

GOLDEN POINT 4246, 1:100 000 geological map

(Bentley Basin, west Musgrave Province)

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Location

Maps: BENTLEY (SG 52-5) and GOLDEN POINT (4246)

Zone: MGA Zone 52

End coordinates: 251066E 7123118N to
290092E 7154141N

Length: 50 km

Scale of interpretation: 1:100 000

This section runs southwest to northeast on sheet GOLDEN POINT (Quentin de Gromard et al., 2015) through the northwestern edge of the Talbot Sub-basin in the Bentley Basin (Fig. 1).

Tectonic units

The Bentley Basin was formed during the intracontinental Ngaanyatjarra Rift which took place within the 1085–1040 Ma Giles Event (Evins et al., 2010; Howard et al., 2011). The basin sequence of the Bentley Supergroup consists of felsic and mafic volcanic and volcanoclastic rocks, and interlayered sedimentary rocks that unconformably overlie the high-grade metamorphic basement rocks of the Musgrave Province, mainly in the Mamutjarra Zone. Several sub-basins form components of the larger Bentley Basin, including the Blackstone, Finlayson, and Talbot Sub-basins (Howard et al., 2011). The Blackstone and Finlayson Sub-basins are dominated by units of the lower part of the Bentley Supergroup (Kunmarnara and Tollu Groups), whilst the Talbot Sub-basin is dominated by the upper part of the Bentley Supergroup (i.e. the Mount Palgrave, Kaarnka, Pussy Cat, Cassidy, and Mission Groups). To the south, the Bentley Supergroup is unconformably overlain by units that were deposited into the Officer Basin, namely the Buldya Group and Lupton Formation.

Structure

In the Talbot Sub-basin the volcanic succession generally shallowly dips ($\leq 30^\circ$) south to southwest (in the western part of the sub-basin) and west (in the eastern part of the sub-basin). Locally the succession is steeply dipping (up to 85°) in the east of the sub-basin adjacent to the Barrow Range Anticline. The upper part of the Bentley Supergroup forms outcrops that extend east from the Warburton Community to the Barrow Range (approximately 40 km southwest of the Jameson Community). This part of the sequence extends laterally for a distance of over 90 km.

The lower part of the sequence, the northwestern part of the Warburton Range, strikes northwest to southeast and the range bends around to strike east to west in the east.

Near Mount Harvest, the Townsend Quartzite (Buldya Group) is exposed in a graben on the western end of the Warburton Range. The Pusycat Group at Mount Harvest forms the hinge of an open south-verging anticline. South-directed reverse faults affect the northern limb of the anticline. Units within the northern limb all dip moderately ($\sim 40^\circ$) to the northeast up to the exposure of the underlying Warakurna Supersuite granite. The granite is heavily intruded by dolerite dykes, and on the northern part of the section line (5 km northeast of Golden Point), metamorphosed siliciclastic rocks of the MacDougall Formation (Kunmarnara Group) are exposed within an anticline. To the northeast at point B the authors interpret granites of the Pitjantjatjara Supersuite to form the basement of the MacDougall Formation.

Geophysical data

A gravity profile was extracted from the GSWA 2013 400 m gravity merged grid of Western Australia (GSWA, 2013a). Magnetic data were extracted along the same profile from the 80 m magnetic compilation of Western Australia (GSWA, 2013b). Topographic data were taken from the Shuttle Radar Topography Mission (SRTM) at the same points.

Physical property data were estimated from global average values and are listed in Table 1.

Modelling

All modelling was performed in the GM-SYS software run within the Oasis Montaj software.

Results

The section A–B was modelled down to a depth of 4 km (Fig. 2a).

The Bouguer anomaly shows a broad rise over the centre of the profile (Fig. 2b). This was modelled with various units of the Warakurna Supersuite and has a relatively high density of 2850 g/cm^3 (Fig. 2c). Such density values are unusually high for granites/syenogranites. However, the granites are intruded by high density dolerite. Hence, the

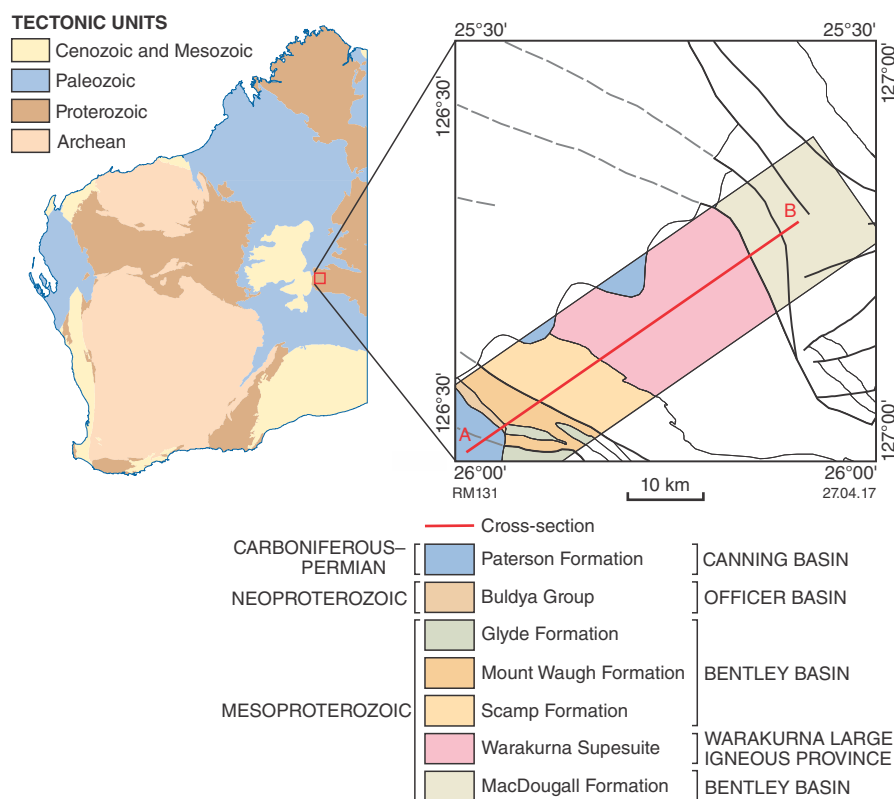


Figure 1. Location of GOLDEN POINT map sheet with simplified interpreted bedrock geology within 8 km of cross-section A–B

average density is reflecting the high proportion of dolerites within the larger granitic intrusion.

The magnetic profile has been modelled to obtain a good fit (Fig. 2d). Nevertheless, to achieve this goal the major Warakurna Supersuite has been subdivided into smaller subdivisions (Fig. 2e) with a generally slightly higher magnetic susceptibility than the surrounding sedimentary rocks and rhyolites.

The dolerites are strongly magnetic and provide most of the peaks within the magnetic profile.

Within the MacDougall formation the schist appears to produce the magnetic peaks.

References

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- Howard, HM, Werner, M, Smithies, RH, Evins, PM, Kirkland, CL, Kelsey, DE, Hand, M, Collins, AS, Pirajno, F, Wingate, MTD, Maier, WD and Raimondo, T 2011, The geology of the west Musgrave Province and the Bentley Supergroup — a field guide: Geological Survey of Western Australia, Record 2011/4, 116p.
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Table 1. Petrophysical properties of modelled units and the corresponding map codes and lithologies. The colour column refers to colours used in Figure 2a

Colour	Modelled unit	Map code	Rock type	Density (g/cm ³)	Magnetic susceptibility (SI)
	Dolerite dykes	P_-od	Dolerite	3000	0.064 – 0.012
	Buldya Group	P_-BU-xs-k	Mixed sedimentary	2600	0.010
	Townsend Quartzite	P_-BUw-stz	Quartzite	2600	0.005
	Cassidy Group				
	<i>Thomas Rhyolite</i>	P_-CAT-frp	Rhyolite	2600	
	<i>Gombuggura Rhyolite</i>	P_-CAo-frp	Rhyolite	2600	0.030
	<i>Wururu Rhyolite</i>	P_-CAu-frp	Rhyolite	2600	0.009 – 0.047
	Pussy Cat Group				
	<i>Glyde Formation</i>	P_-PUg-xbb-s	Basalt/sandstone	2800	0.011
		P_-PUg-bbg	Basalt	2900	0.030
	Mount Palgrave Group				
	<i>Mount Waugh Formation</i>	P_-PGw-fr	Rhyolite	2650	0.010 – 0.020
		P_-PGs-bb	Basalt	2650	0.010
	<i>Scamp Formation</i>	P_-PGs-fr	Rhyolite	2670	0.000 – 0.020
		P_-PGs-frfp	Pumiceous rhyolite	2670	0.020 – 0.040
		P_-PGs-frwp	Pumiceous rhyolite	2670	0.020 – 0.040
		P_-PGs-frl	Rhyolitic breccia	2670	0.020 – 0.040
	Warakurna Supersuite	P_-WK-g	Granite	2670	0.017 – 0.066
		P_-WK-ge, P_-WK-grh, P_-WK-grl	Syenite, syenogranite, rhyolitic breccia	2850	0.017 – 0.066
	MacDougall Formation	P_-KRd-mhe	Granofels	2670	0.022
		P_-KRd-mhs	Schist	2670	0.000
		P_-KRd-mtq	Quartzite	2670	0.000
	Pitjantjatjara Supersuite	P_-PJ-mg	Metagranite	2610	0.028

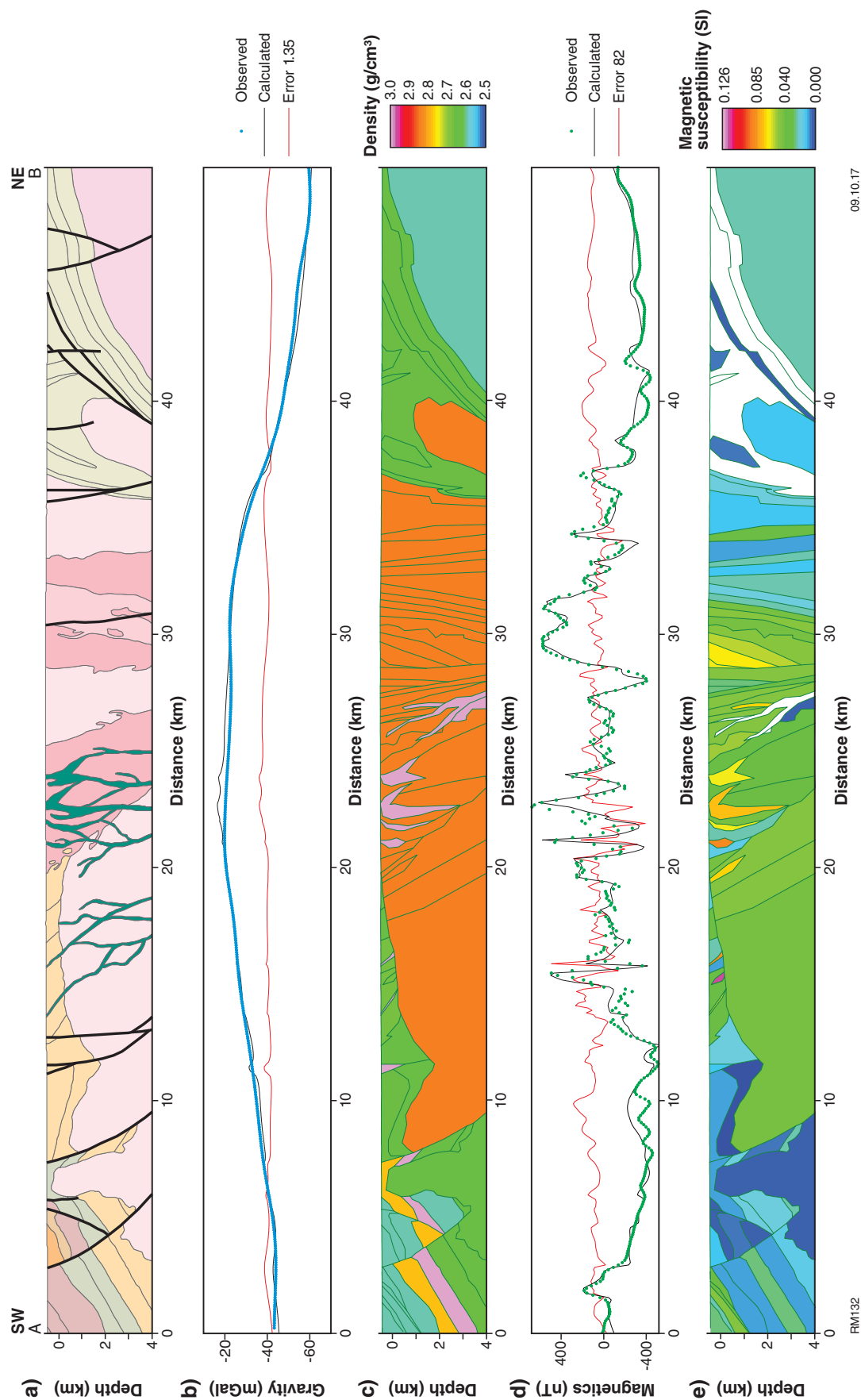


Figure 2. Profile of section A-B showing: a) lithological section from sheet GOLDEN POINT; b) observed and calculated Bouguer anomaly profile with error line; c) section of density per lithology; d) observed and calculated magnetic anomaly profile with error line; e) section of magnetic susceptibility per lithology