



# Geology and mineral resources of the Northern Territory

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## Chapter 37: Canning Basin

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## Chapter 37: CANNING BASIN

### INTRODUCTION

The onshore Phanerozoic Canning Basin covers in excess of 400 000 km<sup>2</sup>, of which only about 5000 km<sup>2</sup> occurs in the Northern Territory. The Lucas Outlier (**Figure 37.1**) forms the easternmost terrane of the Canning Basin and is separated from the main outcrop tract by a narrow structural high containing northerly extensions of the Murraba Basin (Playford *et al* 1975, Hocking 1994). The outlier occurs over extensive parts of THE GRANITES<sup>1</sup> and LUCAS (Western Australia), where it is represented by the Lucas Formation and Pedestal beds, and discontinuous outcrops also occur in STANSMORE and WEBB (Western Australia), and in HIGHLAND ROCKS (Blake *et al* 1979). The Lucas Outlier overlies Neoproterozoic strata of the Murraba Basin and much of it is covered by various surficial Cenozoic sediments. The following discussion is in part based on information from Vandenberg *et al* (in press).

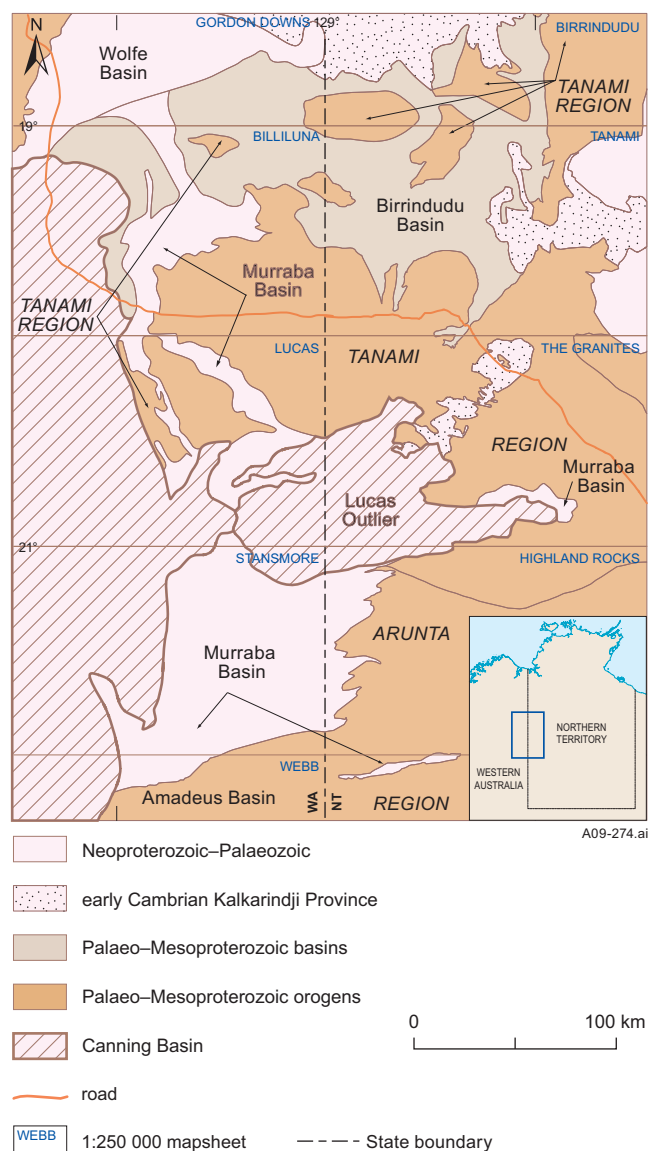
### DEVONIAN

In the Northern Territory, the *Lucas Formation* outcrops over the western and southwestern part of THE GRANITES and the northwesternmost corner of HIGHLAND ROCKS, where <10 m-high cliffs are exposed along the edge of Lake White. The formation is flat-lying to gently dipping and comprises medium- to fine-grained calcareous to non-calcareous sandstone, interbedded with siltstone and mudstone, which are locally calcareous (Blake *et al* 1979). Facies variations and the presence of cross-beds, mudstone pellets and ripple marks, plus the absence of marine fossils suggest deposition in a fluvial–lacustrine environment. The formation is estimated to be about 1000 m thick in THE GRANITES (Hodgson 1976). The Lucas Formation is inferred to unconformably overlie the Redcliff Pound Group of the Murraba Basin and to be unconformably overlain by the Pedestal beds (Blake *et al* 1979). Based on lithostratigraphic correlations with the Pertnjara Group of the Amadeus Basin (Jones 1991) and with other sedimentary rocks of the northeastern Canning Basin, the Lucas Formation is interpreted to be Devonian (Blake *et al* 1979, Hocking 1994).

In the Northern Territory, the *Pedestal beds* outcrop mainly in the western and southwestern part of THE GRANITES and the northwestern edge of HIGHLAND ROCKS. One small outcrop also occurs about 8 km east of Jangga Bluff in the western part of the latter mapsheet. In Western Australia, exposures are widely scattered over LUCAS, STANSMORE and WEBB. The Pedestal beds are up to 500 m thick and are composed of thin to very thick sandstone interbedded with minor conglomerate and shale (Blake *et al* 1979). The sandstone is typically planar laminated to shallowly planar cross-laminated and comprises medium to fine-grained, poorly sorted, subrounded to subangular quartz. In places, the sandstone contains isolated pebbles and stringers of

pebbles. The conglomerate is massive and comprises pebbles and cobbles with very rare boulders supported by a poorly cemented silty sand matrix. Most clasts are tabular and very rounded. They are composed of silicified fine-grained quartz sandstone, with chert of various colours, less common vein quartz and rare granite. Sedimentary structures and facies variations indicate that the Pedestal beds were deposited in an alluvial fan environment.

The Pedestal beds unconformably overlie basalt of the Cambrian Antrim Plateau Volcanics of the Kalkarindji Province in THE GRANITES and are inferred to be unconformably above the Lucas Formation (Blake *et al* 1979). No useful stratigraphic relationships are discernible in HIGHLAND ROCKS. The Pedestal beds have been interpreted to be stratigraphically equivalent to the Devonian Pertnjara Group in the Amadeus Basin and sediments in the eastern Canning Basin (Blake *et al* 1979, Grey 1990, Jones 1991). The southern contact of the northern outcrops of the Pedestal beds in HIGHLAND ROCKS is a steeply north-



**Figure 37.1.** Extent of Lucas Outlier of Canning Basin in Northern Territory and Western Australia.

<sup>1</sup> Names of 1:250 000 mapsheets are shown in large capital letters eg THE GRANITES.

## Canning Basin

dipping fault, which is intensely oxidised and ferruginised. Along this southern margin, the Pedestal beds dip steeply to the north, with dips becoming shallower away from the contact. There are also moderately tight, upright, east-plunging folds up to a few hundred metres across expressed in the Pedestal beds. This deformation probably occurred during the Alice Springs Orogeny suggesting that deposition of the beds predates the latest phase of deformation during this event (latest Carboniferous; Haines *et al* 2001).

## COMMODITIES

The first recorded exploration of the Northern Territory portion of the Canning Basin was during the 1970s when several companies exploring for uranium attempted to follow-up radiometric and magnetic anomalies identified in Government surveys. Work was mainly undertaken in conjunction with exploration programs over the older surrounding rocks. Radiometric anomalies either could not be replicated with ground work or were found to be due to surficial cover. The uranium potential at depth in the Canning Basin itself remains untested.

Magnetic anomalies within, or under the Canning Basin have also been targeted as possible kimberlites without success and some gold exploration programs have been extended from older terrains (eg Tanami Region) into the Canning Basin. Current exploration titles in the area are focused on gold, presumably in the older underlying rocks, or uranium in the Cenozoic cover. Despite the known deposits and occurrences of base metals in the Western Australian portion of the Canning Basin and the presence of mapped structures suitable for mineralisation in the eastern portion, the Northern Territory part of the basin has received almost no systematic work for these commodities. In contrast, the Western Australian portion has been targeted for base metals using various genetic models and geophysical targets with affinities to iron oxide copper gold analogues (eg Newera 2008).

There has been no petroleum exploration in the Northern Territory portion of the Canning Basin.

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