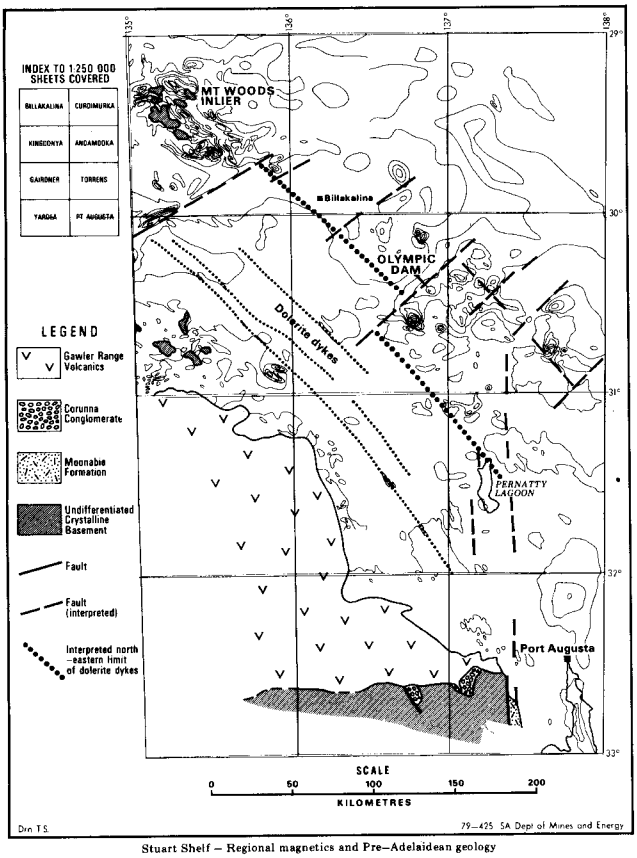

Stuart Shelf – Regional magnetics and Pre–Adelaidean geology

also evident in the region of more intense magnetic relief which contains the Olympic Dam anomaly.

Interpretation of the depth to pre-Adelaidean basement in the region is complicated by the presence of several stratigraphically separate sources. Anomalies due to the Adelaidean Beda Volcanics and associated dolerite dykes are imposed on basement and intra-basement sources. These are distinguished on the basis of anomaly form, orientation and interpreted susceptibility values, but clear distinctions cannot always be made. The proposed regional interpretation of depth to basement does show some correlation with gravity features, but density variations within basement are also evident. Gravity interpretation is also complicated by the unknown contribution of the Cambrian Andamooka Limestone.

PETROPHYSICAL RESULTS FROM ROCKS OF THE WYALONG DISTRICT AND THEIR SIGNIFICANCE IN LOCAL MAGNETIC INTERPRETATION

D. A. Clark[1] and D. W. Emerson[2]

[1]CSIRO Division of Mineral Physics
(02 887-1384

[2]Department of Geology and Geophysics
The University of Sydney,
(02) 692-2031

A prominent 1,000 nT aeromagnetic anomaly occurs in the south-western corner of the Forbes 1:250,000 sheet near the towns of Wyalong/West Wyalong. The anomaly lies on the western edge of an extensive meridional regional aeromagnetic feature about 50 kilometres wide, more than 300 kilometres long and several hundred nanoteslas in amplitude. On the regional BMR aeromagnetic map the Wyalong feature appears as a complex cluster of highs forming the northern termination of a linear anomaly extending well into the Cootamundra sheet to the south.

The magnetic anomaly at Wyalong is associated with a heterogeneous intermediate to basic intrusion mapped as the Bland diorite on the Forbes Metallogenic Sheet, lying on the eastern edge of the Girilambone-Wagga anticlinorial zone near the boundary of the Bogan Gate synclinorical zone. The Bland diorite, of late Ordovician age, intrudes the Ordovician phyllites and schists of the Wagga metamorphics and is in turn intruded to the west by the late Silurian Wyalong granodiorite. The gold mineralization in the area is attributed to hydro-thermal activity associated with emplacement of the Wyalong granodiorite.

In order to constrain and guide geophysical interpretation and to provide data for an integrated geophysical, geochemical and petrological study of the area, a programme of outcrop sampling was undertaken. Oriented samples were collected at a number of sites within the mapped extent of the intrusion and the results of petrophysical measurements on these samples are presented in the accompanying tables. In addition to these rock types a number of hand samples of other lithologies were collected for chemical analysis, petrography, and determination of susceptibility and density. Results of measurements on these rocks are summarised below.

The Wyalong granodiorite is a foliated granitic rock of density 2.78gcm^{-3} and is non-magnetic, having susceptibility of less than 100x10^{-6} emu. The densities of the Ordovician country rock are generally around 2.75 gcm^{-3} and the susceptibilities are mostly less than 100x10^{-6} emu although samples of amphibolite had susceptibilities of 2,500x10^{-6} emu.

The heterogeneity of the dioritic intrusion is evidenced not only by the results presented in Table 1 but also by hand samples collected at a number of other localities within the intrusion. Densities range from 2.77 gcm^{-3} and susceptibilities from 100x10^{-6} emu to 2,500x10^{-6} emu throughout the intrusion reflecting compositions ranging from hornblende diorite to hornblende gabbro and norite. There may be two or

TABLE 1 — Physical properties of rocks from Wyalong

Rock type	Diorite (North)	Basalt	Marginal diorite (West)	Altered volcanics	Felsic xenoliths in diorite	Diorite (South)
No. of specimens	13	20	39	9	7	8
Density (gcm^{-3}), average value	2.87	3.00	2.86	3.01	2.86	2.95
Density (gcm^{-3}), range	2.84-2.88	2.97-3.02	2.71-2.99	2.90-3.15	2.85-2.86	2.92-2.96
emu susceptibility $x10^6$, average value	2630	130	725	50	125	920
emu susceptibility $x\ 10^6$, range	2,060-3,130	60-285	30-1,810	35-70	100-160	70-4,060
NRM intensity (0e $x\ 10^{-6}$), average value	17,870	755	1080	2	970	125
NRM intensity (0e $x\ 10^{-6}$), range	3,900-46,440	425-2,020	5-3,370	1-3	850-1130	1-550
Koenigsberger ratio, average value	10.9	9.3	4.0	0.08	13.3	0.18
Koenigsberger ratio, range	2.3-28.4	5.9-12.0	0.3-53.2	0.04-0.12	10.2-15.8	0.01-0.42
Susceptibility anisotropy (Major/Minor), average value	1.13	1.03	1.08	1.05	1.10	1.22
Susceptibility anisotropy (Major/Minor), range	1.08-1.15	1.00-1.06	1.00-1.19	1.01-1.16	1.05-1.12	1.01-1.40

Note: Koenigsberger ratio Q = NRM/(Susceptibility x Earth's field). The field is taken as 0.59 Oersteds.

TABLE 2 — Summary of remanence directions of rocks from Wyalong

Rock type	NRM directions	Remanence directions after AF cleaning
Diorite (north)	Very scattered with normal, reversed and mixed polarities	Most specimens clean towards (35°, 0°)
Basalt	Clustered around (55°, -25°)	Clean to (25°, -20°)
Marginal diorite (West)	Very scattered with both negative and positive inclinations	Most specimens clean up to (75°, 0)
Altered volcanics	Loosley grouped around (10°, -15°)	Tightly grouped around (10°, -15°)
Felsic xenoliths in diorite	Grouped around (30°, -30°)	Grouped around (30°, -30°) Direction stable as intensity drops
Diorite (South)	Strung between (30°, -30°) and present field (10°, -65°)	Tend to clean towards (30°, -30°)

more distinct intrustions present. The complexity is clearly seen in a recently excavated quarry at the southern end of the mapped intrusion. A number of different phases appear to be present and this is reflected in the scatter of physical properties. The picture is further complicated by the presence of felsic xenolithic pods within the dioritic phases and a basaltic dyke cutting the diorite and striking north towards basalt outcrop found near the centre of the intrusion.

In spite of the complexity of the geological picture, it is believed that the petrophysical results lend support to the applicability of magnetic and gravity surveys in mapping the extent and determining the gross geometry of the overall dense, magnetic intrusion. The results presented here will be used to constrain the geophysical interpretation. A significant fact to emerge from the measurements is that remanence dominates induction in producing the magnetic anomalies and the observed remanence directions (but not the intensities) appear to be remarkable consistent for all the rock types for which they could be determined. Scattered values for natural remanent magnetism (NRM) are assumed to be due to surface effects which can usually be removed by cleaning, isolating the direction believed to be representative of the bulk of the rocks at depth.