POWER AND WATER AUTHORITY

Bore Completion Report

BORES 27610 AND 27611
DJARRUNG EXCISION

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Darwin
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CONTENTS

1. INTRODUCTION
2. HYDROGEOLOGY
3. RESULTS
4. RECOMMENDATIONS
   REFERENCES

ATTACHMENTS

1. COMPOSITE LOG - BORE 27610
2. TEST REPORT - BORE 27610
3. BORE LOCATION MAP
4. COMPOSITE LOG - BORE 27611
5. TEST REPORT - BORE 27611
6. BORE LOCATION MAP

DISTRIBUTION

Regional Manager Katherine (Attention to Bob Dennis) 2
Water Resources Library, Darwin 1
Water Resources Library, Alice Springs 1
Water Resources Bore Data File 1
Hydrogeology Branch, Darwin 2
LIST OF TABLES

1. WATER QUALITY DATA
### LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMG</td>
<td>Australian Map Grid</td>
</tr>
<tr>
<td>°C</td>
<td>degree Celsius</td>
</tr>
<tr>
<td>ID</td>
<td>internal diameter</td>
</tr>
<tr>
<td>Km</td>
<td>litre per second</td>
</tr>
<tr>
<td>L/c/d</td>
<td>litre per capita per day</td>
</tr>
<tr>
<td>m</td>
<td>metre</td>
</tr>
<tr>
<td>mm</td>
<td>millimetre</td>
</tr>
<tr>
<td>m³/d</td>
<td>cubic metres per day</td>
</tr>
<tr>
<td>mg/L</td>
<td>milligram per litre</td>
</tr>
<tr>
<td>pH</td>
<td>acidity and alkalinity index</td>
</tr>
<tr>
<td>SWL</td>
<td>standing water level</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

Djarrung is an excision of West Mathison Station at the Junction of the Flora River and Mathison Creek. A project to provide a potable groundwater supply at the proposed living area was undertaken by the Water Resources Division of the Power and Water Authority at the request of Aboriginal Essential Services. The aim was to construct one production bore and one standby bore with a potable water supply of at least 1 L/s from each. This would provide water for the expected population of 20 people.

Access is via a station track which begins at the Victoria Highway approximately 21 km west of the Scott Creek homestead turnoff. The proposed living area is 40 km north of this gate. The region is covered by the 1:100 000 scale Topographic Map Bowman (AMG Grid Reference 772950 - 8360750).

The excision is located within the Daly Basin and lies at the northwestern corner of an extensive limestone terrace. The climate is monsoonal with a wet season extending from November to early April. The mean annual rainfall is 900 mm while the average evaporation is 3200 mm.

An initial desktop study was undertaken in early 1989. This was followed by a field reconnaissance in November 1990 during which bore sites were pegged and access checked. Following Aboriginal sacred site clearance drilling and pump testing of two bores was undertaken in June 1991.

2. HYDROGEOLOGY

The region is covered by the 1:250 000 scale Geological Series Map Fergusson River (Sheet SD52-12).

The area is underlain by Middle Cambrian Tindall Limestone (crystalline limestone with minor calcilutite and chert nodules). The Tindall Limestone is the basal formation of the Daly Basin and in this area is unconformably underlain by basalts of the Antrim Plateau Volcanics. This site is at the western edge of the Daly Basin and the Limestone is likely to be thinning towards the west. The boundary of the basin is marked by an extension of the Dorisvale Fault, and basalt exposure in Mathison Creek 3 km upstream of the proposed living area.
The level of aquifer development within the Tindall Limestone is dependent on the following factors:

(a) the depth of weathering;

(b) the lithology of the unit that occurs within and below the zone in which water level fluctuations take place (eg solution of limestone is more common than for calcilutite);

(c) the degree of downwarping and subsequent stress fracturing.

Groundwater is present in cavernous and fractured limestone throughout the Tindall Limestone sequence. High yielding bores have been located in areas where cavernous development exists at least 10 m below the standing water level (SWL). The SWL in the bores of the area has ranged between 15 m and 60 m, with a maximum aquifer depth of 102 m (RN 24749). High TDS (up to 2230 mg/L), fluoride, and sulphate have been encountered in the region, but are probably related to overlying Jinduckin Formation rocks which are not present at Djarrung.

3. RESULTS

Two successful bores (RN 27610, RN 27611) have been drilled to 35.6 m and 37 m respectively (see Composite Logs). Bore 27610, constructed with slotted casing adjacent to the aquifer zone, encountered 8 L/s of potable water, while RN 27611 was constructed with screens and yielded 3 L/s of potable water. RN 27611 is about 15 m south of RN 27610 and was drilled as a standby bore. Both bores intercepted aquifers in fractured and cavernous limestone between about 28 m and 35 m, with a SWL of about 19 m. The underlying basalt was not encountered in either bore.

Water quality results from samples taken during pump testing are included in Table 1. Both bores yield bicarbonate water within potable limits (AWRC and NHRMC 1987). The waters are non-corrosive, however moderately high hardness values indicate that scaling of plumbing fixtures and increased soap consumption may occur.

The minimum requirement of 0.25 L/s of potable water for a population of 20 people (based on 1000 L/c/d) is exceeded by these bores.
4. RECOMMENDATIONS

It is recommended that:-

- bore 27610 be equipped as the production bore and RN 27611 be utilised as a standby bore only;

- RN 27610, with a pump setting of 29 m below ground level, should be pumped at a rate not exceeding 8 L/s. For rates less than 5 L/s a pump setting of 24 m will be adequate (see Test Report);

- RN 27611, with a pump setting of 28 m below ground level, should be pumped at a rate not exceeding 3 L/s. For rates less than 3 L/s a pump setting of 24 m would be adequate (see Test Report);

- absorption trenches and septic tanks should not be constructed within 100 m radius of the bore;

- further recommendations for bore equipping are included in the Test Reports (see Attachments).
REFERENCES


<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>BORE REGISTERED NUMBER</td>
<td>2761014.6.91</td>
</tr>
<tr>
<td>DATE OF SAMPLING</td>
<td>885</td>
</tr>
<tr>
<td>SPECIFIC CONDUCTANCE (μS/cm AT 25°C)</td>
<td>520</td>
</tr>
<tr>
<td>TOTAL DISSOLVED SOLIDS (mg/L BY EVAP. AT 180°C)</td>
<td>7.0</td>
</tr>
<tr>
<td>pH</td>
<td>18</td>
</tr>
<tr>
<td>SODIUM (Na)</td>
<td>3</td>
</tr>
<tr>
<td>POTASSIUM (K)</td>
<td>108</td>
</tr>
<tr>
<td>CALCIUM (Ca)</td>
<td>45</td>
</tr>
<tr>
<td>MAGNESIUM (Mg)</td>
<td>455</td>
</tr>
<tr>
<td>TOTAL HARDNESS (AS CaCO₃)</td>
<td>460</td>
</tr>
<tr>
<td>TOTAL ALKALINITY (AS CaO)</td>
<td>3.8</td>
</tr>
<tr>
<td>IRON (TOTAL) (Fe)</td>
<td>9</td>
</tr>
<tr>
<td>SILICA (SiO₂)</td>
<td>32</td>
</tr>
<tr>
<td>CHLORIDE (Cl)</td>
<td>41</td>
</tr>
<tr>
<td>SULPHATE (SO₄)</td>
<td>564</td>
</tr>
<tr>
<td>NITRATE (NO₃)</td>
<td>0.3</td>
</tr>
<tr>
<td>BICARBONATE (HCO₃)</td>
<td>0.3</td>
</tr>
<tr>
<td>FLUORIDE (F⁻)</td>
<td>0.3</td>
</tr>
<tr>
<td>PUMPED SAMPLE</td>
<td>15</td>
</tr>
<tr>
<td>PUMPED SAMPLE</td>
<td></td>
</tr>
<tr>
<td>COMMENTS</td>
<td></td>
</tr>
</tbody>
</table>
DEPTH (m) | BORE CONSTRUCTION | GRAPHIC LOG | STRATA DESCRIPTION | AQUIFERS (WATER STRUCK)
--- | --- | --- | --- | ---
0 | 0.45m CEMENT | TOPSOL and reddish brown clay | | |
2 | 152mm ID STEEL CASING | LIMESTONE: moderately to highly weathered | | |
4 | 152mm ID SLOTTED STEEL CASING | LIMESTONE and CALCILUTITE with chert bands, fractured | | |
6 | 203mm ID STEEL CASING | CHERT: grey | | |
8 | CAVITY | | | |
10 | NO RETURNS; very broken drilling | | | |
12 | SWL 19.17m 14/6/91 | | | |
14 | 8 L/s | | | |
16 | | | | |
18 | | | | |
20 | | | | |
22 | | | | |
24 | | | | |
26 | | | | |
28 | | | | |
30 | | | | |
32 | | | | |
34 | | | | |
36 | | | | |
38 | | | | |
40 | | | | |
42 | | | | |
44 | | | | |
46 | | | | |
48 | | | | |

COMPOSITE LOG OF BORE 27610
TEST REPORT — BORE RN. 27610

Bore Location: DJARRUNG. Client: AES. KATHERINE.
Reference: Purpose: DOMESTIC.

Map: BOWMAN. SHEET 3268 1:100,000
Grid Reference: 729 607.

RECOMMENDATION
Pumping Rate: 8 l/s. Pump Setting: 29 m below Ground Level.
General recommendations are given on the reverse side. The aquifer and bore can sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: [In all correspondence please refer to bores RN number] Water Resources SASCO House, DARWIN NT.

BORING DATA
Finished depth: 35.50 m. Completion Date: Test Date: 14/6/91.
Standing Water Level: 19.17 m. on 14/6/91 Test Rates :4,7,10,15L/s.
Construction details:
Interval Description
0 - 6m 203mm ID. steel casing.
0 - 29.4m 152mm ID. steel casing.
29.4 - 35.0m 152mm ID. slotted steel casing.
35.0 - 35.5m 152mm ID. sump.

Notes:
1. Top of casing as constructed was 0.46 m above ground.
2. All depths are measured from natural ground level.
3. Test rates are not indicative of safe long term pumping rates.

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 152 mm Nominal Size.

COMMENTS
1. The above recommendations are based on a series of tests at 2-15 l/s for 8 hrs and assume hydrological conditions remain constant.
2. Provision to obtain water samples at bore head should be incorporated in the reticulation.
3. Provision to monitor water levels should be provided when equipping this bore.
4. Pump settings and rates; For rates less than 5 l/s a pump setting of 24m. will be adequate.

WATER QUALITY
See water laboratory report Analysis No 90/91/1554.

Prepared by: P. REES T0.1
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

Attention to the following points will ensure a long and safe life for the bore supply and help prevent pollution of the groundwater resource.

1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.

2. Seal the space between the casing and pump equipment to prevent entry of vermin, dirt and pollutants.

3. Maintain pumping equipment in good order to prevent pollution. Prevent spillage of fuel and oil on the ground around the bore. Store fertilizer and other chemicals at least 50 m away.

4. Keep stock away from the bore head. Discourage domestic activity at the bore. The first tap on the pipeline should not be less than 5 m from the bore head.

5. Pumping the bore at higher than recommended rates may fork the bore leading to instability of pump maintenance problems. Seek the professional advice of an hydrogeologist or groundwater engineer.

6. If the bore is no longer required, the casing is to be removed or securely capped and the bore backfilled with clayey material. A cement plug may be required in some instances.

IN ADDITION, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.
Bore Location: DJARRUNG.  
Client: AES. KATHERINE.  
Reference:  
Purpose: DOMESTIC.  

Map: BOWMAN. SHEET 5268 1:100,000  
Grid Reference: 729-607.  

RECOMMENDATION  
Pumping Rate: 3 l/s. Pump Setting: 24 m below Ground Level.  
General recommendations are given on the reverse side. The aquifer and bore  
can sustain higher pumping rates with deeper pump settings or for short  
periods in favourable seasons. Further advice can be obtained from:  
(In all correspondence please refer to bores RN number) Water Resources  
SASCO House, DARWIN NT.  

BORING DATA  
Finished depth: 31.5 m. Completion Date: 2/6/91 Test Date 12/6/91  
Standing Water Level: 19.15 m. on 12/6/91 Test Rates: 4 L/s.  

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6.0m</td>
<td>203mm ID. steel casing.</td>
</tr>
<tr>
<td>0 - 29.0m</td>
<td>152mm ID. steel casing.</td>
</tr>
<tr>
<td>29 - 31.0m</td>
<td>146mm ID. S/S. screen - 1mm aperture.</td>
</tr>
<tr>
<td>31 - 31.5m</td>
<td>152mm ID. steel sump.</td>
</tr>
</tbody>
</table>

Notes:  
1. Top of casing as constructed was 0.34 m above ground.  
2. All depths are measured from natural ground level.  
3. Test rates are not indicative of safe long term pumping rates.  

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 146 mm Nominal Size.  

COMMENTS  
1. The above recommendations are based on a series of tests at 4 l/s for  
7 hrs and assume hydrological conditions remain constant.  
2. Provision to obtain water samples at bore head should be incorporated  
in the reticulation.  
3. Provision to monitor water levels should be provided when equipping this  
bore.  
4. For rates less than 3 l/s., a pump setting of 24m. would be adequate.  
5. Discharge becomes discoloured at rates above 3 l/s.  

WATER QUALITY.  
See water laboratory report Analysis No 90/91/1553.  
Prepared by: P REES T0.1  

boredata2
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

Attention to the following points will ensure a long and safe life for the bore supply and help prevent pollution of the groundwater resource.

1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.

2. Seal the space between the casing and pump equipment to prevent entry of vermin, dirt and pollutants.

3. Maintain pumping equipment in good order to prevent pollution. Prevent spillage of fuel and oil on the ground around the bore. Store fertilizer and other chemicals at least 50 m away.

4. Keep stock away from the bore head. Discourage domestic activity at the bore. The first tap on the pipeline should not be less than 5 m from the bore head.

5. Pumping the bore at higher than recommended rates may fork the bore leading to instability of pump maintenance problems. Seek the professional advice of an hydrogeologist or groundwater engineer.

6. If the bore is no longer required, the casing is to be removed or securely capped and the bore backfilled with clayey material. A cement plug may be required in some instances.

IN ADDITION, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.