

**H Y D R O I L E X**

Groundwater Geosciences

**REPORT**

**HYDROGEOLOGICAL INVESTIGATION**

**GUYRA – EMERGENCY TOWN WATER SUPPLY**

**PREPARED FOR:            ARMIDALE REGIONAL COUNCIL**

**REPORT NUMBER:        HG.19.10.3NT**

**DATE:                        10 OCTOBER 2019**

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<b>Report Title:</b>	Guyra Hydrogeological Investigation – Emergency Town Water Supply	
<b>Client:</b>	Armidale Regional Council	
<b>Report Number:</b>	HG.19.10.3NT	
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<b>Issued:</b>	14 October 2019	
<b>Status:</b>	Revision 1	
<b>Distribution:</b>	Client	1 x PDF
	WaterNSW	-
	File	1

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## 1.0 INTRODUCTION

*Hydroilex* was engaged by *Armidale Regional Council (ARC)* in July 2019 to conduct a groundwater investigation of the Guyra region (**Figure 1**). The objective was to provide an urgent assessment of the potential for useful supplies of groundwater to supplement dwindling surface water storages induced by drought and dwindling run-off. During the investigation period, water was being transported by tankers from the Malpas Dam, whilst a recently constructed pipeline was being commissioned.

Guyra town water supply has been historically supplied from the Guyra Dam, having an aggregate capacity of 460ML, from ‘bottom’ and ‘top’ reservoirs. These sources were effectively empty in mid-2019.

Guyra has a population of 2,500, and the average town water usage for the period 2014 to 2019 is approximately 1.5ML/day. Presently, the town supply is limited by Level 5 water restrictions.

The investigation at Guyra has been proposed as a backup water supply to supplement surface water supplies, where, when drought conditions ease, a dual supply will be available. This style of water supply sourcing is being adopted as an important strategy in many towns throughout NSW.

*ARC* has carefully prepared a scope of works which was adopted by *Hydroilex*, consistent with a comprehensive outline of the scope of work and project rationale (ARC 19/3333).

*Hydroilex* initiated field activities in August 2019 following a data review and desktop study.

This report summarises the results of the investigation planning, and test drilling objectives.

## 2.0 INVESTIGATION OBJECTIVES AND STRATEGY

### 2.1 BOREFIELD DESIGN CONCEPTS

The proposed investigation region was proposed with several constraints:

- Relative proximity to the Guyra Township, Guyra Water Treatment Works and Guyra Dam pipeline route. The preferred zone of investigation is shown in **Figure 2**;
- Priority in the northern part of the town;
- Desirable groundwater borefield yield of 1ML/day;
- Bores to be sited on Council lands;
- Proximity to power and reticulation;

To meet the required 1ML/ day objective, a theoretical bore yield has been determined. If a 50% pumping duty is limited on each bore, the aggregate yield requirement is approximately 24 L/s. This yield is likely from 6-8 successful bores. Much higher yields can however be expected.

## 2.2 CONSTRAINTS ON SITE TARGETTING

The following summarises the main non-geological constraints on target selection, as adopted during the site selection process:

- Satisfaction of *WaterNSW* compliancy (refer to section 6.0 below);
- Road reserve width & area for safe drilling, testing and eventual bore equipping;
- Road reserves, parks and council lands;
- Sites devoid of vegetation;
- Sites not impacted by services (overhead power lines and underground services);
- Compliance with distance setbacks from existing private bores, and bores having a renewable allocation (irrigation bores);

## 3.0 DESKTOP DATA ASSESMENT

The desktop assessment included a thorough review of data, which included:

- Published geological data;
- Registered bore data;
- Prior hydrogeological studies;
- Published geophysical data;
- Stratigraphic data from deep bore records;
- Groundwater impacts on proposed bores;
- Environmental aspects;
- *WaterNSW* compliancy regulations;
- Licensing requirements;
- Pumping impacts;

## 4.0 HYDROGEOLOGICAL SETTING

### 4.1 GEOGRAPHICAL SETTING

Guyra township is located on the New England Highway at the peak of the Great Dividing Range (GDR) at an elevation of 1,330 metres, 38 km north of Armidale. Historic rainfall average is ~700mm, but currently reduced by 50%. Being at the crest of the GDR, rainfall runoff drains both eastward and westwards into the upper catchments of the Macleay and Gwydir Rivers respectively. Those catchments are consequently defined as different water sources – MDB Lachlan Fold Belt (to the west), and New England Fold Belt Coast (to the east).

Regionally the area is defined as the Guyra Plateau, considered the uppermost plateau of the GDR having an approximate area of 250-300 km<sup>2</sup>. By comparison, Armidale, as a reference, has an elevation of 980m.

The geology of the area has a strong influence on the topography. The Guyra Plateau is generally characterised by the extent of the Guyra Basalt, a competent volcanic rock suite which

has retained an erosional resistance relative to the surrounding ‘older’ rock formations which dominate the valleys. The present topography represents an inverted system, where former valleys have been filled with volcanic lavas (which now form a positive topographic expression).

Within the region of the township along the crest of the plateau, the topography is relatively flat to undulating. On the western side of the highway (which approximates the GDR), northerly and south-westerly-trending drainage patterns are evident, draining from Mother of Ducks Lagoon. On the eastern side of the GDR, drainage is dominantly to the southeast (refer to **Figure 6**).

## 4.2 GEOLOGICAL SETTING

The regional geology is depicted in the Dorrigo-Coffs Harbour 1:250,000 geological sheet (NSW Department of Mines, 1971 - **Figure 3**). There are references to a more detailed map - 1:100,000 Guyra sheet which is unavailable.

The Guyra Basalt is Tertiary-aged, and possibly Late Eocene to Early Oligocene (post Armidale Beds). Whilst the ‘Guyra Basalt’ is an informal name, it has been described on the Dorrigo 250k sheet to comprise tholeiitic and alkaline basalts with minor trachyte and dolerite. Locally, lava flows are both dense and vesicular. Ash deposits, tuffs and other pyroclastic rock suites are expected in the subsurface drilling programme.

Several volcanic centres are reported in the area – including Mother of Ducks Lagoon and Chandlers Peak. These sites have not been verified during the investigation.

The regional geological setting, as depicted in **Figure 3**, identifies several features:

1. Guyra location near the centre of the basalt extent;
2. Basement granites predominantly in the east and west; Carboniferous sediments beneath Guyra (more evident in **Figure 4**);
3. Trails of remnant basalt exposed along palaeo-valleys to the south, near Armidale;

**Figure 4A** identifies more recent digital geological mapping, as provided by the Geological Survey of NSW. The airborne magnetic character of the region is shown in **Figure 4B**, where regional interpreted lineaments have been identified.

## 5.0 GROUNDWATER OBJECTIVES

The principal groundwater objectives in the region are considered within the Guyra Basalts. Within the basalts, targets have been sought particularly at locations (consistent with logistical strategies) where:

1. The basalt sequence is thickest;
2. Where the base of the basalt may overlie valley-fill alluvium;
3. Where possible secondary porosity associated with vertical fracturing is likely;

**Figure 5** provides an idealised basaltic sequence, where the likely thickest volcanic pile expected along the main ridge may yield groundwater from several aquifer types, typical of groundwater associations in other basaltic regions (e.g. Southern Highlands, Orange District, Alstonville Plateau, Oberon District).

Typical aquifer occurrences are:

1. Lava contacts and associate palaeo-soils;
2. Joints and fractures within the basalts;
3. Vesicular basalts and associated highly porous lithologies;
4. Alluvial sequences at base of the basalt lavas;

Key bores in the region include the Costa Bore & Old Meat Works Bore. These are the only two bores in the area of interest which have an ‘irrigation’ purpose. They are located close to the basalt crest, where at the Old Meat Works, a 115m deep bore was constructed. A yield of 3 L/s was encountered within the basal alluvium. **Plate 1** provides a more detailed plot of the record. The Costa bore was drilled to a depth of 80m (completed to 60m at the base of basalt) and encountered a reported an airlift yield of 8 L/s from 2 aquifers within the basalt. Subsequent testing certified a yield of 3.8 L/s at 50% duty.

In 2016, *Hydroilex* conducted a test on a bore located on Lot3/1213180 (adjoining the south of the ‘new Costa tomato farm’). Drilling had encountered an aggregate 8.4 L/s yield, and a 48-hour drawdown and recovery test at 5.9 L/s resulted in 18m drawdown.

In the elevated part of the plateau (main area of exploration), the static water level is expected to be at approximately 40-50m for the deeper aquifer, but possibly much shallower if ‘perched’ aquifers are encountered. A free-flowing shallow perched aquifer is located in the land adjacent to the Water Treatment Plant (WTP).

## 6.0 WATER LICENSE ISSUES

Test bore licenses have been lodged and approved by NRAR. Detailed site-specific maps were provided, as appended to this report (**Appendix 1**).

In view of the investigation area being located within two different water sources, different rules apply. Summary rules for each water source is provided in **Appendix 3**. The main relevant differences are provided in **Table 1**. Note that some of the compliance issues can be waived depending on the purpose and bore construction.

**Table 1. Rules summary for LFB MDB and New England Fold Belt Coast Groundwater Sources (relevant)**

DETAIL	LFB MDB	NE FOLD BELT
Distance from access license on another landholding	400m	200m for <20ML license 400m for >20ML license
Distance from a basic landholder on another landholding	200m	200m
Distance from a town water supply bore	400m	500m
Distance from a property boundary	200m	100m (reduced if consent granted)
Distance from a contamination site (septic/stp)	250m	250m
Distance from a recognised GDE	100m	200m
Distance from the high bank of a stream	40m	40m
Distance from a <i>WaterNSW</i> monitoring bore	400m	400m

Additional points to note are:

1. In view that both water sources have adequate surplus unallocated groundwater, generous assignments of water will most likely be possible for the town, subject to hydrogeological assessment and yield certification; it is likely that a gross allocation will be issued for the borefield;
2. It is assumed that distance set-back from boundaries will be waived in view of the nature of the investigation;
3. The bores will sterilise radial zones around them, which may impact on any landholder rights to construct bores for specific purposes (refer to rules summaries);
4. Where bores are located in relative proximity to private bores, deep grouting will eliminate interference;
5. The *Costa* bore has an entitlement of 64 ML, and the 'Old meat works' bore has an assigned license to extract approx. 19ML/yr;

## 7.0 REVIEW OF REGISTERED BORE DATA

A comprehensive review of all registered bores in the investigation area has been conducted. Bore data is tabulated in, as provided in Appendix 2.

The following generalised comments are provided:

1. The majority of bores are shallow, and moderately low-yielding, but provide excellent supplies for 'basic rights' purposes;
2. There are only 5 bores licensed for 'irrigation' (out of 33 bores and wells studied);
3. Few bores have been drilled to basement;
4. The bore data provides useful information, and ultimately indicates significant untested potential;

The distribution of existing bores in the target areas is shown in **Figure GA7RB** (*Appendix 1*), where the following is realised:

- All test bore sites are compliant in respect of distance setbacks from registered bores – both 'basic right' and 'irrigation' bores;

- Each of the test bores are unlikely to impact on registered bores when pumped. Sealing of shallow aquifers down to 30m will however be undertaken during construction;

## 8.0 PREDICTED WATER CHEMISTRY

In NSW, it is well-recognised that basalt aquifers generally provide excellent water quality. Analyses from the Guyra Showground bore provides a useful guide to the likely water quality derived from shallow basalt aquifers. The following summarises the water quality results, with comments:

TDS	342 mg/L	- dominated by high bicarbonate concentration
pH	7.27	- alkaline
Na, K, Mg, Ca, Na, Cl-	all very low <42 mg/L	
Hardness	259	- relatively hard
Fe, Mn		- acceptable

- Plants will not be affected by the water due to low chloride concentration;
- The hardness will affect washing/lathering;
- High alkalinity (bicarbonate) will induce carbonate residues on surface;
- Water softening would be required for domestic use;
- Water would probably tend to induce scaling;
- The groundwater is classified geochemically as a *bicarbonate-magnesium-calcium* water;
- The desirability ranking for drinking water is <500 mg/L TDS (desirable);
- The blending/mixing of such water with meteoric water will reduce hardness;
- Improved water quality from deeper aquifers is expected;

## 9.0 PROPOSED TEST BORE SITES

Ten (10) bores have been identified for test drilling within the region. Most bores are located along the main basalt ridge. Other targets have been sited at the Water Treatment Works and Guyra Dam. It is considered that additional follow-up bores may be located at specific target sites.

The following points are noted:

1. The data review and desktop study has confirmed that the best groundwater potential exists within the Guyra Basalt sequence. Targets have mainly focused on exploring the thickest and deepest parts of the sequence, where a dominantly stratigraphic approach has been employed. Regional structural corridors along northwest and northeast drainage zones are identified in **Figure 6**. These dominant features are well-recognised in most regions of the fold belt and are considered to be a consequence of tensional stresses in response to east-west compression.
2. The preferred target zone depicted in **Figure 2** along Falconer Road and pipeline route to Guyra Dam was generally found to have poor groundwater potential due to the diminished thickness of basalt;

3. Bores have been sited to minimise potential inter-bore interference, where minimum 400-500m separations have been adopted; test drilling to basement (up to approximately 120m is required; the basement is not considered to have a good groundwater potential;
4. Several target sites along the New England Highway may be relocated to the western side of the railway; an existing culvert may be utilised to pipe water to the east;
5. In the region ~5-10 km to the east of Guyra, extensive basalt in the upper reaches of the Gara Creek (Green Hills Rd region) may provide excellent follow-up objectives for water delivery into Gara Dam;

The following provides a brief outline of each target. Site-specific location maps have been prepared for each site, as provided in **Appendix 1**. Most sites are in easy access to 3-phase power.

#### **SITE G1**

The site is located at the water treatment plant (WTP) within basalt. The site has logistical advantages for easy commissioning. Basalt thickness is expected to be ~60m. Alluvial deposits are not expected. A very recent bore to the immediate west encountered an indicative yield of 5 L/s.

#### **SITE G2**

The site is located as a follow-up to G1, adjacent to 'Kenilworth'. To the immediate northwest, an interpreted fracture zone is recognised on private land.

#### **SITE G3**

The site is located at the Sporting Complex, several likely fracture systems are noted in the area. The site lies close to the interpreted axis of palaeo-drainage.

#### **SITE G4**

The site is located at the Guyra Showground, where groundwater has been identified in an existing relatively shallow bore. Drilling at the site is expected to intersect the full basalt sequence.

#### **SITE G5**

The site is located at Izzard Park at the intersection of two interpreted fracture trends near the northern margin of Mother of Ducks Lagoon. The site is consistent with discontinuities in airborne magnetic data and may be within the proximal centre of a postulated volcanic centre.

#### **SITE G6**

The site is well-located to follow-up G5, and to provide potential for additional targets west of the highway.

We are advised that an excellent unregistered bore is located nearby.

#### **SITES G7 – G9**

These sites have been positioned at approximately 1km centres along the predicted thickest part of the basalt at sites which are accessible along the New England Highway. In view of possible licensing issues, the sites may be move to the west. The drilling of these bores will depend on the success with Sites 1-6. The sites have been positioned so that they are distanced from existing bores.

## SITE 10

The site has been selected at the site of the Guyra Dam. It is located within a possible fracture in granite. The potential is considered poor.

## 10.0 TEST DRILLING, BORE CONSTRUCTION AND TESTING

It is recognised that drilling operations in the area will require two different methods depending on the penetration of 'hard' and 'soft/alluvial' sequences:

- Rotary percussion drilling with air in hard rock;
- Rotary mud or 'foam' penetration through unconsolidated alluvium;

All bores are to be constructed consistent with *Minimum Construction Requirements for Water Bores in Australia. Edition 2, Sept. 2003.*

It has been decided that maximum casing sizes will be installed so that sufficiently large pumps can be equipped to satisfy the delivery head. Ideally, 200mm completions will be constructed.

**Plate 1** identifies significant thicknesses of clay in the 'old meat works' bore, where two strings of casing were required to construct the bore. Basalt terrains are reputedly difficult to drill and construct where surface boulders, clays and alluvium may create drilling problems. It is noted that multiple casing strings and associated drill-time factors will increase construction costs.

Borehole geophysical surveying of all production bores will be conducted, utilising natural gamma, caliper, SP/SPR, EC & temperature. The geophysics will assist in providing accurate aquifer definition, positions of fractures and borehole condition, as well as providing excellent inter-bore correlation data. Composite digital lithostratigraphic and geophysical records will be derived for each bore.

Following bore construction, aquifer testing will be conducted, where 72-hour drawdown and recovery testing is recommended, subject to *WaterNSW* agreement. Formal aquifer sampling and analyses will be conducted during that operation.

## 11.0 ENVIRONMENTAL AND SUSTAINABILITY

The sites of each of the bores are not considered to be affected by environmental issues. Where there may be a risk of possible septic or sewerage contamination, the grouting of bores to a minimum 30m depth should be undertaken.

There are no recognised *Groundwater Dependent Ecosystems* (GDE) in the investigation area.

The scope of the investigation study has not enabled a determination of the sustainability of aquifers in the region, in view that there are few aquifer tests recorded in the region, and that there is currently a poor understanding of the groundwater system, particularly in relation to

recharge factors. Key issues to address *after aquifer testing and production pumping* are – sustainability, aquifer storage and recharge parameters. In some areas, groundwater monitoring bores may be necessary.

## 12.0 SUMMARY & RECOMMENDATIONS

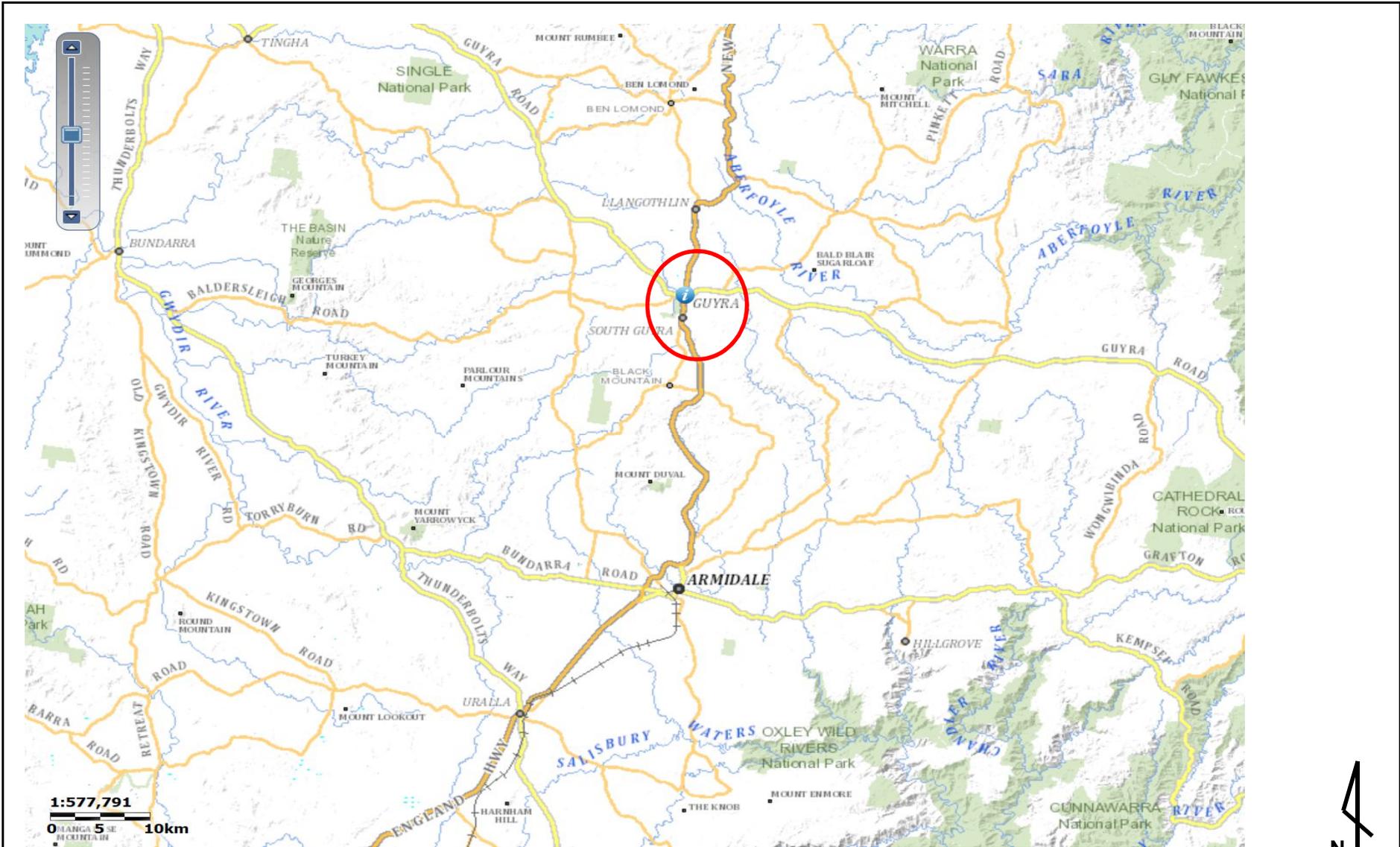
Based on the findings of the investigation, the following recommendations are provided:

- Implement the test drilling programme, and construct all bores having an indicative yield greater than 3 L/s;
- Construct bores with sufficient casing size to accommodate 6” pumps;
- Progressively assess the drilling results and revise the program when considered necessary;
- Conduct aquifer tests which will provide excellent data for equipping and production pumping;
- Equip all bores with data loggers and the means for measuring actual water levels (dipper tubes);
- Review borefield performance after 3 months operation to acquire sufficient data for the development of a borefield management plan;

\* \* \*

## 13.0 REFERENCES

- Agriculture and Resource Management Council of Australia and New Zealand, 2003.  
Minimum Construction Requirements for Water Bores in Australia. Edition 2, Sept. 2003.
- NSW Geological Survey – Dorrigo- Coffs Harbour 1:250,000 Geological Map Sheet 1971
- WaterNSW Registered Bore data

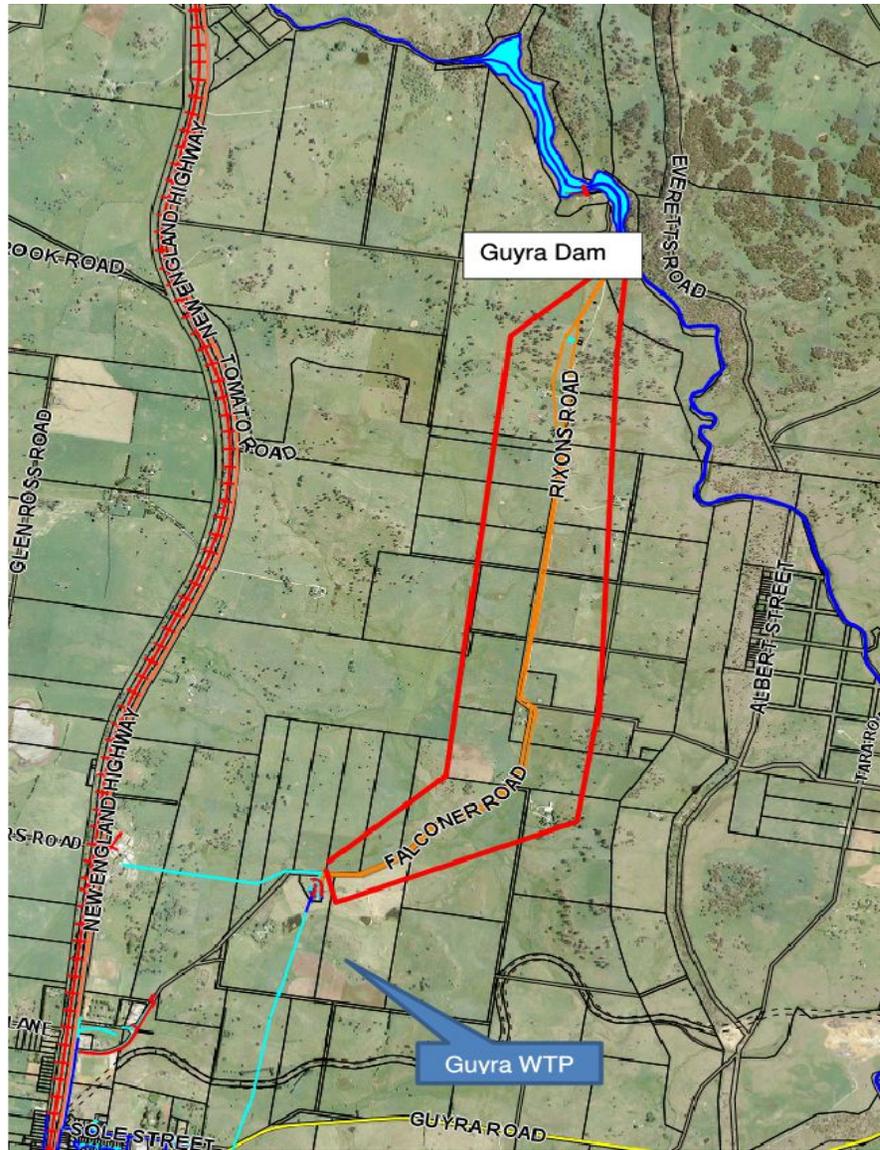



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UTM: -  
Aug-19  
Drawn: RJL  
Approved: RJL

ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION  
**Regional Location Map**

**Figure: 1**



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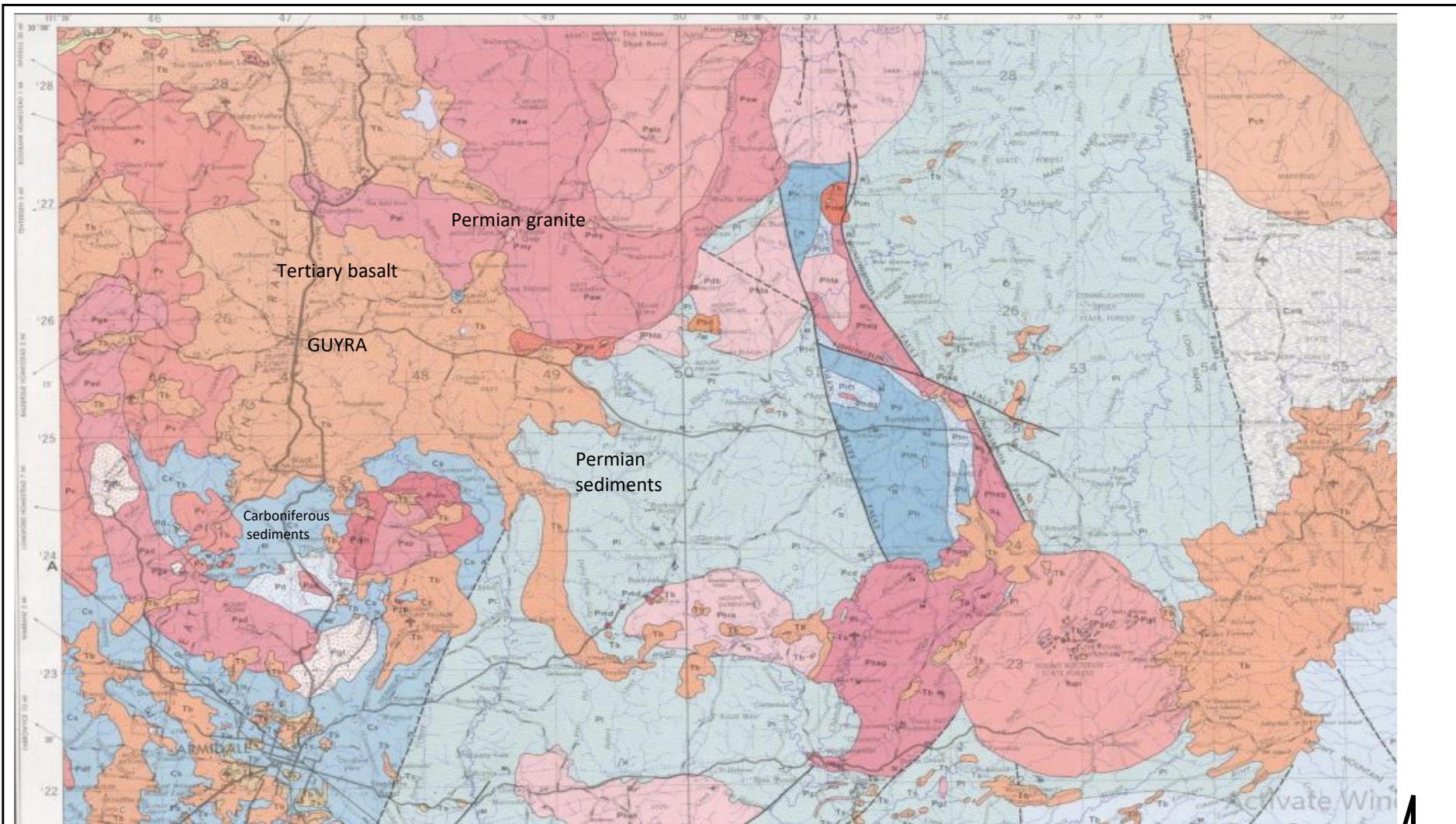
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ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION

**Preferred Investigation Area**

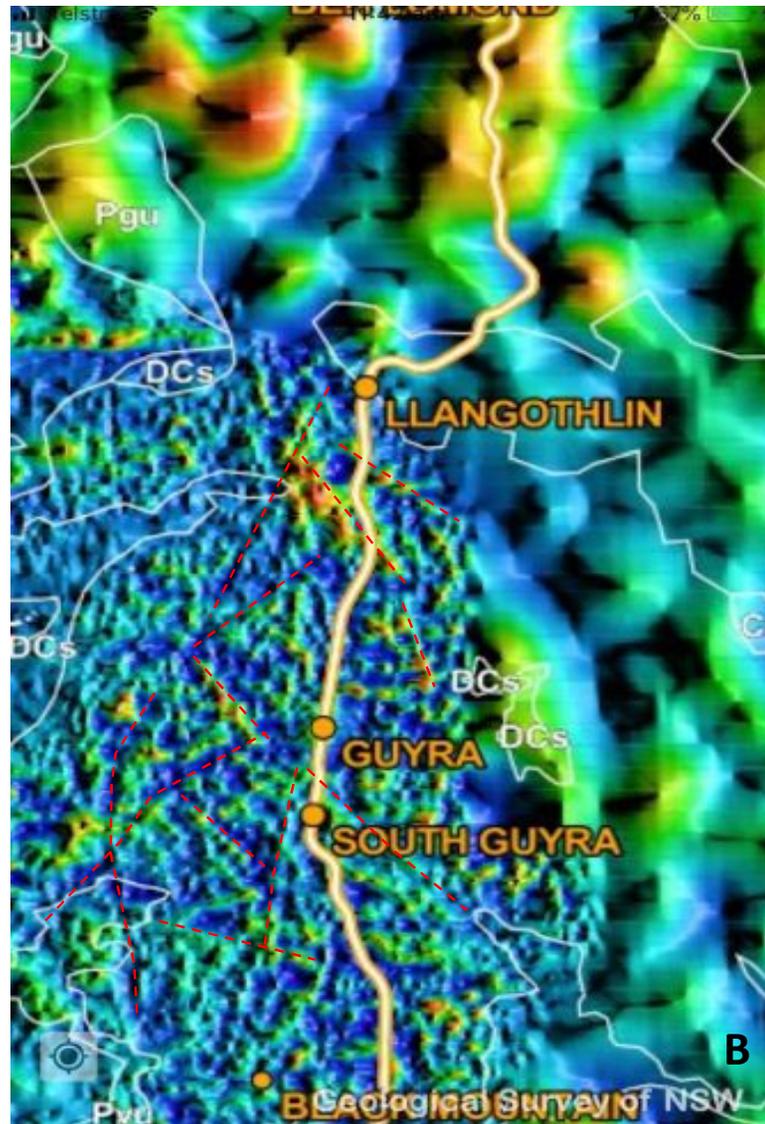
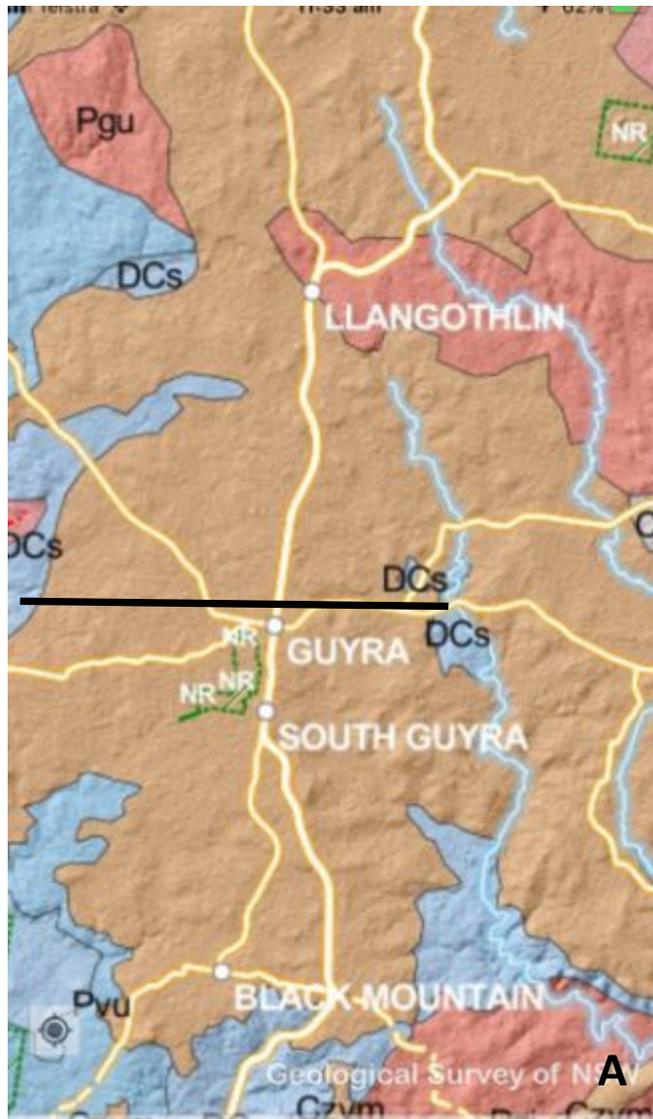
**Figure: 2**



Dorrigo- Coffs Harbour 250k  
1971



 <p>Hydroilex Pty Ltd www.hydroilex.com.au</p>	UTM: -	ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION	Figure: 3
	Aug-19		
	Drawn: RJL	Regional Geological Setting - published Geology	
	Approved: RJL		



~3km



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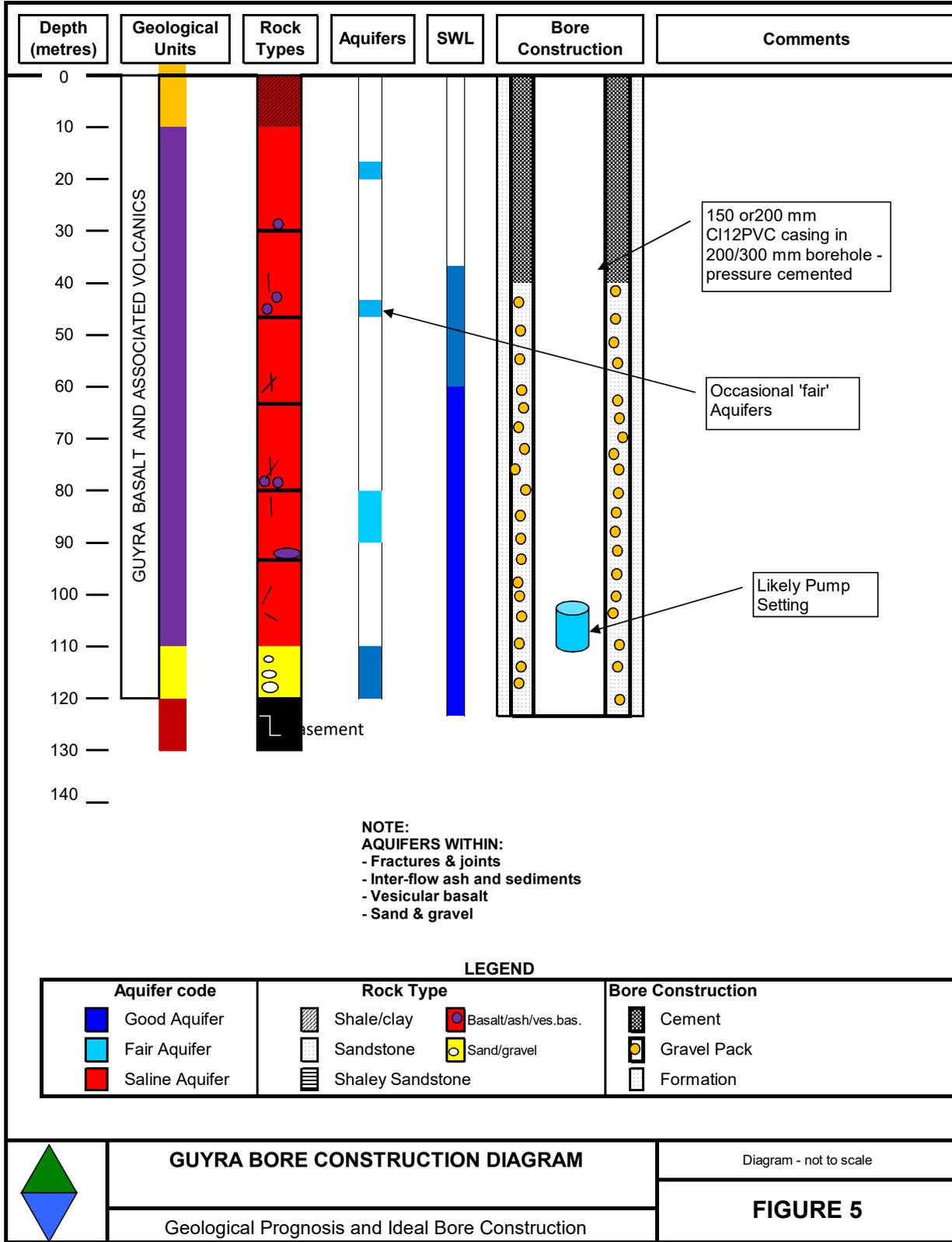
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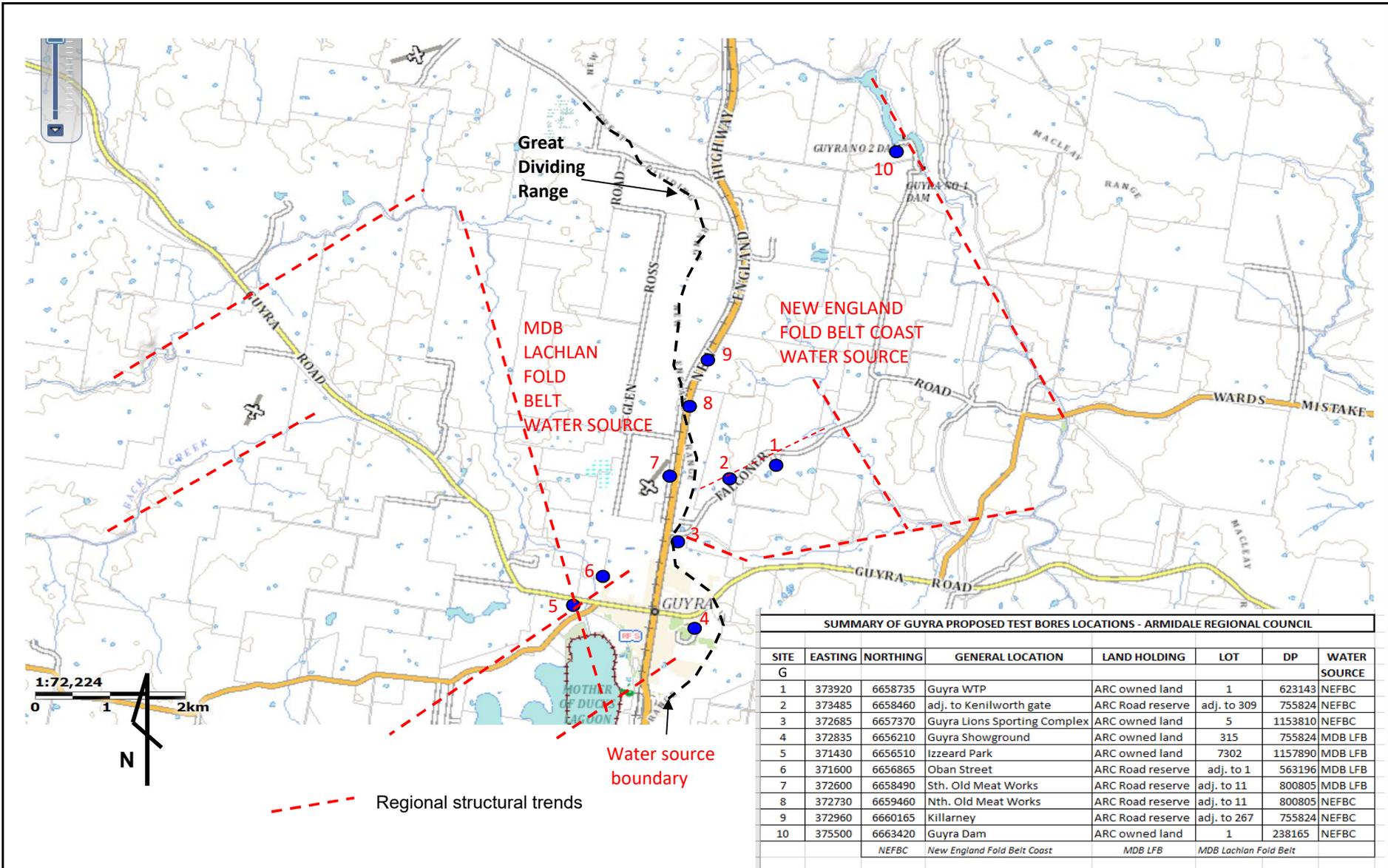
ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION

Regional Geological Setting - published digital data

Figure: 4

**FIGURE 5. CONCEPTIONAL STRATIGRAPHIC COLUMN AND BORE CONSTRUCTION**







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## BORE NAME:

# Guyra Meatworks Bore GW306251

## SUMMARY COMPOSITE LOG

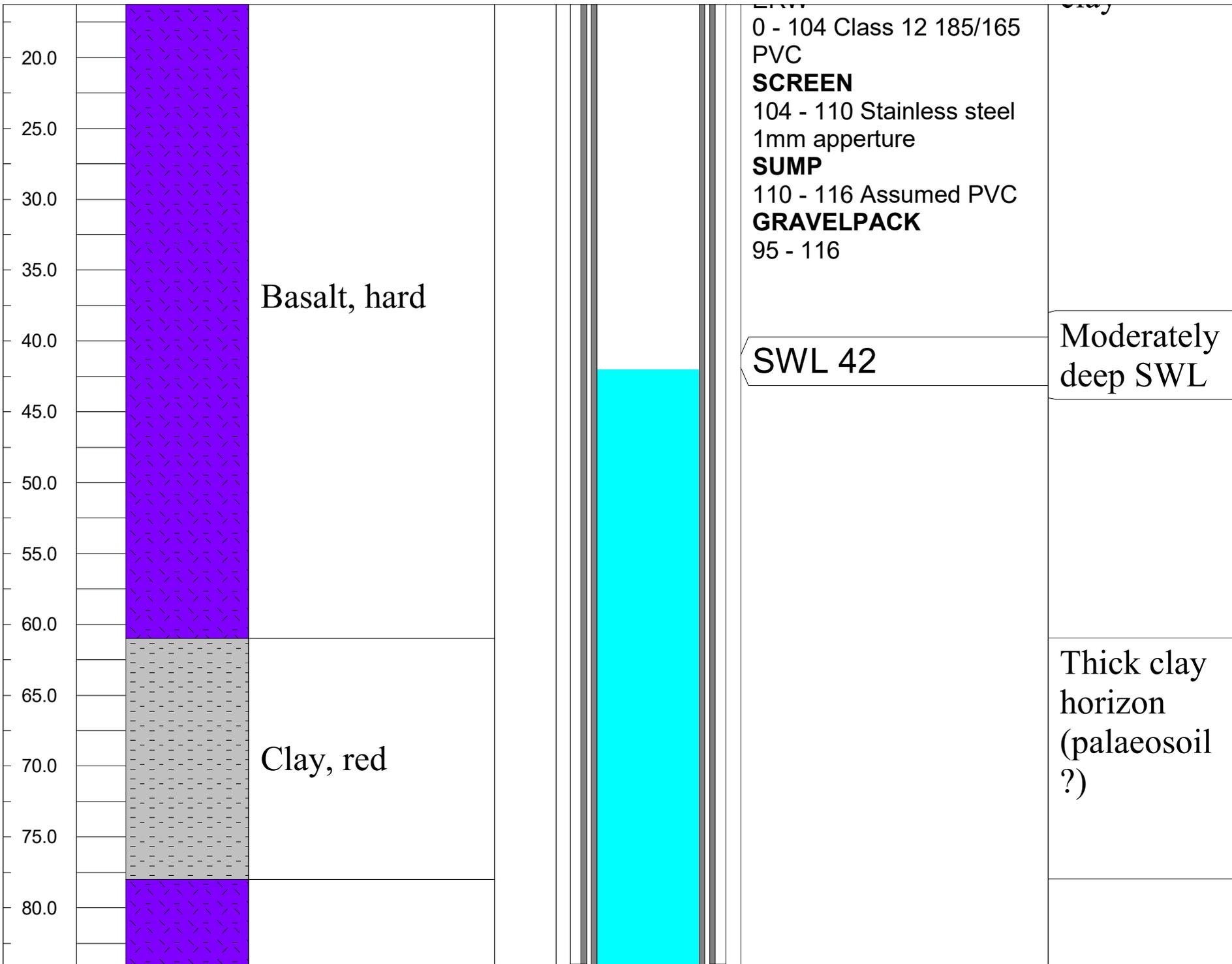
PLATE No: 1

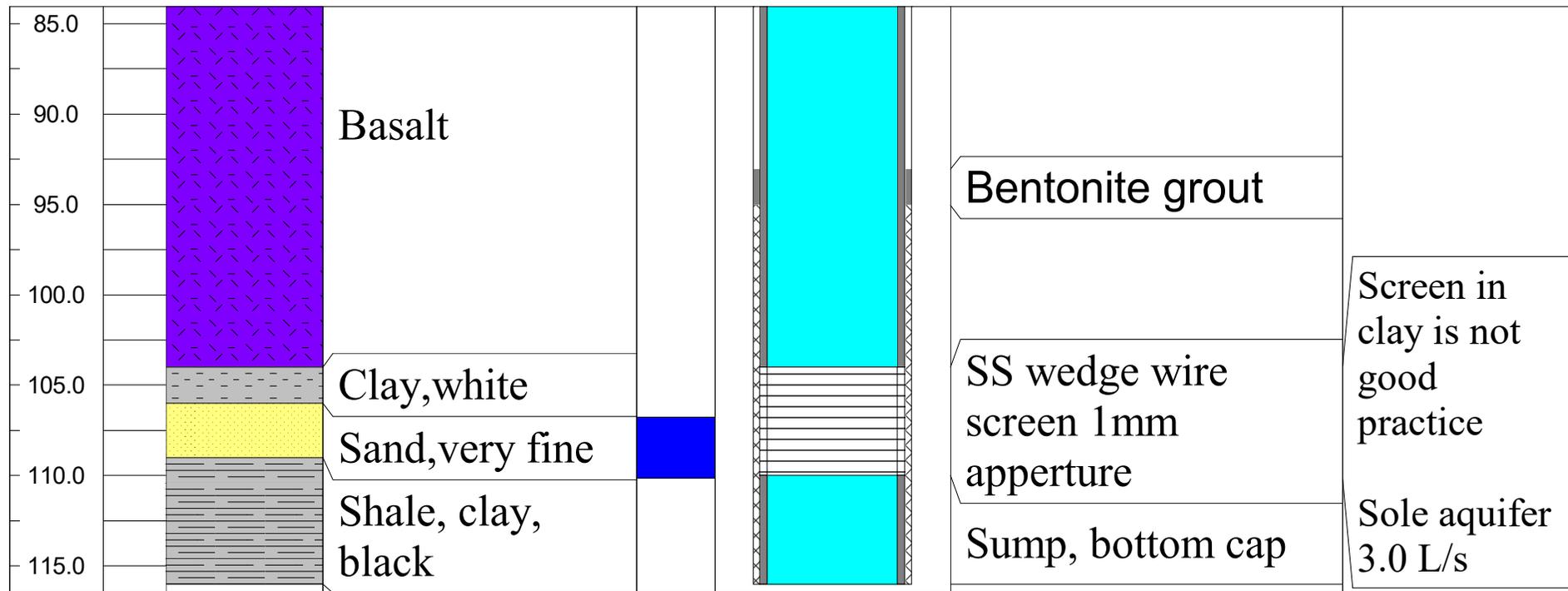
### LITHOLOGY LEGEND

	Soil		Siltstone
	Clay		F.g. Sandstone
	Silt		M.g. Sandstone
	Fine Sand		C.g. Sandstone
	Med Sand		Conglomerate
	Coarse Sand		Peat/Coal
	Fine Gravel		Silty Limestone
	Coarse Gravel		Limestone
	Breccia		Dolomite
	Shale		Quartz Vein
	Claystone		Acid Volcanics

<b>Author:</b> John Lee	<b>Date:</b> Oct 2019	<b>Location - MGA Zone:</b> 56	<b>Fluid Type:</b> Water
<b>WellCAD File No:</b>	<b>Project:</b> Guyra TWS	<b>Easting:</b> 6658886	<b>Fluid Salinity:</b>
<b>Drilled Depth:</b>	<b>Client :</b> ARC	<b>Northing:</b> 372837	<b>Fluid Level:</b>
<b>Logged Depth:</b>	<b>Drilled:</b> 2007	<b>Logged:</b>	<b>Tool:</b> AUSLOG
<b>Hole Size:</b>			
<b>Casing:</b>			
<b>Notes:</b> Drilled by mannion Drilling - data compiled from GW report			

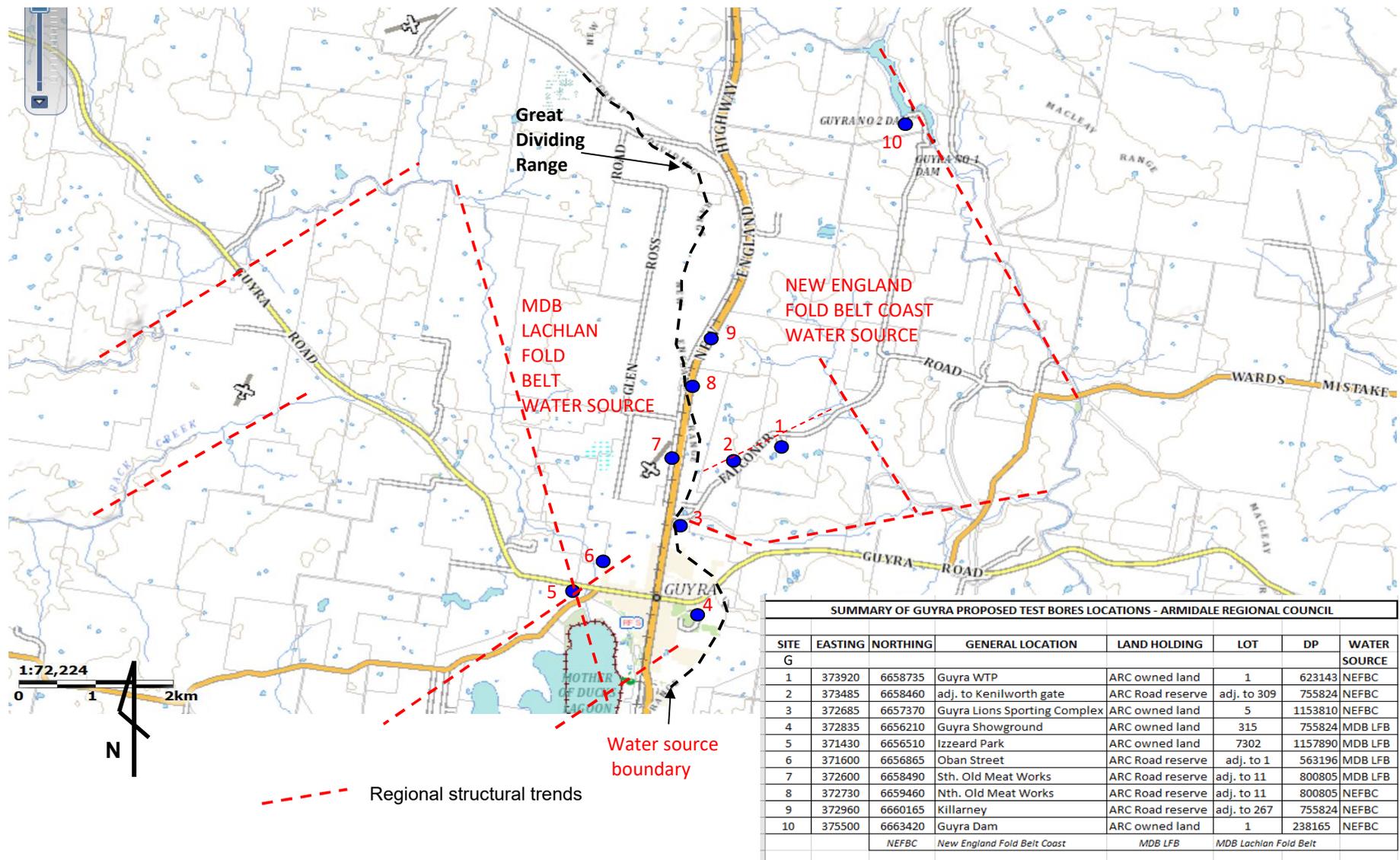
Depth 1m:350m	LITH	LITHOLOGICAL COMMENTS	AQUIF	CONST	CONST. DETAILS	COMMENTS
0.0		Clay, basalt, weathere d		150		<b>DRILLING METHOD</b> Drilled by rotary air method (DHH) and rotary mud below 104m <b>CASING:</b> 0 - 83.8 219/209 Steel FRW
5.0		Basalt, decomposed		150		
10.0						
15.0						





## **APPENDIX 1 FIGURES**

- Figure G1 Locations of Proposed Test Bores & Geological Structures
- Figure GA1 Sites 1 & 2 WTP and Kenilworth
- Figure GA2 Sites 1, 2 & 3
- Figure GA3 Site 3 – Guyra Sporting Field
- Figure GA4 Sites 4,5 & 6
- Figure GA5 New England Highway & Falconer Rd Sites 1,2,3,7,8 &9
- Figure GA6 Site 10 – Guyra Dam Target
- Figure GA7RB Location of Guyra Test Bores in relation to registered bores



SUMMARY OF GUYRA PROPOSED TEST BORES LOCATIONS - ARMIDALE REGIONAL COUNCIL							
SITE	EASTING	NORTHING	GENERAL LOCATION	LAND HOLDING	LOT	DP	WATER SOURCE
G							
1	373920	6658735	Guyra WTP	ARC owned land	1	623143	NEFBC
2	373485	6658460	adj. to Kenilworth gate	ARC Road reserve	adj. to 309	755824	NEFBC
3	372685	6657370	Guyra Lions Sporting Complex	ARC owned land	5	1153810	NEFBC
4	372835	6656210	Guyra Showground	ARC owned land	315	755824	MDB LFB
5	371430	6656510	Izzeard Park	ARC owned land	7302	1157890	MDB LFB
6	371600	6656865	Oban Street	ARC Road reserve	adj. to 1	563196	MDB LFB
7	372600	6658490	Sth. Old Meat Works	ARC Road reserve	adj. to 11	800805	MDB LFB
8	372730	6659460	Nth. Old Meat Works	ARC Road reserve	adj. to 11	800805	NEFBC
9	372960	6660165	Killarney	ARC Road reserve	adj. to 267	755824	NEFBC
10	375500	6663420	Guyra Dam	ARC owned land	1	238165	NEFBC
			NEFBC New England Fold Belt Coast		MDB LFB		MDB Lachlan Fold Belt



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Approved: RJL

ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION

SITES 1 & 2 WTP AND KENILWORTH

Figure: GA1



SITE	E	N	GEN.LOC	TITLE	LOT	DP
1	373920	6658735	Guyra WTP	ARC owned la	1	623143
2	373485	6658460	adj. to Ken'th	ARC Rd res.	adj. 309	755824
3	372685	6657370	Guyra SC	ARC owned la	5	1153810



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 Approved: RJL

ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION  
**SITES 1, 2 & 3**

**Figure: GA2**



372685 6657370



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ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION

**SITE 3 - GUYRA SPORTING CLUB**

**Figure: GA3**



SITE	E	N	GEN.LOC	TITLE	LOT	DP
4	372835	6656210	Guyra S G	ARC owned	315	755824
5	371430	6656510	Izzeard Park	ARC owned	7302	1157890
6	371600	6656865	Oban Street	ARC Road res.	adj. 1	563196



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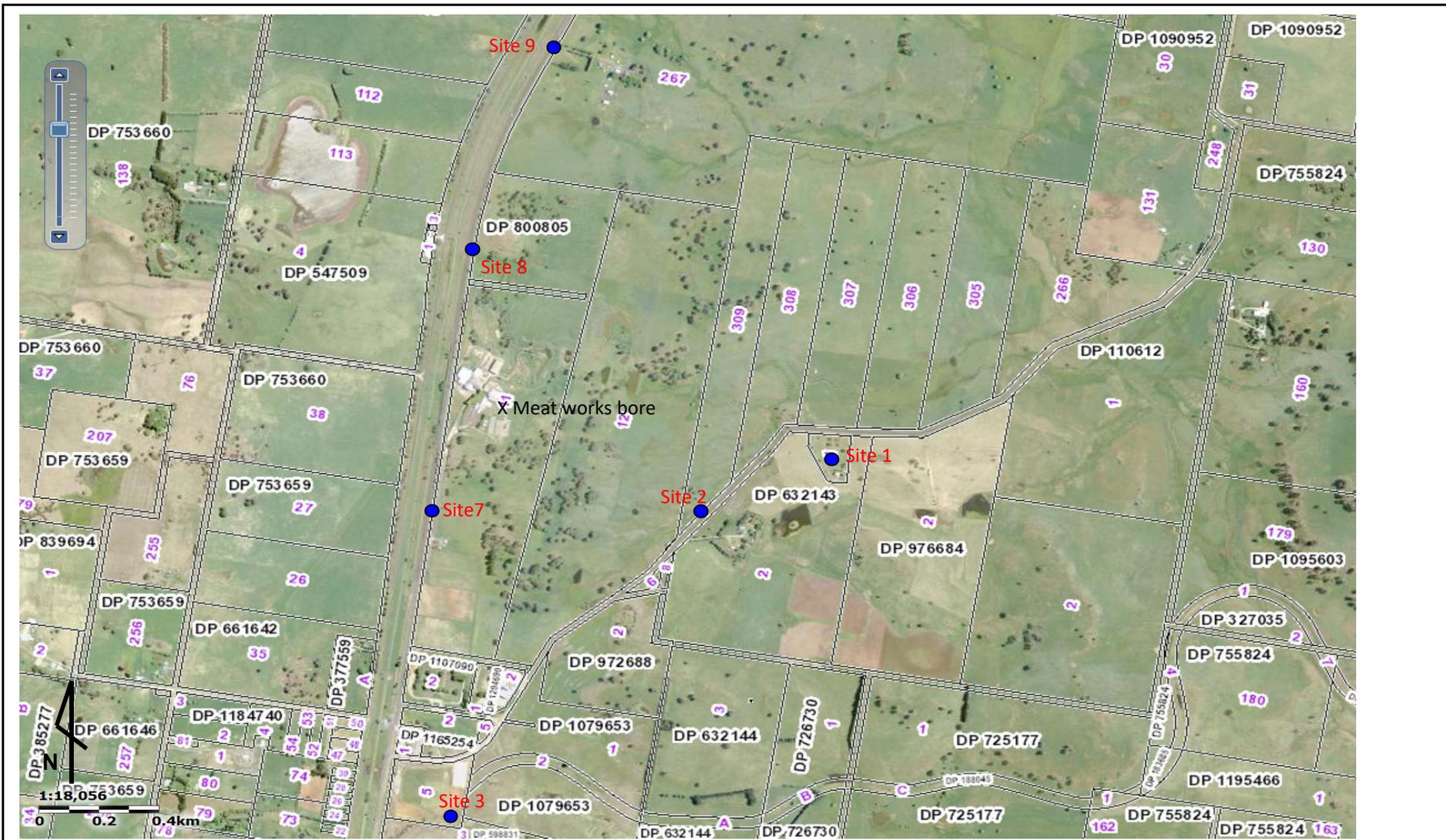
Drawn: RJL

Approved: RJL

ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION

**GUYRA -SITES 4,5 & 6**

**Figure: GA4**



 <p>Hydroilex Pty Ltd www.hydroilex.com.au</p>	UTM: - Aug-19	ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION <b>New England Highway &amp; Falconer Rd Sites 1,2,3,7,8 &amp; 9</b>	<b>Figure: GA5</b>
	Drawn: RJL Approved: RJL		



SITE 10 | 375500E | 6663420N



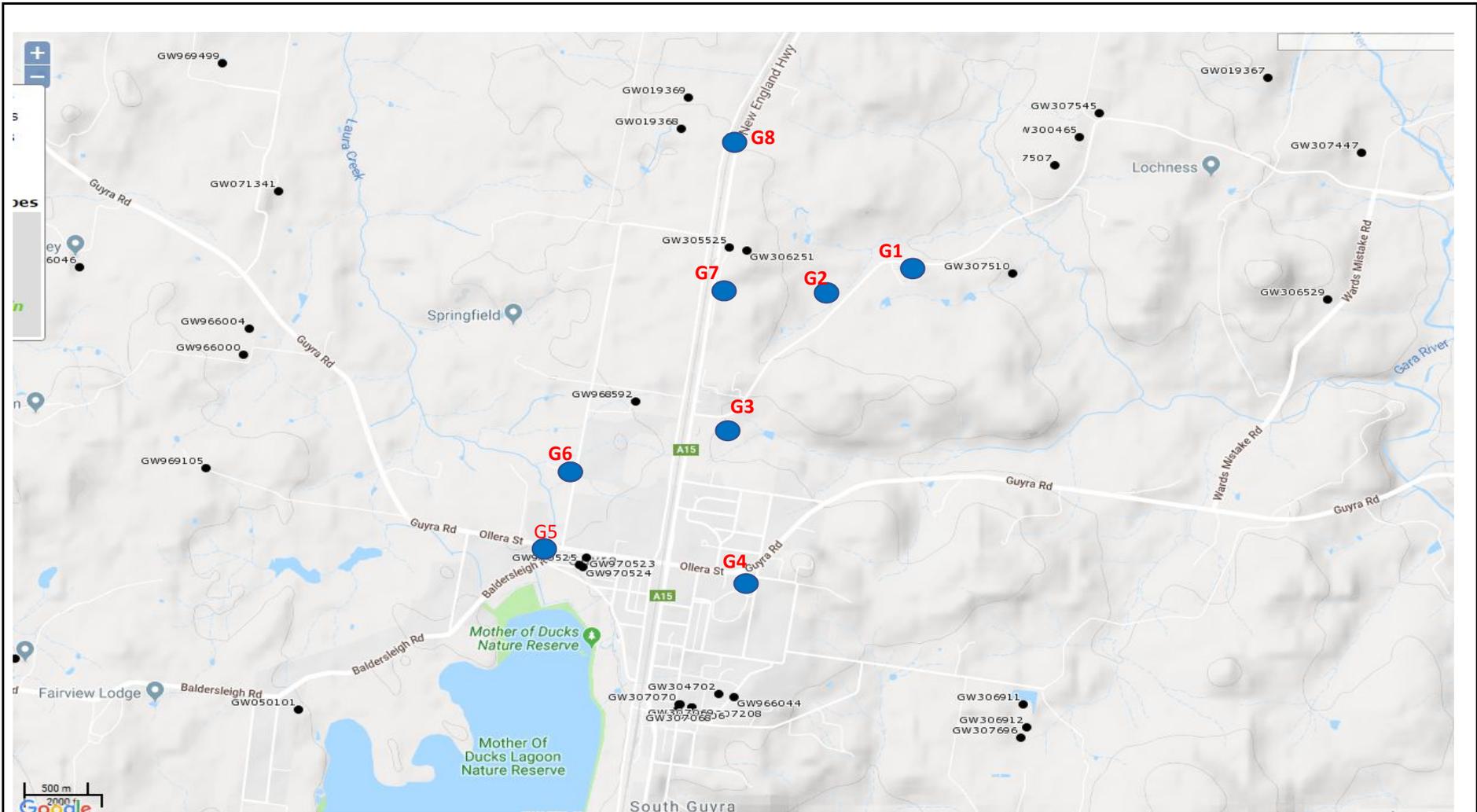
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ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION

SITE 10 - Guyra Dam Target

Figure:GA6



● Target areas



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ARMIDALE REGIONAL COUNCIL - GUYRA GROUNDWATER INVESTIGATION

Location of Guyra Test bores in relation to registered bores

Figure: GA7RB

## APPENDIX 2

SUMMARY OF GROUNDWATER BORE DATA - GUYRA																
AREA	BORE No	LICENSEE	PURPOSE	TYPE	YEAR	DEPTH	AQ	ALLUV.	AQUIFER	YIELD	SWL	GEOLOGY	COMMENTS		BAS. THICK	BASEMENT
	GW						TYPE	m	DEPTH	L/s						
NE	807563	priv.	S & D	bore	2014	76	fr		39-40	0.3	34	shale				
Falconer rd	307566	priv.	s & d	bore	2014	114				nil		basalt/sh			50	50
	307545	priv.	s & d	bore	2014	71			60-61	0.5	7	basalt/sh			12	12-71
	300465	priv.	s & d	bore	1995	18			12-18		7	nd				
	019367	priv.		well												
	307447	priv.	s & d	bore	2014	83			42-43,76	0.13		shale				
	306529	priv.	s & d	bore	2009	67			14-65	2.5		basalt/cl	5 aquif.zones		65?	
	307507	priv.	s	bore	2014	53			47-48	0.8	40	shale	deep swl			
	307510	priv.	stock	bore	2014	59	fr		42-44	0.8		shale				
HWY ZONE	968648	priv.	stock	bore	2008	29	fr		16-18	3.8	5	basalt	possible basement 23m?		23?	23?
	307695	COSTA	irrig													
	019369		S&D	well	1920	15.2										
	019368			well	1910	6.1										
	305525	priv.	test	bore	2006	107			nd				nd			
	306251	old meat.w	industrial	bore	2007	116	alluv	3	106-109	3	42	basalt/sand	106-109 sand		109	109
	698592	priv.	S & D		2008	35				0.25	4	basalt			>35	
TOWN ZONE	970523			auger		11										
	970525			auger		8.4										
	970524			auger		12.7										
	304702		stock,irrig.	bore		75			72-73	4.4	15	basalt			>75	
	307208			MB		8.5										
	307206			MB		11.5										
	307207			MB		15										
	307069			MB		15										
	966044		S & D	bore	2003	44				0.8	6	basalt & clay			>44	
STH Guyra	307461		dom	bore	2014	77.5			64-73	0.75	24	basalt & shale			>77	
	057269		dom	bore	1983	55			24	0.07	15				>55	
EAST GUYRA	306911	tomato	IRR	bore	2008	110			75-76,92-1	3.4	12	basalt			>110	
	306912	exchange	IRR	bore	2008	110			61-62,90-1	7.5	9	basalt			>110	
	307696		test	bore	2014	120				nd		basalt & clay	nd			



## Rules Summary Sheet

### New England Fold Belt Coast Groundwater Source

<b>Water sharing plan</b>	North Coast Fractured and Porous Rock Groundwater Sources
<b>Plan commencement</b>	1 July 2016
<b>Term of the plan</b>	10 years

#### Rules summary

The following rules are a guide only. For more information please call DPI Water on 1800 353 104.

#### Limits to the availability of water

<b>Long-term average annual extraction limit</b>	<p>The long-term average annual extraction limit (LTAAEL) is 60,000 ML/yr.</p> <p><b>Note:</b> If, during the term of the plan, current entitlement reaches 80% of the LTAAEL, then a review of the LTAAEL will be undertaken by the North Coast Interagency Regional Panel or some other similar interagency panel. The LTAAEL may then be increased to a maximum of 375,000 ML/yr.</p>
<b>Upper extraction limit</b>	The upper extraction limit is 375,000 ML/yr.
<b>Unassigned water</b>	<p>The volume of unassigned water is 24,532 ML/yr.</p> <p><b>Note:</b> The volume of unassigned water may change throughout the life of the plan as a result of new licences being granted or existing licences being cancelled.</p>
<b>Available water determinations</b>	<p>Available water determinations (AWDs) will be made at commencement of each water year for:</p> <ul style="list-style-type: none"> <li>• Domestic and stock, local water utility and other specific purpose access licences – 100% of the share component; and</li> <li>• Aquifer access licences – 1 ML/unit share or a lower amount as result of a growth-in-use response.</li> </ul>
<b>Compliance with the long-term average annual extraction limit</b>	Growth in extractions will be assessed against the LTAAEL over a three year period. Averaged growth greater than 5% will result in a reduced available water determination, in order to keep extractions in line with the LTAAEL.

<b>Rules for granting access licences</b>	
<b>Granting of access licences</b>	<p>Granting of water access licences may be considered for the following categories:</p> <ul style="list-style-type: none"> <li>• Specific purpose access licences including local water utility, major water utility, domestic and stock and town water supply;</li> <li>• Aquifer (Aboriginal cultural) access licences up to a maximum of 10 ML/yr;</li> <li>• Aquifer (Aboriginal community development) access licences; and</li> <li>• Aquifer access licences.</li> </ul> <p><b>Note:</b> Aquifer access licences may only be granted under a controlled allocation order made in relation to any unassigned water in this groundwater source.</p>
<b>Rules for managing access licences</b>	
<b>Carryover and account limit</b>	Carryover of up to 20% of account water is permitted, with a maximum account limit of 120% of share components plus any adjustments made for allocation assignments into or out of the account, subject to the installation of a meter.
<b>Trading rules</b>	
<b>INTO groundwater source</b>	Trades are not permitted into the groundwater source.
<b>WITHIN groundwater source</b>	Trades are permitted within the groundwater source subject to assessment.
<b>Conversion to another category of access licence</b>	Trades which result in the conversion of an access licence to another category are not permitted within the groundwater source.
<b>Rules for water supply works approvals</b>	
<b>Rules to minimise interference between bores</b>	<p>No water supply work (bores) to be granted or amended within the following distances:</p> <ul style="list-style-type: none"> <li>• 200 m of an existing bore that is licensed to extract up to 20 ML/yr;</li> <li>• 400 m of an existing bore that is licensed to extract more than 20 ML/yr;</li> <li>• 200 m of an existing bore that is used for basic rights;</li> <li>• 100 m of the boundary of the property (unless consent gained from neighbour);</li> <li>• 500 m of a local or major water utility bore; and</li> <li>• 400 m of a bore used by the Department for monitoring purposes.</li> </ul> <p>The plan lists circumstances in which these distance conditions may be varied.</p> <p><b>Note:</b> These rules apply to <b>new</b> bores <b>NOT existing</b> or <b>replacement</b> bores.</p>

<b>Rules for water supply works approvals</b>	
<b>Rules for bores located near contamination sources</b>	<p>No water supply work (bores) to be granted or amended within the following distances of a plume associated with a contamination source as identified in the plan:</p> <ul style="list-style-type: none"> <li>• within 250 m, or</li> <li>• between 250 m and 500 m if no drawdown of water will occur within 250 m of the plume, or</li> <li>• a distance greater than 500 m if necessary to protect the groundwater source, the environment or public health or safety.</li> </ul> <p>The plan lists circumstances in which these distance conditions may be varied.</p> <p><b>Note:</b> These rules apply to <b>new</b> and <b>replacement</b> bores <b>NOT existing</b> bores.</p> <p><b>Note:</b> Contamination sources are identified in Schedule 1 of the plan.</p>
<b>Rules for bores located near high priority groundwater-dependent ecosystems</b>	<p>No water supply work (bores) to be granted or amended within the following distances of any high priority groundwater-dependent ecosystem (GDE), or a river or stream:</p> <ul style="list-style-type: none"> <li>• 100 m of a high priority GDE for bores that are used for basic rights;</li> <li>• 200 m of a high priority GDE for bores that are not used for basic rights;</li> <li>• 500 m of a high priority karst environment GDE;</li> <li>• 40 m from the top of the high bank of a river or stream; and</li> <li>• 100 m from an escarpment.</li> </ul> <p>The plan lists circumstances in which these distance conditions may be varied.</p> <p>The plan may be amended to add or remove high priority groundwater-dependent ecosystems.</p> <p><b>Note:</b> These rules apply to <b>new</b> bores <b>NOT existing</b> or <b>replacement</b> bores.</p> <p><b>Note:</b> Overview maps of the high priority GDEs identified in this plan are shown in Appendix 3. The legal map of the high priority GDEs (full colour and zoomable) can be found at <a href="http://www.legislation.nsw.gov.au/">http://www.legislation.nsw.gov.au/</a>.</p>
<b>Rules for bores located near groundwater-dependent culturally significant sites</b>	<p>No water supply work (bores) to be granted or amended within the following distances of a groundwater-dependent culturally significant site:</p> <ul style="list-style-type: none"> <li>• 100 m for basic landholder rights bores; and</li> <li>• 200 m for bores not used for basic landholder rights.</li> </ul> <p>The plan lists circumstances in which these distance conditions may be varied.</p> <p>Where a culturally significant site is also a high priority GDE, the more restrictive distance restriction applies to the granting or amendment of a water supply work approval.</p> <p><b>Note:</b> These rules apply to <b>new</b> bores <b>NOT existing</b> or <b>replacement</b> bores.</p>

<b>Rules for water supply works approvals</b>	
<b>Rules for replacement groundwater works</b>	<ul style="list-style-type: none"> <li>• The existing water supply work must have a water supply work approval.</li> <li>• The replacement groundwater work must be constructed to extract water from the same groundwater source as the existing water supply work.</li> <li>• The replacement groundwater work must be constructed to extract water from: <ul style="list-style-type: none"> <li>○ the same depth as the existing water supply work; or</li> <li>○ a different depth if the Minister is satisfied that doing so will result in no greater impact on the groundwater source or its dependent ecosystems.</li> </ul> </li> <li>• The replacement groundwater work must be located: <ul style="list-style-type: none"> <li>○ within 20 m of the existing water supply work; or</li> <li>○ a distance greater than 20 m of the existing water supply work if the Minister is satisfied that doing so will result in no greater impact on the groundwater source or its dependent ecosystems.</li> </ul> </li> <li>• If the existing water supply work is located within 40 m of the high bank of a river, the replacement groundwater work must be located: <ul style="list-style-type: none"> <li>○ within 20 m of the existing water supply work but no closer to the high bank of the river; or</li> <li>○ more than 20 m of the existing water supply work, but no closer to the high bank of the river, if the Minister is satisfied that doing so will result in no greater impact on the groundwater source or its dependent ecosystems.</li> </ul> </li> <li>• The replacement groundwater work must not have a greater internal diameter or excavation footprint than the existing water supply work, except where the internal diameter of the casing of the existing water supply work is no longer manufactured, in which case the internal diameter of the replacement groundwater work is to be no greater than 110% of the internal diameter of the existing water supply work it replaces.</li> </ul>

**More information** about the planning process for the North Coast Fractured and Porous Rock Groundwater Sources is available at the DPI Water website: [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

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## Rules summary sheet Lachlan Fold Belt MDB Groundwater Source

<b>Water sharing plan</b>	NSW Murray-Darling Basin Fractured Rock Groundwater Sources
<b>Plan commencement</b>	16 January 2012
<b>Term of the plan</b>	10 years
<b>Water source</b>	<p>The waters in this groundwater source include all groundwater contained in:</p> <ol style="list-style-type: none"> <li>all rocks within the outcropped and buried areas</li> <li>all alluvial sediments within the outcropped areas</li> </ol> <p>within the boundary of the Lachlan Fold Belt MDB Groundwater Source as shown on the registered map.</p> <p>This does not include water:</p> <ol style="list-style-type: none"> <li>contained in the water sources as defined in another water sharing plan</li> <li>contained in any alluvial sediments below the surface of the ground within the excluded alluvial areas as shown on the registered map</li> <li>contained in all geological formations to a depth of 60 metres below the surface of the ground within the excluded GAB shallow areas as shown on the registered map.</li> <li>contained in the Liverpool Ranges Basalt MDB, Orange Basalt, Warrumbungle Basalt, Yass Catchment and Young Granite Groundwater Sources.</li> </ol>

### Rules summary

The following rules are a guide only. For more information about your actual licence conditions, please contact NSW Office of Water on 1800 353 104.

### Limits to the availability of water

<b>Assessment of average annual extraction against the long-term average annual extraction limit</b>	<p>Growth in extractions will be assessed against the long-term average annual extraction limit over a three year period with a five per cent tolerance.</p> <p>Assessments will commence in the fourth year of the plan.</p>
<b>Available water determinations</b>	<p>Available water determinations will be made at the commencement of each water year for:</p> <ul style="list-style-type: none"> <li>stock and domestic, local and major water utilities and specific purpose access licences – 100 per cent of share component</li> <li>aquifer access licences – one megalitre per unit share or lower amount as a result of a growth in extraction response.</li> </ul>

<b>Access rules</b>	
<b>Granting access licences</b>	<p>Granting new water access licences may be considered for the following categories:</p> <ul style="list-style-type: none"> <li>local water utility, major water utility, domestic and stock and town water supply, and salinity and water table management</li> </ul> <p><i>These are specific purpose access licences in clause 19 of the Water Management (General) Regulation 2011.</i></p> <ul style="list-style-type: none"> <li>aquifer (Aboriginal cultural), up to 10 megalitres per year</li> </ul> <p>Granting of water access licences may also be considered as part of a controlled allocation order made in relation to any unassigned water in this water source.</p> <p><b>Note:</b> Prior to any controlled allocation being made there must be consideration of maximum volumes representing the total share components of access licences in the water source, future priority requirements, including basic landholder rights and specific purpose access licences, and exemptions that do not require an access licence.</p>
<b>Carryover</b>	<ul style="list-style-type: none"> <li>Up to 10 per cent of entitlement can be carried over.</li> </ul> <p><i>No carryover is allowed for domestic and stock, local water utility, salinity and water table management or special purpose access licences.</i></p>
<b>Take limit</b>	<p>The maximum amount of water permitted to be taken in any one water year is the water allocation accrued in the water access account for that water year including carryover from the previous year, adjusted for allocation assignments out of or into individual accounts.</p>

<b>Rules for granting and amending water supply works approvals</b>	
<b>Minimising interference between neighbouring water supply works</b>	<p>Water supply works (bores) are not to be granted or amended within the following distances of existing bores:</p> <ul style="list-style-type: none"> <li>• 400 metres from an aquifer access licence bore on another landholding</li> <li>• 200 metres from a basic landholder rights bore on another landholding</li> <li>• 500 metres from a local or major water utility access licence bore</li> <li>• 400 metres from an Office of Water monitoring bore</li> <li>• 200 metres from a property boundary.</li> </ul> <p><i>The plan lists circumstances in which these distance conditions may be varied.</i></p>
<b>Protecting bores located near contamination</b>	<p>Water supply works (bores) are not to be granted or amended within:</p> <ul style="list-style-type: none"> <li>• 250 metres of contamination identified within the plan</li> <li>• between 250 metres and 500 metres of contamination as identified within the plan unless no drawdown of water will occur within 250 metres of the contamination</li> <li>• a distance greater than 500 metres of contamination as identified within the plan if necessary to protect the water source, the environment or public health or safety.</li> </ul> <p><i>The plan lists circumstances in which these distance conditions may be varied and exemptions from these rules.</i></p>
<b>Protecting bores located near sensitive environmental areas</b>	<p>Water supply works (bores) used solely for extracting basic landholder rights are not to be granted or amended within:</p> <ul style="list-style-type: none"> <li>• 100 metres of high priority groundwater dependent ecosystems (GDE) listed in the plan</li> <li>• 40 metres of the top of the high bank of a river or stream.</li> </ul> <p>Bores not used solely for extracting basic landholder rights are not to be granted or amended within:</p> <ul style="list-style-type: none"> <li>• 200 metres of a high priority GDE listed in the plan</li> <li>• greater than 200 metres of a high priority groundwater dependent ecosystem listed in the plan if the bore is likely to cause drawdown at the perimeter of any high priority GDE listed in the plan</li> <li>• 500 metres from a high priority karst or escarpment</li> <li>• 40 metres of the top of the high bank of a river or stream.</li> </ul> <p><i>The plan lists circumstances in which these distance conditions may be varied and exemptions to these rules.</i></p>
<b>Protecting groundwater dependent culturally significant sites</b>	<p>Water supply works (bores) are not to be granted or amended within the following distances of groundwater dependent cultural significant sites:</p> <ul style="list-style-type: none"> <li>• 100 metres for basic landholder rights bores</li> <li>• 200 metres for bores not used solely for extracting basic landholder rights.</li> </ul> <p><i>The plan lists circumstances in which these distance conditions may be varied and exemptions from these rules</i></p>

<b>Rules for granting and amending water supply works approvals</b>	
<b>Managing the use of existing bores within restricted distances</b>	Existing water supply works (bore) can continue extraction of groundwater with the maximum annual amount extracted equivalent to the shares nominated at the commencement of the plan within <ul style="list-style-type: none"> <li>• 500 metres of contamination listed in the plan</li> <li>• any of the distance restrictions listed above.</li> </ul>
<b>Managing local impacts</b>	The Minister may prohibit or restrict the taking of water from a water source in order to manage local impacts in groundwater sources, where required to: <ul style="list-style-type: none"> <li>• maintain or protect water levels in an aquifer</li> <li>• maintain, protect or improve the quality of water in an aquifer</li> <li>• prevent land subsidence or compaction in an aquifer</li> <li>• protect groundwater-dependent ecosystems</li> <li>• maintain pressure, or to ensure pressure recovery, in an aquifer.</li> </ul>

<b>Trading rules</b>	
<b>INTO groundwater source</b>	Not permitted.
<b>WITHIN groundwater source</b>	Permitted: <ul style="list-style-type: none"> <li>• subject to any applicable local impact management restrictions</li> <li>• unless the dealing would result in the total extraction authorised under access licences from the Lachlan Fold Belt MDB (Mudgee) Management Zone exceeding the limit authorised at the commencement of the plan.</li> </ul>
<b>Conversion to another category of access licence</b>	Not permitted: <ul style="list-style-type: none"> <li>• except those allowed under the Minister's Access Licence Dealing Principles.</li> </ul>
<b>Between states</b>	Permitted: <ul style="list-style-type: none"> <li>• where there is an interstate agreement for such dealings</li> <li>• such arrangements are specified in the Minister's Access Licence Dealing Principles.</li> </ul>

**More information** about the macro planning process for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources is available on the NSW Office of Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

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