5. PERMIAN-HYLAND BAY (?) PETROLEUM SYSTEM

(Londonderry High)

The Permian-Hyland Bay (?) petroleum system is located on the Londonderry High in the Bonaparte Basin. This system may be a continuation of the Hyland Bay/Keyling-Hyland Bay petroleum system in the Petrel Sub-basin. The Londonderry High is a northwest trending structural high comprising Triassic and Permian-Carboniferous units. These units are unconformably overlain by Jurassic or younger units. The petroleum system has a prospective inferred Permian source comprised of the Hyland Bay and Keyling Formations. The Hyland Bay Formation is the primary reservoir in this region but other prospective targets include the Keyling Formation, Cape Londonderry Formation, Plover Formation and the Flamingo Group. The Bathurst Island Group is the regional seal.

This petroleum system has proven hydrocarbon potential with two gas discoveries at Prometheus and Rubicon. Oil shows occur at Torrens 1 in the Hyland Bay Formation and oil bearing fluid inclusions occur in the Fossil Head and Kupangl Formation. Most of the wells drilled in the area have targeted fault-dependent traps that formed during Mesozoic rifting. Stratigraphic traps have good potential as future exploration targets.

### Petroleum System Characteristics

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<tr>
<th>Source</th>
<th>Reservoir</th>
<th>Seal</th>
<th>Source Quality</th>
<th>Expulsion</th>
<th>System Age</th>
<th>Risk</th>
<th>Traps</th>
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<tbody>
<tr>
<td>Permian (Hyland Bay or Keyling Formations)</td>
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<td>Gas and Turbidites</td>
<td>Good</td>
<td>Fair</td>
<td>Permian</td>
<td>Very Good</td>
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### Source Rocks

- **Hyland Bay Formation**: Gas prone with Type III/I/IV kerogen.
- **Keyling Formation**: Gas and oil prone with Type II/III kerogen. Coaly facies (mean TOC = 35%) have the potential to generate oil and gas but are thin and immature.

### Geological Survey

- **Fault seal failure, lack of oil charge.**
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### Geographical Extent

- **Figure 1**: Spatial extent of the Permian-Hyland Bay (?) petroleum system. The map displays occurrences of hydrocarbons and shows faults that are potentially important for hydrocarbon migration. The figure indicates that the Permian-Hyland Bay (?) petroleum system on the Londonderry high, encompassing shows attributed to the system. The system is present in the region of the northern Londonderry High as encompassing shows attributed to the system. The system is possibly a continuation of the Hyland Bay/Keyling-Hyland Bay petroleum system in the Petrel Sub-basin but was separated due to the differing fault sets of the two areas. The seismic line shown refers to Figure 3.

### Resource Discovery

- **Figure 3**: AGSO line 100/7 with Torrens 1 projected. At Torrens 1 an oil stain was discovered in the Hyland Bay Formation. The hydrocarbons were probably sourced from Palaeozoic sediments.

- **Figure 4**: Field reserves for the Permian-Hyland Bay (?) petroleum system. All oil fields were discovered in the Hyland Bay Formation. The fields are shown in a series of histograms and spreadsheets.

- **Figure 5**: Geoscience Australia (Austplay) estimates of the recoverable hydrocarbons to be discovered in the next 10-15 years in the Permian-Hyland Bay (?) petroleum system. Based on the work of Barrett et al. (2004).

- **Figure 6**: Resource discovery in the next 10-15 years. Gas and oil but are thin and immature. The Hyland Bay Formation is gas prone with type III/I/IV kerogen and an overall poor generative potential.

- **Figure 7**: Palaeo oil columns in Torrens 1.