

Condition Assessment of Existing Ground Water Bores

PREPARED FOR

**Orana Water Utilities Alliance
Warrumbungle Shire Council**

PREPARED BY Access Environmental Planning

January 2021



ACCESS ENVIRONMENTAL PLANNING

<i>Proponent</i>	<i>Orana Water Utilities Alliance</i>		
<i>Client</i>	<i>Mid-Western Regional Council</i>		
<i>Purchase Order No</i>			
<i>Document Description</i>	<i>Condition Assessment of Existing Ground Water Bores</i>		
	<i>Name</i>	<i>Signed</i>	<i>Date</i>
<i>Clients Reviewing Officer</i>			
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<i>Location</i>			
<i>Document Status Draft</i>	<i>08/02/2021</i>		
<i>Draft V1.0 Author to Editor Access EP 1st Internal edit</i>	<i>20/11/2020</i>		
<i>Draft V2.0 Report Draft for release for comment to client (Client edit and return)</i>	<i>16/12/2020</i>		
<i>Second internal review and client comment</i>	<i>19/01/2021</i>		
<i>FINAL once latest version of draft approved by client</i>	<i>10/02/2021</i>		
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Assessment of ground water bores has been produced for the Orana Water Utilities Alliance. Any required work will be permitted under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and Regulation 2000 (EP&A Regulation)

Clause 125 of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) permits development, on any public reserve land managed by or vested in the Council, for the purpose of a water supply system to be carried out by or on behalf of the Council without consent.

As this report is an assessment of ground water bores for Local Government Areas, it falls under the provisions of ISEPP and can be assessed under Part 5 of the EP&A Act.

Part 5.1 of the EP&A Act requires the determining authority to examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the proposed activity. Clause 228 (2) of the EP&A Regulation sets out the environmental factors that must be considered in relation to the assessment of the proposal's impacts.

This assessment indicates no environmental or legislative impediments to ongoing maintenance, replacement or improvements to equipment at each bore, assuming adherence to normal Council policy and procedure.

This report is hereby accepted by Council in fulfilment of the requirements of Part 5 of the EP&A Act and will remain valid for two years from the date of final acceptance by Council.

Delegated Officer for the Orana Water Utility Alliance

Introduction

The Orana Water Utility Alliance (OWUA) has engaged Access Environmental Planning (Access EP) to complete an assessment for town water supply bore(s) for four Local Government Areas (LGA), the Council areas assessed were: Warrumbungle, Central Darling, Warren and Walgett Shire Councils (Council). This project was initiated as a result of water shortages experienced during the recent drought, the need for water surety and expressed concern regarding the information available for each bore(s).

This report covers both Stage 1 and Stage 2 as requested by OWUA to present an in-depth assessment and risk rating for each bore. Access EP performed an assessment of the bore performance based on current information gathered from the councils, creating a risk assessment and ranking system to inform decision making on potential repairs and new infrastructure required.

Field visits were performed by Access EP staff in 2020 to gather further information regarding the accessibility of the site, condition of the bore and other issues. These observations further informed the risk ranking system of the bores. In addition to the field investigation, AHIMS and BioNet searches have been completed, giving an overview of the potential threatened species and the occurrence of Aboriginal heritage. Drawing attention to the potential impact work on these sites may have.

This risk ranking system has been based on: the date of construction, diameter of the bore, cementing method, geological strata, pump diameter and yield, water quality, bore casing and pump condition, drawdown data and long-term performance of the bore, monitoring regime for each bore and aquifer characteristics.

Stage 1 of this project included a review of current records obtained from council and the Office of Water to create an initial risk assessment based on this preliminary data. Stage 2 involved gathering more information from outside sources and undertaking site visits to generate a more thorough understanding of the condition of the bore and its order of priority for maintenance, repairs or replacement. This has added additional information to the initial risk assessment of each bore. Stage 3, in-depth field investigations, has not been addressed as the risk assessment and rating in this report will be used to inform what field measurements are required.

This report has been generated to give a thorough understanding of the current condition of water bores used by LGAs under OWUA. It also recommends maintenance and monitoring programs and advises on the urgency of repairs or replacement. It provides an understanding of correct and current maintenance programs that will ensure the longevity of the bore and surety of water supply.

Executive Summary

The proposal

Orana Water Utilities Alliance (OWUA) has commissioned Access Environmental Planning (Access EP) to undertake a bore condition assessment across four Local Government Areas (LGAs), including 15 towns with 31 individual bore sites.

This report provides results for Stage 1 and 2 of the project which includes a desktop study of all available records from the NSW Government and Councils on each bore, to provide an initial risk assessment of the bore. A field visit to each bore site was then undertaken and discussions with Council staff on any other bore information or performance records available followed by review and risk assessment.

The ultimate outcome is a series of recommendations on which bores are high risk and require further investigations including camera or downhole geophysical investigation of casing condition, chemical treatment for iron hydroxide and whether pump testing of bores performance is required.

Table 1: Bores selected by Councils for assessment.

Council/LGA	Bore Location	Number of bores to be assessed
Central Darling	Wilcannia	3
	Ivanhoe	2
Walgett	Walgett	2
	Lightning Ridge	2
	Burren Junction	1
	Rowena	1
	Carinda	1
Warren	Warren	6
	Nevertire	2
Warrumbungle	Coonabarabran	5
	Coolah	4
	Dunedoo	1
	Baradine	2
	Bugaldie	1
	Kenebri	1
		Total: 34

Generic Guide for Maintenance of all Bores

When exploring the options for maintenance and repairs of bores it has been taken into account the fact that many LGA's have not had the capacity, means or need to undertake these measures unless urgently required. Remote councils often experience staff shortages and high rates of staff turnover which causes minor maintenance work, like regular monitoring of a well functioning bore, to be overlooked until water shortages such as those experienced in the last four years, occur.

With the limiting factors taken into consideration, suggested maintenance regimes should streamline processes, ensure reliable records are kept and ensure water security. Many of bores the have been

recommended to have camera inspections performed. While this process has many positive attributes and can be informative about the condition of the well, it must be taken into consideration against the cost of new infrastructure. This will be a particular issue with older bores as they will often have undetected faults and the cost of a camera inspection will be comparable to constructing a new bore.

Priority should be given to transition all bore pumps within the OWUA, or at least within each LGA, to one reputable pump manufacturer as this will standardise and streamline the process when pump maintenance is required. A limiting factor faced within this project was the inability to access information about these bores. It would be in the interest of each council to develop a centralised cooperative for data collection regarding licensing and maintenance that is managed by one central entity and will ensure information is organised and accessible for future use.

For town water supplies a preventative maintenance monitoring schedule is recommended. The frequency of monitoring will depend on the specific council’s ability to access alternative water supplies should the bore fail and whether the bore is pumping near the capacity of the aquifer. There is a generic guide on the monitoring process including the suggested frequency of monitoring for a town water bore. The actual frequency needs to be tailored to meet the needs of each individual bore.

Discussion

This report will give those responsible for the operation of bores an understanding of the importance of correct monitoring and regular assessment of pumps and column condition. These practices will maximise efficiency and longevity of bores.

In addition to the field investigation, AHIMS and BioNet searches have been completed, giving an overview of the potential threatened species and the occurrence of Aboriginal heritage. Drawing attention to the potential impact work on these sites may have. It has been found that no Aboriginal Heritage or potential threatened species will be impacted through any work.

Depending on bore design flow rate, drawdown and water quality should be monitored at regular intervals. Ideally these protocols should occur quarterly or at least annually. The monitoring can identify potential problems in bore performance and can help determine why the bore performance has deteriorated. It will also assist in the management and collection of more accurate records.

Glossary of Terms and Abbreviations

Term	Meaning
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BC	Act Biodiversity Conservation Act 2016
CEMP	Construction Environmental Management Plan
CLM	Act Crown Land Management Act 2016
CMP	Conservation Management Plan
DAWE	Department Agriculture, Water and the Environment
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement

EMP	Environmental Management Plan
EP&A	Act Environmental Planning and Assessment Act 1979
EP&A	Reg Environmental Planning and Assessment Regulation 2000
EPA	Environment Protection Authority
EPBC	Act Environment Protection and Biodiversity Conservation Act 1999
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
FM	Act Fisheries Management Act 1994
GAB	Great Artesian Basin
ISEPP	State Environmental Planning Policy Infrastructure 2007
KTP	Key Threatening Processes
LEP	Local Environmental Plan
LGA	Local Government Area
MG/L	Milligram per Litre
NES	National Environmental Significance
NP&W	Reg National Parks and Wildlife Regulation 2009
NP&W	Act National Parks and Wildlife Act 1974
NRAR	Natural Resources Access Regulator
NT Act	Commonwealth Native Title Act 1993
POEO	Protection of the Environment Operations Act 1997
REF	Review of Environmental Factors
REP	Regional Environmental Plan
RF	Act Rural Fires Act 1997
RO	Reverse Osmosis
SCA	State Conservation Area
SEPP	State Environmental Planning Policy
SS	Stainless Steel
SWL	Standing Water Line
TfNSW	Transport for NSW
TSR	Travelling Stock Route (or Reserve)
WARR	Act Waste Avoidance and Resource Recovery Act 2001
WHS	Work Health and Safety Act 2011

WHS MaPS Act Work Health and Safety (Mines & Petroleum Sites) Act 2013

Note: DPIE Superseded Office of Environment and Heritage (OEH), July 2019

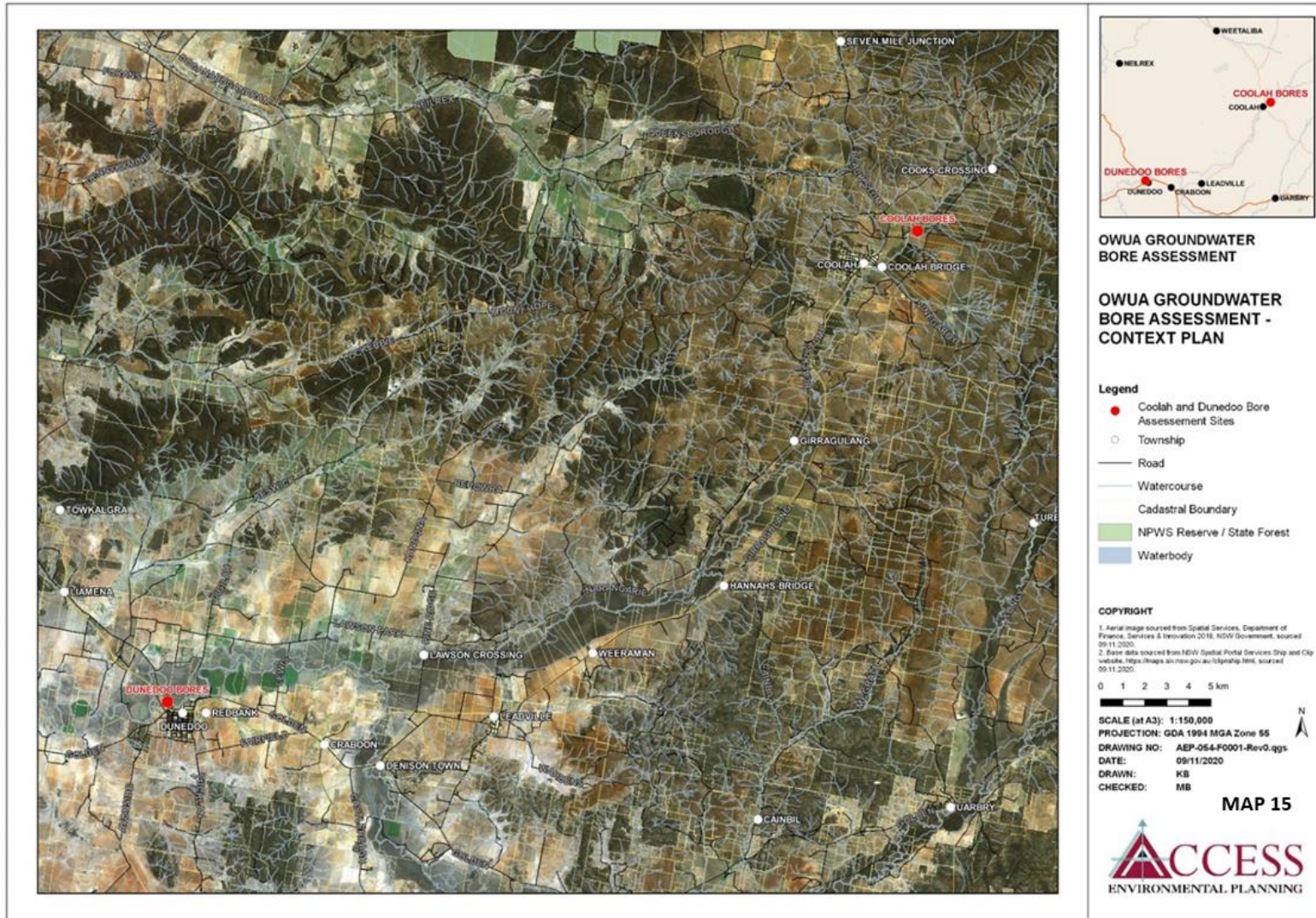
TfNSW Superseded Roads and Maritime Services (RMS), December 2019

Any reference to OEH and RMS in the document relate to published documents or existing databases.

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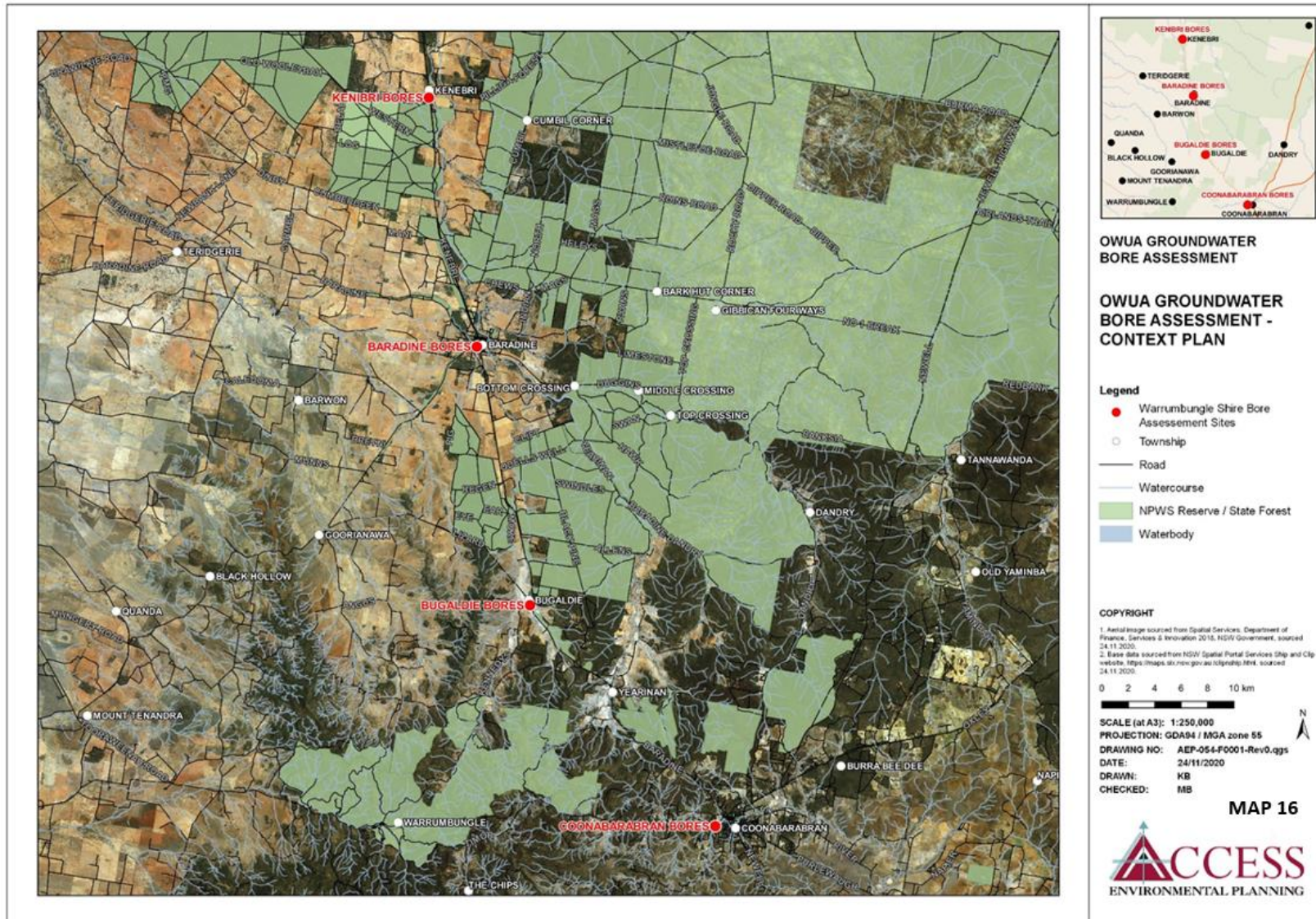
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1. Warrumbungle Shire Council



Map 15: Warrumbungle Bore Sites

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.



Map 2: Coonabarabran, Kenebri and Bugaldie and Baradine

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.

Bore	Bore Number	Recommendation	Comments	Conclusion (risk rating)
Coonabarabran Bore 1 – Robertson Street		<ul style="list-style-type: none"> Camera inspection to identify details about the bore. 		
Coonabarabran Bore 2 – Namoi Street South	GW00613	<ul style="list-style-type: none"> Camera inspection and pump test to monitor bore performance 	Insufficient records, the bore is accessing sandstone	Moderate/high risk
Coonabarabran Bore 3 – Namoi Street North		<ul style="list-style-type: none"> Camera inspection to identify details about the bore. 		
Coonabarabran Bore 4 – Namoi Street North		<ul style="list-style-type: none"> Camera inspection to identify details about the bore. 		
Coonabarabran Bore 6, Water Plant		<ul style="list-style-type: none"> Camera inspection to identify details about the bore. 		
Coolah Old bore	GW027577 80CA716940			
Coolah Town Wells	GW80090	<ul style="list-style-type: none"> Camera inspection recommended and consider a stage pump test to record bore performance. 	Not enough information to make a full risk assessment. It is cased in sedimentary rock.	Low/moderate risk
Coolah back-up Well	GW026813 80CA716940			
Coolah Extra Well	GW059176			
Dunedoo Town Well	GW059164 80CA71638	<ul style="list-style-type: none"> A camera inspection on this bore and possibly a stage pump test and keep annual records of bore to monitor bore performance 	There is a presence of a white material on the pump column (possibly calcium). The age of the bore may affect the performance of the bore.	Moderate risk
Baradine Bore Main Supply	GW273121	<ul style="list-style-type: none"> Recommend a camera inspection to ensure iron and manganese fouling is not occurring in the bore. 	Bore is only 11 years old, good design, low risk.	Low risk
Baradine Back-up Bore	GW025187	<ul style="list-style-type: none"> Recommend Camera inspection and start performance records of bore. 	Bore design is high risk but in sub artesian areas, reducing the risk rating.	Moderate risk
Bugaldie Bore				

Kenebri Bore	GW007716 90CA833298	<ul style="list-style-type: none"> Recommend camera inspection and start recording bore performance drawdown and yield 	This bore has had some sand problems in the past but has performed well considering its age.	High risk
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The Coolah Town Well and the Baradine Main Supply Bore are considered low to low/moderate risk. This is due to the type of rock the bore has been drilled into and the young age of the bore. A camera inspection and pump test have been recommended to assess the condition of the bore and to ensure manganese and iron fouling is not occurring.

The Dunedoo Town Well and the Baradine Back-up Bore are moderate risk, due to the age of the bores and the possible presence of calcium. Camera inspections and regular monitoring programs are recommended for these bores.

Coonabarabran Bore 2 and the Kenebri Bore are considered moderate/high to high risk. This is due to the old age of the bores, the material the bores are constructed with and the construction methods. Camera inspection is recommended for these bores but, given their age, Council should weigh the costs of this against full replacement.

Access EP is unable to provide a risk rating for the remaining bores due to the lack of available information. Councils should refer to Appendix A and B when performing their own risk assessment for management of these bores.

Coonabarabran



Map 3: Coonabarabran Bores

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.

As information is available for only one bore in Coonabarabran, this is the only one that was risk assessed by Access EP. Appendix 4B shows information available from the Water NSW website for the Coonabarabran bore. Bore locations are shown in Map 17. A camera investigation is recommended to confirm the accuracy of information supplied by Water NSW.

Bore 1 - Robertson Street

This bore is located at the end of Robertson St, Coonabarabran. There is limited information available about this bore. The column was replaced 3 years ago and has not had issues since.

Recommendation

Camera inspection to identify details about the bore.

Field Inspection Details

GPS Coordinates	Latitude: -31.27307800 Longitude: 149.27447100
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	NA
Pump-test data available. Stage and constant test	NA
Water Quality Data	NA
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	NA
Any records of pumping sand or turbid water	NA
Any monitoring program, maintenance checks, frequency	NA
Any records of pumping problems	NA
Type of pump	Submersible
Pump depth setting	NA
Type of pump column and diameter	Poly pipe
Cleanliness of pump column when pulled. Any red or brown ochre colour?	NA
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	NA
Additional comments	Column is 3 years old



Figure 1 - Coonabarabran Robertson Street Bore

Bore 2 – Namoi St South

Bore Number: GW003613

This bore is located on the Castlereagh River, to the south of the Camp Street and Namoi Street intersection. It is 36.6 m deep and has been tested to yield 2-3 L/s. It is located on public land but is locked in a cage.

Recommendations

Bore is high risk due to age and the mild steel casing. Recommend a Camera inspection and pump test to monitor bore performance.

Field Inspection Details

GPS Coordinates	Latitude: -31.27224100 Longitude: 149.27201000
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	NA
Pump-test data available. Stage and constant test	2-3 L/s
Water Quality Data	Checked annually
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	Replaced pump 2 years ago No problems since replacement
Any records of pumping sand or turbid water	NA
Any monitoring program, maintenance checks, frequency	Checked periodically
Any records of pumping problems	NA
Type of pump	Submersible
Pump depth setting	20-30 m
Type of pump column and diameter	Poly pipe
Cleanliness of pump column when pulled. Any red or brown ochre colour?	NA
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	NA
Additional comments	

Risk Assessment

Condition of casing well cap and slab	Good condition
Well age	82 years old, high risk
Well type	Low to moderate risk
Screen material	Assume slotted, high risk
Bore material	Moderate/high risk
Pump depth setting	20-30 meters
Bore cementing	No record
Water quality	No record
Iron level	No record
Salinity Level	No record
Relationship of pump depth setting and screen level to Iron Hydroxide potential	Moderately high risk, pump is in slotted casing area
Comments	Not enough records, the bore us accessing sandstone
Conclusion	Moderate/high risk



Figure 2 - Coonabarabran Namoi Street South Bore

Bore 3 – Namoi St North

This bore is located on the northern side of the Castlereagh River, to the east of Namoi Street adjacent to the old bore. There is limited information about these bores.

Recommendation

Camera inspection to identify details about the bore.

Field Inspection Data

GPS Coordinates	Latitude: -31.26889100 Longitude: 149.27073800
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	NA
Pump-test data available. Stage and constant test	NA
Water Quality Data	Checked annually
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	NA
Any records of pumping sand or turbid water	NA
Any monitoring program, maintenance checks, frequency	PVC Casing
Any records of pumping problems	NA
Type of pump	NA
Pump depth setting	NA
Type of pump column and diameter	NA
Cleanliness of pump column when pulled. Any red or brown ochre colour?	NA
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	NA
Additional comments	



Figure 3: Coonabarabran Namoi St North Bore 3

Bore 4 – Namoi St North This bore is located further north on Namoi Street on Lot 1, DP 1085566 Coonabarabran. This bore does not yield much water and pumps a small amount of sand. Due to this it is used as a backup water supply.

Recommendation

Camera inspection to identify details about the bore.

Field Inspection Details

GPS Coordinates	Latitude: -31.26823700 Longitude: 149.27041700
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	NA
Pump-test data available. Stage and constant test	NA
Water Quality Data	Checked annually
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	Never had a problem – doesn't provide much water Water level about 6 meters above the pump
Any records of pumping sand or turbid water	A little sand
Any monitoring program, maintenance checks, frequency	NA
Any records of pumping problems	NA
Type of pump	Submersible pump
Pump depth setting	
Type of pump column and diameter	Poly pipe
Cleanliness of pump column when pulled. Any red or brown ochre colour?	Low iron
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	Power is underground
Additional comments	



Figure 4 - Coonabarabran Namio St North Bore 4

Number 6, Water Plant

The water plant is located on Timor Rd, 1.4 km west of the Coonabarabran town centre. It is the major water supply for Coonabarabran. This bore has had minimal issues after the pump replacement in 2015. There is limited information available on this bore.

Recommendation

Camera inspection to identify details about the bore.

Field Inspection Data

GPS Coordinates	Latitude: -31.27471500 Longitude: 149.26150700
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	NA
Pump-test data available. Stage and constant test	NA
Water Quality Data	Checked annually
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	Pump replaced in 2015
Any records of pumping sand or turbid water	Clean
Any monitoring program, maintenance checks, frequency	Monitored as needed
Any records of pumping problems	NA
Type of pump	Submersible pump
Pump depth setting	20 m
Type of pump column and diameter	Poly pipe
Cleanliness of pump column when pulled. Any red or brown ochre colour?	clean
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	No overhead powerlines
Additional comments	Bore not in shed



Figure 5 - Coonabarabran Water Plant Bore

Coolah



Map 4: Coolah Bores

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.

The Coolah Bores are located on Town Wells Rd, off Coolah Creek Rd, 3.2km north-east of Coolah. They are located within a locked compound and are used for the town water supply. Due to there being four bores available to the council the risk of a water shortage due to a bore failure is minimal. The bores in use are in good, working order.

Coolah – Old Bore

Bore Number: GW027577

Licence Number: 8OCA716940

Field Inspection Details

GPS Coordinates	Latitude: -31.81175000 Longitude: 149.74324000
Date of Inspection	07/10/2020
Original Form A or Drill log or Bore Sketch	Capped / decommissioned
Pump-test data available. Stage and constant test	NA
Water Quality Data	NA
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	NA
Any records of pumping sand or turbid water	NA
Any monitoring program, maintenance checks, frequency	NA
Any records of pumping problems	NA
Type of pump	NA
Pump depth setting	NA
Type of pump column and diameter	300mm (12")
Cleanliness of pump column when pulled. Any red or brown ochre colour?	NA
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	Good accessibility to site. No overhead powerlines
Additional comments	



Figure 6 - Coolah Old Bore

Coolah Town Wells

Bore Number: GW800090

This bore was drilled in 1996 to a depth of 70.1 m. It is the major water supply for Coolah.

Recommendation

The bore is a low to moderate risk as it is cased in sedimentary rock. Unclear what is in the annulus if any material. A camera inspection is recommended and a stage test to record bore performance should be considered.

Field Inspection Details

GPS Coordinates	Latitude: -31.81169900 Longitude: 149.74299000
Date of Inspection	07/10/2020
Original Form A or Drill log or Bore Sketch	Appendix 4B
Pump-test data available. Stage and constant test	Flow is recorded
Water Quality Data	6 monthly quality test Sampling of raw water for turbidity Hard water
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	NA
Any records of pumping sand or turbid water	NA
Any monitoring program, maintenance checks, frequency	NA
Any records of pumping problems	NA
Type of pump	Submersible
Pump depth setting	70 m
Type of pump column and diameter	Steel pipe
Cleanliness of pump column when pulled. Any red or brown ochre colour?	NA
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	Screens located at 16-54 m
Estimate of specific capacity of the well. Flow rate vs drawdown	Water table at 6 m Water level: off 13m on 4m
Site details including accessibility	Powerlines are an adequate distance away from bore
Additional comments	Commissioned November 1996

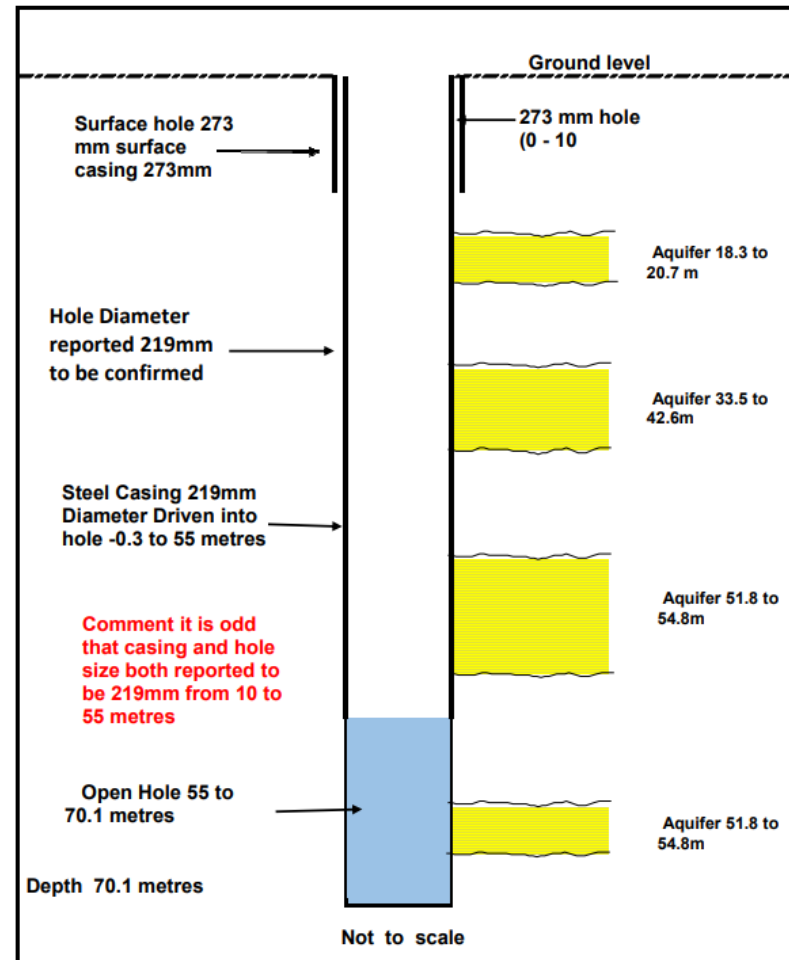
Risk Assessment

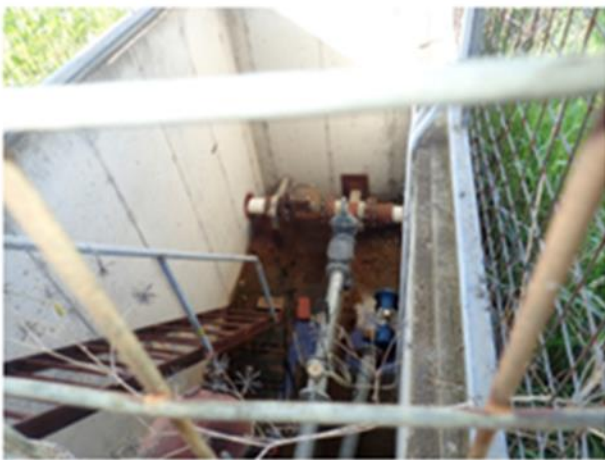
Condition of casing, well cap and slab	Unknown
Well age	24 years, low/moderate risk
Well type	Low risk
Screen type	Slotted casing, low/moderate risk
Bore material	Mild steel, moderate/high risk
Pump depth setting	NA
Bore cementing	No
Gravel pack or natural pack	Gravel pack, sedimentary rock
Water quality	No record
Iron level	No record
Salinity level	No record
Relationship between pump depth setting and screen level on Iron Hydroxide potential	No record
Comments	Not enough information to make a full risk assessment. A camera inspection is suggested
Conclusion	Low/moderate risk



BORE CONSTRUCTION DETAILS

GW800090
Coolah TWS Bore 2





Coolah Back-up Well

Bore Number: GW026813

Licence Number: 80CA716940

This bore was drilled in 1965 10 10.1 m and yields 12.63 L/s.

Field Inspection Details

GPS Coordinates	Latitude: -31.81165500 Longitude: 149.74277800
Date of Inspection	07/10/2020
Original Form A or Drill log or Bore Sketch	Appendix 4B
Pump-test data available. Stage and constant test	NA
Water Quality Data	NA
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	NA
Any records of pumping sand or turbid water	NA
Any monitoring program, maintenance checks, frequency	NA
Any records of pumping problems	The gantry has been identified as needing to be replaced.
Type of pump	Submersible
Pump depth setting	NA
Type of pump column and diameter	Steel pipe – 1800 mm
Cleanliness of pump column when pulled. Any red or brown ochre colour?	NA
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	5 m water table
Additional comments	9 m to sandstone



Figure 7 - Coolah Back -up Well

Coolah – Extra Well

Bore Number: GW059176

This bore was drilled in 1963 to 11.5 m, with a standing water level at 4.5 metres.

Field Inspection Details

GPS Coordinates	Latitude: -31.81157500 Longitude: 149.74199800
Date of Inspection	07/10/2020
Original Form A or Drill log or Bore Sketch	NA
Pump-test data available. Stage and constant test	NA
Water Quality Data	NA
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	NA
Any records of pumping sand or turbid water	NA
Any monitoring program, maintenance checks, frequency	NA
Any records of pumping problems	NA
Type of pump	NA
Pump depth setting	NA
Type of pump column and diameter	NA
Cleanliness of pump column when pulled. Any red or brown ochre colour?	NA
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	NA
Additional comments	6 ft hole/well



Figure 8 - Coolah Extra Well

Dunedoo



Map 5: Dunedoo Bores

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.

Dunedoo Town Well Bore

The Dunedoo Town Well Bore is located 600 m north of Balaro Street in Dunedoo. The Old and New Bores are both utilised. It is monitored regularly resulting in few products. The New Bore was drilled in 1963 and yields 29.18 L/s. It was drilled to 50 m with the final depth of the bore being 38 m.

Bore Number: GW059164

Licence Number: 80CA716938

Recommendation

The bore is at moderate risk and due to its old age and a camera inspection is recommended, possibly in conjunction with a stage pump test, with retention of annual records to monitor bore performance over the long term.

Field Inspection Details

GPS Coordinates	Latitude: -32.01176500 Longitude: 149.38823600
Date of Inspection	07/10/2020
Original Form A or Drill log or Bore Sketch	Appendix 4B
Pump-test data available. Stage and constant test	Draws down, flow
Water Quality Data	Chlorine, pH & turbidity checked daily Liquid chlorine dosing changing to gas
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	Had pump replaced in the past
Any records of pumping sand or turbid water	No
Any monitoring program, maintenance checks, frequency	Flow, depth & water length checked daily
Any records of pumping problems	NA
Type of pump	Submersible
Pump depth setting	
Type of pump column and diameter	Steel pipe column
Cleanliness of pump column when pulled. Any red or brown ochre colour?	White film on new pump
Details of pump and pump column diameter fittings	Casing 342 mm
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	Good clearance from powerlines
Additional comments	Switch between new and old bore monthly

Risk Assessment and Bore Sketch

Condition of casing, well cap and slab	Bore is in a pit, corrosion of surface casing could be an issue
Well age	37 years, moderate risk
Well type	Low risk
Screen type	Telescopic screen, low/moderate risk
Bore material	Mild steel, moderate/high risk
Pump depth setting	No record
Bore cementing	No
Gravel pack or natural pack	Natural pack, moderate/high risk
Water quality	No record
Iron level	No record
Salinity level	No record
Relationship of pump depth setting and screen level to iron hydroxide potential	No record
Comments	There is a presence of a white material on the pump column (possibly calcium)
Conclusion	Moderate risk

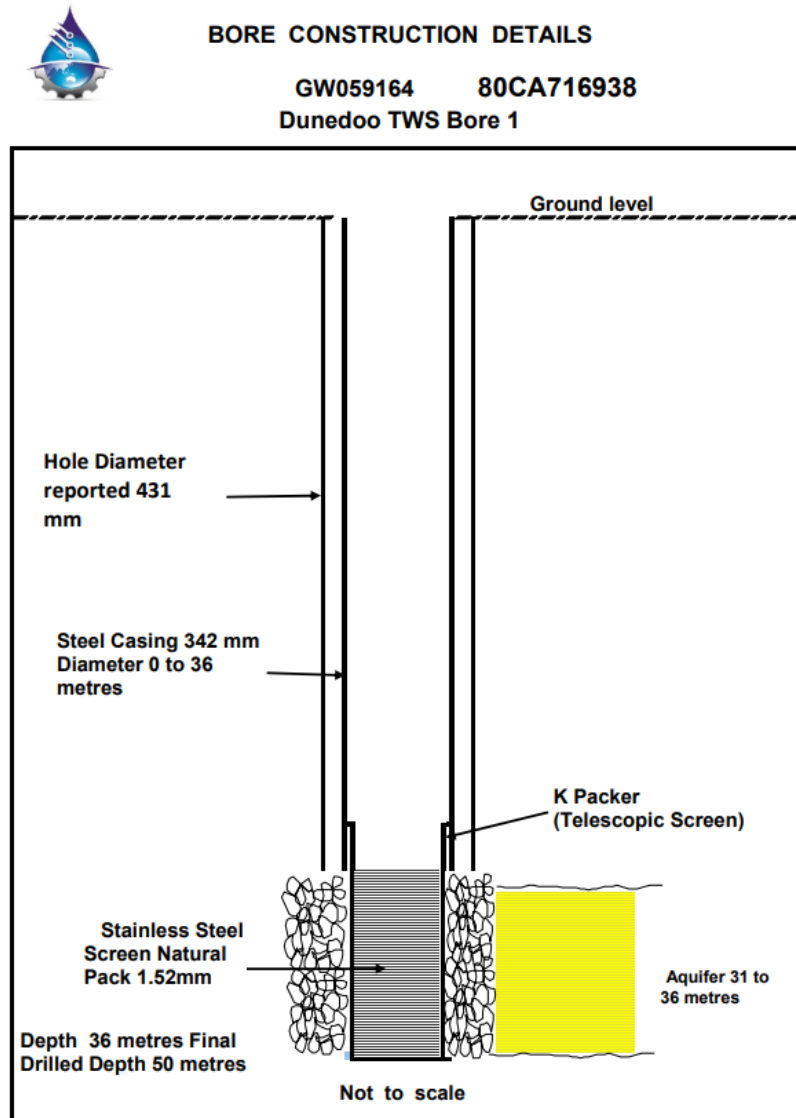




Figure 9 - Dunedoo Town Water Bore

Baradine



Map 6: Baradine Bores

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.

Baradine Main Supply

This bore is located on the corner of Walker St and Narren St. On the southern outskirts of Baradine. This is the major supply for Baradine. It was constructed in 2009 to a depth of 216 m.

Bore number: GW273121

Recommendation

Camera inspection recommended to ensure iron and manganese fouling is not occurring in the bore.

Field Inspection Details

GPS Coordinates	Latitude: -30.95349300 Longitude: 149.06805200
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	Appendix 4B
Pump-test data available. Stage and constant test	NA
Water Quality Data	Iron and manganese tested daily Turbidity tested annually High iron and manganese
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	No issues in 12 years - Old bore collapsed
Any records of pumping sand or turbid water	
Any monitoring program, maintenance checks, frequency	Running full-time - 10-12 hours/ day in summer - 4-5 hours/ day in winter
Any records of pumping problems	NA
Type of pump	Submersible
Pump depth setting	200 m
Type of pump column and diameter	Stainless steel welded
Cleanliness of pump column when pulled. Any red or brown ochre colour?	Has not been removed in 12 years
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	No sand
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	NA
Additional comments	

Risk Assessment and Bore Sketch

Condition of casing, well cap and slab	Low risk
Well age	11 years
Bore Reconditioned	No
Well Design	Low risk, cemented to 180 m and sub artesian
Screen material	Slotted casing, low risk
Bore material	Mild steel, low risk, cemented
Dissimilar metals	No
Bore cementing	Cemented to 180 m, surface casing, low risk
Water quality	No record
Iron level	No record, high in iron and manganese
Salinity level	No record
Relationship of pump depth setting and screen level to iron hydroxide potential	No record
Comments	Bore is only 11 years old, good design, low risk
Conclusion	Low risk

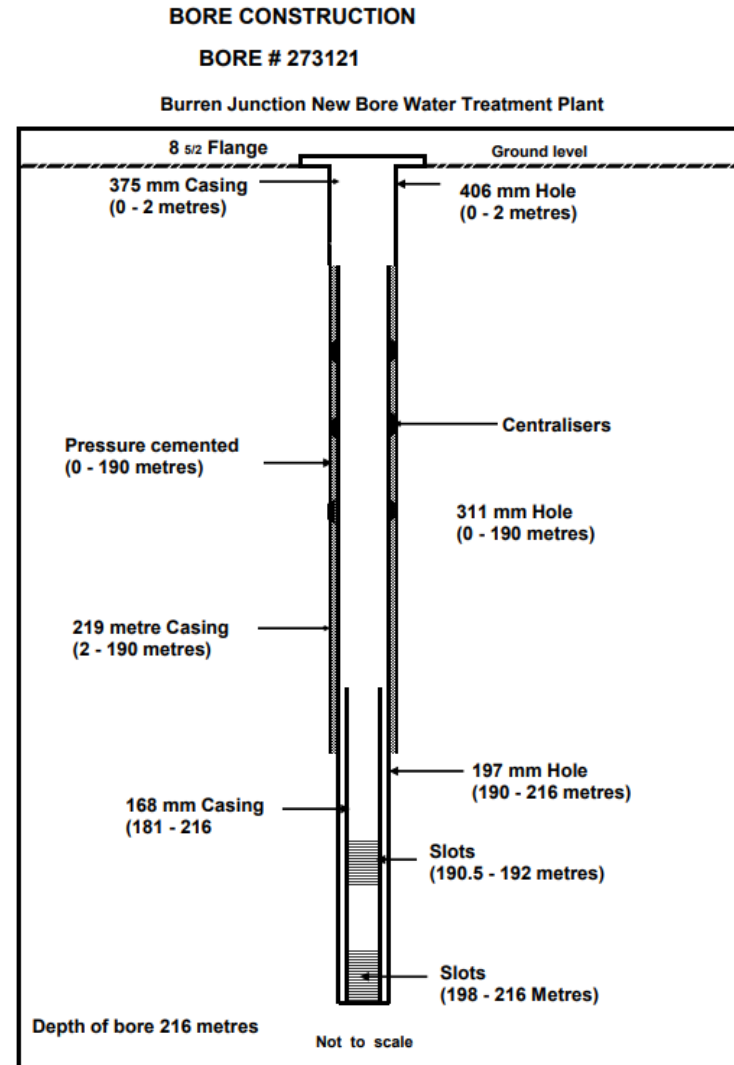




Figure 10 - Baradine Main Supply Bore

Baradine Back up Bore

This bore is located on lot 1 DP 177865 off Wellington Street. This is the back-up supply for the town and is not used often. It was drilled in 1968 to 220.9 m and yields 20.18 L/s.

Bore Number: GW025187

Recommendation

Recommend Camera inspection and start performance records of bore.

Condition of casing, well cap and slab	Bore in brick building and concrete slab
Well age	52 years
Bore Reconditioned	No
Well Design	High risk, cemented to 93 m only with a liner to 220 m
Screen material	Slotted casing, low risk
Bore material	Mild steel, moderate risk
Dissimilar metals	No
Bore cementing	Only cemented surface casing to 93 m
Water quality	No record
Iron level	No record
Salinity level	No record
Relationship of pump depth setting and screen level to iron hydroxide potential	No record
Comments	Bore design is high risk but in sub artesian areas, less risk
Conclusion	Moderate risk



Figure 11 - Baradine Back-up Bore

Bugaldie



Map 7: Bugaldie Bore

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.

Bugaldie Bore

This bore is the only water supply for Bugaldie. It is located on Lot 1 DP 417380, along Baradine Road. There have been no issues since the pump replacement 12 months ago.

Field Inspection Details

GPS Coordinates	Latitude: -31.12535400 Longitude: 149.11087200
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	NA
Pump-test data available. Stage and constant test	NA
Water Quality Data	Electrical conductivity, iron content and manganese tested annually
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	Pump replaced twice in the last 12 years – worn out
Any records of pumping sand or turbid water	No sand
Any monitoring program, maintenance checks, frequency	NA
Any records of pumping problems	NA
Type of pump	Submersible
Pump depth setting	1.5 HP 7m approximately
Type of pump column and diameter	Poly pipe
Cleanliness of pump column when pulled. Any red or brown ochre colour?	Some iron, not a major issue
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	NA
Additional comments	

- 1.
- 2.



Figure 12 - Bugaldie Bore

Kenebri Bore
Kenebri



Map 8: Kenebri Bore

Disclaimer: The cadastral boundaries present on these images are indicative of the maps and are not to be used for survey purposes.

This bore is located along Kenebri Road 800 m south of Wangmans Road. It is the only water source for this community but it only services a small number of homes. It was constructed in 1949 to a depth of 47.2 m and yields 1.23 L/s.

Bore number: GW007716

Licence Number: 90CA833298

Recommendation

This bore is high risk due to old age and old bore design. Recommend camera inspection and start recording bore performance drawdown and yield.

Field Inspection Data

GPS Coordinates	Latitude: -30.78077300 Longitude: 149.02330400
Date of Inspection	14/10/2020
Original Form A or Drill log or Bore Sketch	Appendix 4b
Pump-test data available. Stage and constant test	NA
Water Quality Data	Iron, sand & algae
Camera or previous geophysical investigations	NA
Any maintenance issues in the past	New pump 4 years ago
Any records of pumping sand or turbid water	Some sand
Any monitoring program, maintenance checks, frequency	Annually for chemical & microbiology testing
Any records of pumping problems	Two pumps have been replaced due to contamination and sand No issues since
Type of pump	Submersible pump
Pump depth setting	40-50 m
Type of pump column and diameter	Poly pipe
Cleanliness of pump column when pulled. Any red or brown ochre colour?	Iron & algae – manganese
Details of pump and pump column diameter fittings	NA
Any signs of pumping sand from bore	NA
Any examples of old pump column left near the bore indicating possible iron or corrosion issues with pump column	NA
Estimate of specific capacity of the well. Flow rate vs drawdown	NA
Site details including accessibility	Bore is in a shed
Additional comments	

Risk Assessment

Condition of casing, well cap and slab	Low risk, no obvious surface problems
Well age	71 years, high risk
Well type	Low/moderate risk
Screen type	Assume slotted casing and open hole bottom, 4 m
Bore material	Mild steel, moderate/high risk
Pump depth setting	No record
Bore cementing	No
Gravel pack or natural pack	Sedimentary rock
Water quality	Some comments on iron and sand, no data recorded
Iron level	No record
Salinity level	No record
Relationship of pump depth setting and screen level to iron hydroxide potential	No record
Comments	This bore has had some sand problems in the past
Conclusion	High risk



Figure 13 - Kenebri Bore

Conclusion

This project was undertaken by Access Environmental Planning on behalf the Orana Water Utility Alliance. A report covering Stage 1 and 2, of this project, has been presented with a full assessment of existing data and site information for each bore. Stage 1 incorporated a detailed review of available records for each bore, to understand their condition and analyse risk factors. Stage 2 involved site visits to each bore to gather more information and consolidate the risk estimation. Aggregation of all data resulted in a determination of risk rating and reflection on potential threat to water surety.

The site inspections were undertaken from October to December 2020. The LGA's visited include Central Darling, Walgett, Warren and the Warrumbungle. The field inspection allowed Access EP to gather information from Council staff that adds accuracy to the report.

The risk ranking given to each bore was determined by assessing the date of construction, diameter of the bore, cementing method, geological strata, pump diameter and yield, water quality, bore casing and pump condition, drawdown data, long-term performance and current monitoring regime. This system gave a ranking from low risk to high risk. Bores considered to be low risk are in good working order while those considered to be high risk require a large amount of maintenance or possibly replacement.

This report has been generated to give a thorough understanding of the current condition of water bores used by regional Councils. It also recommends maintenance and monitoring programs and advises on the urgency of repairs or replacement. It provides an understanding of correct and current maintenance programs that will ensure the longevity of the bore and surety of a water supply.

Thank you

The team at Access Environmental Planning would like to thank all Council staff for their cooperation during this process. The entire procedure was well received. We are appreciative of the help and support provided to us when collecting data and during on-site visits as this demonstrated a genuine commitment to this project and ensuring the presentation of a high-quality product. Without this ongoing support this project would not have been possible. It was a pleasure to work closely with Council staff and the level of professionalism demonstrates the commitment the LGA body has to their community.

Appendix 4a: Additional Information for Bores

Bore Number	Licence Number	Date of Drilling	Drilling Method	Depth of Bore	Casing depth and material	Screen Depth and Type	Annular Material	Original SWL	Reported Yield
Coolah Town Wells									
GW800090		14/01/1996	Rotary	70.1 m	0 – 55.5m Welded Steel	15.2 – 54.8 m	Gravel		
Coolah Old Bore									
GW027577	80CA716940	01/02/1967		9.3 m	0 – 9.3 m Concrete cylinder		Cemented	5.2 m	18.95 L/s
Coolah Back-up Well									
GW026813	80CA716940	01/04/1965	Hand Dug	10.1 m	0-10.1 m Concrete cylinder		Cemented	5.2 m	12.63 L/s
Coolah Extra Well									
GW059176		01/12/1983	Rotary	11.5 m	0 – 9.5 m Welded steel	9.5–11.5 m Stainless steel	Gravel	4.5 m	
Dunedoo Town Water Bore (Old)									
GW059164	80CA716938	01/12/1983	Rotary Mud	38 m	0 – 31 m Welded Steel	31 – 36 m Stainless steel	Gravel	8.6 m	29.18 L/s
Coonabarabran – Namoi St South									
GW003613		01/10/1938	Cable Tool	36.6 m	0 – 12.9 m -0.2 -12.9 m Threated steel			5.9 m	5.05 L/s
Baradine Main Supply									
GW273121		19/09/2009	Rotary Mud	216 m	0-216 m Steel	190.5-192 m 198-216 m Gauze/mesh	Cemented		
Baradine Backup bore									
GW025187		01/07/1968	Rotary Mud	221 m	0-220.8 m Welded Steel	97.5-220.9 m	Cemented	28.8 m	20.18 L/s
Kenebri Bore									
GW007716	90CA833298	01/03/1949	Cable Tool	47.2 m	-0.5-43.4 m Threaded steel			21.3m 25.9 m	1.23 L/s

Appendix 4b: Work Summary Reports

WaterNSW Work Summary

GW003613

Licence:	Licence Status:
	Authorised Purpose(s):
	Intended Purpose(s): PUBLIC/MUNICIPAL
Work Type: Bore - GAB	
Work Status: Supply Obtained	
Construct.Method: Cable Tool	
Owner Type: Local Govt	
Commenced Date:	Final Depth: 36.60 m
Completion Date: 01/10/1938	Drilled Depth: 36.60 m
Contractor Name: (None)	
Driller:	
Assistant Driller:	
Property:	Standing Water Level: 5.900 (m)
GWMA:	Salinity Description: Fresh
GW Zone:	Yield (L/s): 5.050

Site Details

Site Chosen By:			
Form A: GOWEN	County: GOWEN	Parish: COONABARRABRAN	Cadastre: 7030/1002143
Licensed:			
Region: 80 - Macquarie-Western	CMA Map: 8735-S	Scale:	
River Basin: 420 - CASTLEREAGH RIVER	Grid Zone:		
Area/District:			
Elevation: 0.00 m (A.H.D.)	Northing: 6537990.000	Latitude: 31°16'20.4"S	
Elevation Source: Unknown	Easting: 716306.000	Longitude: 149°16'19.2"E	
GS Map: -	MGA Zone: 55	Coordinate Source: GD_ACC.MAP	

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralsers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.20	12.90	203			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
15.80	23.40	7.60	(Unknown)	5.90		5.05			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.91	0.91	Soil	Soil	
0.91	7.92	7.01	Sand Silt	Sand	
7.92	21.95	14.03	Sandstone Water Supply	Sandstone	
21.95	23.16	1.21	Gravel Water Supply	Gravel	
23.16	23.47	0.31	Hard Water Supply	Unknown	
23.47	26.21	2.74	Shale	Shale	
26.21	35.05	8.84	Shale Sticky	Shale	
35.05	36.58	1.53	Driller	Unknown	

Remarks

01/11/1983: COONABARRABRAN TWS

*** End of GW003613 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW Work Summary

GW027577

Licence: 80CA716940

Licence Status: EXPIRED

Authorised Purpose(s): TOWN WATER SUPPLY
Intended Purpose(s): PUBLIC/MUNICIPAL

Work Type: Well
Work Status:
Construct.Method:
Owner Type: Local Govt

Commenced Date:
Completion Date: 01/02/1967

Final Depth: 9.30 m
Drilled Depth: 9.30 m

Contractor Name: (None)
Driller:
Assistant Driller:

Property: COOLAH T W S NSW
GWMA: 019 - COOLABURRAGUNDY -
TALBRAGER VALLEY
GW Zone: -

Standing Water Level
(m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

County: BLIGH
Form A: BLIGH
Licensed: BLIGH
Parish: BOOYAMURNA
BOOYAMURNA
Cadastre: 125
Whole Lot 1//653078

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:

CMA Map: 8834-3N
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6477184.000
Easting: 759568.000

Latitude: 31°48'41.4"S
Longitude: 149°44'31.2"E

GS Map: -

MGA Zone: 55

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel
Pack: PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Concrete Cylinder	-1.50	9.30	1829			Seated on Bottom

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
5.20	9.30	4.10	Unconsolidated	5.20		18.95			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	3.66	3.66	Loam Basaltic	Loam	
3.66	9.30	5.64	Gravel Basaltic River Water Supply	Gravel	

01/11/1983: PUBLIC ROADS BETWEEN PORTION 125 & 126
20/07/1984: COOLAH TWS

*** End of GW027577 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW Work Summary

GW800090

Licence:

Licence Status:

Authorised Purpose(s):
Intended Purpose(s): TOWN WATER SUPPLY

Work Type: Bore

Work Status:

Construct.Method: Rotary

Owner Type: Local Govt

Commenced Date:
Completion Date: 14/01/1996

Final Depth: 70.10 m
Drilled Depth: 70.10 m

Contractor Name: Watermin Drillers Pty Ltd

Driller: Ernest Maxwell Jones

Assistant Driller:

Property:

Standing Water Level (m):

GWMA:

Salinity Description: Good

GW Zone:

Yield (L/s):

Site Details

Site Chosen By:

County: BLIGH
Form A: BLIGH
Parish: BOOYAMURNA
Cadastre: CLOSED ROAD BORDE

Licensed:

Region: 80 - Macquarie-Western

CMA Map: 8834-3N

River Basin: - Unknown
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6477152.000
Eastings: 759594.000

Latitude: 31°48'42.4"S
Longitude: 149°44'32.2"E

GS Map: -

MGA Zone: 55

Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralsers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	10.00	273			Rotary Air
1		Hole	Hole	10.00	70.10	219			Rotary Air
1		Annulus	Waterworn/Rounded	0.00	55.00				
1	1	Casing	Steel	-0.30	55.50	219			Driven into Hole, Welded
1	1	Casing	Steel	0.00	10.30	273			Driven into Hole, Welded
1	1	Opening	Slots	15.20	54.80	219		1	Steel, SL: 457.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.30	27.40	9.10	Unknown				27.40		
33.50	42.60	9.10	Unknown				42.60		
51.80	54.80	3.00	Unknown				54.80		
62.50	65.50	3.00	Unknown				65.50		

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.50	1.50	Black soil	Unknown	
1.50	6.10	4.60	Red clays	Unknown	
6.10	8.50	2.40	Sand & gravel	Unknown	
8.50	10.00	1.50	Yellow clays & boulders	Unknown	
10.00	70.10	60.10	Sandstone	Unknown	

*** End of GW800090 ***

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW Work Summary

GW026813

Licence: 80CA716940

Licence Status: EXPIRED

Authorised Purpose(s): TOWN WATER SUPPLY
Intended Purpose(s): PUBLIC/MUNICIPAL

Work Type: Well
Work Status:
Construct.Method: Hand Dug
Owner Type: Local Govt

Commenced Date:
Completion Date: 01/04/1965

Final Depth: 10.10 m
Drilled Depth: 10.10 m

Contractor Name: (None)
Driller:
Assistant Driller:

Property: COOLAH T W S NSW
GWMA: 019 - COOLABURRAGUNDY -
TALBRAGER VALLEY
GW Zone: -

Standing Water Level
(m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

County: BLIGH
Form A: BLIGH
Licensed: BLIGH
Parish: BOOYAMURNA
BOOYAMURNA
Cadastre: 99999
Whole Lot 1//653078

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:

CMA Map: 8834-3N
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6477152.000
Easting: 759620.000

Latitude: 31°48'42.4"S
Longitude: 149°44'33.2"E

GS Map: -

MGA Zone: 55

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Concrete Cylinder	-1.50	10.10	1829			Seated on Bottom

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
5.20	9.80	4.60	Unconsolidated	5.20		12.63			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.44	2.44	Soil Black	Soil	
2.44	9.75	7.31	Gravel Basaltic River Water Supply	Gravel	
9.75	10.06	0.31	Sandstone	Sandstone	

Remarks

12/10/1987: ROADSIDE ADJ TO PORTION 125
12/10/1987: COOLAH TWS

*** End of GW026813 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW Work Summary

GW059176

Licence:

Licence Status:

Authorised Purpose(s):
Intended Purpose(s): PUBLIC/MUNICIPAL

Work Type: Bore

Work Status:

Construct.Method: Rotary

Owner Type: Local Govt

Commenced Date:
Completion Date: 01/12/1983

Final Depth: 11.50 m
Drilled Depth: 11.50 m

Contractor Name: (None)

Driller:

Assistant Driller:

Property:

Standing Water Level
(m):

GWMA:
GW Zone:

Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

County
Form A: BLIGH
Licensed:

Parish
BOOYAMURNA

Cadastre
126

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:

CMA Map: 8834-3N
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6477150.000
Easting: 759699.000

Latitude: 31°48'42.4"S
Longitude: 149°44'36.2"E

GS Map: -

MGA Zone: 55

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Annulus	Waterworn/Rounded	8.50	11.50	500			Ungraded
1	1	Casing	Welded Steel	0.00	9.50	300			Seated
1	1	Opening	Screen	9.50	11.50	300		1	Stainless Steel

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
7.00	11.50	4.50	Unconsolidated	4.50					

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	3.60	3.60	Loam Basaltic	Loam	
3.60	11.50	7.90	Gravel Basaltic River Water Bearing	Gravel	

Remarks

09/03/1987: CLOSED ROAD BETWEEN PORTIONS 125 & 126
09/03/1987: COOLAH TWS

*** End of GW059176 ***

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW Work Summary

GW059164

Licence: 80CA716938

Licence Status: CURRENT

Authorised Purpose(s): TOWN WATER SUPPLY
Intended Purpose(s): TOWN WATER SUPPL

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Rotary Mud
Owner Type: Local Govt

Commenced Date:
Completion Date: 01/12/1983

Final Depth: 38.00 m
Drilled Depth: 50.00 m

Contractor Name: (None)
Driller:
Assistant Driller:

Property: DUNEDOO T W S Whiteley St
DUNEDOO 2844 NSW
GWMA: 019 - COOLABURRAGUNDY -
TALBRAGER VALLEY
GW Zone: -

Standing Water Level 8.600
(m):
Salinity Description:
Yield (L/s): 29.180

Site Details

Site Chosen By:

County	Parish	Cadastre
Form A: LINCOLN	BOLARO	7009//93529
Licensed: LINCOLN	BOLARO	Whole Lot 7009//93529

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:

CMA Map: 8733-N
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6455743.000
Easting: 725608.000

Latitude: 32°00'43.1"S
Longitude: 149°23'18.7"E

GS Map: -

MGA Zone: 55

Coordinate Source: GIS - Geogra

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Annulus	Waterworn/Rounded	0.00	38.00	431			Graded
1		Backfill	Backfill	38.00	50.00				
1	1	Casing	Welded Steel	0.00	31.00	342			Seated
1	1	Opening	Screen	31.00	36.00	275		1	Stainless Steel, A: 1.52mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
31.00	36.00	5.00	Unconsolidated	8.60		29.18			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Driller	(Unknown)	
1.00	4.00	3.00	Clay Red	Clay	

4.00	13.00	9.00	Clay Grey	Clay
13.00	14.00	1.00	Clay Grey Some Fine Sand	Clay
14.00	18.00	4.00	Clay Grey Some Coarse Sand	Clay
18.00	21.00	3.00	Clay Orange	Clay
21.00	26.00	5.00	Clay Orange Some Fine Sand	Clay
26.00	29.00	3.00	Clay Yellow	Clay
29.00	30.00	1.00	Clay Yellow, Sand White Medium	Clay
30.00	32.00	2.00	Sand White Medium Water Supply, some Clay	Sand
32.00	36.00	4.00	Sand White Medium Clean Water Supply	Sand
36.00	37.00	1.00	Clay White Sandy	Clay
37.00	38.00	1.00	Clay White, Sand Yellow	Clay
38.00	39.00	1.00	Sand Yellow Medium, Clay Yellow	Sand
39.00	45.00	6.00	Clay White	Clay
45.00	48.00	3.00	Clay White, Sand Bands	Clay
48.00	50.00	2.00	Clay Yellow Sandy	Clay
50.00	50.01	0.01	Shale	Shale

Remarks

09/03/1987: DUNEDOO TOWN WATER SUPPLY.
 23/07/2012: Nat Carling, 23-July-2012; Updated coordinates, as provided by water licensing. Also updated cadastre (was entered as 'TS&CR 49654').

*** End of GW059164 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

**NSW DEPARTMENT OF
WATER & ENERGY**

**FORM A 0 0 0 0 0
PARTICULARS OF COMPLETED WORK**

Driller's Licence No:	1 7 2 9	1
Class of Licence:	6	
Driller's Name:	Terry Guest	
Assistant Driller:	Alan Southwell	
Contractor:	NOW Groundwater Drilling	
New bore	<input type="checkbox"/>	Replacement bore <input checked="" type="checkbox"/>
Deepened	<input type="checkbox"/>	Enlarged <input type="checkbox"/>
Reconditioned	<input type="checkbox"/>	Other (specify) <input type="checkbox"/>
Final Depth	216 Metres	

Work Licence No:	9 0 C A 8 1 1 5 1 5	2
Name of Licensee:	Warrumbungle Shire Council	
Intended Use:	Town Water Supply	
Completion Date:	19th September 2009	

DRILLING DETAILS 3			
From (m)	To (m)	Hole Diameter (mm)	Drilling Method Code
0	2	406	7
2	190	311	7
190	216	197	7

WATER BEARING ZONES 4											
From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s)		Test method Code	D D L at end of test (m)	Duration		Salinity (Conductivity or TDS)	
				Individual Aquifer	Cumulative			Hrs	min	Cond. (µS/cm)	TDS (mg/L)
191.5	216	24.5		20		1		10			Fresh

CASING / LINER DETAILS 5											
Material Code	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code	Casing support method Code 2		Type of casing bottom Code 8			
9	375	6.4	0	2		Centralisers installed	No <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>	(indicate on sketch)		
9	219	6.4	2	190	7	Sump installed	No <input checked="" type="checkbox"/>	Yes <input type="checkbox"/>	From	m	To m
9	168	5.0	181	216	6	Pressure cemented	No <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>	From	0 m	To 190 m
						Casing Protector cemented in place	No <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>			

WATER ENTRY DESIGN 6										
Material Code	OD (mm)	Wall Thickness (mm)	General				Screen Aperture (mm)	Slot Details		
			From (m)	To (m)	Opening type Code	Fixing Code		Length (mm)	Width (mm)	Alignment Code
9	168	5	190.5	192	7	6		400	4	V
9	168	5	198	216	7	6		400	4	V

GRAVEL PACK 7										
Type	Grade	Grain size (mm)		Depth (m)		Quantity				
		From	To	From	To	Litres or m ³				
Rounded <input type="checkbox"/>	Graded <input type="checkbox"/>									
Crushed <input type="checkbox"/>	Ungraded <input type="checkbox"/>									
Bentonite/Grout seal	No <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>		0	190	225 bags				
Method of placement of Gravel Pack		Code								

For D W E use only: **G W 2 7 3 1 2 1**

**NSW DEPARTMENT OF
WATER & ENERGY**

**FORM A 00000
PARTICULARS OF COMPLETED WORK**

Work Licence No: **WA**

BORE DEVELOPMENT										8
Chemical used for breaking down drilling mud No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Name: _____										
Method	Bailing/Surging <input type="checkbox"/>	Jetting	Airlifting <input checked="" type="checkbox"/>	Backwashing <input type="checkbox"/>	Pumping <input type="checkbox"/>	Other: _____				
Duration	hrs	hrs	10 hrs	hrs	hrs	hrs				
DISINFECTION ON COMPLETION										9
Chemical/s used			Quantity applied (litres)			Method of application				
PUMPING TESTS ON COMPLETION										10
Test type	Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery			
							Water level (m)	Time taken (hrs)	(mins)	
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										
Height of measuring point above ground level _____ m Test Method Code <input type="checkbox"/> See Code Table 4										
WORK PARTLY BACKFILLED OR ABANDONED										11
Original depth of work: _____ metres Is work partly backfilled: No <input type="checkbox"/> Yes <input type="checkbox"/>										
Is work abandoned: No <input type="checkbox"/> Yes <input type="checkbox"/> Method of abandonment: Backfilled <input type="checkbox"/> Plugged <input type="checkbox"/> Capped <input type="checkbox"/>										
Has any casing been left in the work No <input type="checkbox"/> Yes <input type="checkbox"/> From _____ m To _____ m										
Sealing / fill type Code	From depth (m)	To depth (m)	Sealing / fill type Code	From depth (m)	To depth (m)					
Site chosen by:										12
Hydrogeologist <input type="checkbox"/> Geologist <input type="checkbox"/> Driller <input type="checkbox"/> Diviner <input type="checkbox"/> Client <input checked="" type="checkbox"/> Other _____										
Work Location Co ordinates										13
Lot No _____ DP No _____										
Easting 6 9 7 4 3 1 Northing 6 5 7 3 5 0 6 Zone 5 5										
GPS: No <input type="checkbox"/> Yes <input checked="" type="checkbox"/> >> AMG/AGD <input type="checkbox"/> or MGA/GDA <input type="checkbox"/> (See explanation)										
Please mark the work site with "X" on the DIPNR CLID map. Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.										
Signatures:										
Driller: Terry Guest _____					Licensee: _____					
Date: 19th September 2009 _____					Date: _____					

WaterNSW Work Summary

GW025187

Licence:

Licence Status:

Authorised Purpose(s):
Intended Purpose(s): TOWN WATER SUPPL

Work Type: Bore - GAB
Work Status: Supply Obtained
Construct.Method: Rotary Mud
Owner Type: Local Govt

Commenced Date:
Completion Date: 01/07/1968

Final Depth: 220.90 m
Drilled Depth: 221.00 m

Contractor Name: (None)
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:

Standing Water Level 28.800 (m):
Salinity Description:
Yield (L/s): 20.180

Site Details

Site Chosen By:

County Form A: BARADINE
Parish: BARADINE
Cadastre: RD ADJ 2/22/758051

Region: 90 - Barwon
River Basin: 419 - NAMOI RIVER
Area/District:

CMA Map: 8736-S
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6574148.000
Easting: 697025.000

Latitude: 30°56'58.9"S
Longitude: 149°03'45.1"E

GS Map: -

MGA Zone: 55

Coordinate Source: GD_ACC.MAP

Construction

Negative depths indicate Above Ground Level, C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Welded Steel, Pressure Cemented	0.00	97.20	203			Cemented
1	1	Casing	Welded Steel, Pressure Cemented	0.00	97.20	203			
1	1	Casing	Welded Steel	95.80	220.80	152			
1	1	Opening	Slots - Vertical	97.50	220.90	152		1 A: 3.17mm	

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.50	97.40	74.90	(Unknown)						
97.50	220.90	123.40	(Unknown)	28.80		20.18			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	33.52	33.52	Conglomerate Nominal	Conglomerate	
33.52	102.10	68.58	Sandstone Nominal Water Supply, and sand, rock, hard bands, water supply	Sandstone	
102.10	211.83	109.73	Shale Grey Nominal Water Supply, Sandstone Sand Rock, Hard Bands	Shale	
211.83	220.98	9.15	Sandstone Water Supply	Sandstone	

Remarks

04/02/1976: AQUIFER DEPTHS SUSPECT.
20/07/1984: ADJ LOT 2 SECT 22 BARADINE.
20/07/1984: BARADINE TWS.
14/05/2008: Nat Carling, 14-May-2008: Adjusted cadastre, previously entered Lot/DP was 'SEC 22'.
29/08/2011: Karla Abbs, 29-Aug-2011: Removed duplicates from drillers log

*** End of GW025187 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW Work Summary

GW007716

Licence: 90CA833298

Licence Status: CURRENT

Authorised Purpose(s): TOWN WATER SUPPLY
Intended Purpose(s): PUBLIC/MUNICIPAL

Work Type: Bore
Work Status:
Construct.Method: Cable Tool
Owner Type: Local Govt

Commenced Date:
Completion Date: 01/03/1949

Final Depth: 47.20 m
Drilled Depth: 47.20 m

Contractor Name: (None)
Driller:
Assistant Driller:

Property: N/A WARRUMBUNGL SHIRE
COUNCIL P O BOX 191
COONABARABRAN 2357 NSW
GWMA: 023 - MISCELLANEOUS ALLUVIUM
OF THE BARWON REGION
GW Zone: 013 -

Standing Water Level
(m):
Salinity Description: Fresh
Yield (L/s):

Site Details

Site Chosen By:

County: BARADINE
Form A: BARADINE
Licensed: BARADINE
Parish: MILLER
MILLER
Cadastre: L16 (16)
Whole Lot 16/750294

Region: 90 - Barwon
River Basin: 419 - NAMOI RIVER
Area/District:

CMA Map: 8736-S
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6592988.000
Easting: 693571.000

Latitude: 30°46'49.4"S
Longitude: 149°01'22.2"E

GS Map: -

MGA Zone: 55

Coordinate Source: GD_ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.50	43.40	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
21.30	21.60	0.30	Unconsolidated	21.30		0.03			
42.60	43.50	0.90	Unconsolidated	25.90		1.20			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.52	1.52	Loam Sandy	Loam	
1.52	21.33	19.81	Clay Yellow Sandy	Clay	
21.33	21.64	0.31	Sand Fine Water Supply	Sand	
21.64	42.67	21.03	Clay Yellow Sandy	Clay	
42.67	43.58	0.91	Clay Sandy Nodular Water Supply	Clay	
43.58	47.24	3.66	Sand Yellow Clay	Sand	

Remarks

24/11/1981: KENEBRI WATER SUPPLY

*** End of GW007716 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Appendix 4c: AHIMS Report for Warrumbungle Shire Council Bores

Coonabarabran Bores 1, 2, 3 & 4

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -31.2781, 149.2632 - Lat, Long To : -31.2628, 149.2873 with a Buffer of 50 meters, conducted by Michaela Burns on 18 November 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

1	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette](http://www.nsw.gov.au/gazette) (<http://www.nsw.gov.au/gazette>) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Coonabarabran Bore 6, Water Plant

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -31.2821, 149.2504 - Lat, Long To : -31.2669, 149.2746 with a Buffer of 50 meters, conducted by Michaela Burns on 18 November 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

1 Aboriginal sites are recorded in or near the above location.

2 Aboriginal places have been declared in or near the above location. *

ID	Aboriginal Place Name
73	Happy Valley Fringe Camp
64	Nandi Common

Coolah Old Bore, Town Wells, Back-up Well & Extra Well

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -31.8161, 149.7378 - Lat, Long To : -31.8064, 149.7532 with a Buffer of 50 meters, conducted by Michaela Burns on 18 November 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Dunedoo Town Well Bore

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.017, 149.3787 - Lat, Long To : -32.0062, 149.3959 with a Buffer of 50 meters, conducted by Michaela Burns on 18 November 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Bugaldie Bore

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -31.1285, 149.1065 - Lat, Long To : -31.1237, 149.114 with a Buffer of 50 meters, conducted by Michaela Burns on 18 November 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Kenebri Bore

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -30.786, 149.0183 - Lat, Long To : -30.7794, 149.0288 with a Buffer of 50 meters, conducted by Michaela Burns on 18 November 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Appendix 4d: BioNet Atlas of NSW Wildlife search results

Coonabarabran Bore 1, 2,3 and 4 & Bore 6 (Water Plant)

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -31.22 West: 149.22 East: 149.32 South: -31.32] returned a total of 71 records of 22 species. Report generated on 18/11/2020 2:16 PM

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status
Animalia	Aves	Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern	V,P	
Animalia	Aves	Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P	
Animalia	Aves	Accipitridae	^^ <i>Lophoictinia isura</i>	Square-tailed Kite	V,P,3	
Animalia	Aves	Cacatuidae	^ <i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V,P,2	
Animalia	Aves	Cacatuidae	^ <i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo	V,P,2	
Animalia	Aves	Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V,P	
Animalia	Aves	Psittacidae	^^ <i>Neophema pulchella</i>	Turquoise Parrot	V,P,3	
Animalia	Aves	Psittacidae	^^ <i>Polytelis swainsonii</i>	Superb Parrot	V,P,3	V
Animalia	Aves	Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P	
Animalia	Aves	Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V,P	
Animalia	Aves	Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A,P	CE
Animalia	Aves	Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P	
Animalia	Aves	Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P	
Animalia	Aves	Artamidae	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V,P	
Animalia	Aves	Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V,P	
Animalia	Aves	Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V,P	
Animalia	Mammalia	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V,P	V
Animalia	Mammalia	Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P	
Animalia	Mammalia	Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V,P	V
Animalia	Mammalia	Vespertilionidae	<i>Chalinolobus picatus</i>	Little Pied Bat	V,P	
Animalia	Mammalia	Vespertilionidae	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V,P	V

Plantae	Flora	Myrtaceae	<i>Homoranthus prolixus</i>	Granite Homoranthus	V	V
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Coolah Old Bore, Town Wells, Back-up Well & Extra Well

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -31.76 West: 149.69 East: 149.79 South: -31.86] returned a total of 7 records of 7 species.

Report generated on 18/11/2020 2:27 PM

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status
Animalia	Aves	Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V,P	
Animalia	Aves	Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V,P	
Animalia	Aves	Psittacidae	^^ <i>Polytelis swainsonii</i>	Superb Parrot	V,P,3	V
Animalia	Aves	Strigidae	^^ <i>Ninox connivens</i>	Barking Owl	V,P,3	
Animalia	Aves	Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P	
Animalia	Mammalia	Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V,P	E
Animalia	Mammalia	Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P	

Dunedoo Town Well Bore

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteri : Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -31.96 West: 149.33 East: 149.43 South: -32.06] returned a total of 2 records of 2 species.

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Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status
Animalia	Aves	Falconidae	<i>Falco subniger</i>	Black Falcon	V,P	
Animalia	Mammalia	Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P	

Baradine Main Supply & Back-up Bore

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -30.89 West: 149.01 East: 149.11 South: -30.99] returned a total of 80 records of 22 species.

Report generated on 18/11/2020 2:42 PM

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status
Animalia	Aves	Phaethontidae	<i>Phaethon rubricauda</i>	Red-tailed Tropicbird	V,P	C,J
Animalia	Aves	Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail	P	V,C,J,K

Animalia	Aves	Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1,P	
Animalia	Aves	Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V,P	
Animalia	Aves	Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V,P	
Animalia	Aves	Accipitridae	^^ <i>Lophoictinia isura</i>	Square-tailed Kite	V,P,3	
Animalia	Aves	Otididae	<i>Ardeotis australis</i>	Australian Bustard	E1,P	
Animalia	Aves	Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V,P	
Animalia	Aves	Psittacidae	^^ <i>Polytelis swainsonii</i>	Superb Parrot	V,P,3	V
Animalia	Aves	Strigidae	^^ <i>Ninox connivens</i>	Barking Owl	V,P,3	
Animalia	Aves	Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P	
Animalia	Aves	Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V,P	
Animalia	Aves	Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P	
Animalia	Aves	Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P	
Animalia	Aves	Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V,P	
Animalia	Mammalia	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V,P	V
Animalia	Mammalia	Macropodidae	<i>Macropus dorsalis</i>	Black-striped Wallaby	E1,P	
Animalia	Mammalia	Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V
Animalia	Mammalia	Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V,P	
Animalia	Mammalia	Vespertilionidae	<i>Chalinolobus picatus</i>	Little Pied Bat	V,P	
Plantae	Flora	Apocynaceae	<i>Tylophora linearis</i>		V	E
Plantae	Flora	Fabaceae (Faboideae)	<i>Swainsona murrayana</i>	Slender Darling Pea	V	V

Bugaldie Bore

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -31.07 West: 149.06 East: 149.16 South: -31.17] returned a total of 37 records of 12 species.

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Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status
Animalia	Aves	Cacatuidae	^^ <i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V,P,2	
Animalia	Aves	Psittacidae	^^ <i>Polytelis swainsonii</i>	Superb Parrot	V,P,3	V
Animalia	Aves	Strigidae	^^ <i>Ninox connivens</i>	Barking Owl	V,P,3	
Animalia	Aves	Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V,P	
Animalia	Aves	Meliphagidae	<i>Epthianura albifrons</i>	White-fronted Chat	V,P	
Animalia	Aves	Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P	

Animalia	Aves	Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P
Animalia	Aves	Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V,P
Animalia	Mammalia	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V,P V
Animalia	Mammalia	Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P
Animalia	Mammalia	Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V,P
Animalia	Mammalia	Vespertilionidae	<i>Chalinolobus picatus</i>	Little Pied Bat	V,P

Kenebri Bore

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -30.72 West: 148.97 East: 149.07 South: -30.82] returned a total of 49 records of 14 species. Report generated on 18/11/2020 2:57 PM

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status
Animalia	Reptilia	Elapidae	<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V,P	
Animalia	Aves	Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1,P	
Animalia	Aves	Psittacidae	^^ <i>Neophema pulchella</i>	Turquoise Parrot	V,P,3	
Animalia	Aves	Strigidae	^^ <i>Ninox connivens</i>	Barking Owl	V,P,3	
Animalia	Aves	Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P	
Animalia	Aves	Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V,P	
Animalia	Aves	Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V,P	V
Animalia	Aves	Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P	
Animalia	Aves	Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P	
Animalia	Aves	Artamidae	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V,P	
Animalia	Aves	Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V,P	
Animalia	Mammalia	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V,P	V
Animalia	Mammalia	Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P	
Animalia	Mammalia	Muridae	<i>Pseudomys pilligaensis</i>	Pilliga Mouse	V,P	V

NSW status

1	Sensitivity Class 1 (Sensitive Species Data Policy)
2	Sensitivity Class 2 (Sensitive Species Data Policy)
3	Sensitivity Class 3 (Sensitive Species Data Policy)
CH	Critical Habitat (Biodiversity Conservation Act 2016)
E1	Endangered (Biodiversity Conservation Act 2016)
E2	Endangered Population (Biodiversity Conservation Act 2016)
E3	Endangered Ecological Community (Biodiversity Conservation Act 2016)
E4	Presumed Extinct (Biodiversity Conservation Act 2016)
E4A	Critically Endangered (Biodiversity Conservation Act 2016)
E4B	Critically Endangered Ecological Community (Biodiversity Conservation Act 2016)
FCE	Critically Endangered Fish (Fisheries Management Act 1994)
FE	Endangered Fish (Fisheries Management Act 1994)
FEC	Endangered Ecological Community of Fish (Fisheries Management Act 1994)
FEP	Endangered Population of Fish (Fisheries Management Act 1994)
FKTP	Key Threatening Process of Fish (Fisheries Management Act 1994)
FP	Protected Fish (Fisheries Management Act 1994)
FV	Vulnerable Fish (Fisheries Management Act 1994)
FX	Extinct Fish (Fisheries Management Act 1994)
KTP	Key Threatening Process (Biodiversity Conservation Act 2016)
P	Protected (National Parks & Wildlife Act 1974)
V	Vulnerable (Biodiversity Conservation Act 2016)
V2	Vulnerable Ecological Community (Biodiversity Conservation Act 2016)

Commonwealth status

C	Listed on China Australia Migratory Bird Agreement
CD	Conservation Dependent (Commonwealth EPBC Act 1999)
CE	Critically Endangered (Commonwealth EPBC Act 1999)
E	Endangered (Commonwealth EPBC Act 1999)
J	Listed on Japan Australia Migratory Bird Agreement
K	Listed on Republic of Korea Australia Migratory Bird Agreement
KTP	Key Threatening Process (Commonwealth EPBC Act 1999)
V	Vulnerable (Commonwealth EPBC Act 1999)
X	Extinct (Commonwealth EPBC Act 1999)
XW	Extinct in the Wild (Commonwealth EPBC Act 1999)

Appendix A: Risk Assessment for Shallow Water Bore Design

	Low Risk	Low-Moderate Risk	Moderate-High Risk	High Risk
Condition of Casing well cap and slab	No holes or cracks. Cap tightly secured. Secured vent. Slab is present	No defects visible. Well vented but not screened. Slab is present	No holes or cracks visible. Cap loose. No slab present	Holes or cracks visible. Cap loose or missing. Can hear water running
Well Age	Less than 20 years	21 to 40 years old	41 to 60 years old	More than 60 years old
Well Type	Drilled in accordance with min drilling standards	Drilled not necessarily to standard	Drive point sand spear	Hand dug well
Screen Material	Stainless steel 316	Stainless steel	PVC slotted	Mild steel slotted casing. Bronze
Bore Material	SS361	PVC	Mild steel	Mild steel with dissimilar metals
Dissimilar metals				
Pump depth setting			Pump in screen	Pump below screen
Bore Cementing				
Gravel pack or natural pack				
Water Quality				
Iron Level	<100 mg/L	100-300 mg/L	300-1000 mg/L	>1000 mg/L
Salinity Level	<400 mg/L	400-700 mg/L	700-1000 mg/L	>1000 mg/L
Relationship of pump depth setting and screen level to iron hydroxide potential				

Appendix B: Risk Assessment for Artesian Constructed Bore

	Low Risk	Low-Moderate Risk	Moderate-High Risk	High Risk
Condition of Casing well cap and slab	No holes or cracks. Cap tightly secured. Secured vent. Slab is present	No defects visible. Well vented but not screened. Slab is present	No holes or cracks visible. Cap loose. No slab present	Holes or cracks visible. Cap loose or missing. Can hear water running
Well Age	Less than 40 years old	40 to 70 years old	71 to 100 years old	More than 100 years old
Bore Reconditioned	Reconditioned less than 20 years ago	20 to 30 years	30 to 50 years	Greater than 50 years ago
Well Type	Drilled in accordance with min drilling standards	Drilled not necessarily to standard	Drive point sand spear	Hand dug well
Screen Material	Slotted casing plasma oxy cut	Slotted casing oxy cut	Perforated casing downhole	Open hole
Bore Material	Stainless steel	Mild steel casing		PVC Casing
Dissimilar metals				
Bore Cementing	Surface casing cemented. Perkins method inside out	No surface casing. Inner casing Perkins method	Old style cementing pumped or poured from top	No cementing
Water Quality				
Iron Level	<100 mg/L	100-300 mg/L	300-1000 mg/L	>1000 mg/L
Salinity Level	<700 mg/L	700-1200 mg/L	1200-2000 mg/L	>2000 mg/L
Relationship of pump depth setting and screen level to iron hydroxide potential				

Appendix C: Generic guide for the monitoring process and suggested frequency of monitoring for town water bores

It is recommended that for town water supplies that preventative maintenance is undertaken. The frequency of this monitoring will depend on the specific town and its access to alternative water supplies should the bore fail and if the bore is pumping to the capacity of the aquifer. The table below provides a generic guide on monitoring and the suggested frequency of monitoring for a town water bore. The actual frequency needs to be tailored to meet the individual bore.

Category	Specific Activity	Schedule/Frequency
Physical inspection	Borehole colour video	A minimum 5-year interval or at pump service intervals. If the bore is high risk or has a specific problem, such as iron hydroxide, this should occur more frequently, ideally annually or biannually.
	Surface facility inspection, inspect sampling points and clean as needed	Monthly or whenever the site is visited
	Examination of withdrawn components	As needed (at least pump test annually, if not withdrawing pump annually)
Hydraulic Performance	Well discharge rate and pressure	Weekly or monthly (recommended automatic data collection)
	Drawdown- take concurrently with well discharge measurements	Weekly or monthly (recommended installation of pressure transducer automatic recording)
	Conduct graphical analysis to determine pump performance	Quarterly
	Higher yielding bore conduct a 3 or 4 stage step test to determine bore efficiency (bores greater than 10 litres per second)	Minimum annual frequency or possibly biannual
Electric Power	System and motor voltage, current and resistance, phase imbalance	Weekly and at various pump configurations, recommend installation of alarms to existing monitors.
Physio-chemistry	Inorganic parameters	Annual measurement prior to the treatment of the water for evaluation
	Suspended particulate matter	Manually at testing or bore
	Turbidity	Manually at testing of bore. If there is a problem install inline monitoring as turbidity will change depending on time of pumping

This table has been adapted from: Sustainable Wells Maintenance, Problem Prevention and Rehabilitation, Stuart A Smith Allen E Comeskey CRC Press 2009.