

# Hydrocarbon prospectivity of the southern Georgina Basin, Northern Territory

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The southern Georgina Basin contains a thick, areally extensive, oil-prone, alginitic, black shale unit in a depocentre in the Middle Cambrian Arthur Creek Formation. Typical source rock intercepts range between 20 and 100 m in thickness, with the total organic carbon content commonly averaging 3 to 4% and ranging up to 9.6%. Extensive oil generation and migration from this depocentre is evidenced by numerous good oil shows in overlying and underlying carbonate formations. There have been at least two phases of oil generation; an early phase that has been degraded to bitumen, and a later phase that currently exists as a fresh to relatively undegraded crude oil of aromatic-intermediate composition.

Reservoir potential, with adequate sealing capacity occurs in two separate Middle Cambrian-aged carbonate sequences: the basal dolomite reservoir unit, and the basal Hagen Member of the Chabalowe Formation. The basal dolomite reservoir unit underlies the source rock unit and is best developed over palaeohighs and in shoreward settings. The better reservoir developments contain dolomitised carbonate grainstones with intercrystalline, vuggy and locally, extensive fracture

porosity. Effective permeabilities range up to 1055 md in gross potential pay of 17 m. The basal Hagen Member of the Chabalowe Formation was deposited in nearshore environments at the base of an extensive regressive carbonate blanket in the western part of the depocentre. Net reservoir thicknesses range between 3 and 18 m, porosities range between 6.9 and 14.6%, and permeabilities vary from 2 to 3400 md. Overlying the reservoir unit are tight anhydritic, supratidal, argillaceous carbonate beds.

Structurally, the area is dominated by syndepositional horst and graben architecture and by the effects of the Late Devonian Alice Springs Orogeny. Anticlinal structures in the southernmost part of the depocentre appear to have been breached during the Alice Springs Orogeny with a consequent loss of hydrocarbons. Better exploration potential is inferred to the north where the effects of the Alice Springs Orogeny have not been as drastic and where there is potential for post-Devonian oil generation and migration. The region also contains prospective carbonate pinch-out plays combined with structural flexuring.

