



Geology and mineral resources of the Northern Territory

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Chapter 14: Other Palaeoproterozoic inliers

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Chapter 14: OTHER PALAEOPROTEROZOIC INLIERS

M Ahmad

INTRODUCTION

Apart from inliers that form the Arnhem and Murphy provinces, there are a number of small Palaeoproterozoic inliers exposed within younger north Australian basins (Figure 14.1). These include two small inliers of the Inverway Metamorphics in the Birrindudu Basin, the Scrutton and Urupunga inliers in the McArthur Basin and several small inliers in the Wiso Basin, which are here collectively named the South Lake Woods inliers.

Inverway Metamorphics

Two small inliers (2 km² and 0.5 km² in area) of Inverway Metamorphics (Sweet *et al* 1974) are exposed as low, rounded symmetrical hills in LIMBUNYA¹, within the Birrindudu Basin (Figure 14.2). These inliers comprise steeply dipping sub-greenschist- to greenschist-facies muscovite quartz schist, silicic volcanic rocks and minor siltstone

¹ Names of 1:250 000 mapsheets are shown in large capital letters eg LIMBUNYA.

(Figure 14.3). Concordant quartz veins are common and form massive quartz reefs 2–4 m thick that cut through the succession (Cutovinos *et al* 2002a). The volcanic rocks are schistose and consist of subhedral and anhedral quartz and green feldspar in a groundmass of quartz, sericite, iron oxide and minor muscovite (Sweet *et al* 1974).

In the early 1990s, Geopeko drilled several shallow drillholes (including LMDH8 and LMDH10–13, Figure 14.2) that intersected the Inverway Metamorphics in this area (Hurrell 1992, 1993a, b). These encountered up to several tens of metres of various metamorphosed rocks, including haematitic, sericitic and graphitic shale, shale with talc alteration, quartz-muscovite schist (metapelite to meta-arenite), altered felsic volcanic rocks, dolomitic siltstone and quartz-graphite breccia. These are unconformably overlain by interbedded mudstone and siltstone of the Birrindudu Group (Cutovinos *et al* 2002a).

Drillhole LBD 1 (Proto Resources & Investments Ltd), which is located about 17 km east-northeast of the northernmost inlier of Inverway Metamorphics (at 52K 619792mE 8066817mN), intersected 429 m of Inverway Metamorphics from 322.8 m (Jones 2009),

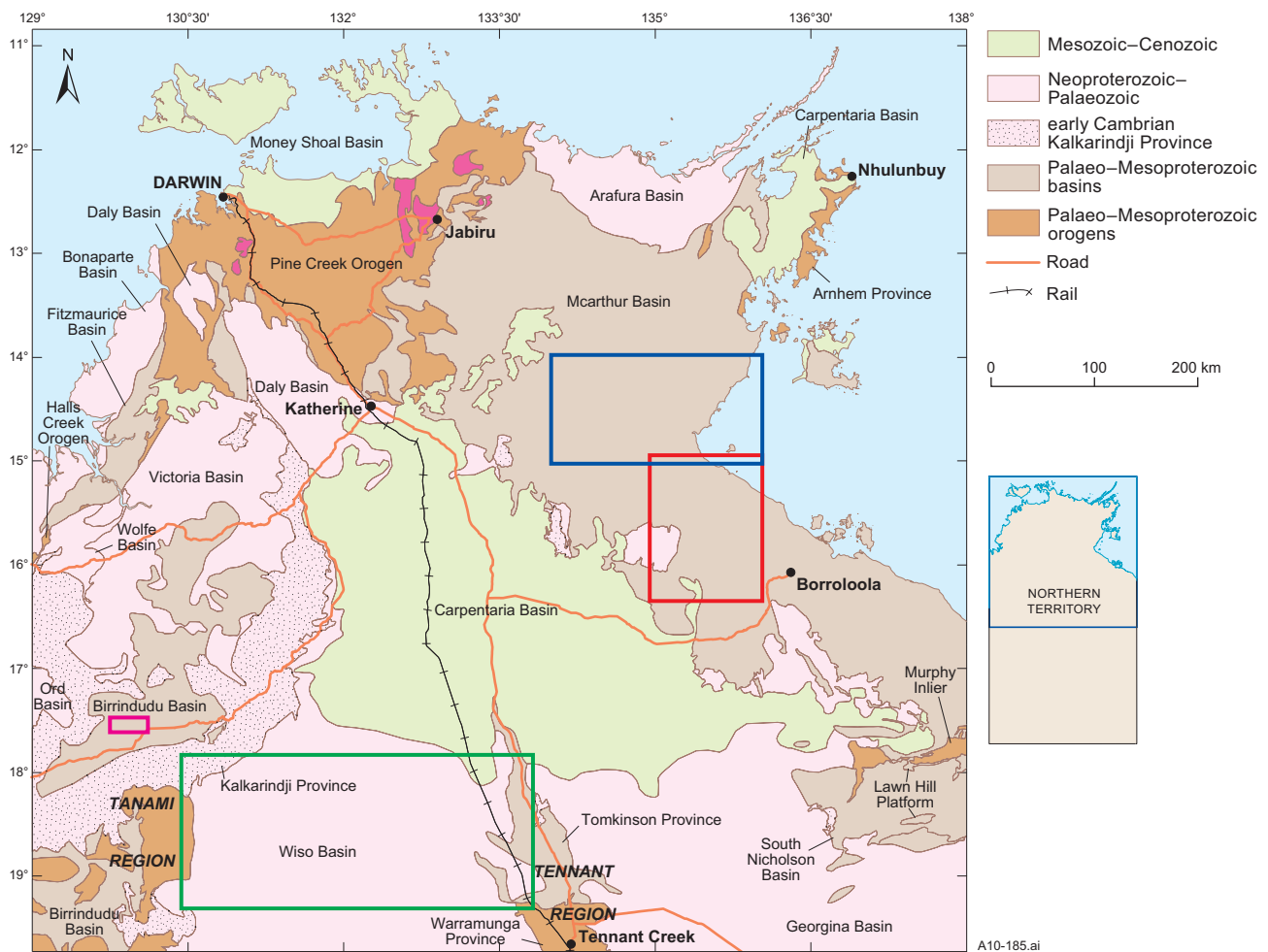


Figure 14.1. Geological regions of the northern half of the NT (1:2.5M scale), showing locations of more detailed maps: pink box = location of Figure 14.2 (Inverway Metamorphics); red box = location of Figure 14.4 (Scrutton Inlier); blue box = location of Figure 14.6 (Urupunga Inlier); green box = location of Figure 14.7 (South Lake Woods inliers).

Other Palaeoproterozoic inliers

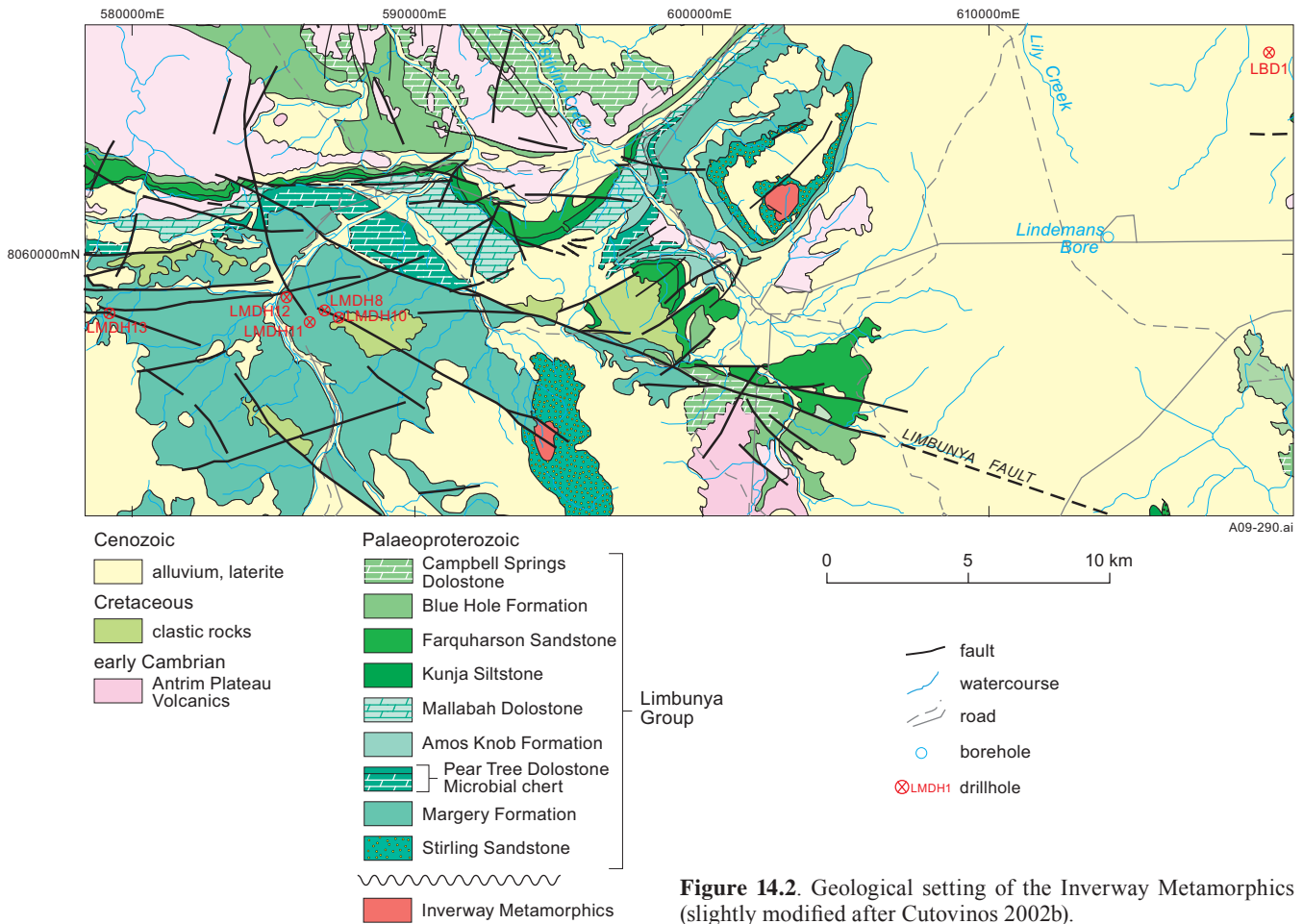


Figure 14.2. Geological setting of the Inverway Metamorphics (slightly modified after Cutovinos 2002b).



Figure 14.3. Weakly metamorphosed muscovite-bearing silicic volcaniclastic rocks of Inverway Metamorphics (LIMBUNYA: 52K 602188mE 8062065mN). (a) Typical outcrop, showing bedding. Image courtesy of David Maidment (GA). (b) Cross-bedded volcaniclastic rock. Image courtesy of Chris Carson (GA).

but did not penetrate the entire unit. In this drillhole, the Inverway Metamorphics unconformably underlie the basal Stirling Sandstone of the Limbunya Group and consist of metamorphosed, foliated, carbonate-rich sedimentary rocks, including relatively common carbonate breccias, minor mudstone and sandstone. This succession is intruded by abundant mafic sills, from 1 cm up to 50 m in thickness, that are composed of highly magnetic metabasalt and very minor fine-grained metadolerite. These mafic rocks are in places strongly deformed, along with their enclosing host rocks, and do not intrude the Limbunya Group; they therefore appear to predate the Birrindudu Basin and Jones (2009) included them as a part of the Inverway Metamorphics lithological/structural package.

The absolute age of the Inverway Metamorphics has not been determined; however, the most likely correlation is with rocks of the Tanami and/or Ware groups of the Tanami Region. They are included in the P4 subdivision of Ahmad and Scrimgeour (2006).

Scrutton Inlier

The Scrutton Inlier is a collective name for a few small areas of silicic and minor mafic volcanic rocks and interbedded sedimentary rocks, outcropping within the McArthur Basin in BAUHINIA DOWNS and MOUNT YOUNG in the northeast of the NT. This succession is referred to as the Scrutton Volcanics (Smith 1964, Haines *et al* 1993). Apart from a few small fault slivers in the Tawallah Range, the main outcrops include a small area

of about 29 km², which is exposed about 7 km southwest of Tawallah Pocket, and a largely fault-bounded area of about 8 km², located 15 km south-southeast of Nathan River Station in the Costello Range (**Figures 14.4, 14.5**). The base of the Scrutton Volcanics is not exposed and the unit is unconformably overlain by the Yiyintyi Sandstone (Tawallah Group), which is the basal unit of the McArthur Basin succession. An estimated minimum thickness of about 1000 m has been estimated for the Costello Range section (Haines *et al* 1993).

The Scrutton Volcanics comprises massive pink, purple-grey and green-brown porphyritic volcanic rocks of rhyolitic to dacitic composition. An abundance of broken crystals and fiamme suggest that most outcrops represent ignimbrites, although some lavas and subvolcanic feeders are also present (Haines *et al* 1993). Rhyodacitic air-fall tuffs are sometimes interbedded with the ignimbrites and with the associated sedimentary beds. The interbedded sedimentary units consist of fine- to medium-grained sandstone and mudstone, and these contain a significant volcanoclastic component. A porphyritic basalt is present west of Tawallah Pocket, and minor basalt has been noted in the Costello Range. Mafic igneous dykes are also present, but it is not clear whether these are related to this unit or are younger.

Page *et al* (2000) obtained a U-Pb zircon age of 1851 ± 7 Ma on a sample of Scrutton Volcanics from the central part of the Tawallah Range, suggesting that the unit is equivalent in age to the Cliffdale Volcanics of the Murphy Province.

Urapunga Inlier

This is a small (<10 km²) inlier of granite and felsic volcanic rocks exposed about 5 km northwest of Roper Bar (URAPUNGA) in the core of an anticline (**Figure 14.6**). It comprises the Urapunga Granite and coeval Mount Reid Rhyolite. The Urapunga Granite is a non-foliated biotite granite containing K-feldspar megacrysts up to 2 cm long. Quartz, K-feldspar, plagioclase and biotite are the main minerals, with accessory apatite, zircon and opaques (Abbott *et al* 2001). Zircons from the granite have yielded a SHRIMP U-Pb age of 1858 ± 7 Ma (Page *et al* 2000).

The Mount Reid Rhyolite comprises fine rhyolite, containing sparse phenocrysts (up to 2 mm) of rounded and embayed quartz and feldspar in a recrystallised siliceous matrix. Zircons from the Mount Reid Rhyolite have yielded a SHRIMP U-Pb age of 1847 ± 6 Ma (Page *et al* 2000).

South Lake Woods inliers

Small isolated outcrops consisting mainly of quartz sandstone and minor siltstone, chert and quartzite have been mapped as Proterozoic in SOUTH LAKE WOODS and WINNECKE CREEK (Kennewell 1977, Huleatt 1977, **Figure 14.7**). These outcrops are probably surface expressions of northwest-trending ridges of Palaeoproterozoic rocks forming basement for the Palaeozoic Wiso Basin. They are correlated with the Tomkinson Creek Group (Hussey *et al* 2001) of the Tomkinson Province and upper Hatches Creek Group (see Donnellan *et al* 2001) of the Davenport Province. Ahmad

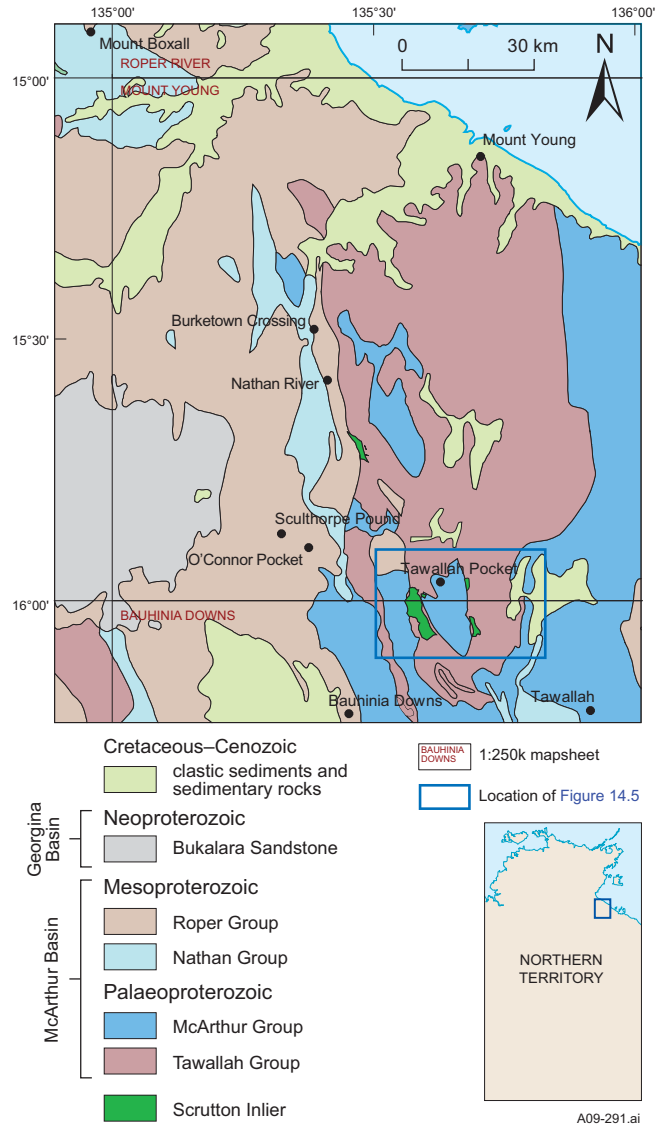


Figure 14.4. Location of small areas of outcrop of Scrutton Inlier, central McArthur Basin. Regional geology simplified from NTGS 1:2.5M geological dataset.

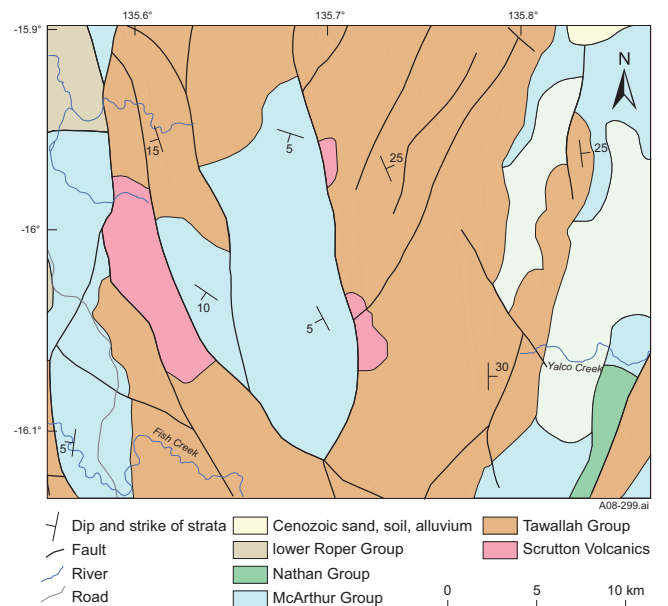


Figure 14.5. Geological setting of the Scrutton Inlier near Tawallah Pocket, central McArthur Basin (derived from Rawlings 2001).

Other Palaeoproterozoic inliers

and Scrimgeour (2006) included these outcrops under their P6 subdivision.

Silicified quartz sandstone is the most common rock type. This is medium grained, well rounded and well sorted, but fine- or coarse-grained, silty, angular and poorly sorted sandstone is also present. Ripple marks, both symmetrical and asymmetrical, and medium-scale low-angle cross-beds are present, and a shallow-marine environment of deposition is inferred (Kennewell 1977). Siltstone, limestone and chert, which forms part of the Tomkinson Creek Group in HELEN SPRINGS, are not present. This suggests that these isolated outcrops are possibly equivalent to the lower Tomkinson Group.

MINERAL RESOURCES

No substantial mineral occurrences have been recorded from within the rocks of any of the inliers described above. However, a series of quartz haematite lenses are hosted by the Mount Birch Sandstone (Nathan Group of McArthur Basin) at the unconformable contact with the Mount Reid Rhyolite in the vicinity of the Urupunga Inlier. This occurrence is named the *Murphys* Fe prospect. The ironstone lenses are up to 100 m long and 7 m wide, and can be traced for about 1000 m along strike. Bulk samples collected by BHP Ltd assayed up to 54% Fe over 5 m and 51% Fe over 11 m (Hickey 1987).

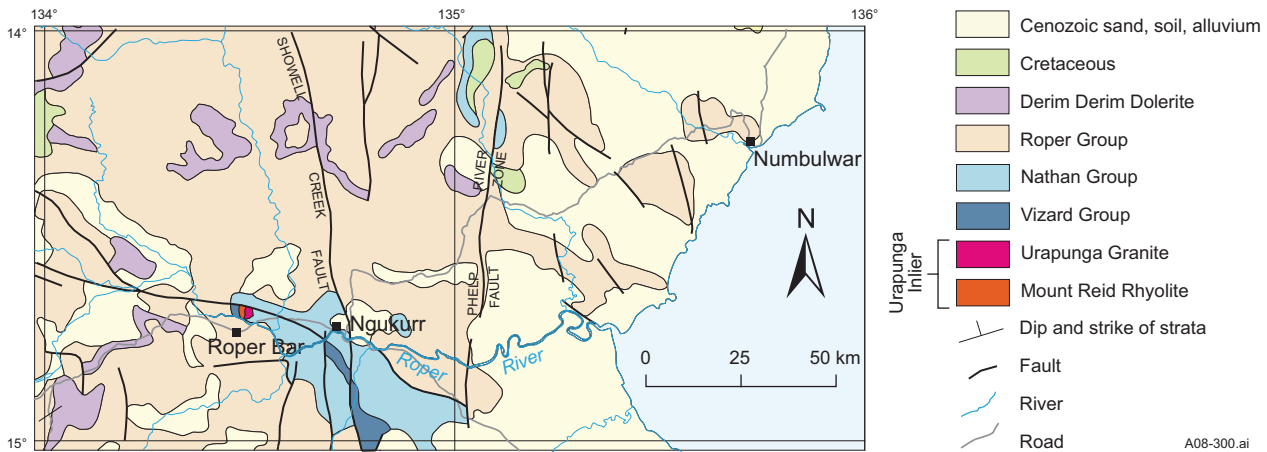


Figure 14.6. Geological setting of the Urupunga Inlier, central McArthur Basin (simplified from Rawlings 2001).

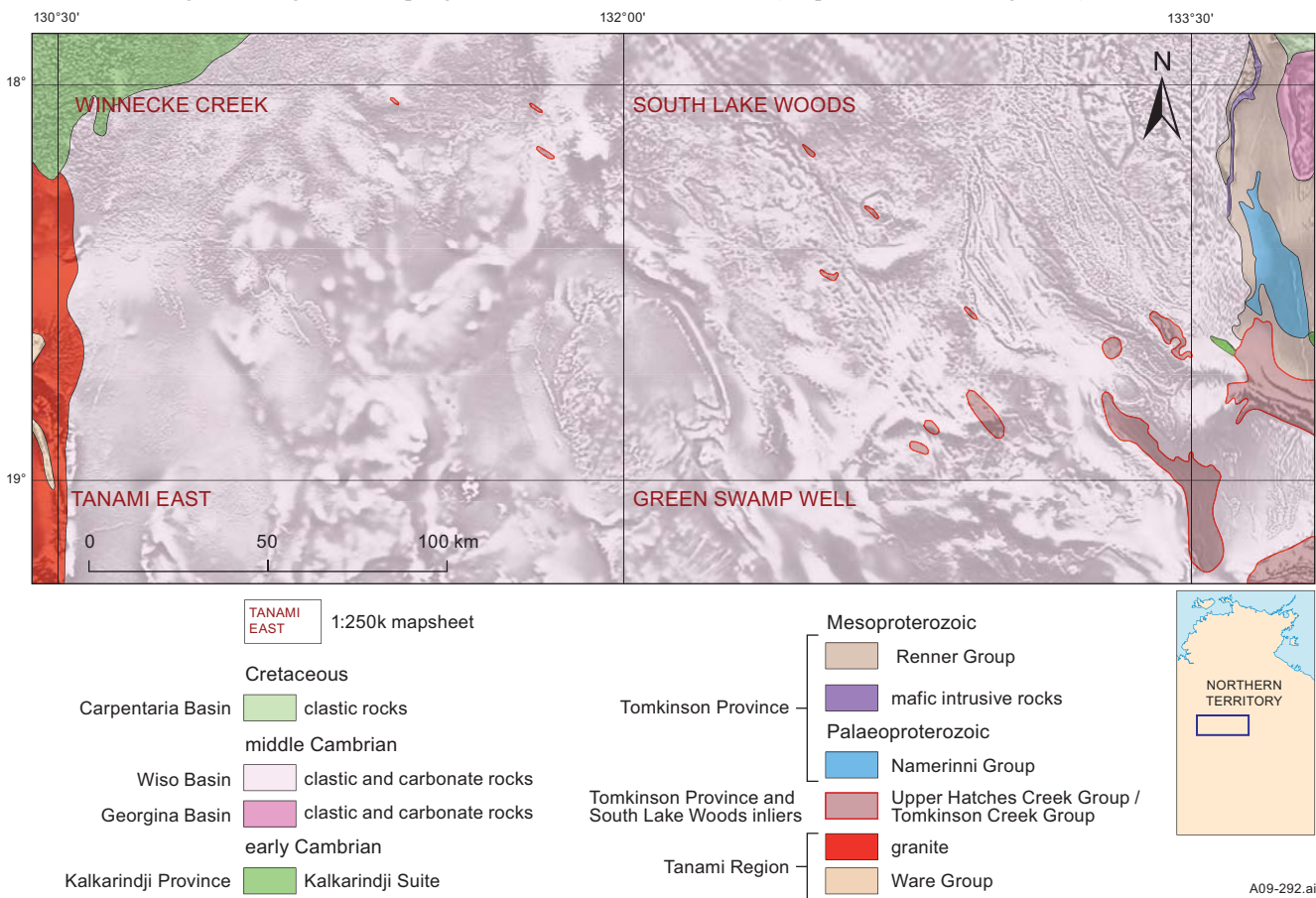


Figure 14.7. Distribution of Proterozoic inliers within Wiso Basin in SOUTH LAKE WOODS and WINNECKE CREEK from NTGS 1:2.5M geological dataset, overlain by IVD magnetic image. Inliers are broadly parallel to northwest-trending bands within magnetic image that are interpreted to be subsurface extensions of Tennant Region strata. Finely rippled magnetic texture in northwest of image is interpreted as early Cambrian Kalkarindji Suite basalt flows beneath middle Cambrian Wiso Basin and Cenozoic strata (not shown).

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