Bore Completion Report
CARPENTARIA AND STUART
HIGHWAY ROAD BORES
1991/1992

REPORT 23/1993

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Hydrology Branch
Water Resources Division
Darwin
April 1993
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1. INTRODUCTION
This report describes bore drilling and rehabilitation in the Larrimah and Carpentaria Highway areas. This project was undertaken by the Power and Water Authority Water Resources Division for the Department of Transport and Works during the 1991/92 financial year.

Included in the report are results from drilling and rehabilitation works, test pumping, chemical analysis of groundwaters and appraisal of groundwater availability.

2. BACKGROUND
The Water Resources Division was initially approached by Transport and Works to drill two new bores on the Carpentaria Highway. The first was to be sited between chainage 60km and 125km, preferably central in this area, and the second between 185km and 230km. Existing bores at 78km and 90km had been reported as being dry.

Subsequent drilling in October 1991 at approximately 92km (RN 27846, RN 27847) was unsuccessful, but a successful bore at 209km (RN 27848) was constructed and test pumped. With funds remaining, bore RN 6329 at October Creek (169.4km) was redrilled to total depth by the PAWA period contractor. This bore had silted up and on subsequent test pumping rapidly silted up again.

Bore 28082, 2.5km south of Larrimah on the Stuart Highway, was drilled and constructed in May 1992. This work, undertaken using a PAWA drilling rig, continued with the drilling of two unsuccessful bores at chainages 248.1km and 259.2km on the Carpentaria Highway.

Further funding by Transport and Works enabled PAWA to utilise a downhole camera in several existing bores to delineate what work was required to upgrade these bores. Successful rehabilitation of bores at 24.8km (RN 5942) and 169.4km (RN 6329) and redrilling of RN 6066 at chainage 90.6km (RN 28085) was subsequently undertaken. This work was performed by the PAWA drilling rig during May and June 1992, with test pumping undertaken soon after completion.
3. HYDROGEOLOGY

Three distinct hydrogeological environments exist in the study area:

1. the siltstone, sandstones and carbonate rocks of the southern Daly River Basin (Jinduckin Formation and Tindall Limestone);
2. the siltstones, sandstones, shales and limestone and dolomitic rocks of the Georgina Basin (Mullaman Beds and Anthony Lagoon Beds);
3. the dolomitic and siltstone rocks of the McArthur Basin (Emmerugga Dolomite).

3.1 JINDUCKIN FORMATION AND TINDALL LIMESTONE

These mainly carbonate sediments occur, with a thin veneer of Cretaceous Mullaman Beds, in the Larrimah area.

The Middle Cambrian to Lower Ordovician Jinduckin Formation consists predominantly of sandstone and siltstone with minor marl, dolomite and chert. Aquifers have been struck in the Jinduckin Formation in sandstone, dolomite and chert beds and especially where fracturing is present. Bore yields of up to 12 L/s have been developed (RN 22166, Katherine). The underlying Middle Cambrian Tindall Limestone (crystalline limestone with minor calcilutite, and calcareous mudstone interbeds) is a more reliable aquifer with groundwater present in cavernous and fractured limestone throughout the sequence. High yielding bores (up to 90 L/s) are located in areas where cavernous development exists at least 10m below the standing water level (eg. Katherine supply bores RN 6893, RN 7807). Road bore RN 28082 at Larrimah intercepted in excess of 15 L/s of potable quality water in Tindall Limestone.

3.2 MULLAMAN BEDS AND ANTHONY LAGOON BEDS

The Cretaceous Mullaman Beds (lateritised claystone, soft grey claystone/sandstone and conglomerate) unconformably overly Cambrian age carbonate rocks. Limited data suggests that the Cambrian sediments vary between Tindall Limestone at Daly Waters and Anthony Lagoon Beds/Top Springs Limestone as the Carpentaria Highway traverses towards the "jumpup". The carbonate lithologies were
deposited in the Georgina Sedimentary Basin.

With thicknesses varying between 10m and 130m the Mullaman Beds are poor aquifers in this area. A predominance of fine grained lithologies (clays, claystone, shale), which are unaffected by tectonic fracturing, accounts for the lack of permeability of this unit.

The Anthony Lagoon Beds consist of generally dolomitic lithologies (calcareous and dolomite siltstone and fine grained sandstone, dolomite and dolomitic limestone with chert nodules). The laterally equivalent Top Springs Limestone is a massive limestone with laminated cherty limestone interbeds. Cavity development, with consequent aquifer presence, is common in the Top Springs Limestone, while the Anthony Lagoon Beds, with their more clastic nature, are a less reliable aquifer. However, where limestone beds are present within the Anthony Lagoon Beds, supplies in excess of 10 L/s have been obtained (RN 28085).

3.3 EMMERUGGA DOLOMITE
The Proterozoic Emmerugga Dolomite is composed of massive dolomite, chert breccia, dolomitic sandstone and siltstone. This 800m thick unit outcrops between the 248km chainage and Paddy Spring Creek on the Carpentaria Highway. Primary porosity of this unit is negligible.

Secondary porosity due to fracturing associated with the Mallapunyah Fault has yielded bores of up to 6 L/s (RN 24516). However, where fracturing is not present, or siltstone lithologies predominate, then bore yields are negligible. Bores 28083 (248.1km) and 28084 (259.2km) intercepted seepage supplies only in siltstone and unfractured dolomite respectively. Bore 28083 was accurately sited at the Mallapunyah Fault, but the encountered siltstone did not have open fractures. Faulting probably resulted in crushing of the siltstone only.
4. RESULTS
The results of the PAWA bore rehabilitation, drilling and testing programme are summarised here using chainages.

4.1 Stuart Highway, 2.5km South of Larrimah
Bore 28082 was drilled to a total depth of 203.2m and yielded in excess of 15 L/s of potable quality water in Tindall Limestone (see Test Report and Composite Log of Bore). The bore was constructed with 203mm ID surface casing cemented into 54m with the hole left open to total depth.

Lost circulation was experienced from about 70m with very poor sample return. Subsequent downhole gamma logging indicated a typical Tindall Limestone sequence in this hole.

4.2 CARPENTARIA HIGHWAY 24.8km
Two bores exist at this chainage. RN 5761 was drilled in April 1967 to a depth of 96.7m and lined with 188mm ID steel casing. Downhole closed circuit television (CCTV) inspection during this project has indicated the presence of an obstruction, probably a pump shaft, at 89m. The current SWL in this hole is 84.8m, suggesting that this bore was abandoned due to lack of available drawdown following the loss of a pump down the hole.

Bore 5942 was drilled as a replacement bore in October 1967 to a depth of 104.2m. The bore was lined with 188mm ID steel casing to 93.3m, and left as open hole to total depth.

CCTV inspection of RN 5942 indicated mild corrosion from the top of casing to 57.4m, increasing to medium level corrosion to 84.2m (SWL). Heavy scaling was present from 90.5 to 93.3m. The hole was silted back to 100.1m, with fractures clearly visible in the limestone at 99m. The PAWA drilling rig was used to clear some of the silt from the bore using a duo-pipe setup, and to line the bore with 143mm ID slotted steel casing between 90.6 and 102.6m. This bore was tested on two occasions with rates up to 12 L/s with only minimal drawdown (less than 10cm). The pump should be set within the 143mm ID casing.
at about 95m.

To avoid confusion, the adjacent bores, 5761 and 5942, have been tagged with the WRD registered number.

4.3 CARPENTARIA HIGHWAY 90.6km.

Bore 6066 was drilled to 167.8m in December 1967 and lined to 129.5m with 188mm ID steel casing. A baler test at the time of drilling indicates that in excess of 2 L/s was available for pumping. The water was encountered below 155.6m with a SWL of 141.8m.

CCTV inspection of this bore shows significant corrosion from 39.8m onwards. The camera could not progress beyond 142.1m. It is possible that a pump with steel cable attached has been dropped in this bore. Attempts to remove this obstruction using the PAWA drilling rig were unsuccessful and replacement bore 28085 was drilled adjacent to it.

Bore 28085, drilled to a total depth of 177.7m encountered Cretaceous claystone and shale to 123m, and dolomitic and limestone beds of the Anthony Lagoon Beds to total depth. Drilling circulation was lost from 147m onwards. This bore was fully lined with 152mm ID steel casing and slotted between 155 and 176m. Subsequent test pumping indicates that this bore will yield in excess of 10 L/s with a pump setting of 160m. Further details are summarised in the Test Report and Composite Log of Bore.

4.4 CARPENTARIA HIGHWAY, 93 and 95km

Bores 27846 (approx. 93km) and 27847 (approx. 95km) were drilled to 178.8m and 200m respectively in October 1991. Both encountered in excess of 100m of Cretaceous siltstone, claystone and shale before intercepting limestone and shale lithologies of the Anthony Lagoon Beds. Bore 27846 lost drilling circulation at 105m. These bores were considered dry at the time of drilling and were subsequently backfilled.
4.5 CARPENTARIA HIGHWAY 123.3KM

RN 6067 was drilled in Cretaceous clays and sandstone to 97.6m and limestone to a total depth of 138.8m in December 1967. This bore was lined to total depth with 6 inch old-style casing and slotted between 130m and total depth (SWL = 125.4m). A CCTV survey has shown that the mild to heavily corroded steel casing has parted at 55.7m and this bore would probably cause problems if pumping were attempted.

4.6 CARPENTARIA HIGHWAY 169.4km - OCTOBER CREEK

RN 6329 was drilled in November 1968 to a depth of 106.7m. This bore encountered 65.5m of Cretaceous sandstone and clay before circulation was lost in probable Anthony Lagoon Beds. The bore was subsequently lined with 188mm ID steel casing to 77.3m.

During pumping by roading contractors bore discharge declined dramatically. This was most likely due to bore silting at high pumping rates. A PAWA contract rig was utilised in October 1991 to airlift this bore. With only poor returns to the surface the bore was observed to have a depth of 109.2m. Subsequent test pumping at 10.6 L/s resulted in further silting of the bore.

In June 1992 a PAWA rig utilising duo-pipe methods was used to clear the bore of silt to total depth and the bore was lined with slotted 143mm ID steel casing from 76.2m to 109.2m. It was observed that the bore produces sand when pumped at more than 7 L/s and therefore the rate should be considered as the maximum recommended.

4.7 CARPENTARIA HIGHWAY 209km.

Bore 27848 was drilled to 101.5m in October 1991. The bore penetrated Cretaceous sediments to 54m and dolomitic and limestone lithologies of the Anthony Lagoon Beds to 70m. Drilling circulation was lost from 70m to total depth. The bore was constructed with 91m of suspended 152mm ID steel casing slotted between 78.8 and 84.9m.

Subsequent test pumping at 13 L/s yielded clear and clean water of potable quality.
4.8 CARPENTARIA HIGHWAY, 248.1km and 259.2km
Two unsuccessful bores were drilled in the Proterozoic Emmerugga Dolomite. Bores 28083 (248.1km) and 28084 (259.2km) were located on lineaments interpreted from aerial photographs, but intercepted only seepage supplies.

5. WATER QUALITY
Water samples were taken for laboratory chemical analysis during the pump test phase of the project. The results are summarised in Table 1. All samples are within health related guidelines set by the National Health and Medical Resource Council and the Australian Water Resources Council. However, total hardness is excessive (guideline value 500 mg/L in bores 6329, 27848, 28082 and 28085). This is unlikely to be detrimental in a road construction situation.

6. RECOMMENDATIONS
It is recommended that:
(1) bores are equipped in accordance with the accompanying Test Reports;
(2) where recommended pump settings are within the slotted section of the casing, then if electric submersible pumps are utilised, these should be shrouded to protect from possible sand intake;
(3) further rehabilitation work should make use of downhole video technology where possible.

REFERENCE
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<th>POTASSIUM, K</th>
<th>CALCIUM, Ca</th>
<th>MAGNESIUM, Mg</th>
<th>TOTAL HARDNESS (AS CaCO₃)</th>
<th>TOTAL ALKALINITY (AS CaCO₃)</th>
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**TABLE 1**

WATER QUALITY DATA

Analysis in milligrams per liter - mg/l. (unless otherwise stated)
WATER RESOURCES DIVISION

TEST REPORT — BORE RN. 5942

Bore Location: CARPENTARIA HIGHWAY. Map: SCARLET HILL 1:100,000 Sheet 5665.
Client: T & W.
Grid Reference: 442 - 968.
Purpose: ROAD CONSTRUCTION.

RECOMMENDATION

Pumping Rate: 11 L/s. Pump Setting: 95 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: Water Resources.
(In all correspondence please refer to bores RN number) Sasco House, DARWIN NT.

BORO DATA

Finished depth: 102.6 m. Completion Date: 27/5/92 Test Date: 16/6/92.
Standing Water Level: 85.15 m. on 16/6/92. Test Rates: 8 L/s.
Construction details:

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<td>90.6 - 102.6 m.</td>
<td>143 mm. ID. steel casing.</td>
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</table>

Test Duration: 16 Hrs.

Notes: 1. Top of casing as constructed was 0.20 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 143 mm.

COMMENTS

1. The above recommendations are based on multi-rate tests up to 10.7 L/s., a constant rate test at 8 L/s. for 16 hrs. and assume hydrological conditions remain constant.

2. Provision to monitor water levels and obtain water samples should be incorporated when equipping this bore.

WATER ANALYSIS

See water laboratory report Analysis No. 92/93/0025.

Prepared by: P. REES. Checked by: R. SANDERS.
16/7/92. 27/7/92.
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 a 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.
<table>
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<tr>
<th>DEPTH (m)</th>
<th>BORE CONSTRUCTION</th>
<th>GRAPHIC LOG</th>
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<th>AQUIFERS (WATER STRUCK)</th>
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<td>143mm ID SLOTTED STEEL CASING</td>
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S.W.L. 85.15m
16/6/1992

11 L/s

COMPOSITE LOG OF BORE 5942
WATER RESOURCES DIVISION

TEST REPORT — BORE RN.6329

Bore Location: OCTOBER CK. Client: T. & W.
Map: OCTOBER. 1:100,000 Sheet 5864. Purpose: ROAD CONSTRUCTION.
Grid Reference: 851 - 607

*** THIS REPORT SUPERSEDES ALL PREVIOUS REPORTS ***

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RECOMMENDATION.

Pumping Rate: 7 L/s Pump Setting: 77 m below Ground Level. General recommendations are given on the reverse side. The aquifer and bore cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: Water Resources. (In all correspondence please refer to bores RN number) Sasco House,
DARWIN NT.

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BORE DATA.

Finished depth: 109.2 m Completion Date: 3/6/92 Test Date: 17/6/92
Standing Water Level: 72.20 m on 17/6/92. Test Rates: 10 L/s
Construction details: Test Duration: 17 hrs

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<td>76.2 - 109.20 m</td>
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Notes: 1. Top of casing as constructed was 0.7 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 143 mm.

*******************************************************************************

COMMENTS.

1. The above recommendations are based on a constant rate test at 10 L/s, for 17 hrs. and assume hydrological conditions remain constant.
2. Provision to monitor water levels and obtain water samples should be incorporated when equipping this bore.
3. This bore will produce sand at rates above 7 L/s.

*******************************************************************************

WATER ANALYSIS. See water laboratory report Analysis No. 92/93/0028.

Prepared by: P. REES TO.1 Checked by: R. SANDERS.
16/7/92. 27/7/92.
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.
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<tr>
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<th>BORE CONSTRUCTION</th>
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<th>STRATA DESCRIPTION</th>
<th>AQUIFERS (WATER STRUCK)</th>
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</table>

S.W.L. 72.20m 17/6/1992

7 L/s

COMPOSITE LOG OF BORE 6329
WATER RESOURCES DIVISION

TEST REPORT — BORE RN. 27848

Bore Location: BROADMERE.  
Map: OT DOWNS. 1:100,000. Sheet 5964.  
Client: ROADS DEPT.  
Purpose: CONSTRUCTION.

RECOMMENDATION.

Pumping Rate: 13 L/s. Pump Setting: 90 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: Water Resources. (In all correspondence please refer to bores RN number)

Sasco House,  
DARWIN NT.

BORE DATA.

Finished depth: 101.5 m. Completion Date: 24/10/91. Test Date: 7/11/91.  
Standing Water Level: 77.8 m. on 3.11.91.

Test Rate: 13 L/s. Test Duration: 6 hrs.

Construction details:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6.50 m.</td>
<td>203 mm. ID. steel casing.</td>
</tr>
<tr>
<td>0 - 78.80 m.</td>
<td>152 mm. ID. steel casing.</td>
</tr>
<tr>
<td>78.80 - 84.90 m.</td>
<td>152 mm. ID. steel slotted casing.</td>
</tr>
<tr>
<td>84.90 - 91.00 m.</td>
<td>152 mm. ID. steel casing.</td>
</tr>
<tr>
<td>91.00 - 101.50 m.</td>
<td>OPEN HOLE.</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.65 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.

COMMENTS.

1. The above recommendations are based on a multi-rate test to 13 L/s., a constant rate test at 13 L/s. for 6 hrs. and assume hydrological conditions remain constant.

2. Provision to monitor water levels and obtain water samples should be incorporated when equipping this bore.

3. This bore is located in a drain 20 m. off the road and may be subject to flooding.

WATER ANALYSIS. See water laboratory report Analysis No. 91/92/0649.

Prepared by: P. REES TO.1  
18/11/91.  
Checked by: R. SANDERS.  
30/7/92.
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 MAP

[Map showing bore location]
COMPOSITE LOG OF BORE 27848
Bore Location: LARRIMAH.
Map: LARRIMAH. 1:100,000. Sheet 5566.
Grid Reference: 095 - 751.

Client: T. & W.
Purpose: ROAD CONSTRUCTION.

*******************************************************************************
RECOMMENDATION. Pumping rate: 15 L/s. Pump Setting: 50 m.
For alternative pumping rates or settings contact: - Water Resources.
In all correspondence please quote bore RN. Darwin NT.

*******************************************************************************
BORE DATA.
Finished depth: 203.2 m. Completion Date: 15/5/92. Test Date: 28/5/92.
Standing Water Level: 45 m. on 28/5/92. Test Rates: 10 L/s.
Construction details:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 54.0 m</td>
<td>203 mm. ID. steel casing.</td>
</tr>
<tr>
<td>54.0 - 120.5 m</td>
<td>203 mm. open hole.</td>
</tr>
<tr>
<td>120.5 - 203.2 m</td>
<td>200 mm. open hole.</td>
</tr>
</tbody>
</table>

Test Duration: 14.6 hrs.

Notes: 1. Top of casing as constructed was 0.45 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 200 mm.
MINIMUM INTERNAL BORE DIAMETER TO RECOMMENDED PUMP SETTING IS 203 mm.

*******************************************************************************
COMMENTS.

1. The above recommendations are based on multi-rate tests to 15 L/s.,
a constant rate test for 14.6 hrs. at 10 L/s. and assume hydrological
conditions remain constant.

2. Provision to monitor water levels and obtain water samples while pumping,
should be incorporated when equipping this bore.

*******************************************************************************
WATER ANALYSIS. No. 91/92/1493.

Prepared by: P. Rees
12/7/92.

Checked by: R. Sanders.
27/7/92.
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 MAP

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.
I POWER
WATER
AUTHORITY

DEPTH (m)  BORE CONSTRUCTION  GRAPHIC LOG  STRATA DESCRIPTION  AQUIFERS (WATER STRUCK)

0.45m

LATERITE and CLAY
SILTY QUARTZ SANDSTONE: yellow/red/white
SILTY QUARTZ SANDSTONE with LIMESTONE bands
QUARTZ SAND: coarse and CLAY: red
MUDSTONE: yellow/red/brown
LOST CIRCULATION
LIMESTONE: yellow/brown moderately weathered fine grained
LIMESTONE: white/grey fine grained
LIMESTONE: yellow/white fine to coarse grained

S.W.L. 45m 28/5/1992

LOST CIRCULATION
(Gamma Log indicates LIMESTONE with intermittent MUDSTONE and SILTSTONE beds to total depth)

15 L/s

COMPOSITE LOG OF BORE 28082
WATER RESOURCES DIVISION

TEST REPORT — BORE RN. 28085

Bore Location: CARPENTARIA HIGHWAY. Client: T. & W.
Map: ARNOLD RIVER. 1:100,000. Sheet 5765. Purpose: ROAD CONSTRUCTION.
Grid Reference: 083 - 831.

RECOMMENDATION.

Pumping Rate: 10 L/s. Pump Setting: 160 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: Water Resources. (In all correspondence please refer to bores RN number) Sasco House, DARWIN NT.

BORE DATA.

Finished depth: 177.7 m. Completion Date: 2/6/92. Test Date: 18/6/92.
Standing Water Level: 154.65 m. on 18/6/92. Test Rates: 7.6 L/s. Test Duration: 13.6 hrs.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6.5 m.</td>
<td>203 mm. ID. steel casing.</td>
</tr>
<tr>
<td>0 - 155.0 m.</td>
<td>152 mm. ID. steel casing.</td>
</tr>
<tr>
<td>155.0 - 176.0 m</td>
<td>152 mm. ID. slotted steel casing.</td>
</tr>
<tr>
<td>176.0 - 177.7 m</td>
<td>152 mm. ID. steel casing.</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.80 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.

COMMENTS.

1. The above recommendations are based on a multi-rate test to 10.7 L/s., a constant rate test at 7.6 L/s. for 13.6 hrs. and assuming hydrological conditions remain constant.
2. Provision to monitor water levels and obtain water samples should be incorporated when equipping this bore.
3. This bore is capable of higher yields. Further advice should be obtained from Water Resources.

WATER ANALYSIS. See water laboratory report Analysis No.92/93/0027.

Prepared by: P. REES. Checked by: R. SANDERS.
16/7/92. 27/7/92.
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 MAP
**COMPOSITE LOG OF BORE 28085**

- **Cemented**
- **Sandy Clay**: white and red
- **Siltstone**: red and white
- **Clay**: red/white and siltstone
- **Clay**: red and white
- **Clay**: grey
- **Shale**: dark grey and clay
- **Limestone with dolomite and mudstone**: pink/white/grey interbeds
- **Limestone with mudstone**
- **Lost circulation**

**Aquifers (Water Struck)**

**Construction Log**

**Graphic Log**

**Description**

- S.W.L.: 154.65m
- 18/6/1992
- 10 L/s