Diorite 4347, section C–D–E, 1:100 000 geological map

(Bentley Basin, west Musgrave Province)

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Location

Maps: Bentley (SG 52-5) and Diorite (4347)

Zone: MGA Zone 52

End coordinates: 338558E 7185457N to
345769E 7203100N to
342075E 7221532N

Length: 37.8 km

Scale of interpretation: 1:100 000

This section runs approximately south to north through the Wanarn area (Fig. 1).

Tectonic units

The Wanarn area is dominated by rocks of the Kunmarnara Group, the basal volcano-sedimentary sequence deposited within the Bentley Basin. The Bentley Basin was formed during the intracontinental Ngaanyatjarra Rift which took place within the1085–1040 Ma Giles Event (Evins et al., 2010; Howard et al., 2011). The Bentley Basin developed on the high-grade metamorphic basement of the Musgrave Province. In the Wanarn area, two basement components have been identified: the c. 1600 Ma Warlawurru Supersuite (Quentin de Gromard et al., 2016) and the Pitjantjatjara Supersuite of the 1220–1150 Ma Musgrave Orogeny. To the north, the Bentley Supergroup is unconformably overlain by Cambro–Ordovician units that were deposited into the Amadeus Basin. These sedimentary units, in turn, were unconformably overlain by the Permian Paterson Formation, which was deposited into the Canning Basin.

Structure

The Wanarn area forms a wedge structure that is bounded to the south by the steeply south-dipping Mitika Fault and to the north by the shallow south-dipping Woodroffe Thrust. Mylonitic deformation is pervasive throughout the area and tectonic interleaving of metagranite slivers within paragneiss represents the tectonic style of the area. Distinct ductile flow directions are evident from stretching lineations and shear sense indicators. Two main directions are observed: north- to northeast-directed thrusting interleaves orthogneisses and metagranites of the c. 1600 Ma Warlawurru Supersuite into paragneisses of the MacDougall Formation, and west-directed thrusting interleaves metagranites of the 1220–1150 Ma Pitjantjatjara Supersuite into the MacDougall Formation.

Geophysical data

Magnetic data were extracted along the same profile from the 80 m magnetic compilation of Western Australia (GSWA, 2013). Topographic data were taken from the Shuttle Radar Topography Mission (SRTM) at the same points. The gravity coverage of this area is only at 11 km spacing, which is not a dense enough coverage to generate a definable model.

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 C–D–E was modelled down to a depth of 4 km (Fig. 2c).

In the north, the sedimentary rocks of the Paterson formation (Fig. 2a) have no magnetic susceptibility and blanket all underlying units. The Warakurna Supersuite has a low susceptibility (Fig. 2c) and causes the low rise in magnetic anomaly (Fig. 2b) below the Paterson Formation.

The small peaks in the northern half of the profile are generated where the folds of the Pitjantjatjara Supersuite are exposed at the surface. This also produces the main peak in the southern half of the profile. Where the granofels and schist layers of the MacDougall formation come to the surface, small magnetic peaks show in the southern end of the profile.

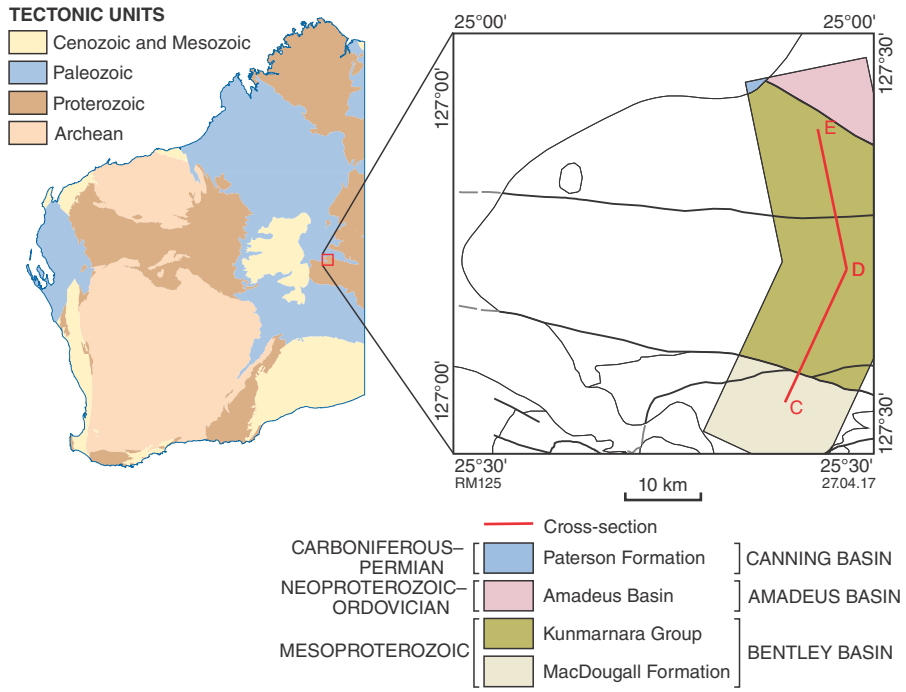

Figure 1. Location of DIORITE map sheet with simplified interpreted bedrock geology within 8 km of cross-section C–D–E

Table 1. Petrophysical properties of modelled units and the corresponding map codes and lithologies. The colour column refers to colours used in Figure 2

Colour	*Modelled unit*	*Map code*	*Rock type*	*Magnetic susceptibility (SI)*
	Paterson Formation	CP-_pa-sepg	Conglomerate/sandstone	0.000
	MacDougall Formation	P_-KRd-mhe	Granofels	0.000
		P_-KRd-mhs	Psammitic schist	0.011 – 0.048
		P_-KRd-mt	Metamorphosed arkose	0.021 – 0.058
		P_-KRd-mte	Granofels	0.008 – 0.022
		P_-KRd-mtn	Psammitic gneiss	0.000 – 0.015
		P_-KRd-mxym	Mylonite	0.000
	Kunmarnara Group	P_-KR-xmd-mb	Metamorphosed siliciclastic and mafic rocks	0.000
	Warakurna Supersuite	P_-WK-g	Granite	0.007
	Pitjantjatjara Supersuite	P_-PJ-mg	Metagranite	0.002 – 0.057
		P_-PJ-mgmg	Metamonzogranite	–
		P_-PJ-mgnb	Metamonzogranite	–
	Warlawurru Supersuite	P_-WR-mg	Metasyenogranite	0.000

References

Evins, PM, Smithies, RH, Howard, HM, Kirkland, CL, Wingate, MTD and Bodorkos, S 2010, Redefining the Giles Event within the setting of the 1120–1020 Ma Ngaanyatjarra Rift, west Musgrave Province, Central Australia: Geological Survey of Western Australia, Record 2010/6, 36p.

Geological Survey of Western Australia 2013, Magnetic anomaly grid (80 m) of Western Australia (2013 – version 2): Geological Survey of Western Australia, digital data layer.

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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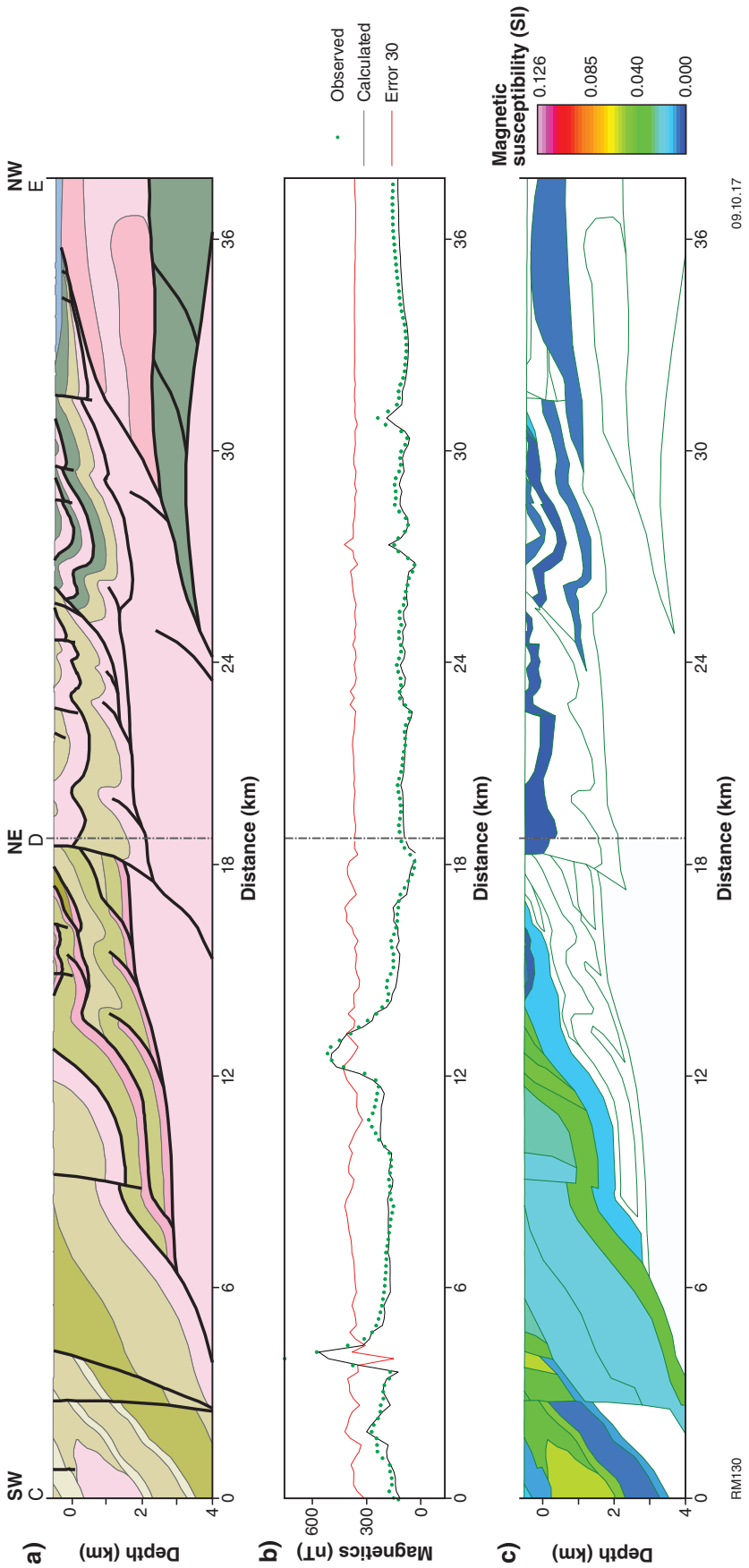

Figure 2. Profile of section C–D–E showing: a) lithological section from sheet DIORITE; b) observed and calculated magnetic anomaly profile with error line; c) section of magnetic susceptibility per lithology