment and dispersion of Au and other elements, so as to improve selection of drilling targets and further optimize interpretation of geochemical data.

The Panglo Au deposit lies immediately north of Kalgoorlie, adjacent to a palaeochannel system. However, the ore body generally has thin (commonly less than 3 m) transported cover, along with extensive carbonate at the surface, previously shown to accumulate Au. The groundwaters are hypersaline at all depths, acid and oxidizing at surface and therefore highly corrosive for Au. Thus this deposit presents an ideal opportunity to investigate modes of Au redistribution in thin transported cover and *in situ* regolith in the Kalgoorlie region.

D.J. Gray
Project Leader
August 1999

ABSTRACT

This report discusses studies of the 3D Au geochemistry of the Panglo Au deposit as well as presenting calculations of Au grades in the regolith and the variation in Au content with depth from surface, elevation or distance from the unconformity. The only regolith transition determined was the unconformity between transported material and weathered Archaean rocks. A palaeochannel system in the southeast of the area is known to flow into a major system south and west of the study area. Transported cover is generally thin over the ore body, being commonly less than 3 m thick.

There is little evidence for any supergene Au halo or plume, though there is a strong upward depletion (approximately 85%) above 35 m depth. Above the depleted zone, close to the soil surface, Au concentrations are higher, though not as high as at depth. Both 3D visualization and Au grade calculations suggest that this surface Au is not due to an enrichment process, but is due to residual Au still retained at the top of the *in situ* regolith. In parts of the Panglo ore body with significant overburden, this situation matches other areas in the Yilgarn Craton with interface anomalies. Gold associated with carbonate at the surface may be being supplied from this interface Au. This is most clearly observed in areas of the ore body where the transported cover is comparatively thicker.

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1 INTRODUCTION

1.1. Aim

The principal objective of CRC LEME-AMIRA Project 504, *Supergene mobilization of gold and other elements in the Yilgarn Craton*, is to determine the mechanisms of supergene/secondary depletion, enrichment and dispersion of Au and other elements, so as to improve selection of drilling targets and further optimize interpretation of geochemical data. Within this framework, this study aims to investigate the geochemical dispersion of Au at the Panglo Au deposit using the Mining Visualization System (MVS) program to establish the three-dimensional patterns of Au distribution in the regolith and for calculating degrees of depletion and enrichment.

1.2. Site description

The Panglo Au deposit is held by Goldfields Exploration Pty Ltd and is located some 30 km north of Kalgoorlie along the Kalgoorlie-Leonora Highway at latitude 30° 32' S and longitude 121° 23' E. The area has an arid climate with an average annual rainfall of about 250 mm, most of which falls during the cooler months of May to August. However, there is a significant component of summer rainfall from erratic thunderstorms.

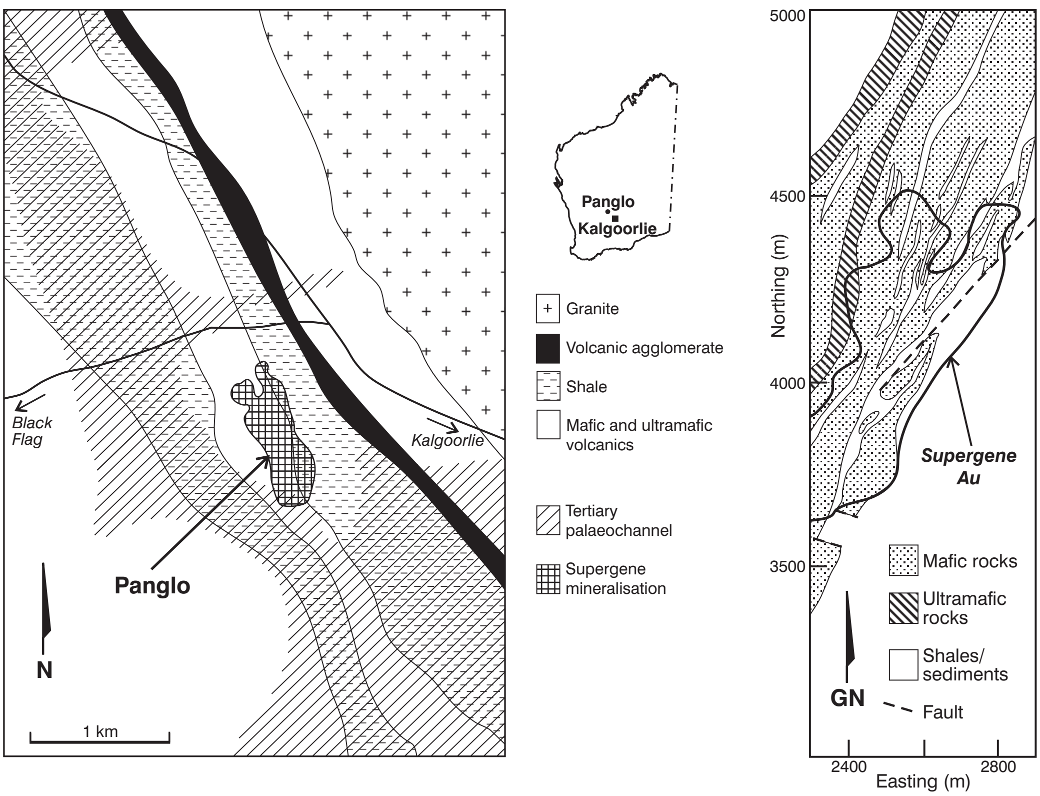

Figure 1: Location and geology of Panglo Au deposit

Various CSIRO (now CRC LEME) studies have investigated the geochemistry, mineralogy, hydrogeochemistry and soil chemistry of the area (Scott, 1989a,b , 1990; Scott and Davis, 1990; Scott and Dotter, 1990; Lintern and Scott, 1990; Gray, 1990). The deposit is oriented SSW-NNE within steeply west-dipping carbonaceous shales and mafic to ultramafic volcanics, within a major shear zone (Figure 1). Economic mineralization occurs as a supergene deposit at a depth of about 40 m. There is little outcrop over mineralization but mineralized lithorelics of various sizes (ranging up to several centimetres) occur in a matrix of heavy clays within a few centimetres of the surface.

Bleached saprolitic clays are a prominent feature of the weathering profile. The depth of weathering is in excess of 60 m.

The Panglo deposit is situated partly below, but mainly adjacent to, a broad, poorly-defined, highly saline ephemeral drainage channel. Towards the southern end of the mineralized zone, at 3700 mN, the drainage narrows to a relatively flat channel, approximately 100m wide, confined by steep banks. The gradient of the drainage channel decreases from north to south. To the west and south-west of mineralization, a palaeochannel of presumed Tertiary age has been defined. This partially encroaches over the southern limit of mineralization (Figure 1), as indicated by near-surface loosely cemented lateritic gravels (Figure 1). A detailed hydrogeochemical study of this area, indicated highly saline groundwaters, which are acid and oxidizing at surface (Gray, 1990). As such, the shallow groundwaters are highly corrosive for Au, with concentrations up to 4 µg/L Au determined for shallow groundwaters.

2. METHODS

Logging and geochemical data were supplied by Goldfields Exploration Pty Ltd for modelling using Mining Visualization System (MVS; © C Tech Corporation). Unfortunately, due to the complex exploration history of the area, the logging only enabled delineation of transported and *in situ* (including bedrock) units.

Three study areas (Figure 2) were gridded, these being:

1. The large area (the whole area in Figure 2), which was gridded to a 10 m:10 m:3 m (X:Y:Z) grid. Regolith stratigraphy and Au distribution were modelled.
2. The Panglo ore body (internal box in Figure 2), which was gridded to a 6 m:6 m:2.1 m (X:Y:Z) grid and also to a 6 m:6 m:0.5 m grid size for elevations > 334 mRL (for studies of the unconformity). Regolith stratigraphy and Au distribution were modelled, and well as calculation of Au grades.
3. NW of the ore body (dashed box in Figure 2), which was gridded to a 5 m:5 m:0.5 m (X:Y:Z) grid for elevations > 334 mRL. This area was selected as having a more uniform and deeper transported cover. The thickness of the cover for the entire area is > 1 m, with 50% of the area covered by material ≥ 6 m thick. Only Au grade calculations were done.

The grid spacing used were based on the density of available drilling data.

Regolith transitions (surface and unconformity) were gridded (see below), “point” anomalies removed by filtering of the input data, and the data re-gridded. In general, only single data points resulting in large errors were removed, as these probably represent mis-logging. Although filtering has potential to bias the data, it was considered necessary to give coherent weathering horizons. In addition, no surface elevation data were available for the southeast corner of the large study area (the blank region in Figure 2). In this region, the elevation was assumed to be 345 mRL, which could cause minor problems for data interpretation. For visualization purposes, the data were pre-processed by a logarithmic transformation (base 10) of Au concentrations before gridding. Although this can tend to weaken the interpolated magnitude of the main mineralization, it enhanced details of subtle supergene Au redistributions.

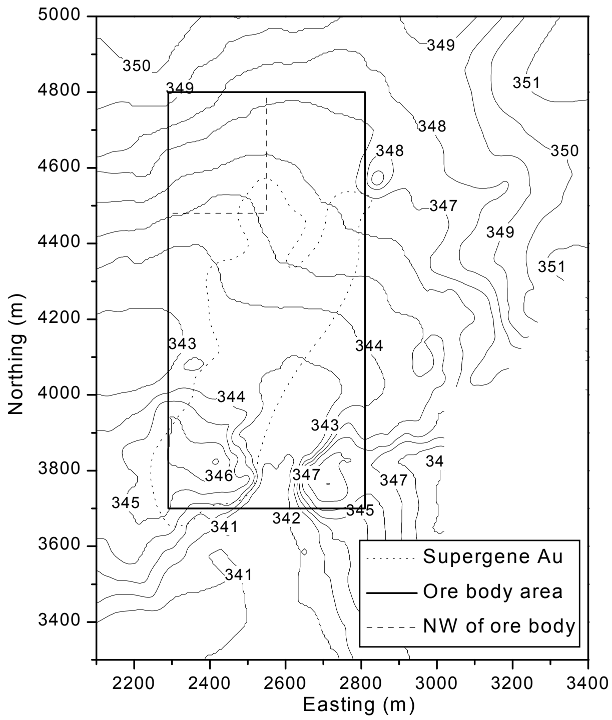

Figure 2: The surface topography of the Panglo study area, with the location of supergene Au mineralization, the ore body and NW of the ore body areas also shown.

The grid sizes used for the study areas are given above. The stratigraphy was gridded using the KRIG_3D_GEOLOGY module (within MVS), using specified rectilinear co-ordinates (as shown in Figure 2), the maximum number of samples points was set to 80, boundary offset to 0, and other settings at default. The geochemical data were then gridded in relation to the surfaces, using the KRIG_3D module, with the maximum number of data points considered for the parameter estimation at a model node set to 120. Horizontal/vertical anistrophy was set at 2.5, rectilinear offset parameter at 0, post-processing minimum and maximum Au concentrations at 0.005 and 20 ppm Au, respectively, for logarithmic data and 0 - 20 ppm for untransformed data (used for Au grade calculations), and all other settings at default.

The main goals for this project were modelling the regolith stratigraphy, modelling the Au distribution in the regolith and calculating Au grade statistics. Models of the regolith stratigraphy and Au distribution are presented diagrammatically on the enclosed CD with example figures given in the text. The Au grade statistics are discussed in Section 5.

Gold concentrations were calculated for the Panglo ore body and for NW of the ore body (Figure 2), using untransformed data, with the VOLUME_AND_MASS module. No attempt was made to model different densities for different units; densities assumed to be uniform. Note that this has only a minor influence on most calculations as the raw Au concentration data have units of mass/mass rather than mass/volume. The calculated concentrations do not compensate for leaching of mobile constituents: if half of the minerals have been leached then Au grade will double because of residual concentration.

In addition, by including the ISOVOLUME module, the Au concentration can be calculated for slices defined either by elevation (e.g., 390-393 mRL) or distance from a regolith transition (e.g., 3-6 m above the unconformity). Thus, Figure 3 illustrates nominal 3 m slices taken downwards from the unconformity, in this case becoming truncated downwards at the base of weathering, as the analysis is set up not to include the next regolith horizon. While this method may be arithmetically correct, it can lead to problems as the slices get further from the reference transition (in this case the unconformity). This is because ultimately the slice being analyzed is not complete, again illustrated in Figure 3 as the slices becoming more and more truncated by the base of weathering. This can be measured as a reliability factor, which is the volume of the slice in question divided by the volume of an untruncated slice (Figure 3). A reliability index of 85% indicates that the slice is 15% truncated.

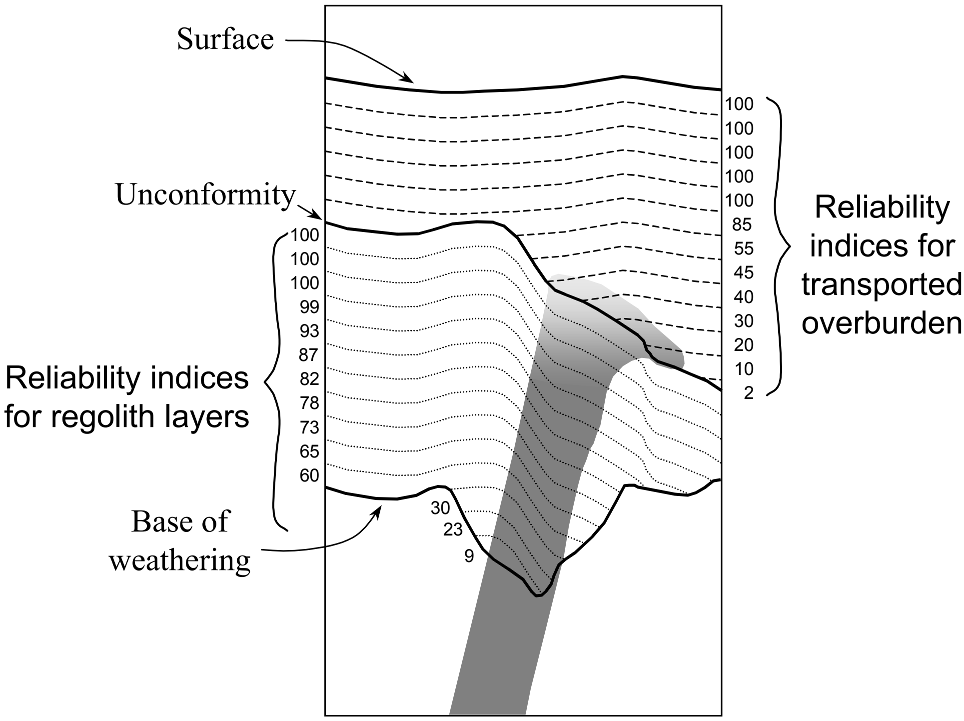

Figure 3: Diagrammatic representation of the method for calculating Au grade from slices defined for the upper surface and for the unconformity. Shaded area represents mineralized zone, with depletion near the top of the in situ *regolith.*

As the reliability index decreases, significant errors can occur. Figure 4 shows the results of Au concentration measurement for each 3 m slice from the unconformity. Though the deeper slices are truncated (Figure 4a), they can still contain mineralized material, as in this example (Figure 3). Thus, a similar mass of Au is being divided by lesser and lesser masses of regolith, which leads to anomalous estimates of the Au concentrations in each slice (Figure 4b). In this example, the results indicate that deepest slice has up to 440 ppb Au even though the "real" Au content is invariant at 80 ppb, except for the depletion zone at the top of the *in situ* regolith.

When all slices with reliability indices of less than 60% are removed, the remaining results can be coded for reliability (Figure 4c). A much clearer picture of the Au concentration trends is observed, with the major feature being the depletion towards the unconformity. Note that this example is for the maximum possible overestimation of Au grade (the maximum overestimation = 100 ÷ reliability: e.g., when reliability is 60%, maximum overestimation is 1.67; when reliability is 90%, maximum overestimation is 1.11). In other cases, underestimation can occur for low reliability samples (due to truncated intersection with mineralization). In summary, those samples with reliabilities less than 80% are suspect (but can still be valuable if treated with caution), whereas those with a reliability of less than 60% should generally not be used.

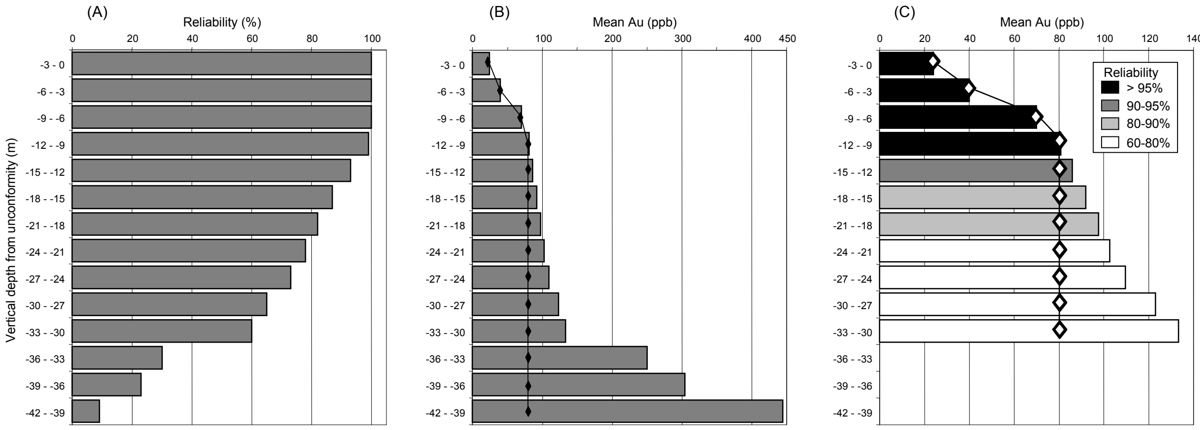

Figure 4: Calculated (a) regolith reliability, (b) unfiltered Au grade and (c) filtered (> 60% reliability) Au grade colour coded to reliability, for in situ *regolith. Diamonds represent expected Au grade. Data based on situation represented in Figure 3.*

3. REGOLITH STRATIGRAPHY

The only stratigraphic boundaries that were modelled were the land surface and the depth of the transported material. The main surface feature is the drainage in the south centre of the large area (Figure 2). The palaeochannel cuts across the south-east of the large area (Figure 5), with the main channel south and then west of the study area (Figure 1). The ore body study area is in an area of thin transported cover (85% of the area had less than 3 m transported cover and 99.9% less than 9 m cover).

2 3D VISUALIZATION OF GOLD DISTRIBUTION

3.1. Introduction

Gold data were gridded as described in Section 2. The visualized data will be discussed in this Section, with the Au concentration results given in Section 5. Several plots are included as bitmap files in the accompanying CD, in sub-directories within the separate LARGE_AREA and ORE_BODY directories, as described briefly below, and listed in Appendix 1:

(i) the STRATIGRAPHY sub-directory includes the transported and *in situ* layers, either merged together to show the true stratigraphy (TOGETHER.BMP), or with elevation information included (*e.g.*, Figure 5);
(ii) the LAYERS directory includes the transported and *in situ* layers, with a particular Au grade cut-off for each file (thus the plot shown in Figure 6 is named 200PPBAU.BMP);
(iii) the SLICE-N directory includes vertical slices at selected northings, with plots named accordingly. Thus the plot shown in Figure 9 is named 3900mN.BMP;
(iv) the SLICE-E directory includes vertical slices at selected eastings, with plots named accordingly.

3.2. Large area

The SSW-NNE strike of the mineralization is shown in Figure 6, using a 200 ppb cut-off. Thus, where Au is greater than 200 ppb, the area is coloured according to the horizon (yellow - transported, blue – *in situ*). The upper material and soil are invisible (*i.e.*, < 200 ppb), indicating the upward depletion. At a lower cut-off (*e.g.*, 50 ppb; Figure 7), the surface anomaly, which closely matches the distribution of supergene Au at depth, can be observed. The supergene mineralization appears to be "spotty" (Figure 9), with a possible weak supergene plume extending up to 100 m eastwards. This differs from previous interpretations of a major supergene halo at this site (Butt *et al*., 1991). At intermediate depths, there is a depleted zone to approximately 35 m depth.

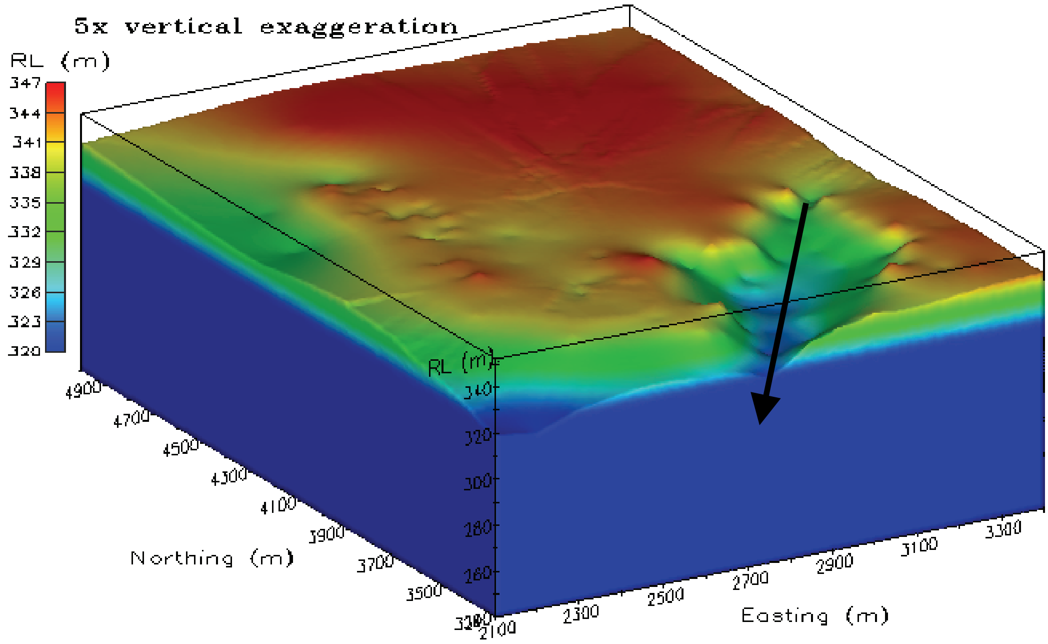

Figure 5: Palaeotopography of the Panglo large area (i.e., elevation of the unconformity). Large arrow represents drainage direction.

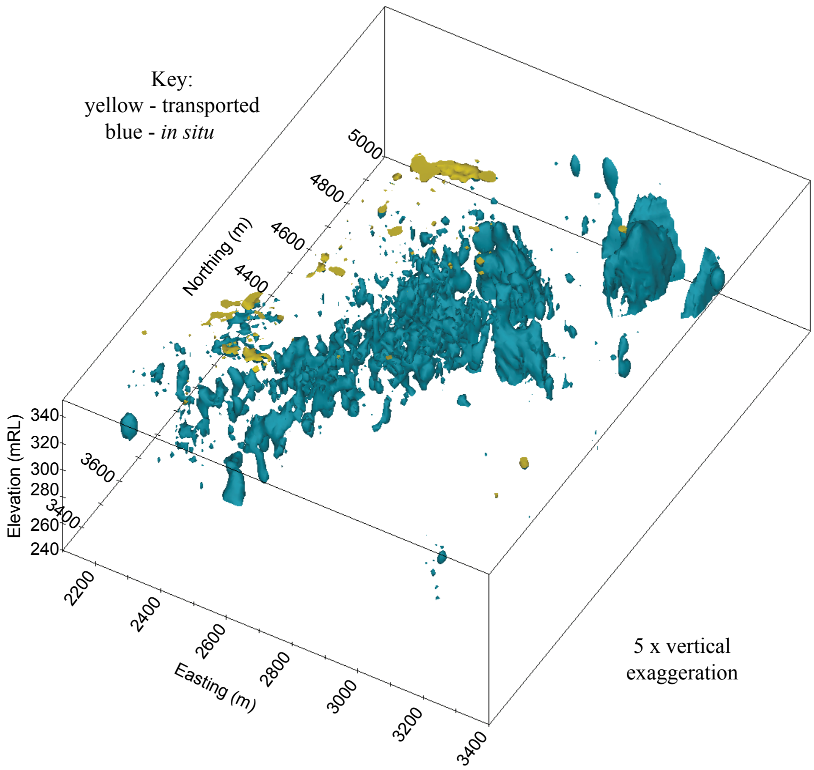

Figure 6: Gold distribution using a 200 ppb cut-off, Panglo large area.

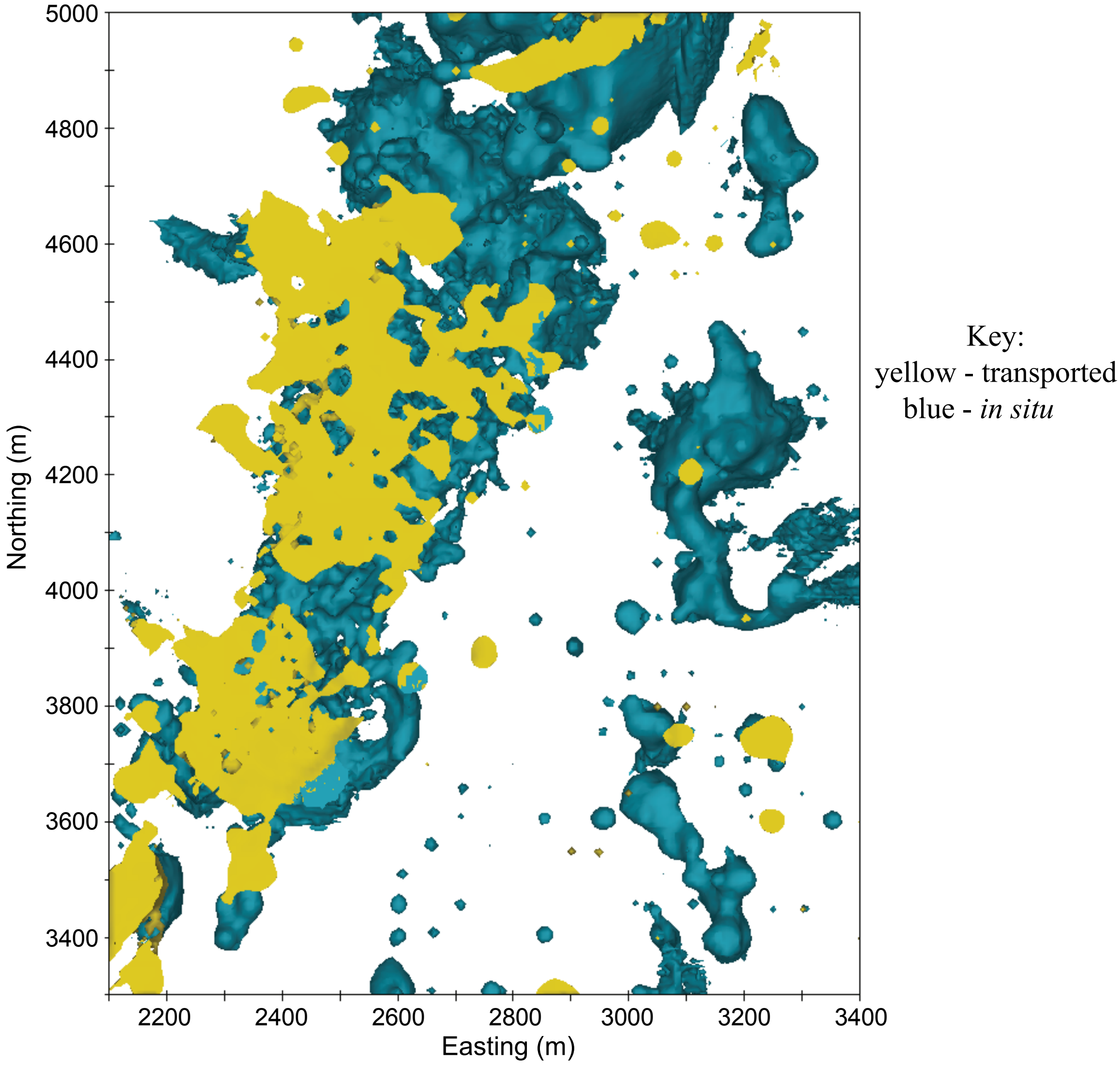

Figure 7: Plan of Au distribution using a 50 ppb cut-off, Panglo large area.

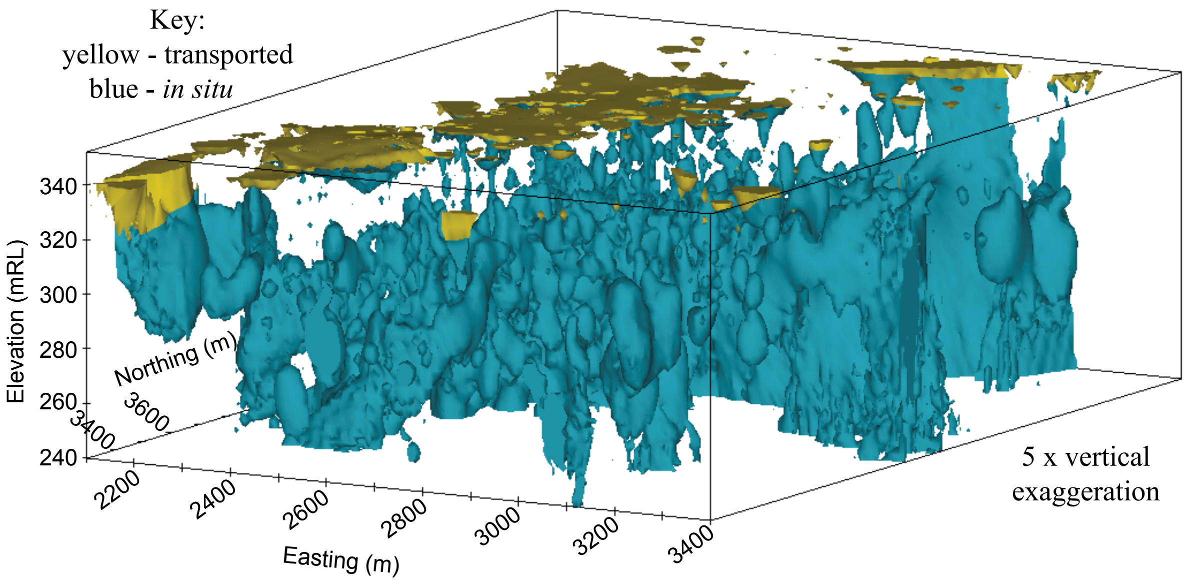

Figure 8: Gold distribution using a 50 ppb cut-off, Panglo large area.

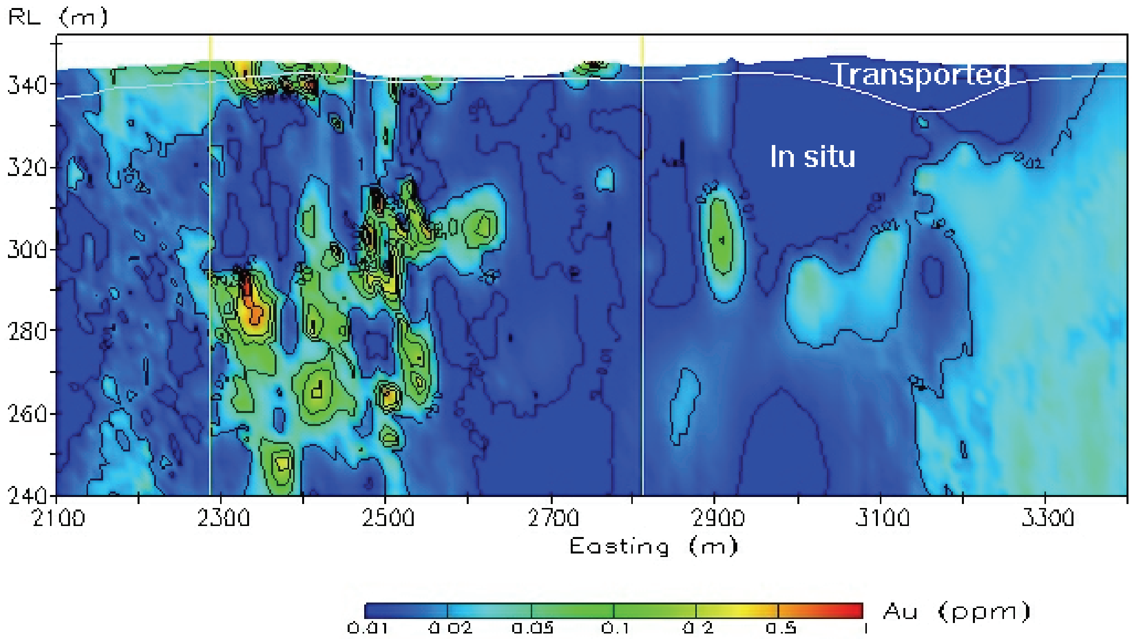

Figure 9: Calculated Au grade for 3900 mN traverse, 5 x vertical exaggeration, Panglo large area. Yellow lines show ore body area.

3.3. Ore body

Results for the ore body case are similar to those for the large area, though data tends to be slightly more detailed and less noisy (compare Figure 10 with Figure 6 and Figure 11 with Figure 9). On the basis of the higher resolution, it appears that in some cases, the shallow enrichment is not concentrated at the surface, but instead at the interface between transported and *in situ* regolith. Thus, it is possible that some or much of the surface enrichment is actually being "fed" from the interface enrichment. This correlates with observations by Scott (1989b) that in surficial elevations at Panglo Au is greatest 2 – 3 m below surface, and correlated with As and sometimes Mo, Sn and W. Similarly, the Runway Au deposit, also near Kalgoorlie with thin transported cover, also shows Au in surface carbonates, as well as at the top of the residual saprolite (Lintern, 1996).

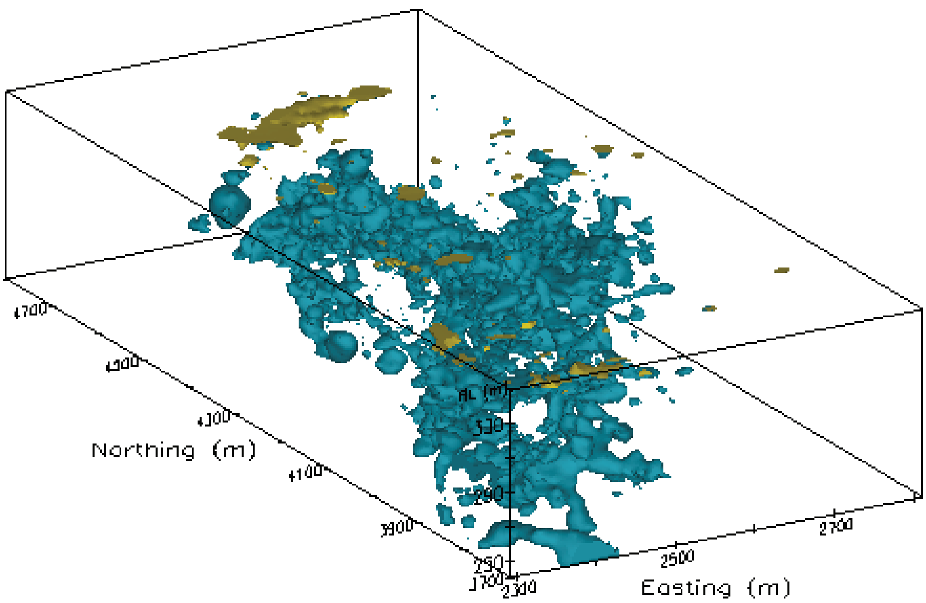

Figure 10: Gold distribution using a 200 ppb cut-off, Panglo ore body.

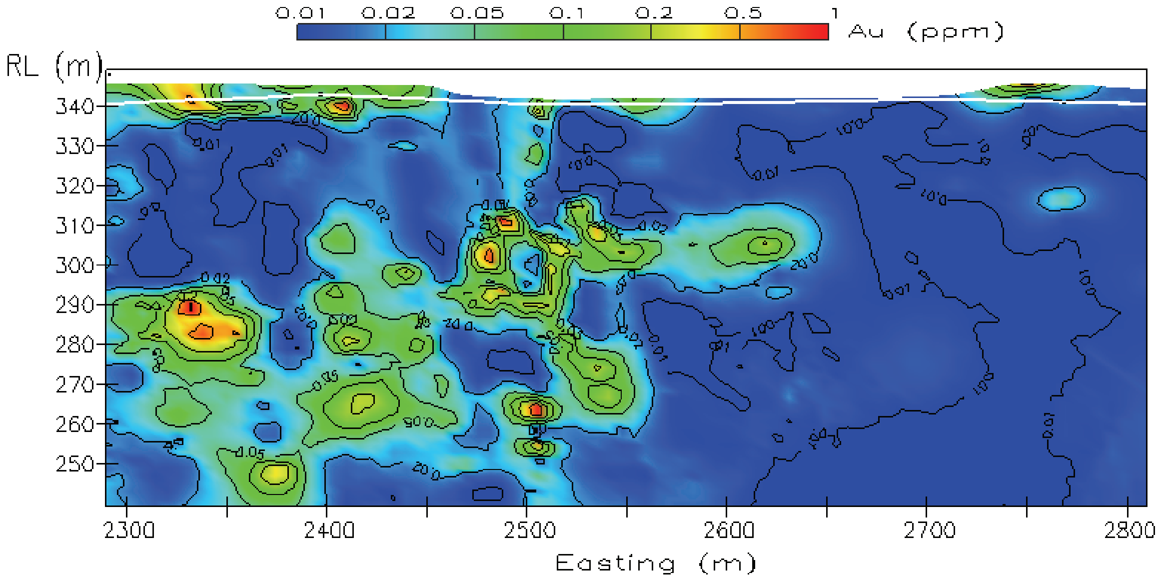

Figure 11: Calculated Au grade for 3900 mN traverse, 2 x vertical exaggeration, Panglo ore body.

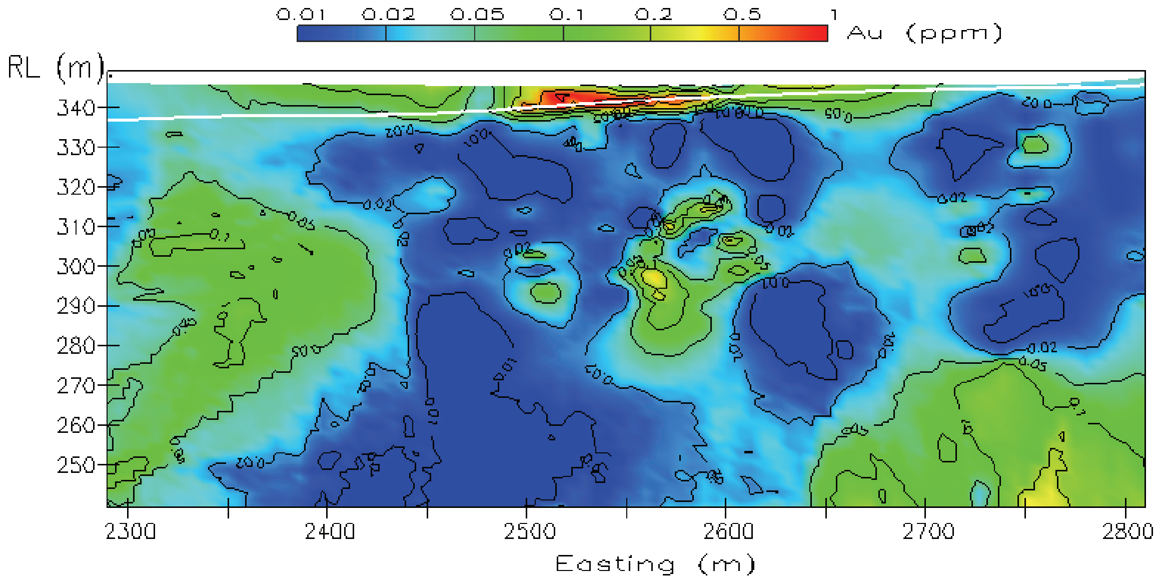

Figure 12: Calculated Au grade for 4600 mN traverse, 2 x vertical exaggeration, Panglo ore body.

5 GOLD CONCENTRATION CALCULATIONS

As stated previously (Section 2), calculations of Au concentrations in regolith slices were done on the untransformed data for the ore body study area, as a greater proportion of the data are above detection than for the large area. The ore body has a veneer of transported material, which tends to be concentrated in uplands (*i.e.*, materials higher than 345 mRL are 86% transported; Table 1). Unless otherwise stated, the transported and *in situ* units are combined in further calculations.

Table 1: Proportion of transported material vs. elevation and vs. depth

Elevation (mRL)	Completeness of layer (%)	Percentage transported		Depth from surface (m)	Percentage transported
> 345	18	86		0 – 3	61
342-345	72	65		3 – 6	15
339-342	100	18		6 – 9	4.2
336-339	100	1.1		9 - 12	0.1
333-336	100	0			

There is a clear depletion of Au at Panglo (Figure 13) from greater than 170 ppb at levels below 305 mRL to < 30 ppb above 320 mRL (approximately 85% depletion). Gold is less depleted at surficial levels. Results from the data visualization (Section 3.3) suggest that the Au at surface is primarily sourced from the top of the *in situ* regolith, being due to residual Au rather than larger scale transport to the soil surface. When Au concentration is measured from the surface using the "standard" gridding size (*i.e.*, Au concentrations determined for 3 m slices) Au content appears to decrease from surface (Figure 14). However, if a higher Z resolution (0.5 m) is used, then the average Au content is observed to be virtually constant for 0 - 4 m depth (Figure 14), only very slightly increasing from 83 ppb at surface to 86 ppb at 3 m depth. For the NW of the ore body, which has an average of 6 m transported cover, there is a clear increase in Au concentration from the surface (87 ppb) to 3 m below surface (114 ppb) (Figure 15).

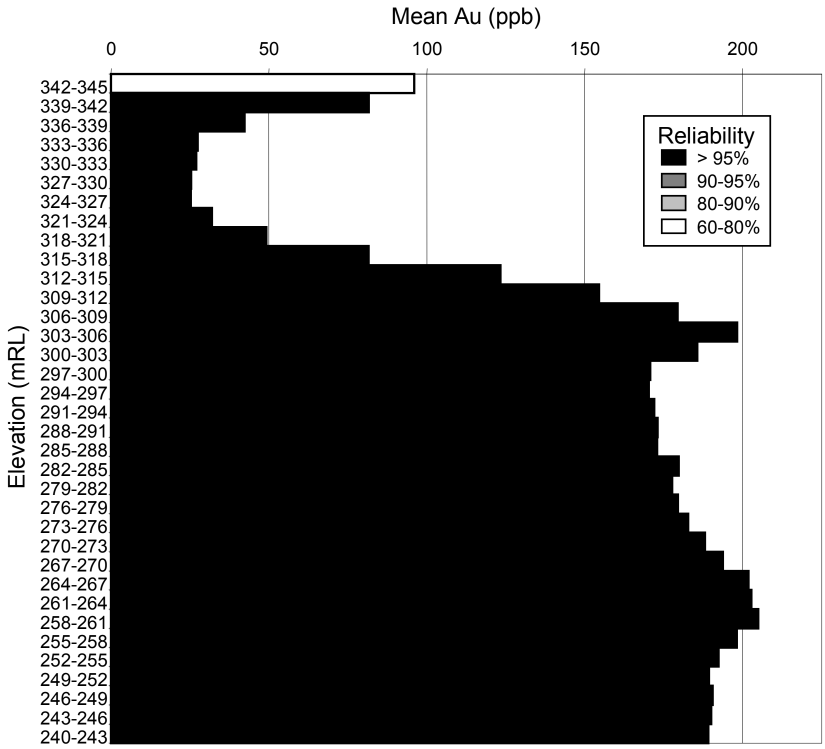

Figure 13: Mean Au vs elevation for the Panglo ore body.

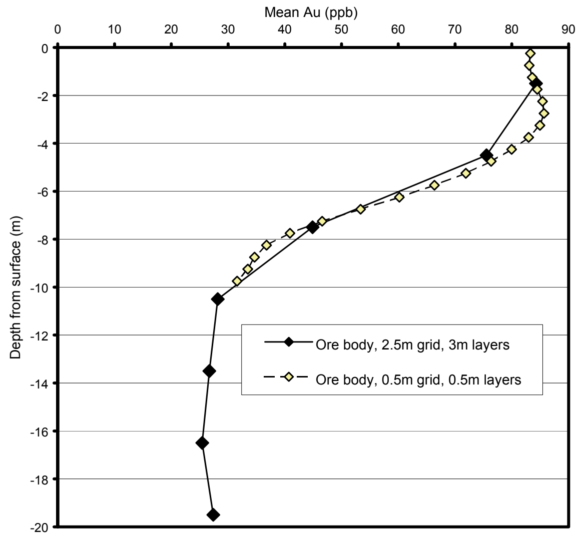

Figure 14: Calculated Au content vs. depth from surface for the Panglo ore body area

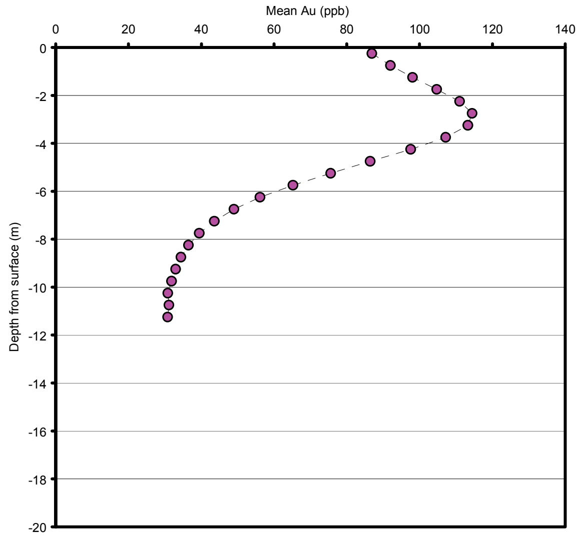

Figure 15: Calculated Au content vs. depth from surface for the NW of the Panglo ore body

Gold concentrations have also been calculated for slices above and below the unconformity. For the Panglo ore body area (Figure 16), few reliable determinations can be made above the unconformity, as the transported cover is very thin. At the unconformity, the Au concentration is calculated to be 98 ppb, which is greater than that at surface (83 ppb, see above; Figure 14). This effect is stronger for the NW of the ore body, for which Au concentration is calculated to be 107 ppb 1 m above the unconformity (Figure 17), compared with 87 ppb Au at the surface. Thus, data indicates that Au content at the unconformity is equal to or greater than that at surface. Surface sampling may still be a more effective exploration technique in areas such as Panglo, as it will be cheaper and more convenient than interface sampling and the Au concentrations at surface are nearly as high as at the interface due to the thin cover. However, it is still important to understand the genesis of these anomalies, so as to most effectively interpret results. This becomes particularly important where the transported cover is thicker, so that Au concentration at surface will therefore be less.

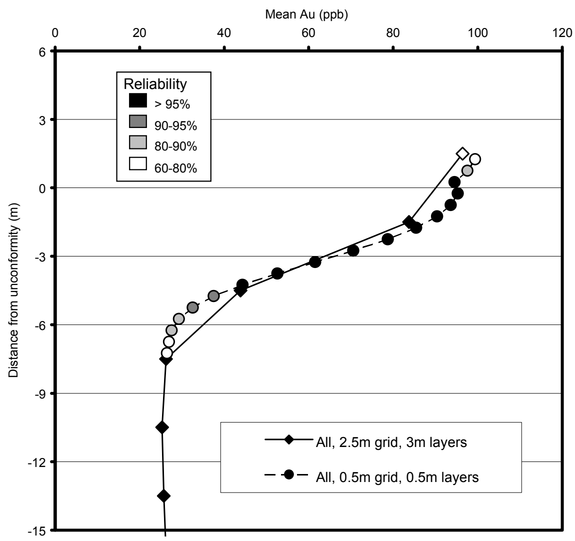

Figure 16: Calculated Au content vs. distance from unconformity for the Panglo ore body area

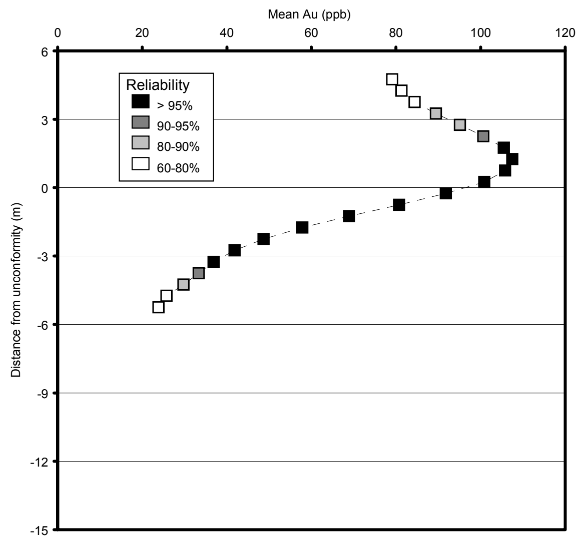

Figure 17: Calculated Au content vs. depth from unconformity for the NW of the Panglo ore body

4. CONCLUSIONS

The computer program MVS has been used successfully for the visualization of stratigraphy and Au geochemistry in three dimensions, and for calculation of Au concentrations in the regolith at the Panglo Au deposit.

The regolith profile is divided into transported and *in situ* units. A palaeochannel system in the southeast of the area is known to flow into a major system south and west of the study area. The transported cover is thin (commonly less than 3 m) over the ore body.

There is little evidence for any supergene Au halo or plume, though there is a strong upward depletion (approximately 85%) above 35 m depth. Both 3D visualization and Au grade calculation suggest that the shallow enrichment is primarily at the interface between transported and *in situ* regolith. Gold enrichment within near-surface carbonates may be supplied from this interface Au. This is most clearly observed NW of the ore body, where the transported cover is comparatively thicker.

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APPENDIX: CONTENTS OF ENCLOSED CD

CONTENTS OF PANGLO CD

The CD is divided into five directories: Au calculations; Large_area; Ore_Body; Report and Interactive. The contents of these directories and a description of each file are given below.

Au calculations

Pang_res.xls	Au concentration data and plots.

Large_area

Panglo area 2100mE 3300mN to 3400mE 5000mN.

↳ **Layers**

1_5ppmAu.bmp	3D Panglo area - 1.5ppm Au cut off.
100ppbAu.bmp	3D Panglo area - 100ppb Au cut off.
10ppbAu.bmp	3D Panglo area - 10ppb Au cut off.
150ppbAu.bmp	3D Panglo area - 150ppb Au cut off.
15ppbAu.bmp	3D Panglo area - 15ppb Au cut off.
1ppmAu.bmp	3D Panglo area - 1ppm Au cut off.
200ppbAu.bmp	3D Panglo area - 200ppb Au cut off.
20ppbAu.bmp	3D Panglo area - 20ppb Au cut off.
2ppmAu.bmp	3D Panglo area - 2ppm Au cut off.
300ppbAu.bmp	3D Panglo area - 300ppb Au cut off.
30ppbAu.bmp	3D Panglo area - 30ppb Au cut off.
400ppbAu.bmp	3D Panglo area - 400ppb Au cut off.
40ppbAu.bmp	3D Panglo area - 40ppb Au cut off.
500ppbAu.bmp	3D Panglo area - 500ppb Au cut off.
50ppbAu.bmp	3D Panglo area - 50ppb Au cut off.
600ppbAu.bmp	3D Panglo area - 600ppb Au cut off.
60ppbAu.bmp	3D Panglo area - 60ppb Au cut off.
800ppbAu.bmp	3D Panglo area - 800ppb Au cut off.
80ppbAu.bmp	3D Panglo area - 80ppb Au cut off.

↳ **Slice-E**

2100mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2100mE
2150mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2150mE
2200mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2200mE
2250mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2250mE
2300mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2300mE
2350mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2350mE
2400mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2400mE
2450mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2450mE
2500mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2500mE
2550mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2550mE
2600mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2600mE
2650mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2650mE
2700mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2700mE
2750mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2750mE
2800mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2800mE
2850mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2850mE

2900mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2900mE
2950mE.bmp	3300mN to 5000mN vertical slice of Au grades at 2950mE
3000mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3000mE
3050mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3050mE
3100mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3100mE
3150mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3150mE
3200mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3200mE
3250mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3250mE
3300mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3300mE
3350mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3350mE
3400mE.bmp	3300mN to 5000mN vertical slice of Au grades at 3400mE

↳ **Slice-N**

3400mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3400mN
3450mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3450mN
3500mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3500mN
3550mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3550mN
3600mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3600mN
3650mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3650mN
3700mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3700mN
3750mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3750mN
3800mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3800mN
3850mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3850mN
3900mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3900mN
3950mN.bmp	2100mE to 3400mE vertical slice of Au grades at 3950mN
4000mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4000mN
4050mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4050mN
4100mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4100mN
4150mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4150mN
4200mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4200mN
4250mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4250mN
4300mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4300mN
4350mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4350mN
4400mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4400mN
4450mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4450mN
4500mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4500mN
4550mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4550mN
4600mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4600mN
4650mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4650mN
4700mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4700mN
4750mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4750mN
4800mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4800mN
4850mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4850mN
4900mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4900mN
4950mN.bmp	2100mE to 3400mE vertical slice of Au grades at 4950mN
5000mN.bmp	2100mE to 3400mE vertical slice of Au grades at 5000mN

↳ **Stratigraphy**

Alltogether.bmp	Panglo area 3D view (from SW) of regolith stratigraphy.
Palaeotopo.bmp	Panglo area 3D view (from SW) of palaeotopography.
SurfaceElev.bmp	Panglo area 3D view (from SW) of present surface elevation.

Ore_Body — Close-up of Panglo orebody 2300mE 3700mN to 2800mE 4800mN.

↳ **Layers**

1_5ppmAu.bmp	3D Panglo orebody - 1.5ppm Au cut off.
100ppbAu.bmp	3D Panglo orebody - 100ppb Au cut off.
10ppbAu.bmp	3D Panglo orebody - 10ppb Au cut off.
150ppbAu.bmp	3D Panglo orebody - 150ppb Au cut off.
15ppbAu.bmp	3D Panglo orebody - 15ppb Au cut off.
1ppmAu.bmp	3D Panglo orebody - 1ppm Au cut off.
200ppbAu.bmp	3D Panglo orebody - 200ppb Au cut off.
20ppbAu.bmp	3D Panglo orebody - 20ppb Au cut off.
2ppmAu.bmp	3D Panglo orebody - 2ppm Au cut off.
300ppbAu.bmp	3D Panglo orebody - 300ppb Au cut off.
30ppbAu.bmp	3D Panglo orebody - 30ppb Au cut off.
3ppmAu.bmp	3D Panglo orebody - 3ppm Au cut off.
400ppbAu.bmp	3D Panglo orebody - 400ppb Au cut off.
40ppbAu.bmp	3D Panglo orebody - 40ppb Au cut off.
4ppmAu.bmp	3D Panglo orebody - 4ppm Au cut off.
500ppbAu.bmp	3D Panglo orebody - 500ppb Au cut off.
50ppbAu.bmp	3D Panglo orebody - 50ppb Au cut off.
5ppmAu.bmp	3D Panglo orebody - 5ppm Au cut off.
600ppbAu.bmp	3D Panglo orebody - 600ppb Au cut off.
60ppbAu.bmp	3D Panglo orebody - 60ppb Au cut off.
800ppbAu.bmp	3D Panglo orebody - 800ppb Au cut off.
80ppbAu.bmp	3D Panglo orebody - 80ppb Au cut off.

↳ **Slice-E**

2300mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2300mE
2400mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2400mE
2500mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2500mE
2550mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2550mE
2600mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2600mE
2650mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2650mE
2700mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2700mE
2750mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2750mE
2800mE.bmp	3700mN to 4800mN vertical slice of Au grades at 2800mE

↳ **Slice-N**

3700mN.bmp	2300mE to 2800mE vertical slice of Au grades at 3700mN
3750mN.bmp	2300mE to 2800mE vertical slice of Au grades at 3750mN
3800mN.bmp	2300mE to 2800mE vertical slice of Au grades at 3800mN
3850mN.bmp	2300mE to 2800mE vertical slice of Au grades at 3850mN
3900mN.bmp	2300mE to 2800mE vertical slice of Au grades at 3900mN
3950mN.bmp	2300mE to 2800mE vertical slice of Au grades at 3950mN
4000mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4000mN
4050mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4050mN
4100mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4100mN
4150mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4150mN

4200mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4200mN
4250mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4250mN
4300mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4300mN
4350mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4350mN
4400mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4400mN
4450mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4450mN
4500mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4500mN
4550mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4550mN
4600mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4600mN
4650mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4650mN
4700mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4700mN
4750mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4750mN
4800mN.bmp	2300mE to 2800mE vertical slice of Au grades at 4800mN

↳ **Stratigraphy**

Alltogether.bmp	Panglo orebody 3D view (from SW) of regolith stratigraphy.
Palaeotopo.bmp	Panglo orebody 3D view (from SW) of palaeotopography.
SurfaceElev.bmp	Panglo orebody 3D view (from SW) of present surface elevation.

Report

Panglo.doc	CRC LEME report 118R / CEM report 649R - Supergene gold dispersion at the Panglo gold deposit, Western Australia (D.J. Gray)

Interactive

Instructions for viewing VRMLs

VRMLs are 3D images written with Virtual Reality Modelling Language. The user can manipulate the image and view from different angles.

The folder named “Interactive” on the enclosed CD contains:

- A web page – “panglo.htm” and an associated images folder.
- A folder called “VRML” which contains the VRMLs.
- An installation file for Cosmo Player.

You will need to have a web browser installed on your computer (but it does not have to be connected to an outside line). You will need a plug-in, such as COSMO Player, that will enable your internet browser to display the VRMLs. To install Cosmo Player from this CD, follow the steps below (which are also set out on the web page).

Note: The computer will need at least 200 MHz and 64 MB to run the VRMLs effectively.

Instructions

1. Open the CD, then open the "Interactive" folder. Click on the icon named "cosmo_win95nt_eng.exe" and it will launch with prompts. Read the first page, close any open Windows programs, then click NEXT.
2. Agree to the License Agreement and click YES.
3. It will determine which internet browsers are on your system and list some options. Choose the option that you usually use, e.g. Netscape Communicator 4.5 or Internet Explorer (provided with Windows). Some users will have older systems and will need to choose "Other". Click NEXT.
4. Choose the destination folder using the BROWSE button. Then click NEXT. The plug-in will now install itself.
5. It will then ask you if you would like to associate all VRML related files (.wrl, .wrz, .wrl.gz) with Cosmo Player. Choose YES.
6. Set up is complete. You should be able click on the options below and use the VRMLs.

Web Page
A web page is provided as a convenient way of navigating through the VRMLs. In particular, it provides a handy reference to the regolith legend and geochemical scale as these features are not supported by the VRMLs.

Either open the page through your browser (File Menu – Open Page) or if your computer is configured to recongise htm/html files then just click on the "panglo.htm" icon to launch the page.

Panglo 3D Au Cut-offs
CRC LEME created 3D models of Au concentrations at the Panglo deposit using various cut-offs. These models show all those parts of each regolith unit that have a nominated Au concentration or greater. The colours match the regolith stratigraphy used in the report.

↳ **VRML**

panglo1.5ppm.wrl	3D Panglo orebody - 1.5ppm Au cut off.
panglo100ppb.wrl	3D Panglo orebody - 100ppb Au cut off.
panglo1ppm.wrl	3D Panglo orebody - 1ppm Au cut off.
panglo200ppb.wrl	3D Panglo orebody - 200ppb Au cut off.
panglo2ppm.wrl	3D Panglo orebody – 2ppm Au cut off.
panglo300ppb.wrl	3D Panglo orebody - 300ppb Au cut off.
panglo3ppm.wrl	3D Panglo orebody – 3ppm Au cut off.
panglo400ppb.wrl	3D Panglo orebody - 400ppb Au cut off.
panglo4ppm.wrl	3D Panglo orebody – 4ppm Au cut off.
panglo500ppb.wrl	3D Panglo orebody - 500ppb Au cut off.
panglo5ppm.wrl	3D Panglo orebody – 5ppm Au cut off.
panglo600ppb.wrl	3D Panglo orebody - 600ppb Au cut off.
panglo800ppb.wrl	3D Panglo orebody - 800ppb Au cut off.

Note: the larger files may take some time to load and there will be lag-time before they respond to commands.