PROGRESS REPORT IN IDENTIFYING POTENTIAL ZONES OF GAS SHALES AT PERTH BASIN

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14 Sep 2012
OUTLINES

PROGRESS SO FAR

- Visual Core Description and Rock-Type Diagnosis
- Petrophysical Analysis
- Mineralogical Analysis
- Geochemical Analysis

ONGOING WAY

- GR Response of lithofacies
- Parasequence Identifications
- Gamma-Ray Parasequences in Sequence Stratigraphy Interpretation

THE WAY FORWARD

- Regional mapping of GR-Parasequences
THE DIAGNOSIS OF ROCK-TYPES AT KOCKATEA SHALE

L1 Siliceous Mudstone
L2 Siliceous Ca-Mudstone
L3 Calcareous Mudstone
L4 Wavy Laminated dep.
L5 Bioturbated Mudstone
L6 Fossiliferous Mudstone
L7 Pyritic Mudstone
L8 Black Shale
L9 Sandy-Silty interlam.
L10 Shaly siltstone
L11 Shaly-Sandy interlam.
**THIN-SECTION STUDY OF KOCKATEA SHALE LITHOFACIES**

<table>
<thead>
<tr>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
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<tbody>
<tr>
<td>Siliceous Mudstone</td>
<td>Siliceous Ca-Mudstone</td>
<td>Calcareous Mudstone</td>
<td>Wavy Laminated dep.</td>
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<tr>
<td>Bioturbated Mudstone</td>
<td>Fossiliferous Mudstone</td>
<td>Pyritic Mudstone</td>
<td>Black Shale</td>
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<th>L9</th>
<th>L10</th>
<th>L11</th>
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<tr>
<td>Sandy-Silty interlam.</td>
<td>Shaly siltstone</td>
<td>Shaly-Sandy interlam.</td>
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SCANNING ELECTRON MICROSCOPY AT KOCKATEA SHALE LITHOFACIES

L1 Siliceous Mudstone

L2 Siliceous Ca-Mudstone

L3 Calcareous Mudstone

L4 Wavy Laminated dep.

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L6 Fossiliferous Mudstone

L7 Pyritic Mudstone

L8 Black Shale

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L11 Shaly-Sandy interlam.
MINERALOGICAL ANALYSIS
X-RAY POWDER DIFFRACTION

XRD BULK

CLAY DIFFRACTION
MINERALOGICAL ANALYSIS
FOURIER TRANSFORM INFRARED SPECTROSCOPY

FTIR-KBR

FTIR-ATR

Clays & Water

Carbonates

Organic matter

Quartz & Clays
GEOCHEMICAL ANALYSIS

<table>
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<tr>
<th>Depth</th>
<th>TOC</th>
<th>Lithofacies</th>
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<tbody>
<tr>
<td>3792.5-3792.55</td>
<td>2.545</td>
<td>Fossiliferous Mudstone</td>
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<td>3798.82-3798.87</td>
<td>4.75</td>
<td>Pyritic Mudstone</td>
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<td>3819.32-3819.36</td>
<td>1.43</td>
<td>Black Shale</td>
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<tr>
<td>3832.75-3832.80</td>
<td>2.2</td>
<td>Siliceous Mudstone</td>
</tr>
<tr>
<td>3834.50-3834.55</td>
<td>2.55</td>
<td>Calcareous Mudstone</td>
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</tbody>
</table>
GR RESPONSE OF LITHOFACIES

- **Black Shale**
- **Calcite Mudstone**
- **Fossiliferous Mudstone**
- **Pyritic Mudstone**
- **Siliceous Mudstone**
- **Sandy-silty interlaminated Deposit**
- **Siliceous Mudstone**
- **Shaly Siltstone**
PARASEQUENCE IDENTIFICATION

Lithofacies (3809.7-3827.1m)

Lithofacies (3787.9-3800m)

Lithofacies (3797.8-3815.2m)
GRPS IN SEQUENCE

STRATIGRAPHY INTERPRETATION

- Fossiliferous mudstone
- Pyritic mudstone
- Siliceous calcareous mudstone
- Calcareous mudstone
- Black shale
- Siliceous mudstone
- Bioturbated mudstone

Strat. Intervals

| Strat. Int.1 | TR1 | FS1  |
| Strat. Int.2 | TR2 | FS2  |
| Strat. Int.3 | TR3 | FS3  |
| Strat. Int.4 | TR4 | FS4  |
| Strat. Int.5 | TR5 | FS5  |

Gr (API) values:
- 250
- 0

Lithofacies:
- 28
- 0

TOC values:
- 6

Depth in S. L. units:
- 0

Stratigraphic intervals:
- Strat. Int.1
- Strat. Int.2
- Strat. Int.3
- Strat. Int.4
- Strat. Int.5

TSE1, TSE2, TSE3, TSE4, TSE5

TR1, RE1, TR2, RE2, TR3, RE3, TR4, RE4, TR5, RE5

Kockatea Shale - Hovea Member

Graph showing variations in GR, Lithofacies, and TOC across stratigraphic intervals.
REGIONAL MAPPING OF GR-PATTERNS