Shallow core drilling in the Douglas / Daly area
Cover photo: Drill cores from RN34675, 0 to 9 metres
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Introduction

Eight investigation holes were drilled in the Douglas / Daly area as part of the project “Water Quality in the Daly River” funded jointly by the National Action Plan for Salinity & Water Quality program and the NT government. This report documents the drilling results. The aim of the drilling was to provide strata samples beneath a representative set of soil types on cleared and uncleared areas. The locations of the drill sites are shown in Figure 1 and key details of each site are summarised in Table 1. Plates 1 to 8 are photographs of the sites showing the vegetation and landscape. Measurements of soil water chloride, moisture content and matric potential were made on the samples by CSIRO Land & Water and these will be reported on in the project’s final report. The vertical profiles of these parameters will be used to estimate groundwater recharge.

The holes were drilled with a trailer mounted Gemco rig using compressed air as the drilling medium. The core barrel is 1.5 metres long and has an internal diameter of 60 mm. After each core is taken the entire drill string has to be removed to retrieve the barrel. The intention was to fully core the holes to a depth of about twenty metres but soft sand at some of the sites made for either reduced or no core recovery. The depths of the holes ranged from 6.8 metres to 24.8 metres. Once hard limestone was encountered drilling was stopped because the rig was unable to penetrate it. Where no core was recovered airlift samples were collected. As soon as the cores were extracted from the core barrel they were sampled at 1.5 metre intervals and sealed in 500ml glass jars for later analyses. Cores and airlifted samples were laid out in nine metre intervals and photographed (Plates 9 to 18). Graphical logs showing the lithological descriptions, interpreted geological formation and the core recovery for each hole are presented in Figures 2 to 9. Note that none of the holes were deep enough to reach the watertable and all were backfilled.
<table>
<thead>
<tr>
<th>SITE</th>
<th>ZONE</th>
<th>EASTING</th>
<th>NORTHING</th>
<th>DATUM</th>
<th>VEGETATION</th>
<th>SOIL</th>
<th>LANDFORM</th>
<th>GEOLOGY</th>
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</thead>
<tbody>
<tr>
<td>RN34670</td>
<td>52</td>
<td>750495</td>
<td>8453247</td>
<td>WGS84</td>
<td>Cleared &gt;10 years</td>
<td>sand red sandy earth</td>
<td>flat to gently sloping</td>
<td>Cretaceous</td>
</tr>
<tr>
<td>RN34671</td>
<td>52</td>
<td>749589</td>
<td>8453545</td>
<td>WGS84</td>
<td>Cleared &gt;10 years</td>
<td>red loamy earth</td>
<td>gently undulating</td>
<td>Cretaceous</td>
</tr>
<tr>
<td>RN34672</td>
<td>52</td>
<td>748773</td>
<td>8453128</td>
<td>WGS84</td>
<td>Cleared &gt;10 years</td>
<td>sand loamy earth</td>
<td>gently undulating, low lying</td>
<td>Oollo Dolostone</td>
</tr>
<tr>
<td>RN34673</td>
<td>52</td>
<td>748792</td>
<td>8455160</td>
<td>WGS84</td>
<td>Cleared &lt;5 years</td>
<td>red sandy earth</td>
<td>gently sloping</td>
<td>Cretaceous Oollo Dolostone</td>
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<tr>
<td>RN34674</td>
<td>52</td>
<td>758399</td>
<td>8436152</td>
<td>WGS84</td>
<td>Cleared</td>
<td>red sandy earth</td>
<td>flat, low lying</td>
<td>Oollo Dolostone</td>
</tr>
<tr>
<td>RN34675</td>
<td>52</td>
<td>758439</td>
<td>8437581</td>
<td>WGS84</td>
<td>Cleared</td>
<td>red sandy earth</td>
<td>flat, low lying</td>
<td>Oollo Dolostone</td>
</tr>
<tr>
<td>RN34676</td>
<td>52</td>
<td>758342</td>
<td>8433259</td>
<td>WGS84</td>
<td>Cleared</td>
<td>red sandy earth</td>
<td>top of broad hill undulating</td>
<td>Cretaceous</td>
</tr>
<tr>
<td>RN34677</td>
<td>52</td>
<td>758410</td>
<td>8442742</td>
<td>WGS84</td>
<td>Cleared</td>
<td>sand</td>
<td>rocky outcrop</td>
<td>Cretaceous</td>
</tr>
</tbody>
</table>

Table 1 Drill site details.
Figure 1 Drill site locations. Stippled areas indicate the extent of Cretaceous rocks. The red line is the north eastern limit of the Ooloo Dolostone.
Figure 2 Graphic log of RN34670

- **Regolith**
  - Sand
    - Red brown, fine grained
  - Clayey sand
    - Dark red brown, fine grained
  - Sandy clay
    - Pale red brown, fine grained
  - Clayey sand
    - Pale red brown, fine grained
  - Sand
    - Pale brown, fine grained
  - Limestone
    - Very hard, grey, fine grained

*Note: No cores taken*
Graphic Log Strata

- **10 m** Depth (Metres)

- **4 m**
  - Clayey sand
  - Dark red brown, soft, slightly moist from 2.5m

- **4.5 m**
  - Sand
  - Light brown, fine-grained

- **7.5 m**
  - Sand
  - Slightly clayey, more clay with depth, light brown, fine-grained

- **10 m**
  - Sandy clay
  - Dark red brown, slightly moist, fine-grained

- **10.5 m**
  - Clayey sand
  - As above with minor sandstone, hard white, fine-grained

- **14 m**
  - Sand
  - Slightly clayey to clean, light brown, fine-grained

- **15 m**
  - Limestone
  - Very fine grained, pale brown, very hard

*Note: No cores taken*

Figure 3 Graphic log of RN34671
Figure 4 Graphic log of RN34672
Graphic Log

Strata

Core Recovery (%)

Regolith

Silty sand
- Light brown, fine-grained, loose

Clayey sand
- Dark red/brown, soft, abundant roots

Clayey sand
- As above and sparse sandstone, fine grained, white, moderately hard, chips 0.5 to 5cm, roots to 2.5m

Sandstone
- White with light red/brown streaks, very fine-grained, soft, porous, clean

Sandstone
- White, moderately hard, irregular bedding (up to 30 degrees), small circular rusty stains (after pyrite?)

Sandstone
- White, very fine to fine-grained, moderately hard, porous, rare fractures with red/brown clayey sand lining, slightly damp

No recovery

Sandstone
- White, minor (<5%) white clay matrix, porous, moderately hard, fine-grained, some banding (red brown and yellow brown)

No recovery

Sandstone
- White, clean, very fine to fine-grained, porous, trace clay matrix, moderately hard

Sand and Sandstone
- White, very fine-grained, soft

Sand
- Very fine-grained to silt, pale brown, loose, minor clay matrix

Sand
- As above and minor soft white clay

Clay
- White and red/brown mottled, soft and fine-grained sand as above

Figure 5 Graphic log of RN34673
Figure 6 Graphic log of RN34674

- **Sand**
  - Clays, light red brown, soft to firm, fine to medium grained, slightly moist, slightly porous

- **Clayey sand**
  - As above but moist

- **Sandy clay**
  - Dark red brown, soft to firm, moist, slightly moister towards base

- **Sandy clay**
  - As above but sandier towards base

- **Sandy clay**
  - Dark red brown, soft to firm, moist, slightly moister towards base

- **Sandstone**
  - White, fine grained, clean, soft

- **Clayey sand**
  - Red brown, fine to medium grained

- **Clayey sand**
  - Red brown, fine grained, soft to loose, fragments of clayey sandstone, hard, pale yellow, fine-grained, interbedded sandstone, rock with manganese cement, gray, angular and up to 5mm

- **Clayey sand**
  - Brown and claystone, yellow, moderately hard

- **Clayey sand**
  - Red brown, fine-grained, loose, very moist, sandy claystone, pale yellow, weakly bedded

- **No recovery**

- **Sandy clay**
  - Brownish yellow (mustard), minor red brown motting, clay skins in cracks (peds), rare root casts, soft, sand is fine grained

- **Clayey sand**
  - Pale red brown with minor cream motting, sand medium to fine grained

- **Clay**
  - Slightly sandy, medium to fine grained sand, mottled red brown and dark gray (manganese staining?), clay skins on peds and rare root casts with clay things, moist, soft to firm

- **Clay**
  - Orange brown, minor pink, gray and black motting, occasional coarse quartz granules, sub angular/irregular

- **Limestone**
  - White, fine to medium crystalline, very hard
Figure 7 Graphic log of RN34675

dark red-brown, soft to firm, roots to 0.5m, dry, sand fine to medium grained, 1.5 to 3.0m slightly hard, clayey, hard bands and rare 1mm ironstone granules

dark red-brown, soft, sand fine grained rare medium, sparse ironstone granules to 2mm, sub-rounded to sub-angular, pieces of limonite cemented sandstone to 2cm @ 7.5m

angulat ironstone fragments to 3cm in yellow sandy clay matrix, hard, red brown sandy clay lining cracks

finely crystalline, sugary, white, porous, very hard
<table>
<thead>
<tr>
<th>Depth (Metres)</th>
<th>Graphic Log Strata</th>
<th>Core Recovery (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>sand, slightly clayey, dark red brown, soft, fine to medium grained, fine roots</td>
<td>87%</td>
</tr>
<tr>
<td>2</td>
<td>sand as above but roots are rare and slightly moist, rare coarse quartz sand</td>
<td>67%</td>
</tr>
<tr>
<td>2.5</td>
<td>clayey sand, dark red brown, soft, slightly moist, sparse coarse quartz and ironstone grains to 5mm, at 4.4 to 4.5m ironstone clasts to 3cm, sub angular, partly decomposed to soft yellow limonite</td>
<td>60%</td>
</tr>
<tr>
<td>3</td>
<td>clayey sand, dark red brown, fine grained, sparse ironstone granules to 5mm, sub rounded, ironstone increases with depth</td>
<td>77%</td>
</tr>
<tr>
<td>4</td>
<td>breccia, ironstone clasts to 2cm, sub angular to sub-rounded, in fine clayey sand matrix, very hard drilling, some iron cemented coarse grained sandstone clasts</td>
<td>53%</td>
</tr>
<tr>
<td>4.5</td>
<td>breccia as above and some bands of solid ironstone up to 5cm thick, made of iron cemented sandstone, fine to coarse grained</td>
<td>73%</td>
</tr>
<tr>
<td>5.6</td>
<td>sand, slightly clayey, dark red brown, soft, slightly moist</td>
<td>53%</td>
</tr>
<tr>
<td>5.9</td>
<td>sandstone, cream, fine-grained, minor coarse, rare granule beds, porous, clean, firm to hard</td>
<td>27%</td>
</tr>
<tr>
<td>6.5</td>
<td>sandstone, cream to white, fine-grained, hard some firm bands, porous, slightly damp</td>
<td>0%</td>
</tr>
<tr>
<td>7.1</td>
<td>sand, cream, fine-grained, loose, slightly damp</td>
<td>0%</td>
</tr>
<tr>
<td>8</td>
<td>sand, pale cream to brown, fine-grained, sub angular to sub-rounded, minor medium to coarse, loose, trace gravel @ 14 to 15m</td>
<td>0%</td>
</tr>
</tbody>
</table>

Figure 8 Graphic log of RN34676
<table>
<thead>
<tr>
<th>Depth (Metres)</th>
<th>Core Recovery (%)</th>
<th>Regolith</th>
<th>Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.5</td>
<td>sand</td>
<td>pale brown, fine grained, loose, dry, minor ironstone grains to 2mm</td>
</tr>
<tr>
<td>4</td>
<td>100%</td>
<td>sandy clay</td>
<td>red brown minor yellow brown mottles, soft, fine grained, abundant ironstone grains to 4mm</td>
</tr>
<tr>
<td>5</td>
<td>4.5</td>
<td>sandstone</td>
<td>clayey, fine grained, red brown with minor yellow brown mottles, soft to firm, irregular bedding, horizontal, interbeds of sandy clay as above, minor vertical cracks</td>
</tr>
<tr>
<td>6.8</td>
<td>9.5</td>
<td>sandy clay</td>
<td>red brown, fine grained, with light grey and yellow brown mottles</td>
</tr>
<tr>
<td>7.3</td>
<td>33%</td>
<td>sandy clay</td>
<td>light yellow brown with minor white and red brown mottles, fine grained, minor fine clays, sand interbeds, weak irregular bedding, high angle cracks with clay stone, firm, sandy beds slightly micaceous (muscovite)</td>
</tr>
<tr>
<td>8.5</td>
<td>100%</td>
<td>claystone</td>
<td>orange brown and white mottled, some fine scale colour banding, firm, slightly damp</td>
</tr>
<tr>
<td>8.8</td>
<td>100%</td>
<td>claystone</td>
<td>white with minor, red brown mottling, firm to slightly damp</td>
</tr>
<tr>
<td>9</td>
<td>13%</td>
<td>claystone</td>
<td>orange brown with minor white and red brown mottling, firm to soft, sandier @ 8-9m, a 2mm live root @ 8.5m, minor fractures</td>
</tr>
<tr>
<td>10</td>
<td>100%</td>
<td>sandy clay</td>
<td>orange brown</td>
</tr>
<tr>
<td>10.3</td>
<td>100%</td>
<td>claystone</td>
<td>banded white and dark red brown, soft to firm, horizontal bedding, weakly fractured</td>
</tr>
<tr>
<td>10.5</td>
<td>100%</td>
<td>silt</td>
<td>slightly clayey, light orange brown, loose</td>
</tr>
<tr>
<td>11</td>
<td>1.5</td>
<td>silt</td>
<td>slightly clayey, pale yellow brown, loose</td>
</tr>
<tr>
<td>12.2</td>
<td>7%</td>
<td>silt</td>
<td>slightly clayey, cream, loose</td>
</tr>
<tr>
<td>12</td>
<td>7%</td>
<td>silt</td>
<td>slightly clayey, pale gray brown, loose</td>
</tr>
<tr>
<td>14.2</td>
<td>14.8</td>
<td>silt</td>
<td>slightly clayey, light brown, loose</td>
</tr>
<tr>
<td>14.5</td>
<td>100%</td>
<td>sand</td>
<td>light brown, slightly clayey, loose</td>
</tr>
<tr>
<td>14.8</td>
<td>100%</td>
<td>claystone</td>
<td>clayey, sand, light brown and white mottled, soft</td>
</tr>
<tr>
<td>15.2</td>
<td>100%</td>
<td>sandstone</td>
<td>dark brown, fine to medium grained, thin cemented, matrix supported, very hard</td>
</tr>
</tbody>
</table>

Figure 9 Graphic log of RN34677
Plate 1  Site of RN34670

Plate 2  Site of RN34671
Plate 3  Site of RN34672

Plate 4  Site of RN34673
Plate 5  Site of RN34674

Plate 6  Site of RN34675
Plate 7  Site of RN34676

Plate 8  Site of RN34677
Plate 9 Drill cuttings from RN34670 (0.5 metre samples, shallowest sample in foreground)
Plate 10 Drill cores from RN34672, 0 to 7.1 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 11 Drill cores from RN34673, 0 to 9 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 12 Drill cores from RN34674, 0 to 9 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 13 Drill cores from RN34674, 9 to 17.6 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 14 Drill cores from RN34675, 0 to 9 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 15 Drill cores from RN34676, 0 to 9 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 16 Drill cores and cuttings from RN34676, 9 to 16 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 17 Drill cores from RN34677, 0 to 9 m (each row is 1.5 metres, shallowest core is at top left of photo)
Plate 18 Drill cuttings and cores from RN34677, 9 to 14.8 m (each row is 1.5 metres, shallowest core is at top left of photo)