BIG SKY LIBRARIES

COOPERATIVE LIBRARY SERVICE AGREEMENT

THIS AGREEMENT is made on _____ of _____ 20____.

BETWEEN:

(1) Moree Plains Shire Council

(2) Brewarrina Shire Council

(3) Walgett Shire Council

BACKGROUND

This is an Agreement made pursuant to s. 12(2) of the Act.

The Participating Councils agree to adopt a model of cooperative library service that will operate in the local government areas of the Participating Councils upon the terms and conditions set out in this Agreement and will be known as the 'Big Sky Libraries Cooperative Library Service Agreement'.

The Participating Councils have, by individual resolutions of their respective Councils, resolved to adopt the Library Act 1939 as amended, pursuant to section 8(1)(a) of the Act.

1. TERMS OF THE AGREEMENT

1.1 The Participating Councils enter into this agreement whereby Moree Plains Shire Council undertakes the function of providing, controlling and managing specified library services on behalf of the other Participating Councils.

1.2 The terms and conditions upon which the library services shall be so provided, controlled, and managed are set out in the Service Level Agreement, attached.

1.3 Moree Plains Shire Council shall have the powers and duties of a local authority relating to the provision, control and management of library services as may be delegated to it by this Agreement.

2. DEFINITIONS AND INTERPRETATION

2.1 In this Agreement, unless the context otherwise requires:

"**Act**" means the Library Act 1939 as amended.

"**Agreement**" means this agreement, which includes the attachments that are incorporated into this agreement by reference, as amended from time to time in accordance with the terms of this Agreement.

"**Annual Contribution Payment**" refers to the annual funds paid by each of the participating councils

"**Annual Contribution Percentage**" refers to the percentage of the total contributions that a member Council pays each year. For example if a member Council paid $30,000 as an annual contribution payment and the total member contributions for that year were $300,000 then their annual contribution percentage is 10%.

"**Area**" in relation to a Participating Council means the geographic area administered by that Council under the Local Government Act 1993 as amended.

"**Big Sky Libraries**" means the organisational structure within Moree Plains Shire Council that is responsible for delivering the services set out in this Agreement.

"**Books**" incorporates all library materials both print and non-print

"**Broadband**" means a high –speed internet connection of at least 512 kbps.

"**Committee**" has the meaning ascribed to that term in clause 5.1.

"Contingent liability" is a liability that may occur depending on the outcome of an uncertain future event such as the outcome of a pending lawsuit. A contingent liability is recorded in the accounting records if the contingency is probable and the amount of the liability can be reasonably estimated.

"**Cooperative Library Services Manager**" means the Cooperative Library Services Manager appointed by Moree Plains Shire Council to manage the delivery of services set out in this Agreement.

"Liability" means the financial debt or obligations that arise during the course of its business operations, including loans, accounts payable and accrued expenses.

"**Library Council**" means the Library Council of New South Wales.

"**Library material**" includes book, periodical, newspaper and any other printed matter and also includes map, music, manuscript, picture, photographic plate and film and any other matter or thing on by which words, sounds or images are recorded or reproduced.

"**Participating Council**" means a signatory to this Agreement.

"**Region**" means the total geographic area covered by the Participating Councils. Service Level Agreement means the Service Level Agreement which forms part of this Agreement.

"**Service Level Agreement**" means the Service Level Agreement which forms part of this Agreement.

"**State Library**" means the State Library of New South Wales

"**Term**" means the duration of this Agreement, or until the date on which this Agreement is terminated, whichever occurs first.

"**WCAG**" means the Web Content Accessibility Guidelines released by the World Wide Web Consortium

2.2 Except where the context otherwise requires:

a) References to legislation. A reference to a statute, regulation, ordinance, or by-law ("Law") will be deemed to extend to include a reference to all statutes, regulations, ordinances, or by-laws amending, consolidating, or replacing that Law from time to time.

b) Reconstitution of a party. A reference to a person or body which has ceased to exist, or has been reconstituted, amalgamated, or merged, or other functions of which have become exercisable by any other person or body in its place, shall be taken to refer to the person or

body established or constituted in its place by which its said functions have become exercisable.

c) Time Limits. Where any time limit pursuant to this Agreement falls on a non- business day, then that time limit shall be deemed to have expired on the next business day.

d) Grammatical forms. Where a word or phrase is given a defined meaning in this Agreement, any other part of speech or other grammatical form in respect of such word or phrase shall, unless the context otherwise requires, have a corresponding meaning.

e) Rules of Construction. No rule of construction operates to the detriment of a party only because that party was responsible for the preparation of this Agreement, or any part of it.

f) Headings. The headings and index in this Agreement are for convenience only and do not affect the interpretation of this Agreement.

g) References to groups. A reference to a group of persons is a reference to all of them collectively, and to any two or more of them collectively, and to each of them individually.

h) References to persons. Persons will be taken to include any natural or legal person.

3. TERM

3.1 This Agreement commences on the date of the Commencement Date of this Agreement or 30 June 2018, whichever is earlier.

3.2 This Agreement shall continue in force until it has been amended by the Participating Councils under the terms of this Agreement; or until after the expiration of two (2) years notice in writing being received by Moree Plains Shire Council from all of the other Participating Councils; or by Moree Plains Shire Council seeking the renegotiation of this Agreement.

4. COOPERATIVE LIBRARY COMMITTEE

4.1 Upon execution of the Agreement, a committee shall be formed and shall be known as the "Big Sky Libraries Committee", hereinafter called the Committee.

4.2 Each of the Participating Councils shall nominate two (2) persons, one of whom must be an elected member of a Participating Council, and these persons nominated shall become members of the Committee, together with the Executive Officer.

4.3 The Cooperative Library Services Manager shall attend all Committee meetings but does not have the right to vote on any matter before the Committee.

4.4 The General Manager of Moree Plains Shire Council, or a nominated Director, shall act as the Executive Officer of the Committee, and shall be entitled to a vote on all decisions made by the Committee.

4.5 The members of the Committee shall continue to hold office until written notice is received from their nominating Council advising the Executive Officer that an alternative nomination is made by that Council.

4.6 Each Participating Council shall, at the first Council meeting after the quadrennial election of Councillors, appoint or reappoint its Committee members and nominate an alternate elected member who may attend in the place of either member in the event of his/her absence.

4.7 A member of the Committee may resign his/her office by a letter addressed to the Committee or to the Council by whom s/he was appointed.

4.8 If a member of the Committee is absent from three (3) consecutive meetings without tendering an apology to the Committee, his/her seat shall become vacant, and the member's nominating Council will be advised accordingly.

4.9 Each member of the Committee may be removed from office at any time by resolution of the Council by whom he/she was appointed.

4.10 The procedure for the conduct of meetings and general business of Councils, as provided for in the Local Government Act 1993 as amended and the Regulations made thereunder, shall apply to the conduct of meetings and general business of the Committee. Attendance at meetings as per 4.13.

4.11 Majority plus one (1) member of the Committee shall form a quorum.

4.12 Both a Chairperson and a Deputy Chairperson shall be elected by the Committee at its first ordinary meeting held after the first annual meeting of the Participating Councils, and the Chairperson and Deputy Chairperson shall both be an elected member of his/her Participating Council. The Chairperson shall preside over the meetings of the Committee, and in the event of the absence of the Chairperson, the Deputy Chairperson shall chair the meeting. In the event of the absence of the Chairperson and Deputy Chairperson, any member of the Committee may be elected to chair the meeting, as provided in Clause 236 of the Local Government (General) Regulation 2005.4

4.13 The Committee shall meet at a minimum of three (3) times every twelve (12) months and extraordinary meetings shall be called by the Executive Officer on the request of the Chairperson or the signed, written request from any of the Participating Councils. Committee members may attend through teleconferencing or other electronic means providing the business of the meeting is clearly audible to all attending members.

4.14 Subject always to the provisions of Chapter 14 of the Local Government Act 1993 as amended, each member and the Executive Officer shall have full rights to discuss and vote upon any matter before the Committee. All motions shall be determined by equality of votes, the Chairperson shall have the right to exercise a casting vote.

4.15 Motions to recommend to the Participating Councils an amendment to this Agreement, and motions for the adoption or amendment of regulations and by-laws by the Committee, shall be the subject of a Notice of Motion which shall be circulated to Members, one month at least, prior to the meeting at which such motion shall be discussed, and may be determined by a majority of the votes of those present entitled to vote.

4.16 Subject to the terms of this Agreement, the Committee may regulate its own operations, time, and venue of meetings.

4.17 The Committee may appoint an Executive Sub-Committee to advise the Committee on any matter determined by the Committee. This Executive Sub-Committee shall comprise the General Managers of each Participating Council or their nominees, the Cooperative Library Services Manager, and the Executive Officer or his/her nominee. The Executive Sub-Committee may invite any person to assist it in its consideration of a matter referred to it by the Committee.

4.18 The Committee has delegated to it the power or duty of a local authority in relation to the provision, control and management of specified library services under section 12(2) of the Library Act 1939 as amended, and to exercise all the powers and duties of the Participating Councils in accordance with the provisions of the Library Act 1939 as amended. The Participating Councils, never the less, reserve unto themselves the right to propose amendments to the agreement to be voted upon at a Committee meeting and be accepted by two thirds majority of members.

5. ENTRY OR WITHDRAWAL OF A PARTICIPATING COUNCIL

5.1 A Council which is not a party to this Agreement may, by supplementary agreement with the Participating Councils, be admitted as a party to this Agreement and subject to the provisions of the supplementary Agreement, shall have the same rights, duties and obligations of the Participating Councils of this Agreement. The amount payable by the new Council for admission to membership of Big Sky Libraries shall be recommended by the Committee and resolved by the Executive Council.

5.2 A Participating Council may withdraw from this Agreement 12 months following receipt of written notice to the Executive Officer.

5.3 A Participating Council which has given notice under Section 5.2 of this Agreement must, unless otherwise agreed to be all Participating Councils, withdraw on 30 June in any Year.

5.4 A Participating Council which withdraws from this Agreement shall be entitled to:

- The physical collection currently allocated to libraries in the Council's area

- The computer hardware and RFID hardware currently allocated to libraries in the Council's area
- A portion of the unrestricted funds held by the Executive Council on behalf of the Big Sky Libraries Cooperative (those being funds not held in reserve for a specific purpose) as at the date of its withdrawal from the Agreement, less an agreed amount which represents the administration costs to the withdrawal

5.5 The portion of unrestricted funds to which a Member Council is entitled:

i) Shall be calculated according to the value of the unrestricted funds as disclosed by the relevant audited financial statements and multiplied by the exiting Council's annual contribution percentage.

ii) Will be taken as a cash payment.

5.6 A Member Council which withdraws from this Agreement shall be liable for a portion of the liabilities, including contingent liabilities, of the Big Sky Libraries as at the date of its withdrawal from the Agreement.5

5.8 The portion of the liabilities and contingent liabilities to which a Member Council is liable:

i) Shall be calculated according to the liabilities and contingent liabilities as disclosed by the relevant audited financial statements and reports, and multiplied by the exiting Council's annual contribution percentage.

5.9 It is agreed by all Member Councils that the decision of the group comprising the Chairperson of the Committee the Big Sky Libraries Executive Officer and a delegate from the withdrawing Council, shall be final and binding in respect of calculating the unrestricted funds and liabilities of the Committee at any time and of the books, computer and RFID hardware, and cash to be apportioned or paid to a Participating Council upon termination, withdrawal or expulsion pursuant to this Agreement.

5.10 All Member Councils agree that there shall be a right of appeal in respect of any such decision with the Library Council of New South Wales to act as arbitrator in any dispute regarding the allocation of assets to Regional Libraries on the exit of a Member Council.

5.11 In accordance with sections 5.4 - 5.10 the calculation of the cash payment an exiting Council is entitled to is demonstrated by the following formula:

Calculation of unrestricted funds entitlement

Unrestricted funds balance x Exiting Council's Annual Contribution percentage

Less

Calculation of Liabilities owing

Contingent and other liabilities x Exiting Council's Annual Contribution percentage

Example of calculations.

An exiting Council has an annual contribution percentage of 15%, meaning there annual contribution equates to 15% of the total member contributions for that year.

Reported in the financial statements for that year are

Total Unrestricted Funds	$300,000
Total Contingent and Other Liabilities	$ 20,000

The exiting Council's cash payment will be calculated as follows:

($300,000 x 15%) – ($20,000 x 15%) = $42,000

6. APPORTIONMENT OF ASSETS

6.1 If this Agreement is terminated, or if a Participating Council withdraws from this Agreement in accordance with Clause 6.4, the Council or Councils so terminating shall be entitled to receive books and/ or other assets of Big Sky Libraries to the current written down value on a pro rata basis proportionate to the amount contributed by the Council during the currency of the asset compared to the total amount contributed by all Participating Councils during the same period, subject to:

(a) Allowance for depreciation being taken into account.

(b) The withdrawing Council or Councils will pay the full cost of adjustments to any records made necessary as a result of the withdrawal of that Council.

(c) That in lieu of distributing such books or other assets, Moree Plains Shire Council may acquire such books or other assets by payment to the withdrawing Council a sum equal to but not exceeding the written down value of the share of such assets to which the withdrawing Council is entitled under this Clause.

(d) In the event of a dispute, or the failure to agree on the method of distribution of assets, an independent arbitrator shall be appointed as set out in Clause 8.

(e) In the event of a specific donation, bequest, gift or the like being made to an individual Library, then this donation, bequest, gift or the like shall remain the property of the individual Council and shall not be included in any calculation involving financial arrangements of Big Sky Libraries.

7. DISPUTE RESOLUTION

7.1 Where a Participating Council clain1s that a dispute has arisen, it may give written notice of the dispute to each Participating Council.

7.2 The Participating Councils must seek to resolve the dispute within fourteen (14) days of receipt of a notice under Clause 8.1.

7.3 If the dispute is not resolved within fourteen (14) day period, or within such further period as the Participating Councils agree in writing, then the dispute is to be referred to the Australian Commercial Dispute Centre for mediation.

7.4 The mediation shall be conducted in accordance with the Australian Commercial Dispute Centre Mediation Guidelines, which set out the procedures to be adopted, the process of selection of the mediator, and the costs involved.

7.5 Notwithstanding anything else in this clause, pursuant to section 12(5) of the Library Act 1939 as amended, any dispute arising under this Agreement shall, on the application to the Library Council of a Participating Council, be settled by arbitration by an arbitrator appointed by the Library Council.

8. RESPONSIBILITIES OF MOREE PLAINS SHIRE COUNCIL

Pursuant to section 12(2) of the *Library Act* 1939 as amended, Moree Plains Shire Council undertakes to provide, for and on behalf of the Participating Councils, the following in relation to the provision, control, and management of specified library services:

8.1 Moree Plains Shire Council will appoint suitably qualified library staff capable of delivering the services required by this Agreement.

8.2 The Cooperative Library Services Manager will visit each branch library at least twice per annum for the purposes of collection maintenance and professional advisory assistance to branch library staff.

8.3 Moree Plains Shire Council will facilitate four (4) All-Staff Meetings per annum, at rotating locations throughout the service area.

8.4 In providing a library management system for the Participating Councils, the Cooperative Library Services Manager will use a competitive software package that is affordable and complies with best library practice.

8.5 Moree Plains Shire Council will ensure that the library management system is properly maintained as set out in the Service Level Agreement.

8.6 The Cooperative Library Services Manager will provide any necessary training related to the Participating Councils' operation of the library management system.

8.7 Moree Plains Shire Council as the Executive Council will provide any necessary policies regarding borrowing, loan limits, replacement costs, overdues, etc, to ensure the consistent and efficient operation of the library management system.

8.8 Moree Plains Shire Council as the Executive Council will provide collection development services in accordance with the Service Level Agreement and the Collection Development Policy, including acquisitions, cataloguing, and end-processing, to industry standard, and within the agreed annual materials budget. Distribution will be in accordance with each Participating Council's Annual contribution percentage, relative to the total materials budget.

8.9 Moree Plains Shire Council as the Executive Council will coordinate the purchase, installation and management of public access computers and associated software.

8.10 Moree Plains Shire Council as the Executive Council will coordinate the purchase, installation and management of the RFID system and its associated software.

8.11 Moree Plains Shire Council will provide an interlibrary loan and document delivery service in accordance with the Service Level Agreement, the current Australian Interlibrary Resource Sharing Code (ILRS), accepted library best practice, and the Interlibrary Loan Policy.

8.12 Moree Plains Shire Council will submit accurate statistics as required by the State Library of New South Wales.

8.13 Moree Plains Shire Council will submit an annual Report no later than the thirtieth day of November each year for the preceding twelve (12) month period, ending the thirtieth day of June. This Report shall include details of performance measures and a statement of income and expenditure.

8.14 Moree Plains Shire Council shall provide and maintain the Big Sky Libraries website as set out in the Service Level Agreement

8.15 The preparation of agendas and business papers for Committee meetings, the keeping of minutes and the implementation of all decisions of the Committee.

9. RESPONSIBILITIES OF PARTICIPATING COUNCILS

9.1 The Participating Councils will each provide suitable, adequate, and appropriate buildings, furniture, shelving, equipment and insurance to enable delivery of a minimum standard of library services to their respective communities as required by section 10(1) of the Library Act 1939 as amended and to ensure the safety and security of the collections and the staff.

9.2 The Participating Councils will each provide suitably qualified library staff capable of delivering a minimum standard of library services as required by section 10(1) of the Library Act 1939 as amended.

9.3 The Participating Councils will each release library staff for appropriate periods of continuing professional development as required in Section 8.3 of this Agreement, with a minimum of four (4) days per year.

9.4 The Participating Councils will each provide the necessary computer hardware, operating system(s) and peripherals in each library for the library management system, with minimum specifications as required by the library management system.

9.5 The Participating Councils will each provide reliable broadband internet connections to each library's library management system computer.

9.6 The Participating Councils will each provide reliable e-mail accounts for each library to facilitate communication regarding cooperative library services.

9.7 The Participating Councils will each comply with all policies regarding borrowing, loan limits, replacement costs, overdues, etc, to ensure the consistent and efficient operation of the library management system.

9.8 The Participating Councils will each ensure that overdue notices are processed at least once per week and that overdue materials are retrieved and/ or accounted for within 60 days of becoming overdue.

9.9 The Participating Councils will each comply with all other policies required for the consistent and efficient operation of Big Sky Libraries.

9.10 The Participating Councils shall determine the opening hours of the Branch Libraries in their areas.

10. STANDARDS OF SERVICE

10.1 The services that Big Sky Libraries will provide are set out in Service Level Agreement.

10.2 The standard of library service to be provided shall be reviewed annually, particularly with regard to expenditures on library resources and staff, with a view to raising the standard by stages as described in the approved Strategic Plan.

11. LIABILITY

11.1 Any liability incurred by Moree Plains Shire Council in connection with the performance of its functions of exercising powers and/ or duties under this Agreement, except where it has been negligent in the performance of its functions, is to be borne by each Participating Council in the same proportion as the population in its area bears in relation to the total population of the Region.

12. FINANCE

12.1 The Participating Councils will each pay Moree Plains Shire Council an annual contribution payment commencing with the 2017/18 figure, increased by the IPART annual "Allowable Rate Peg" increase for NSW Local Government to exercise the powers and/ or duties referred to in Section 8 of this Agreement. Each Participating Council's contribution is based on the below percentage.

Annual Percentage Contribution breakdown:

- 60% Moree Plains Shire Council
- 30% Walgett Shire Council
- 10% Brewarrina Shire Council

12.2 This annual payment is due on 15 September every year.

12.3 Interest on any amount payable under this Agreement which is not received within fourteen days of the due date must be paid at the rate specified from time to time by the Local Government Minister by notice published in the Gazette pursuant to s. 566 of the Local Government Act 1993, until the date it is received.

13. NOTICES

13.1 A notice under this Agreement must be:

(a) in writing, directed to the representative of each Participating Council; and

(b) forwarded to the address, facsimile number or e-mail address of that representative or the address last notified by the intended recipient to the sender.

13.2 A notice under this Agreement will be deemed to be served:

(a) in the case of delivery in person- when delivered to the recipient's address for service and a signature received as evidence of delivery;

(b) in the case of delivery by post- within three business days of posting;

(c) in the case of delivery by e-mail, on receipt of confirmation by the recipient that the recipient has received the e-mail.

13.3 Notwithstanding the preceding subclause, if delivery or receipt of a communication is on a day which is not a business day in the place to which the communication is sent or is later than 5:00pm local time in that place, it will be deemed to have been duly given or made at 9:00am local time at that place on the next business day in that place.

13.4 In the case of each Participating Council, the address for notices under this Agreement as at the date of this Agreement is:

Moree Plains Shire Council

Address: PO Box 420, Moree NSW 2400

Facsimile: 02 6752 5473

Phone: 02 6757 3222

Email: council@mpsc.nsw.gov.au

Attention: The General Manager

Brewarrina Shire Council

Address: PO Box 125, Brewarrina NSW 2839

Facsimile: 02 6839 2100

Phone: 02 6830 5100

Email: breshire@brewarrina.nsw.gov.au

Attention: The General Manager

Walgett Shire Council

Address: PO Box 31, Walgett NSW 2832

Facsimile: 02 6828 1608

Phone: 02 6828 1399

Email: admin@walgett.nsw.gov.au

Attention: The General Manager

14. MISCELLANEOUS

Writing

14.1 All amendments to this Agreement and all consents, approvals, waivers, and agreements made under or pursuant to this Agreement must be evidenced in writing.

Consents

15.2 A Participating Council may give its consent or approval conditionally or unconditionally or may withhold its consent, in its absolute discretion, unless this Agreement specifically provides otherwise.

Severability

15.3 If any part of this Agreement is prohibited, void, voidable, illegal, or unenforceable, then that part is severed from this Agreement but without affecting the continued operation of the remainder of the Agreement.

15.4 If any part of this Agreement is not in accordance with the provisions of the Library Act 1939 as amended, then that part is severed from this Agreement but without affecting the continued operation of the remainder of the Agreement.

Inconsistency

15.5 In the event of an inconsistency between the terms of this Agreement, for the purpose only of resolving the inconsistency, the following order of decreasing priority applies:

(a) Operative provisions of this Agreement.

(b) Service Level Agreement.

(c) Other attachments (if any).

Legal advice and costs

15.6 Each Participating Council will bear its own costs incurred in relation to this Agreement.

This agreement is executed on _____ day of _____

Execution by Administering Council:

Signed for and on behalf of Moree Plains Shire Council

by Lester Rodgers, General Manager Signature_____

in the presence of_____ Signature _____

Execution by the Delegating Council (s):

Signed for and on behalf of Walgett Shire Council

by Mr Donald Ramsland, General Manager Signature _____

in the presence of_____ Signature _____

Signed for and on behalf of Brewarrina Shire Council

By Jeff Sowiak, General Manager Signature _____

in the presence of_____ Signature _____

BIG SKY LIBRARIES

SERVICE LEVEL AGREEMENT

1. Administration and Governance

Administration and Governance services are provided as follows:

- Reporting to the Executive Council, Committee and State Library of New South Wales
- General secretarial and administrative services
- Development, application and maintenance of policy and strategy
- Development and monitoring of budgets
- Development, implementation and reporting of Service Level Agreements
- Continuing professional development of staff

Service	**Performance Indicator**
Provide a written reports to the meetings of the Big Sky Libraries Committee each year	Timely, quality, advice with no significant oversights
Financial Statements Audited	Completed auditors report
Annual financial reporting to the Library Council	Financial statements completed and forwarded to Library Council annually
Statistical reporting to Library Council	Annual statistical data provided to Library Council
Present an annual budget and member Council contribution advice to the first Big Sky Libraries Committee meeting each year	Annual budget and contribution advice presented at first Big Sky Libraries Committee meeting each year
Progress on Big Sky Libraries Strategic Plan 2015-2020 reported on 6 monthly to Committee	Progress on Big Sky Libraries Strategic Plan reported to Committee
Professional Development of Staff	Minimum of 2 training sessions delivered per year – may be incorporate into team meetings
Annual Contribution Payment invoice raised to Participating Councils	Invoices raised and forwarded in July each year to Participating Councils

2. Information communications and technology services

The Big Sky Libraries staff support library service provision across the region through:

- the supply and maintenance of software to operate the Spydus Library Management System (LMS)
- coordinating support issues relating to RFID hardware and software
- coordinating support issues relating to the public pc internet and public wifi and internet.

It should be noted that provision and maintenance of library staff computers and associated support is the responsibility of each member council.

Service	**Performance indicator**
Library Management System (LMS) licensing	LMS licences provided
Library Management System (LMS) software support enquiries	LMS support enquiries provided
Library Management System (LMS) upgrades	LMS upgrades applied
Library Management System (LMS) reporting	Reporting provided via LMS Dashboards
RFID hardware and software support	RFID support enquires logged with vendor
Public Access Computers	Support enquiries logged with vendor and
Training and onsite support	Support and instruction provided across library management system applications Onsite support as required
Procedural guides	Procedural guides provided and maintained

3. eLibrary Services

ELibrary services are an important and growing area of service delivery and encompass the many aspects of technological developments that influence the way libraries provide services. Including:

- Website
- eResources including but not limited to eBooks, eMagazines, eAudio & databases
- Social media
- Discovery tools

Service	**Performance Indicator**
Website development and maintenance	Website information is current and accurate
Access to eResources	Current eResources available via website
Social media	Online newsletter created
Discovery tools	Integrated services and search tools available and working

4. Collection services

Big Sky Libraries collections services are provided as follows:

- Development, maintenance and application of the Big Sky Libraries Collection Development Strategy
- Allocation of collection resources funding to Participating Council libraries on a per-capita basis
- Administration of the Big Sky Libraries outsourced shelf-ready collections process
- Maintenance of the Big Sky Libraries online catalogue
- Coordinate the movement of stock between libraries

Service	Performance Indicator
Collection Development Strategy	Current Strategy
Distribution of collection	Collection items received regularly
Shelf-ready processing collection items	Supplier KPIs are achieved
Online Catalogue maintained	Data is current and accurate
Stock exchanges	Library stock rotated as per specification on monthly basis as per the roster Feb - November

5. Information services

Provision of a reciprocal Inter-Library Loan and Document Delivery service is a key service provided to Big Sky Libraries members as a means of supporting access to resources not available in the Big Sky Libraries collection.

Service	Performance Indicator
Outgoing Inter-library Loan request	Internal requests from Big Sky Libraries members are responded by Big Sky Libraries staff within 2 working days of receipt
Incoming Inter-Library Loan requests	Requests from external libraries are responded by Big Sky Libraries staff within 4 working days of receipt as outlined in Australian Library & Information Association's (ALIA) ILL National Code
Information requests	90% of enquiries responded to within 2 working days

Walgett Shire Council
Drinking Water Management System
2018

DOCUMENT CONTROL SHEET

JOB NUMBER 2017.0246C
PROJECT LEAD Michael Lawrence
CLIENT Walgett Shire Council
CLIENT CONTACT Sylvester Otumbo

	Author	Reviewer	Comment	Date
1.0	Jessica Huxley	MTR		10/09/2014
	Dilip Tiwari		Revision of CCPs & Process diagram for Walgett & Collarenebri W/S	06/12/2016
2.0	A Wilson	M Lawrence	Major amendment	23/02/2018

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1.1 Overview

Walgett Shire Council (WSC), in partnership with NSW Health, has developed a risk based Drinking Water Management System (DWMS) consistent with the *Australian Drinking Water Quality Guidelines* (ADWG) (NHMRC, NRMMC, 2011).

NSW Health has provided funding to support Walgett Shire Council to fulfil its obligations under Section 25 of the *Public Health Act 2010* (NSW) and Part 5 Section 34 the Public Health Regulation 2012.

The ADWG provides the framework for the good management of drinking water supplies. The framework was developed to guide a structured and systematic approach for the management of drinking water quality from catchment to tap. It incorporates a quality assurance program developed specifically for the water industry, and includes elements of Hazard Analysis Critical Control Point (HACCP), ISO 9001 (Quality Management) and AS/NZS ISO31000:2009 (Risk Management).

Figure 1 Walgett Region

2 COMMITMENT TO DRINKING WATER QUALITY

2.1 Objective

This document aims to support Walgett Shire Council to deliver safe drinking water. Access to safe water is a basic need and is one of the most important contributors to public health.

The overall approach is to provide drinking water supply system staff (i.e. operators and managers) with a user-friendly document that supports Council in its management of a safe drinking water supply. It provides an overview of the system and a summary of all relevant documentation and supporting requirements.

This DWMS is a living document. The system will be reviewed and updated in line with Council's monitoring and reporting procedures and when new processes or changes are introduced.

2.2 Commitment

Walgett Shire Council is committed to managing its drinking water supply systems to provide a safe, quality drinking water that consistently meets the ADWG, consumer expectations and regulatory requirements. Council demonstrates commitment to drinking water quality management throughout the organisation by:

- Formally adopting drinking water quality as a priority
- Defining the roles and responsibilities to provide safe drinking water
- Adopting a continuous improvement approach
- Identifying and assessing risks, controls and preventative to protect drinking water quality and public health
- Adopting a measurable Improvement Plan
- Implementation of a Drinking Water Policy

2.3 Regulatory and Formal Requirements

Council is required to adhere to many regulatory and formal requirements. There is commonwealth legislation (i.e. the *Water Act 2007)*, state legislation (i.e. *Public Health Act 2010, Fluoridation of Public Water Supplies Act 1957)* and National and State Guidelines and Programs (i.e. Australian Drinking Water Guidelines 2011). The regulatory and formal requirements relating to drinking water quality in Walgett Shire Council have been identified and detailed in Table 1.

Table 1 Summary of regulatory and formal requirements

Commonwealth Legislation		
Competition and Consumer Act 2010	Replaces the *Trade Practices Act 1974* and incorporates Schedule 2 – The Australian Consumer Law. As a "seller" of water, the local council is subject to provisions of Consumer transactions and Consumer guarantees, which guarantees that the goods supplied are reasonably fit for purpose.	Australian Competition and Consumer Commission
Water Act 2007	Provides for the management of the ground and surface water resources of the Murray-Darling Basin, with particular focus on managing extractions to 'protect, restore and provide for the ecological values and ecosystem services of the Murray-Darling Basin'.	Murray Darling Basin Authority
NSW Legislation		
Aboriginal Land Rights Act 1983	Establishes Local Aboriginal Land Councils, which are responsible for managing land for the benefit of local Aboriginal people.	NSW Education and Communities: Aboriginal Affairs
Catchment Management Authorities Act 2003	Natural resource management, from planning to operations, is to be undertaken at the catchment level. State-wide standards are to be applied. A Catchment Action Plan (CAP) is used to define key themes for each catchment, with specific catchment and management targets.	Central West Local Land Service (LLS) Natural Resources Commission Landholders
Environmental Planning & Assessment Act 1979	Requires that the environmental impacts of projects be studied at all stages on the basis of scale, location and performance. Under Part 3 of the Act, Local Environmental Plans (LEPs) are developed to establish what forms of development and land use are permissible and/or prohibited. LEPs ensure that drinking water quality is considered when assessing development applications. The Draft Walgett LEP (2012) applies to all lands within the Walgett Shire.	NSW Department of Planning and Infrastructure
Fluoridation of Public Water Supplies Act 1957, Regulation and Code of Practice	Requirements for testing and reporting where water supplies are fluoridated.	NSW Health
Local Government Act 1993	Local councils have the responsibility for the provision of water supply to consumers, in accordance to the NSW Best-Practice Management of Water Supply and Sewerage Guidelines.	NSW Government - Division of Local Government
Protection of the Environment (Operations) Act 1997	Requires licenses for activities for activities with potentially significant environmental impacts. Prosecution may be carried out under this act for any chemical leakage, spill, and disposal of wastes or similar.	NSW EPA
Public Health Act 2010	Requires all water authorities to develop Drinking Water Management Systems. Bestows certain powers on NSW Health with respect to provision of safe drinking water, including ability to enter treatment facilities, order mandatory testing or obtain information about the drinking water, power to close a water supply. Council is required to issue public advice regarding the water supply when directed by the Chief Health Officer of NSW Health.	NSW Health

Water Management Act 2000	Provides the basis for water planning, the allocation of water resources and water access entitlements. The "Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources" (2008) governs the use of groundwater, including rules for protecting the environment, extractions, managing licence holders' water accounts, and water trading in the plan area. The "Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources" (2012) covers surface and ground waters in the Walgett Shire.	NSW Office of Water
Work, Health & Safety Act 2011	Specifies conditions for storage and handling of chemicals on-site at water treatment plants.	Work Cover Authority of NSW
National and State Guidelines and Programs		
Aboriginal Communities Water and Sewerage Program	Provides funds for maintenance, operations and repairs to water systems in discrete Aboriginal communities, covering Walli, Gingie and Namoi Reserve communities.	NSW and Local Aboriginal Land Council
Australian Drinking Water Guidelines 2011	Ensures the accountability of drinking water managers and operators and health authorities/auditors for the supply of safe, good quality drinking water to consumers.	NSW Health NHMRC
Best-Practice Management of Water Supply and Sewerage Guidelines 2007	Provides for appropriate, affordable and cost-effective services to meet community needs while protecting public health and the environment and making best use of regional resources. Walgett Shire Council has not yet developed Best Practices documents requiring a Strategic Business Plan (SBP), including a Financial Plan and associated asset management plans, and a 30-year Integrated Water Cycle Management (IWCM) plan.	NSW Office of Water
NSW Groundwater Quality Protection Policy 1998	Manages groundwater resources for sustainable economic, social and environmental uses, with a specific principle to protect town water supplies against contamination. A key recommendation is to develop wellhead protection plans.	NSW Office of Water
NSW Health Drinking Water Monitoring Program 2005	NSW Health provides analysis of drinking water samples for water utilities, providing an independent analysis of water at point of supply.	NSW Health
NSW Health Response Protocol for management of microbial quality of drinking water 2011	Guides Public Health Units and water utilities in their joint response to following rapidly changing source water quality, treatment failure or microbial contamination.	NSW Health
NSW Health Response Protocol for management of physical and chemical quality 2004	Guides Public Health Units and water utilities in their joint response following the detection of physical and chemical water characteristics that exceed the Guidelines. Aesthetic and health related guideline values are considered.	NSW Health
National Partnership Agreement on Water for the Future	The COAG Strategy on Water and Wastewater Services in Remote Communities in New South Wales aims to provide water infrastructure and build the capacity of the Council to improve the management and overall security of water in remote communities.	Australian Government NSW Office of Water
Plumbing Code of Australia	Performance requirements for the design, construction, installation, replacement, repair, alteration and maintenance of plumbing and drainage installations. To be complied with by administrators, plumbing Licensees, developers and property owners/occupiers.	NSW Office of Fair Trading

2.4 Engaging Stakeholders

The stakeholders involved in the management of drinking water quality in Walgett Shire are listed below. Both NSW Health (both state and regional) and Department of Industry (Lands and Water) participated in the development of this DWMS.

Table 2 Stakeholders in Drinking Water Quality Management

NSW Health	Provides expert advice and support Council in achieving their regulatory requirements	Provide water analysis through the NSW Health Drinking Water Monitoring Program. NSW Health response protocol to microbial and physical and chemical exceedances. Representatives from the Local Public Health Unit and NSW Health Water Unit participated in site visits and the Risk Assessment Workshop as part of the development of the DWMS.
Lands and Water	Provides expert advice and support Council in achieving their regulatory requirements	Inspector visits and assesses WTPs compliance every three months. Technical support on investigations, design, construction, operation, maintenance and management. Annual Reporting on Water Supply performance. Participated in site visits and Risk Assessment Workshop as part of the Walgett Shire Council DWMS. Barwon Regional Algal Coordinating Committee (RACC) provides algal alerts.
Central West Local Land Service	Catchment Management Coordinates action plans and funding in the drinking water catchment	Liaises with Walgett Shire Council for the management of source water quality in the drinking water catchment.
Murray Darling Basin Authority	Catchment Management	Assists in management of algal blooms through varying flows
Namoi Reserve, Gingie and The Walli Aboriginal Communities	Aboriginal Water and Sewage Interim Management Plans	External contractors manage the internal water supply under the Aboriginal Communities Water and Sewage Program. A list of key contacts can be found in the Namoi Aboriginal Water and Sewerage Management Plan Table 1.

3 DRINKING WATER SUPPLY SYSTEM OVERVIEW

The table below provides an overview of the six drinking water supply systems managed by Walgett Shire Council: Lightning Ridge, Walgett, Collarenebri,

Rowena, Carinda and Cumborah. There are also 3 remote towns; Namoi (supplied by Walgett), The Walli (supplied by Collarenebri) and Gingie (Artesian Bore – not connected to a council drinking water scheme). Gingie scheme is managed by Council under a service agreement in place since 2014 with Department of Land and Water for council to provide operations, maintenance and monitoring services under the ACWSP.

Table 3 Overview of Walgett Shire Council Drinking Water Supply Systems

Catchment	Namoi & Barwon River. GAB.	Barwon River	Great Artesian Basin (GAB)	GAB	GAB	GAB	GAB
License Allocation (ML/year)	2271 (River) 300 (Bore)	416	407/168 Old Bore 407/168 New Bore	?	7	65	n/a
Treatment Plants	Conventional Treatment Plant & Disinfection.	Media filtration, ultrafiltration, Carbon Filtration and Disinfection.	No Treatment or disinfection.	No Treatment or disinfection.	No Treatment or disinfection.	No Treatment or disinfection.	No Treatment or disinfection.
Capacity	1.5ML/Day	0.7ML/Day	n/a	n/a	n/a	n/a	n/a
Reservoirs Capacity	Raw- 5ML Filtered- 1.4ML	Raw- 1.2ML Filtered- 0.5ML	5ML, 1ML	2 Overhead tanks	2 Overhead tanks	1 Ground Tank & Stand Pipe- Cumborah	1 Ground Tank & 2 Elevated Tanks
Town Supplied	Walgett Namoi Village	Collarenebri The Walli Village	Lightning Ridge	Carinda	Rowena	Cumborah	
Population	Walgett - 1275 Namoi – 250-350	Collarenebri - 255 The Walli – 50	1,496	50	60	200	150 - 350
Annual Demand (ML/year)	Walgett (240ML) Namoi – 25.5ML (Table 1.1 NAWSMP)	Filtered Water – 186ML + 4.6 (Wali) Raw Water – 465ML + 0.4 ML (Walli)					16

3.1 Catchment Overview

Overview

WSC is situated within two Catchment Management Authority areas; Western Catchment Authority and Namoi Catchment Authority. The two major river systems are the Barwon River and the Namoi River; these rivers form part of the Barwon Catchment within the Barwon Darling Basin. WSC extracts water from the rivers to supply drinking water and/or raw water.

Western Catchment

The Western Catchment is the largest catchment in NSW. It includes the Barwon-Darling, Culgoa, Paroo, Warrego, Narran, Bokhara and Birrie River catchment. The Catchment is predominantly leasehold land, administered under the Western Lands Act (1901). Predominant land uses in this semi-arid zone are grazing, dryland cropping, irrigated cotton production, mining, tourism and natural conservation.

Barwon Darling Catchment

Barwon Darling Catchment is situated within the Western Catchment Management Area. Walgett Shire is located in the upper region of the Barwon Darling Catchment. Water is sourced from the Barwon River for the Collarenebri drinking water supply, as well as the raw water supply for the towns of Walgett and Collarenebri.

Namoi Catchment

The Namoi River rises on the western slopes of the Great Dividing Range and flows west to the confluence with the Barwon River. There are many wetlands and billabongs found along the river. The Namoi Catchment covers an area of approximately 42,000 km2 with elevations of around 140 m ASL. Nearly two-thirds of the Namoi catchment area is comparatively flat.

Walgett Shire is located at the lower region of the catchment where the Namoi River joins the Barwon River. Water is sourced from the Namoi River for the Walgett drinking water supply. Agriculture is the main land use, dominated by grazing, along with wheat, cotton and other broadacre crops on the alluvial floodplains. Cotton is the main irrigated crop, accounting for about threequarters of the water used in the catchment.

NSW Great Artesian Basin Groundwater (GAB)

The GAB is one of the largest underground water reservoirs in the world with an estimated 65 million GL of stored water. The GAB was formed 100 - 250 million years ago. It comprises of alternating layers of water-bearing (permeable) sandstone aquifers and non-water-bearing (impermeable) siltstones and mudstones. The impermeable rocks confine the aquifers, causing the groundwater to become pressurised (i.e. artesian bores).

The aquifers are recharged by infiltration from rainfall and streams, mainly on the eastern edge of the Basin along the Great Dividing Range. Groundwater flow is slow, about 0.1 to 5 metres per year, and in some parts the discharging water is up to 2 million years old.

Water quality issues include the high levels of ions. Total dissolved solids (TDS), varies between 500 and 1500 milligrams per litre. For this reason, the water is not suitable for irrigation. The predominantly fresh water emerges at temperatures which average 30°C to 50°C from shallow areas to 100°C from the deeper region.

Water quality in the main aquifers is generally good for watering livestock but is also used for domestic purposes throughout the GAB. The “Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources (2009)” governs the use of water, including rules for protecting the environment, extractions, managing licence holders' water accounts, and water trading in the plan area.

WSC extracts from artesian bores to supply both drinking water and raw water.

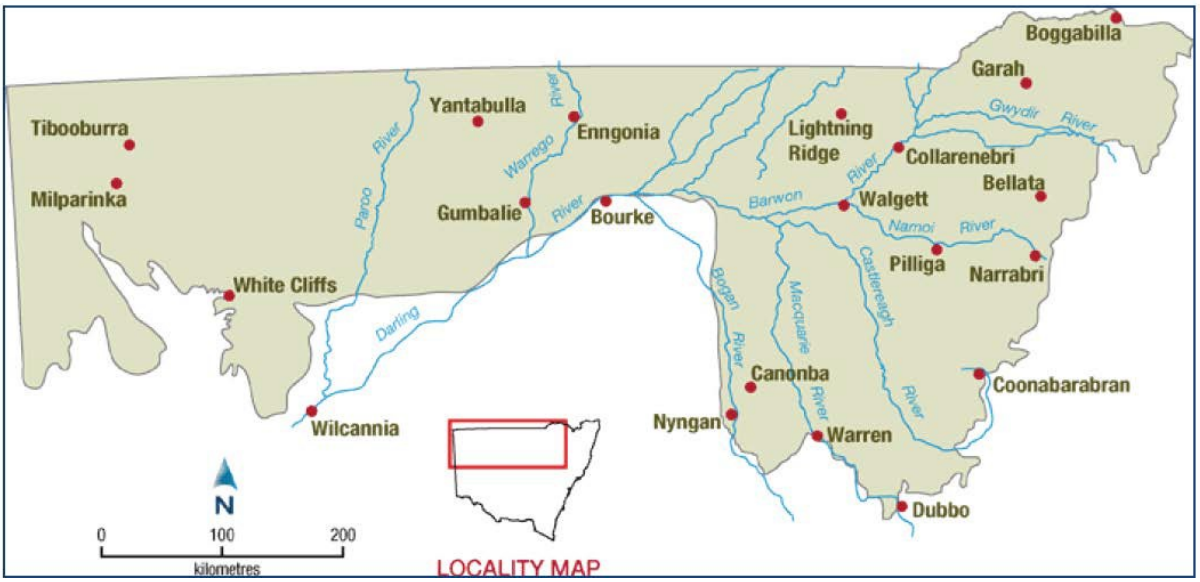


Figure 2 GAB in NSW

4 WALGETT SUPPLY SYSTEM

4.1 Description

Walgett Shire Council operates two separate systems to supply potable and non-potable water to consumers in Walgett. Water for the two systems is extracted from two separate river systems. The Namoi Intake supplies raw water to the WTP while the non-potable supply is sourced from the Barwon River Intake. The non-potable system extracts water from the river near the Golf Course. Water is pumped to a separate untreated water reticulation system which consists of another standpipe reservoir.

Figure 3 provides a process flow diagram of the Walgett drinking water supply system.

Source Water

Raw water for the Walgett drinking water supply system is sourced from the Namoi River. The Namoi River is one of the Murray-Darling Basin's major NSW sub-catchments. It covers a total area of about 42,000 square kilometres from the Great Dividing Range near Tamworth to the junction with Barwon River near Walgett. Water quality in the Namoi River is often poor due to intensive farming in the catchment and blue-green algae.

Water Treatment

The Walgett Water Treatment Plant (WTP) was built in 2014 and commissioned in the 2015 with a design capacity of 1.5 ML/day. The Walgett WTP treatment process consists of optional pre-chlorination (not normally used) coagulation, flocculation, clarification through a clarifier, and filtration through a single media filter followed by disinfection. The process also included chemical dosing for pH correction and PAC. Treated water is pumped to the 1.4 ML standpipe storage reservoir via town's reticulation. A list of chemicals for the plant is provided in Table 8.

Distribution

Treated water is both pumped and reticulated through the town via gravity. Treated water not used within the reticulation system is stored in the treated water reservoir. The reservoir helps sustain water pressure for the reticulation system.

Namoi

Namoi Aboriginal Reserve is located approximately 2km from Walgett. The Reserve community comprises 21 houses, 1 outlying dwelling, 1 workshop and has an estimated population of 250 people (peak population of 350). The Namoi Aboriginal Reserve is supplied both potable and raw water from the Walgett water supply systems. Potable water is delivered to a bulk meter connecting to Namoi Aboriginal Reserve drinking water supply and transferred via the rising mains and reticulation systems. Raw water is delivered to the village via a separate bulk meter and pipe networks.

Walgett Shire Council is responsible for suppling water to the bulk meter, while the internal reticulation is the responsibility of the Local Aboriginal Land Council. The management of the drinking water supply system within the community is subcontracted. The NSW Government Office of Water developed a Water & Sewerage Management Plan for Namoi in 2011 – as this scheme is operated by Council, the water quality issues for Namoi are the same as for Walgett.

Gingie Scheme – Managed by Local Land Council

Gingie is located 6km North West of Walgett. The Local Land Council operates Gingie supply, however WSC conducts the monitoring as per the NSW Health Drinking Water Monitoring Program 2005. Gingie is provided with untreated bore water from the GAB. The water flows via pressure to a ground tank and the water is then pumped into two steel and covered reservoirs and reticulated through the town via gravity. The full management plan is listed as Appendix D.

4.2 Schematic

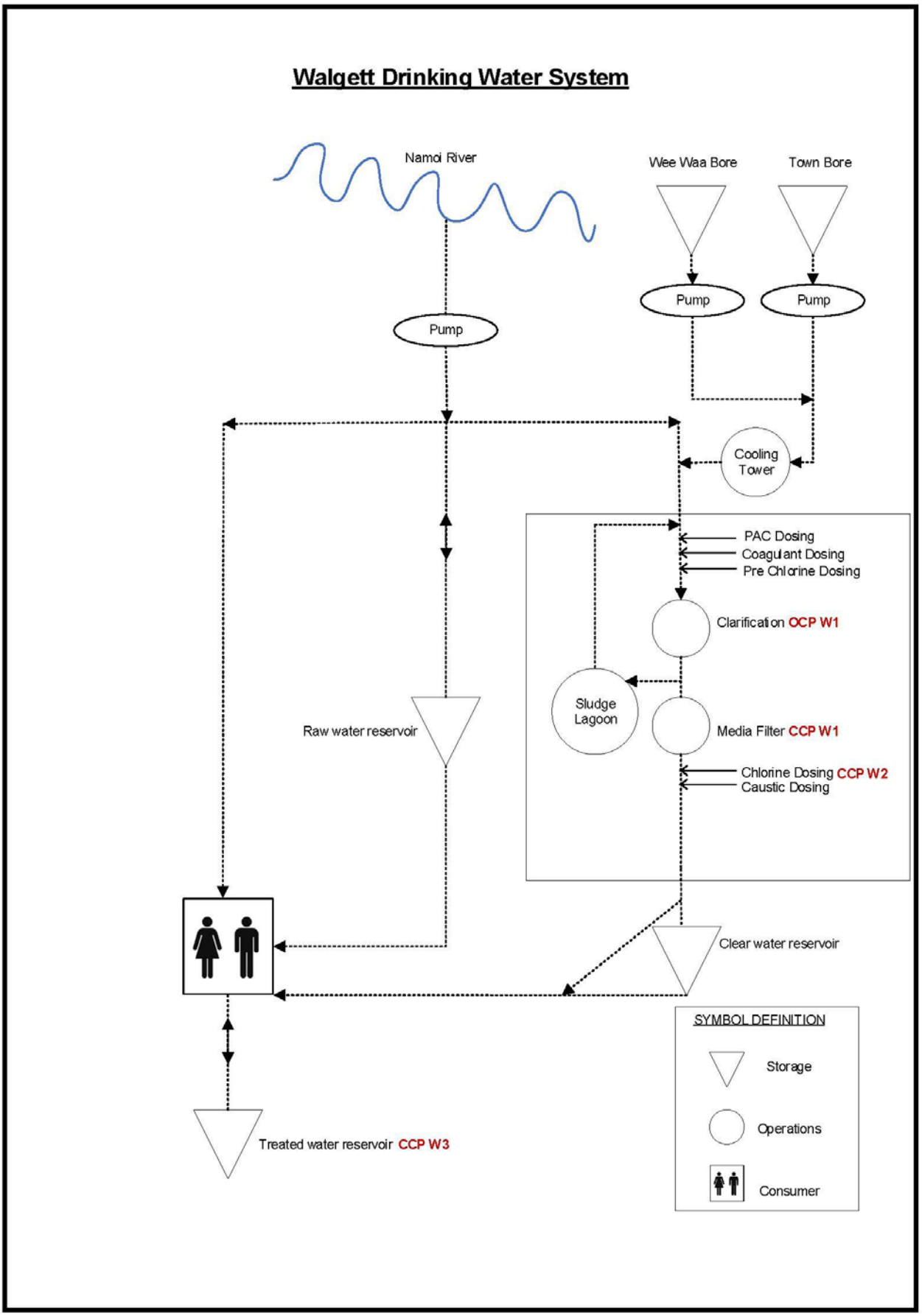


Figure 3 Walgett Drinking Water Supply Process Flow Diagram

4.3 Monitoring

Walgett scheme has a range of monitoring including:

- Verification monitoring
  - The verification data from 2012-2017 is shown in Table 7. Furthermore, the sites, analytes and performance summary are detailed in sections 10 & 12.
- 1 Operational Control Point and 3 dedicated Critical Control Points (for more information see the CCPs on the following pages)
  - OCP W1: Coagulation (Turbidity)
  - CCP W1: Filtration (Turbidity)
  - CCP W2: Disinfection (Free or total chlorine)
  - CCP W3: Reservoirs (Free chlorine and reservoir integrity)
- Operational monitoring

A summary of the various monitoring schedules and results is provided below.

Table 4 Operational Monitoring Regime for Walgett

Catchment	Rainfall River Flow		Daily Daily	Online (BOM) Meter reading
River intake	Fencing, security, signs, intake, pump station, river level	People / livestock Algae / debris	Daily	Visual Visual
WTP - Raw water	Usage pH Turbidity		Daily Daily Daily	Meter reading Grab sample Grab sample
WTP - Alchlor dosing	Dose rate		Daily	Grab sample
WTP - Settled water	Turbidity	As per OCP	Daily Continuous	Grab sample Online
WTP - Media Filter	Turbidity Headloss	As per CCP	Daily Continuous	Grab sample Online
WTP - Chlorine dosing	Dose rate	As per CCP	Daily	Visual
WTP Clear water tank	Free chlorine pH Turbidity	As per CCP < 6.5 or > 8.8 Target <0.3 Adjustment <0.5 Critical >1	Daily Daily Daily	Grab sample Grab sample Grab sample
Reticulation – Bore/Reservoir	Free chlorine Integrity of asset	As per CCP	Routine Weekly Monthly	Grab sample Walk around Detailed inspection

Table 5 Verification Monitoring Regi ıe for Walgett

Reticulation	Microbial	≥ 1 cfu/ 100 ml	Weekly	Grab sample – analysed by external lab
(NSW Health monitoring)	Chemical	> ADWG 2011	6 Monthly	

Seven months (March- October 2017) of operational data was reviewed; a summary is provided below. There were 4 CCP exceedances for low chlorine and high turbidity.

Table 6 Verification Monitoring Locations for Walgett

Walgett		
	3: Hospital - Fox Street	6: 77 Fox Street
1: High School	4: Sporting Club - Fox Street	7: Kookaburra Court Aged Hostel Fox Street
2: Depot - Euroka Street	5: Wee Waa (old plant – not normally used)	9: New Water Treatment Plant

Namoi Reserve
8: George Sands Way

Gingie Reserve (see specific plan for further information in Appendix D)
1 Gary Murphy Rd Gingie

Table 7 Operational monitoring results at Walgett WTP (March - Oct 2017)

Dosing	ACH/PACL (mg/L)	8.00	45.30	105.00			239
Dosing	Chlorine (mg/L)	2.00	4.95	6.50			325
Dosing	Caustic soda (mg/L)						0
Dosing	PAC (mg/L)						0
Raw water	Turbidity (NTU)	0.17	56.42	1,160.00			304
Clarified water	Turbidity (NTU)	0.08	1.83	22.28			304
Clear water well	Turbidity (NTU)	0.04	0.19	0.70		1.00	325
Clear Water	Free chlorine (mg/L)	0.60	1.76	3.50	0.50		304
Raw Water	pH	6.80	8.05	8.80			325
Clear Water	pH	6.80	7.87	8.70	6.50	8.80	304

Table 8 Walgett Scheme (Verification data 2012-2017)

Total Coliforms	0	mpn/100 mL	297	0	200	5.4
E. coli	0	mpn/100 mL	297	0	0	0.0
Free Chlorine	0.2 - 5	mg/L	96	0.0	3.6	0.7
Total Chlorine	5	mg/L	81	0.0	3.1	0.9
True Colour	15	Hazen Units (HU)	11	1.0	5.0	2.5
Turbidity	5	NTU	113	0.0	4.3	0.6
pH	6.5 - 8.5		105	7.1	9.0	7.8
Aluminium	0.2	mg/L	11	0.0	0.2	0.1
Antimony	0.003	mg/L	11	0.001	0.001	0.001
Arsenic	0.01		11	0.00	0.00	0.00
Barium	2	mg/L	11	0	0	0
Boron	4	mg/L	11	0	0	0
Cadmium	0.002	mg/L	11	0.000	0.000	0.000
Calcium	10000	mg/L	11	13	46	29
Chloride	250	mg/L	11	28	121	55
Chromium	0.05	mg/L	11	0.00	0.00	0.00
Copper	2	mg/L	11	0	0	0
Fluoride	1.5	mg/L	11	0.1	0.4	0.2
Iodine	0.5	mg/L	11	0.0	0.1	0.0
Iron	0.3	mg/L	11	0.0	0.1	0.0
Lead	0.01		11	0.00	0.00	0.00
Magnesium	10000	mg/L	11	7	33	19
Manganese	0.5	mg/L	11	0.0	0.0	0.0
Mercury	0.001	mg/L	11	0.000	0.000	0.000
Molybdenum	0.05	mg/L	11	0.00	0.00	0.00
Nickel	0.02	mg/L	11	0.01	0.01	0.01
Nitrate	50	mg/L	11	1	1	1
Nitrite	3	mg/L	11	0	0	0
Selenium	0.01		11	0.00	0.00	0.00
Silver	0.1		11	0.0	0.0	0.0
Sodium	180	mg/L	11	21	113	51
Sulfate	500	mg/L	11	7	73	32
Total Dissolved Solids (TDS)	600	mg/L	11	120	451	275
Total Hardness as $CaCO_3$	200	mg/L	11	60	251	153
Zinc	3	mg/L	11	0	0	0

Chemicals

Table 9 List of Chemicals Walgett

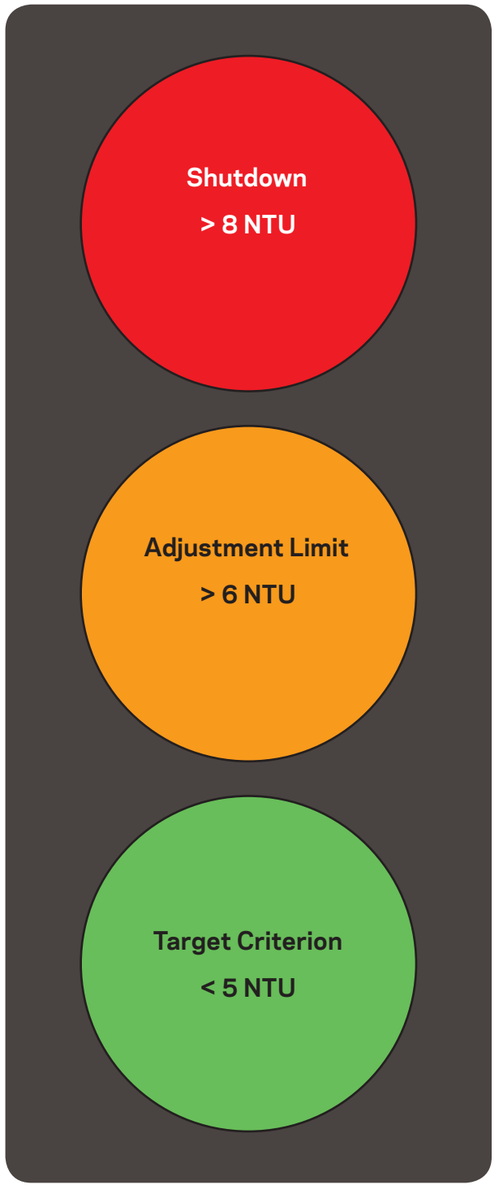
Chemical	Purpose	Dosing Concentration	Procurement/Storage
Gas Chlorine	Primary disinfectant	5mg/L	Stored in Tank in bunded area
Caustic Soda	pH adjustment	As required	25kg bag Stored in shed
PACl (polyaluminium chlorides)	Coagulation	Dose is adjusted in line with raw water turbidity	Stored in Tank in bunded area
PAC (Powder Activated Carbon	Remove toxins	25 kg every 3 - 4 days	25kg bags Pallets in shed

Walgett Water Treatment Plant

Coagulation Operational Control Point Procedure

OCP W1

What is measured where	How and when is it measured	What is the control point	What are the hazards	Record Keeping
Settled water turbidity	Continuous online monitoring and daily grab sample (benchtop meter)	Alchlor dosing	Pathogens, turbidity	All grab sample results and adjustment or critical limit actions are to be written in the daily log sheets



Shutdown > 8 NTU

- Shut down WTP
- Check Reservoir and estimate the storage levels
- Identify cause of high turbidity (follow adjustment actions)
- Switch to bore if river water is difficult to coagulate or rapidly changing
- Inform Utilities Engineer

Adjustment Limit > 6 NTU

- Check raw water turbidity
- Check coagulant dosing system to ensure dosing (e.g. is flash mixer or dosing line blocked)
- Consider need to increase rate of desludging clarifier
- If raw water turbidity has changed significantly
  - reduce plant flow and
  - increase sludge bleed (and or)
  - perform jar test to optimise coagulant dose rate
  - Alter dosage and record in plant log as appropriate
- If unable to effectively coagulate river water, switch to bore water
- Inform Utilities Engineer

Target Criterion < 5 NTU

- Plant walk around and visual inspection
- Check chemical supply is sufficient
- Daily chemical drop test to confirm dose rates are correct
- Weekly flush of flash mixer and dosing line to avoid blockages
- Weekly jar tests (or more frequently if river turbidity is changing)
- WTP water sampling and testing - compare daily bench test to online monitoring
- Clean and calibrate turbidity meter monthly

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Walgett Water Treatment Plant

Filtration Critical Control Point Procedure

CCP W1

What is measured where	How and when is it measured	What is the control point	What are the hazards	Record Keeping
Turbidity	Continuous online monitoring and daily grab sample (benchtop meter)	Media Filter	Pathogens, turbidity	All grab sample results and adjustment or critical limit actions are to be written in the plant diary

Critical Limit

> 1 NTU

immediately for a grab sample (online for > 15 min)

- Shut down WTP
- Check Reservoir and estimate the storage levels
- Identify cause of high turbidity (follow adjustment actions)
- Switch to bore if river water is difficult to coagulate/filter or rapidly changing
- Inform Utilities Engineer
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to contact Director Engineering
- Collect and analyse *E. coli* sample from clearwater tank to ensure effective disinfection

Adjustment Limit

> 0.5 NTU

immediately for a grab sample (online for > 15 min)

- Check raw and clarified water turbidity
- Check coagulant dosing system to ensure dosing
- Consider need to increase rate of desludging clarifier
- Backwash filter
- If raw water turbidity has changed significantly, or clarifier turbidity > (3) NTU
  - reduce plant flow and
  - increase sludge bleed (and or)
  - perform jar test to optimise coagulant dose rate
  - Alter dosage and record in plant log as appropriate
- If unable to effectively coagulate and filter river water, switch to bore water
- Contact Engineer Manager if turbidity remains > 0.5 NTU after adjustments
- Consider Increasing chlorine dosing to 3 mg/L
- Sample and test for free chlorine in reticulation network to ensure sufficient chlorine penetration

Target Criterion

< 0.3 NTU

- Plant walk around and visual inspection
- Equipment checks
- WTP water sampling and testing - compare daily bench test to online monitoring
- Clean and calibrate pH and turbidity meters monthly

NOTE: The critical and target limits are based on reducing turbidity to ensure effective chlorine disinfection, and do not effectively manage *Cryptosporidium*

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Walgett Water Treatment Plant

Disinfection Critical Control Point Procedure

CCP W2

What is measured

Free or total chlorine

Where or how is it measured

Continuous online monitoring and daily grab sample from clear water tank

What is the control point

Chlorine dosing system

What are the hazards

Chlorine sensitive pathogens

Record Keeping

All grab sample results and adjustment or critical limit actions are to be written in the plant diary

Critical Limit

< 0.6 mg/L Free Chlorine or > 5 mg/L Total Chlorine

- Shut down WTP
- Contact Engineer
- Repeat checks, adjustment and operational procedures
- If treated water sample is below 0.6 mg/L, check clear water tank volume.
  - If < 40% primary disinfection cannot be assured to all customers
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to contact Director Engineering
- Take reservoir sample at sampling tap to confirm chlorine residual entering reticulation
- If treated water sample is > 4.5 mg/L free chlorine, measure total chlorine
- If > 5 mg/L total chlorine follow NSW Health Response Protocol for Managing Physical and Chemical Parameters

Adjustment Limit

Free Chlorine

< 0.8mg/L or > 4 mg/L

- Bench test water sample
- Plant walk around and visual inspection, including checking chlorine dosing system.
- Check rotameter is functioning
- Ensure cylinder has gas, and change as required
- Adjust dose rate as appropriate
- Take a treated water reservoir sample, to confirm sufficient chlorine
- Contact Engineer

Target

Free Chlorine (River)

> 2 mg/L

Free Chlorine (Bore)

> 1.2 mg/L

- Plant walk around and visual inspection
- Check all dosing equipment
- WTP water sampling and testing
- Compare daily bench test to online monitoring
- Weekly reticulation testing

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Walgett Reservoirs

Critical Control Point Procedure

CCP W3

What is measured

Free Chlorine and Reservoir Integrity

Where or how is it measured

Routine grab samples, weekly reservoir walk around, monthly detailed inspection

What is the control point

Chlorine dosing at WTP, Reservoir integrity

What are the hazards

Pathogens, chlorine

Record Keeping

All grab sample results and adjustment or critical limit actions are to be written in the plant diary

Critical Limit

Evidence of contamination or vermin identified
OR
Free Chlorine < 0.2 mg/L or > 4.0 mg/L

- Immediately report breach to Engineer.
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to report to Director Engineering
- Check CCP2 for critical chlorine breach
- Sample reservoir for *E coli* if evidence of contamination/vermin or chlorine < 0.2 mg/L

Adjustment Limit

Evidence of breach

Free Chlorine < 0.3 mg/L

Low Chlorine

- Take grab sample and test for free chlorine and pH at reservoir sample tap
- Review the CCP2 to assess if low chlorine is due to insufficient chlorine dosing
- Contact Treatment Supervisor and Engineer
- Consider isolating the reservoir if necessary
- Consider need for manual dosing reservoir or increase chlorine dosing at WTP

Reservoir Breach

- Conduct thorough inspection of reservoirs
- Contact Treatment Supervisor and Engineer
- Consider isolating the reservoir if possible/ necessary
- Contact relevant personnel to organise repairs e.g. welder/ roofing contractor
- Visually inspect reservoir daily until breach rectified

Target

Secure and vermin proof

Free Chlorine > 0.3 mg/L

- Routine testing of free chlorine
- All reticulation samples should be above 0.2 mg/L
- Monthly reservoir integrity inspection
  - Ensure hatches are sealed and locked
  - Check vermin proofing is intact
  - Check for water leak/ pooling/ other signs of deterioration
  - Check for evidence of animals/ birds nesting
  - Inspect fencing and ladders for security
- 12 monthly reservoir maintenance (external)
- Weekly chlorine residual testing in the reticulation
- Sample and test for free chlorine and pH daily at reservoir sample tap
- Record details in the plant diary

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5 COLLARENEBRI SUPPLY SYSTEM

5.1 Description

Figure 4 provides a process flow diagram of the Collarenebri drinking water supply system.

Source Water

The Collarenebri drinking water supply system is sourced from the Barwon River from Walgett. The Barwon-Darling is considered an unregulated river above the Menindee Lakes. There are many weirs in the Barwon-Darling that have a major influence on water quality and water supply for users along the river.

The water quality in the Barwon River is notably of high turbidity and high colour due to extensive clearing and agricultural landuse in the catchment. There are approximately 18,500 people residing in the Barwon-Darling catchment with the catchment representative of a large Australian dryland river system with mainly agricultural production of dryland grazing and cotton plantations.

In addition to the drinking water supply system, Walgett Shire Council supplies raw water from the Barwon River to Collarenebri and the Walli Aboriginal Reserve.

Water Treatment

Raw water is pumped from the Barwon River and directed to the 1 ML raw water reservoir. Water is then transfer to the raw water system and directed to a water treatment plant for treatment.

The water treatment process filters the raw water by continuous filtration through media filtration, ultrafiltration through membranes and granular activated carbon (GAC) filters.

The media filtration is unable to effectively reduce turbidity (the turbidity of the media filtered water is 94% of the turbidity of the raw water). The following steps of membrane filtration followed by GAC filters produces water with low turbidity such that disinfection is not compromised. The filtered water is disinfected by chlorine. The water has a high chlorine demand, so at present there is a requirement to overdose chlorine (>5 mg/L) at the WTP to ensure that there is a chlorine residual leaving the water tower (there is a dedicated rising main to the Reservoir, so this practice, whilst not ideal, does not pose a health risk).

A fluoridation plant has been constructed but is not in use. Treated water is then transferred to a 0.5 ML water reservoir and reticulated to town via gravity.

Distribution

Collarenebri is serviced by a dual reticulation water supply scheme delivering potable and non – potable water to the township. The treated water is reticulated through the town via gravity.

The Walli

The Walli Reserve is located just outside Collarenebri has an estimated permanent population of 50. The Walli Aboriginal Reserve is supplied both potable and raw water from the Collarenebri water supply systems. Potable water is delivered to a bulk meter connecting to The Walli Aboriginal Reserve drinking water supply and transferred via the rising mains and reticulation systems. Raw water is delivered to the village via a separate bulk meter and pipe networks. Walgett Shire Council is responsible for suppling water to the bulk meter, while the internal reticulation is the responsibility of the Local Aboriginal Land Council. The management of the drinking water supply system within the community is subcontracted.

5.2 Schematic

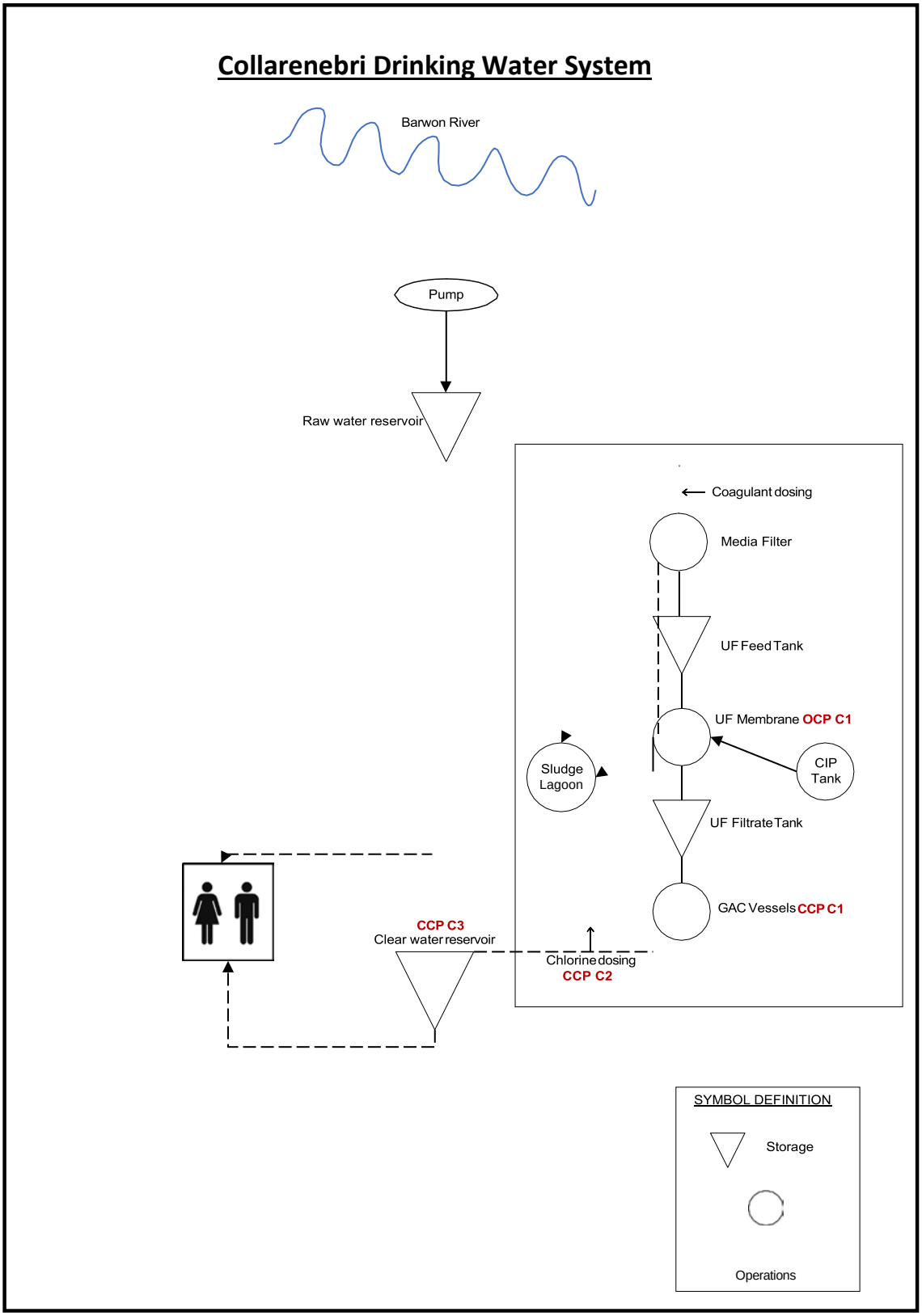

Figure 4 Collarenebri Drinking Water Supply Process Flow Diagram

5.3 Monitoring

Collarenebri scheme has a range of monitoring including:

- Verification monitoring
  - The verification data from 2012-2017 is shown in Table 13. Furthermore, the sites, analytes and performance summary are detailed in sections 10 & 12.
- 1 OCP and 3 dedicated CCPs (for more information see the CCPs on the following pages)
  - OCP C1: Ultrafiltration (Membrane Integrity Test)
  - CCP C1: GAC Filtration (Turbidity)
  - CCP C2: Disinfection (Free Chlorine)
  - CCP C3: Reservoirs (Free chlorine at outlet and reservoir integrity)
- Operational monitoring

A summary of the various monitoring schedules and results is provided below.

Table 10 Operational Monitoring Regime for Collarenebri

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Catchment	Rainfall River Flow	Flooding	Daily Daily	Online (Bureau of Meteorology) Visual
River intake	Fencing, security, signs, intake, pump station	Evidence of access, algae, debris	Weekly	Visual
WTP Raw water	pH Turbidity	Nil	Daily Daily	Grab sample Grab sample
WTP - Media Filter	Turbidity		Daily	Grab sample
WTP – UF Filtered water	Turbidity Membrane Integrity Test	 As per OCP	Daily Daily	Grab sample MIT test
WTP Filtered water post GAC	Turbidity pH	As per CCP 7 - 8	 Daily	 Grab sample
WTP – Chlorine dosing	Dose rate Free chlorine	 As per CCP	Daily Daily	Grab sample Grab sample
Reticulation – Reservoir	Free chlorine Integrity of asset Consumption – Raw Consumption – Potable	As per CCP	Daily Weekly Monthly Daily Daily	Grab Sample Walk around Detailed inspection Meter reading Meter reading

Table 11 Verification Monitoring Regime for Collarenebri

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Reticulation	Microbial	≥ 1 cfu/ 100 ml	Weekly	Grab sample – analysed by external lab
(NSW Health monitoring)	Chemical	> ADWG 2011	6 Monthly	

Table 12 Verification Monitoring Locations for Collarenebri

NSW Health Drinking Water Monitoring Program		
Collarenebri		
1: Council Agency -Herbert Street	5: Lions Park - Walgett Street	10: West end of Walgett Street
2: Central School - Earl Street	6: Water Treatment Plant - Herbert St	
3: Depot - Narran Street	7: Pool - Herbert St	
4: Hospital - Walgett Street	8: Tennis Club - Queen Street	
The Walli		
9: Walli Reserve		

Seven months (March- October 2017) of operational data was reviewed; a summary is provided below. There were exceedances for UF filtered water turbidity and low chlorine.

Table 13 Operational monitoring results at Collarenebri WTP (March -Oct 2017)

Process	Parameter	Min	Average	Max	Lower critical limit	Upper critical limit	Count
Raw water	Turbidity (NTU)	2.10	126.93	1,353.00			304.00
Media filter outlet	Turbidity (NTU)	0.54	115.48	1,452.00			326.00
UF Filtered water	Turbidity (NTU)	0.05	0.35	2.71		1.00	326.00
Chlorine	Dose rate (ppm (mg/L))	0.05	3.16	261.00			304.00
Chlorine	Free Chlorine at WTP (ppm (mg/L))	0.09	3.54	7.40	0.60	5.00	304.00
Potable water	pH	6.92	7.79	8.80			304.00

Table 14 Collarenebri Scheme (Verification data 2012-2017)

Characteristic	Guideline Value	Units	Count	Min	Max	Average
Total Coliforms	0	mpn/100 mL	300	0	200	3.4
E. coli	0	mpn/100 mL	300	0	16	0.1
Free Chlorine	0.2 - 5	mg/L	91	0.0	5.9	0.4
Total Chlorine	5	mg/L	74	0.0	5.0	0.5
True Colour	15	Hazen Units (HU)	11	0.5	32.0	9.3
Turbidity	5	NTU	115	0.0	12.3	0.5
pH	6.5 - 8.5		112	6.8	11.8	7.7
Aluminium	0.2	mg/L	11	0.0	0.6	0.1
Antimony	0.003	mg/L	11	0.001	0.001	0.001
Arsenic	0.01		11	0.00	0.00	0.00
Barium	2	mg/L	11	0	0	0
Boron	4	mg/L	11	0	1	0
Cadmium	0.002	mg/L	11	0.000	0.001	0.000
Calcium	10000	mg/L	11	1	22	10
Chloride	250	mg/L	11	25	64	44
Chromium	0.05	mg/L	11	0.00	0.01	0.00
Copper	2	mg/L	11	0	1	0
Fluoride	1.5	mg/L	11	0.1	1.1	0.4
Iodine	0.5	mg/L	11	0.0	0.1	0.0
Iron	0.3	mg/L	11	0.0	0.4	0.0
Lead	0.01		11	0.00	0.01	0.00
Magnesium	10000	mg/L	11	0	13	6
Manganese	0.5	mg/L	11	0.0	0.0	0.0
Mercury	0.001	mg/L	11	0.000	0.000	0.000
Molybdenum	0.05	mg/L	11	0.00	0.01	0.00
Nickel	0.02	mg/L	11	0.01	0.01	0.01
Nitrate	50	mg/L	11	1	2	1
Nitrite	3	mg/L	11	0	0	0
Selenium	0.01		11	0.00	0.00	0.00
Silver	0.1		11	0.0	0.0	0.0
Sodium	180	mg/L	11	18	275	89
Sulfate	500	mg/L	11	1	27	9
Total Dissolved Solids (TDS)	600	mg/L	11	99	652	266
Total Hardness as $CaCO_3$	200	mg/L	11	3	109	49
Zinc	3	mg/L	11	0	0	0

Chemicals

Table 15 List of Chemicals Collarenebri

Chemical	Purpose	Dosing Concentration	Procurement/Storage
Sodium Hypochlorite	Primary disinfectant	5 mg/L	Stored in Tank in bunded area
Sodium Hydroxide	CIP Cleaning	NA	NA
Granular Activated Carbon	Remove toxins	NA	GAC Filters
Citric Acid	CIP Cleaning	NA	CIP Tank

Collarenebri Water Treatment Plant

Ultrafiltration Operational Control Point

OCP C1

What is measured where	How and when is it measured	What is the control point	What are the hazards	Record Keeping
Membrane Integrity test	(Best practice is DAILY) MIT test	Ultrafilters	Pathogens	SCADA records, and plant diary

Operational Limit

> 1.5 kpa/Min

- Shut down Rack
- Isolate failed cartridges
- Adjust UF feed pressure to match number of active cartridges
- Pin broken straws
- Observe Check Reservoir and estimate the storage levels
- Identify cause of high turbidity (follow adjustment actions)
- Switch to bore if river water is difficult to coagulate/filter or rapidly changing
- Inform Utilities Engineer
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to contact Director Engineering
- Collect and analyse *E. coli* sample from clearwater tank to ensure effective disinfection

Target Criterion

< 1.5 kPa/min

Turbidity < 0.15 NTU

- Undertake routine membrane integrity test to ensure ultra-filtration membranes are intact
- Observe test to identify failing cartridges
- Equipment checks
- WTP water sampling and testing
- Regular maintenance clean of membranes
- Monthly recovery cleans of membrane (adjust frequency as necessary)
- Perform chemical cleans of membranes when water only backwash unable to reduce TMP to < XXXXXXX

NOTE: intact membranes can remove 3-4 log *Cryptosporidium*. However, this will require both daily MITs and continuous online turbidity monitoring with turbidity <0.15 NTU to demonstrate.

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Collarenebri Water Treatment Plant

GAC Filtration Critical Control Point Procedure

CCP C1

What is measured where	How and when is it measured	What is the control point	What are the hazards	Record Keeping
Turbidity	Continuous online monitoring and daily grab sample (benchtop meter)	Media Filter	Pathogens, turbidity	All grab sample results and adjustment or critical limit actions are to be written in the plant diary

Critical Limit

> 1 NTU

- Shut down WTP
- Check Reservoir and estimate the storage levels
- Identify cause of high turbidity (follow adjustment actions)
- Inform Utilities Engineer
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to contact Director Engineering
- Collect and analyse *E. coli* sample from Reservoir outlet to ensure effective disinfection

Adjustment Limit

> 0.5 NTU

immediately for a grab sample (online for > 15 min)

- Backwash GAC filter
- Check Post UF turbidity is < 0.5 NTU if > 0.5, undertake MIT
- Contact Engineer if turbidity remains > 0.5 NTU after backwash
- Sample and test for free chlorine at reservoir outlet and in reticulation CCP2 and CCP3 to ensure that chlorine is penetrating the reticulation network.

Target Criterion

< 0.3 NTU

- Plant walk around and visual inspection
- Equipment checks
- WTP water sampling and testing - compare daily bench test to online monitoring
- Clean and calibrate pH and turbidity meters monthly

NOTE If the UF OCP is implemented, cryptosporidium can be managed at that step, and this filtration CCP is to ensure effective disinfection

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Collarenebri Water Treatment Plant

Disinfection Critical Control Point Procedure

CCP C2

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Free chlorine leaving Reservoir	Continuous online monitoring at WTP and daily grab sample from Reservoir	Chlorine dosing system	Chlorine sensitive pathogens	All grab sample results and adjustment or critical limit actions are to be written in the plant diary

Critical Limit

< 1 mg/L Free Chlorine (treated water)

OR > 5.0 mg/L (at Reservoir outlet)

- If < 1 mg/L, increase chlorine dosing
- Contact Engineer
- Repeat checks, adjustment and operational procedures
- Check CCP3
- On breach of CCP2 AND CCP3, (or if unable to rectify CCP2) Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to contact Director Engineering
- Take reservoir sample at sampling tap to confirm chlorine residual entering reticulation
- If treated water sample is > 4.5 mg/L free chlorine, measure total chlorine
- If > 5 mg/L total chlorine at Reservoir outlet
  - Reduce chlorine dose
  - Follow NSW Health Response Protocol for Managing Physical and Chemical Parameters

Adjustment Limit

Free Chlorine in Reservoir

< 3 mg/L

- Repeat bench test of treated water sample
- Visual inspection, including checking chlorine dosing system.
- Check dosing pump is functioning
- Fix any leaks/ replace any fittings as necessary
- Ensure sufficient sodium hypochlorite
- Adjust dose rate as appropriate
- Take a treated water reservoir sample, to confirm sufficient chlorine
- Contact Engineer

Target

Free Chlorine in Reservoir > 3 mg/L

- Plant walk around and visual inspection
- Check all dosing equipment
- WTP water sampling and testing
- Compare daily bench test to online monitoring
- Weekly reticulation testing

NOTE: The inability to effectively coagulate water at Collarenebri means that the water supply has a high chlorine demand. Whilst the dosing point is a key control point, the reservoir outlet is the point at which chlorine concentrations must be maintained. This control point should ensure that there is sufficient chlorine in the reservoir, however,

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Collarenebri Reservoirs

Critical Control Point Procedure

CCP C3

What is measured

Reservoir Integrity

Where or how is it measured

Daily grab samples of outlet, and reservoir walk around.
Monthly detailed inspection

What is the control point

Chlorine dosing at WTP, Reservoir integrity

What are the hazards

Pathogens, chlorine

Record Keeping

All grab sample results and adjustment or critical limit actions are to be written in the plant diary

Critical Limit

Evidence of contamination or vermin identified

- Immediately report breach to Engineer.
- On breach of CCP3, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to report to Director Engineering
- Check CCP2 for critical chlorine breach
- Sample reservoir for *E coli* if evidence of contamination/vermin or chlorine < 0.2 mg/L
- If *E coli* detected, follow NSW Health Protocol - Microbiological Quality

Adjustment Limit

Evidence of breach

Low Chlorine

- Take grab sample and test for free chlorine and pH at reservoir sample tap
- Review the CCP2 to assess if low chlorine is due to insufficient chlorine dosing
- Contact Treatment Supervisor and Engineer
- Consider isolating the reservoir if necessary
- Consider need for manual dosing reservoir or increase chlorine dosing at WTP

Reservoir Breach

- Conduct thorough inspection of reservoirs
- Contact Treatment Supervisor and Engineer
- Consider isolating the reservoir if possible/ necessary
- Contact relevant personnel to organise repairs e.g. welder/ roofing contractor
- Visually inspect reservoir daily until breach rectified

Target

Secure and vermin proof

- Routine testing of free chlorine
- All reticulation samples should be above 0.2 mg/L
- Monthly reservoir integrity inspection
  - Ensure hatches are sealed and locked
  - Check vermin proofing is intact
  - Check for water leak/ pooling/ other signs of deterioration
  - Check for evidence of animals/ birds nesting
  - Inspect fencing and ladders for security
- 12 monthly reservoir maintenance (external)
- Weekly chlorine residual testing in the reticulation
- Sample and test for free chlorine and pH daily at reservoir sample tap
- Record details in the plant diary

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6 LIGHTNING RIDGE SUPPLY SYSTEM

6.1 Description

Figure 5 provides a process flow diagram of the Lightning Ridge drinking water supply system.

Drinking Water Catchment

Lightning Ridge bore water is sourced from the Great Artesian Basin (GAB). Groundwater flows under the influence of gravity and pressure toward natural discharge springs in the west and southwest. Groundwater flow is slow, about 0.1 to 5 metres per year, and in some parts the discharging water is up to 2 million years old. Walgett Shire Council extracts from two artesian bores to supply water to the township of Lightning Ridge.

Water Treatment

The Lightning Ridge drinking water supply system pumps water from the town bores to the town reservoirs, via a heat exchange system with the Swimming Pool. Chlorine is reactively added manually to the reservoir to manage bacterial risks.

Distribution

The water is stored in two reservoirs, reticulated through the town via gravity. The Lightning Ridge drinking water supply system supplies approximately 1,437 (2016 Census) people in Lightning Ridge town. Further to reticulation, water is supplied to regional properties by private water carters.

6.2 Schematic

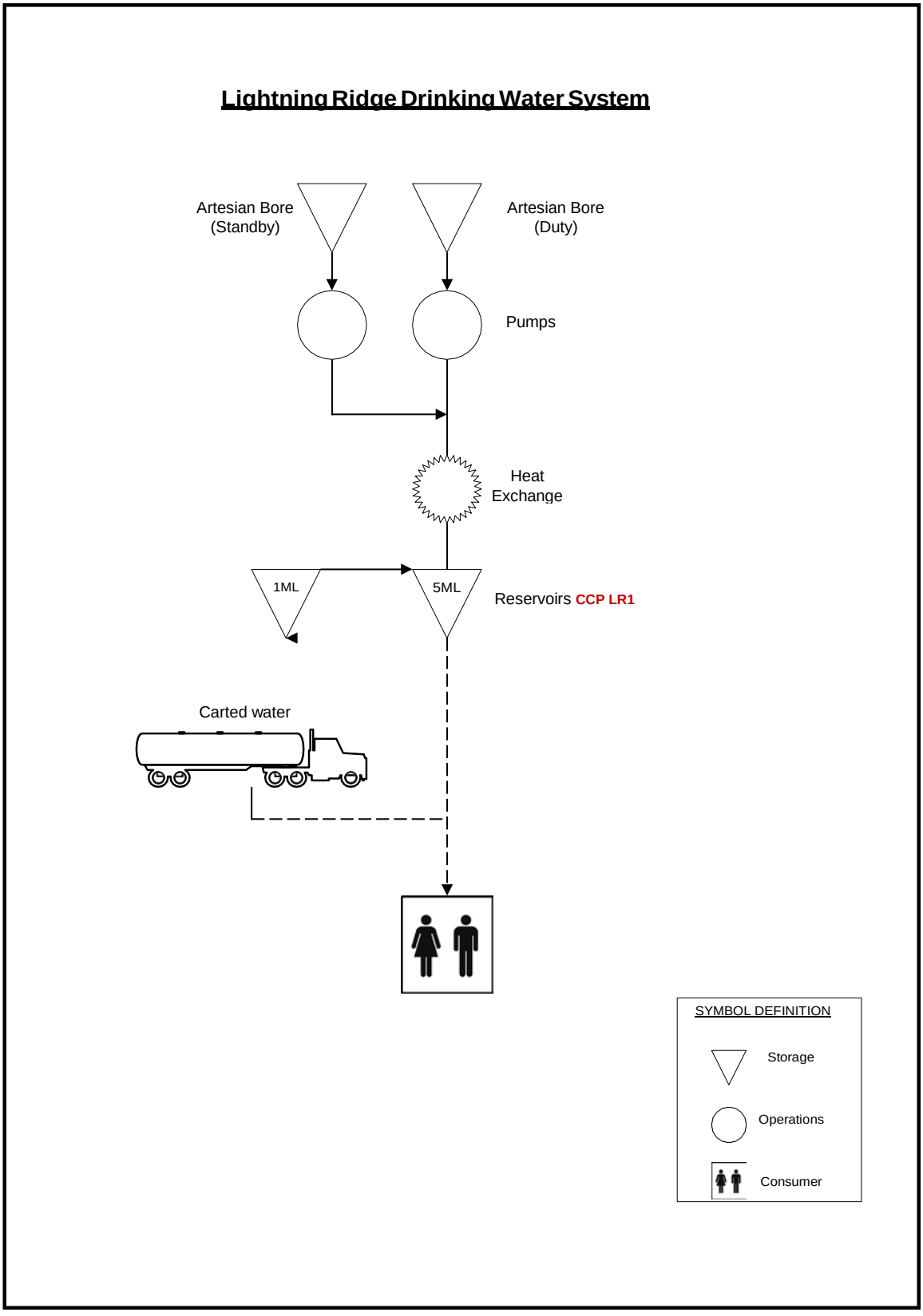

Figure 5 Lightning Ridge Drinking Water Supply Process Flow Diagram

6.3 Monitoring

Lightning Ridge scheme has a range of monitoring including:

- Verification monitoring

  The verification data from 2012-2017 is shown in Table 19 Furthermore, the sites, analytes and performance summary are detailed in sections 10 & 12.

- 1 dedicated CCP (for more information see the CCP on the following pages)
  - CCP LR1: Bore and Reservoir Integrity (Integrity of asset)
- Operational monitoring

A summary of the various monitoring schedules and results is provided below.

Table 16 Operational Monitoring Regime for Lightning Ridge

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Catchment	Rainfall, storms, flooding	Potential flooding at borehead	Daily	Online (Bureau of Meteorology)
Reticulation – Bore/Reservoir	Integrity of asset	As per CCP	Daily Monthly	Walk around Detailed inspection

Table 17 Verification Monitoring Regime for Lightning Ridge

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Reticulation (NSW Health monitoring)	Microbial Chemical	≥ 1 cfu/ 100 ml > ADWG	Weekly 6 Monthly	Grab sample – analysed by external lab

Table 18 Verification Monitoring Locations for Lightning Ridge

NSW Health Drinking Water Monitoring Program		
Lightning Ridge		
1: Bowling Club - Morilla Street	4: Depot -Butterfly Avenue	7: Old Bore 1
2: Central School - Kaolin Street	5: Bore baths - Pandora Street	8: New Bore 2
3: Visitor Information Centre - Morilla Street	6: Lions Park/tap	

Table 19 Lightning Ridge (Verification data 2012-2017)

Characteristic	Guideline Value	Units	Count	Min	Max	Average
Total Coliforms	0	mpn/100 mL	236	0	200	2.1
E. coli	0	mpn/100 mL	236	0	70	0.3
Free Chlorine	0.2 - 5	mg/L	3	0.1	0.2	0.2
Total Chlorine	5	mg/L	3	0.1	0.3	0.2
True Colour	15	Hazen Units (HU)	12	0.5	2.0	0.9
Turbidity	5	NTU	40	0.1	5.8	0.4
pH	6.5 - 8.5		38	8.1	8.9	8.4
Aluminium	0.2	mg/L	12	0.0	0.0	0.0
Antimony	0.003	mg/L	12	0.001	0.001	0.001
Arsenic	0.01		12	0.00	0.00	0.00
Barium	2	mg/L	12	0	0	0
Boron	4	mg/L	12	0	0	0
Cadmium	0.002	mg/L	12	0.000	0.001	0.000
Calcium	10000	mg/L	12	2	2	2
Chloride	250	mg/L	12	63	75	66
Chromium	0.05	mg/L	12	0.00	0.01	0.00
Copper	2	mg/L	12	0	1	0
Fluoride	1.5	mg/L	12	0.5	0.7	0.5
Fluoride (weekly WU)	0.9 - 1.5	mg/L	1	0.93	0.93	0.93
Fluoride Ratio	0.8 - 1.2		1	0	0	0
Iodine	0.5	mg/L	12	0.0	0.0	0.0
Iron	0.3	mg/L	12	0.0	0.1	0.0
Lead	0.01		12	0.00	0.00	0.00
Magnesium	10000	mg/L	12	0	0	0
Manganese	0.5	mg/L	12	0.0	0.0	0.0
Mercury	0.001	mg/L	12	0.000	0.000	0.000
Molybdenum	0.05	mg/L	12	0.00	0.01	0.00
Nickel	0.02	mg/L	12	0.01	0.01	0.01
Nitrate	50	mg/L	12	1	1	1
Nitrite	3	mg/L	12	0	0	0
Selenium	0.01		12	0.00	0.00	0.00
Silver	0.1		12	0.0	0.0	0.0
Sodium	180	mg/L	12	178	252	217
Sulfate	500	mg/L	12	1	1	1
Total Dissolved Solids (TDS)	600	mg/L	12	476	497	486
Total Hardness as $CaCO_3$	200	mg/L	12	4	6	5
Uranium	0.017	mg/L	2	0.0025	0.0025	0.0025
Zinc	3	mg/L	12	0	0	0

Lightning Ridge Reservoirs

Critical Control Point Procedure

CCP LR1

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Reservoir Integrity	Weekly reservoir walk around, monthly detailed inspection	Reservoir integrity	Pathogens	Note inspections in the plant diary

Critical Limit

Evidence of contamination or vermin identified

- Immediately report breach to Engineer.
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to report to Director Engineering
- Sample reservoir for *E coli*
- If *E coli* detected, follow NSW Health Protocol - Microbiological Quality

Adjustment Limit

Possible points of ingress identified

- Seal the reservoir as soon as possible (e.g. replace vermin proofing, seal small holes, replace any missing bolts etc)
- Conduct thorough inspection of reservoirs looking for evidence of contamination
- Contact Treatment Supervisor and Engineer to report breeches that cannot be immediately fixed
- Engineer to arrange repairs e.g. welder/ roofing contractor
- Visually inspect reservoir daily until breach rectified

Target

Secure and vermin proof

- Monthly reservoir integrity inspection
  - Ensure hatches are sealed and locked
  - Check vermin proofing is intact
  - Check for water leak/ pooling/ other signs of deterioration
  - Check for evidence of animals/ birds nesting
  - Inspect fencing and ladders for security
- 12 monthly reservoir maintenance (external)
- Record details in the plant diary

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7 ROWENA SUPPLY SYSTEM

7.1 Description

Figure 6 provides a process flow diagram of the Rowena drinking water supply system.

Source Water

The system sources raw water from the GAB Shallow Groundwater Source via the Bungara Bore which has a depth of 102m.

The Rowena Bore is located out of town in the middle of a wheat farming and grazing property. The bore may become inaccessible during flood events and as the bore is not fully sealed, contamination from the surrounding property may be possible.

Water Treatment

The Rowena water supply is not treated or disinfected.

Distribution

Water is stored in two tanks and reticulated through Rowena town via gravity.

7.2 Schematic

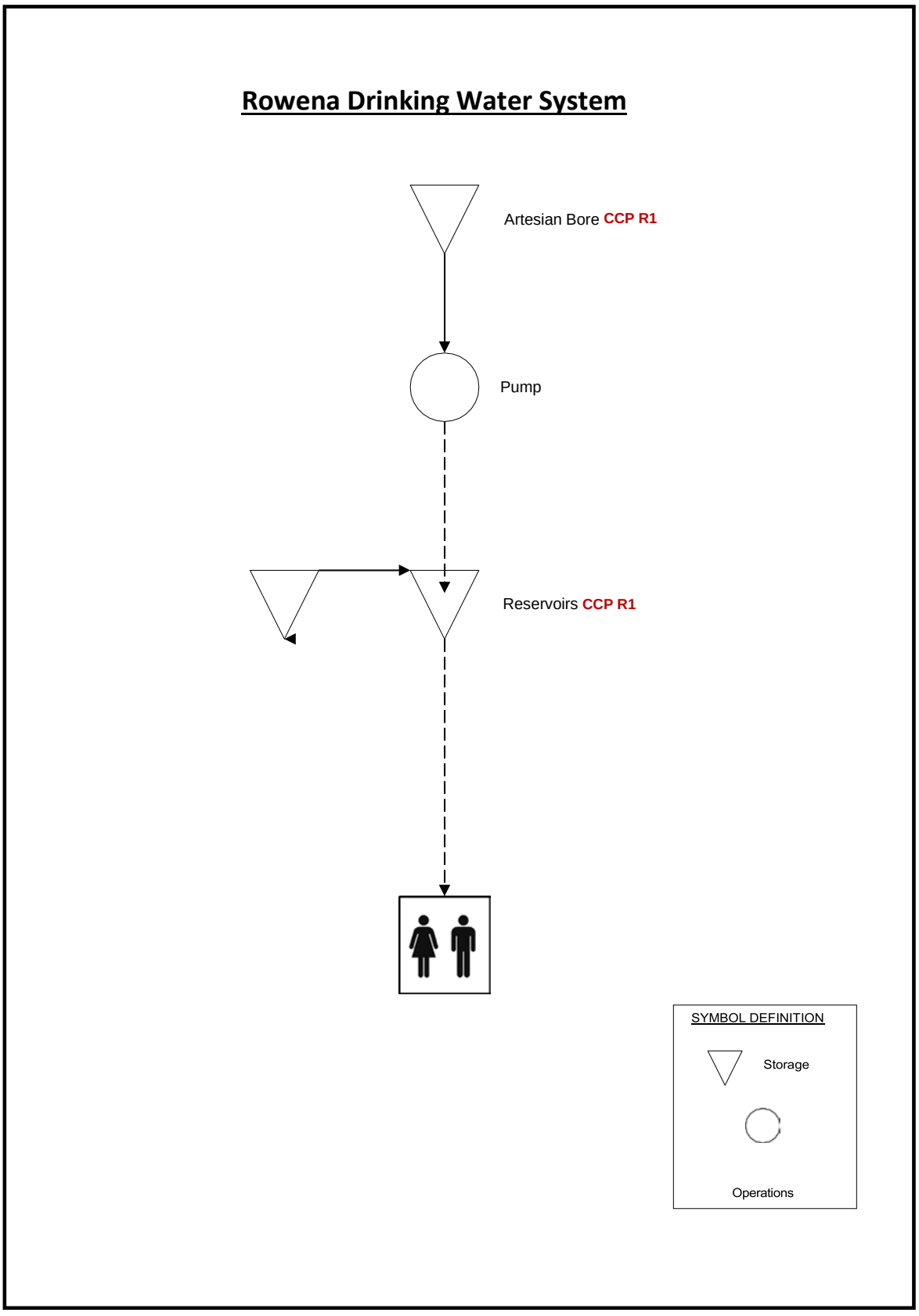

Figure 6 Rowena Drinking Water Supply Process Flow Diagram

7.3 Monitoring

Rowena scheme has a range of monitoring including:

- Verification monitoring
  - The verification data from 2012-2017 is shown in Table 23. Furthermore, the sites, analytes and performance summary are detailed in sections 10 & 12.
- 1 dedicated CCP (for more information see the CCP on the following pages)
  - CCP R1: Bore and Reservoir Integrity (Integrity of asset)
- Operational monitoring

A summary of the various monitoring schedules and results is provided below.

Table 20 Operational Monitoring Regime for Rowena

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Catchment	Rainfall, storms, flooding	Potential flooding at borehead	Daily	Online (Bureau of Meteorology)
Reticulation – Bore/Reservoir	Integrity of asset	As per CCP	Weekly Monthly	Walk around Detailed inspection

Table 21 Verification Monitoring Regime for Rowena

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Reticulation (NSW Health monitoring)	Microbial Chemical	≥ 1 cfu/ 100 ml > ADWG 2011	Monthly 6 Monthly	Grab sample – analysed by external lab

Table 22 Verification Monitoring Regime for Rowena

NSW Health Drinking Water Monitoring Program		
Rowena		
1: Public School	3: Hotel	5: Headmasters House
2: Bore Head	4: Pre School	6: Rowena Hall

Table 23 Rowena (Verification data 2012-2017)

Characteristic	Guideline Value	Units	Count	Min	Max	Average
Total Coliforms	0	mpn/100 mL	59	0	130	15.3
E. coli	0	mpn/100 mL	59	0	3	0.1
True Colour	15	Hazen Units (HU)	9	0.5	1.0	0.7
Turbidity	5	NTU	20	0.1	0.5	0.3
pH	6.5 - 8.5		20	7.7	8.2	7.9
Aluminium	0.2	mg/L	9	0.0	0.0	0.0
Antimony	0.003	mg/L	9	0.001	0.001	0.001
Arsenic	0.01		9	0.00	0.00	0.00
Barium	2	mg/L	9	0	0	0
Boron	4	mg/L	9	0	0	0
Cadmium	0.002	mg/L	9	0.000	0.000	0.000
Calcium	10000	mg/L	9	5	8	6
Chloride	250	mg/L	9	174	257	195
Chromium	0.05	mg/L	9	0.00	0.01	0.00
Copper	2	mg/L	9	0	1	0
Fluoride	1.5	mg/L	9	0.2	0.5	0.3
Iodine	0.5	mg/L	9	0.1	0.1	0.1
Iron	0.3	mg/L	9	0.0	0.0	0.0
Lead	0.01		9	0.00	0.01	0.00
Magnesium	10000	mg/L	9	3	6	4
Manganese	0.5	mg/L	9	0.0	0.0	0.0
Mercury	0.001	mg/L	9	0.000	0.000	0.000
Molybdenum	0.05	mg/L	9	0.00	0.00	0.00
Nickel	0.02	mg/L	9	0.01	0.01	0.01
Nitrate	50	mg/L	9	1	1	1
Nitrite	3	mg/L	9	0	0	0
Selenium	0.01		9	0.00	0.00	0.00
Silver	0.1		9	0.0	0.0	0.0
Sodium	180	mg/L	9	201	238	219
Sulfate	500	mg/L	9	20	31	24
Total Dissolved Solids (TDS)	600	mg/L	9	536	630	567
Total Hardness as $CaCO_3$	200	mg/L	9	26	45	33
Zinc	3	mg/L	9	0	0	0

Rowena Bore and Reservoir Integrity

Critical Control Point Procedure

CCP R1

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Reservoir Integrity	Weekly reservoir walk around, monthly detailed inspection	Reservoir integrity	Pathogens	Note inspections in the plant diary

Critical Limit

Evidence of contamination or vermin identified

- Immediately report breach to Engineer.
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to report to Director Engineering
- Sample reservoir and reticulation for *E coli*
- If *E coli* detected, follow NSW Health Protocol - Microbiological Quality

Adjustment Limit

Possible points of ingress identified for bore or reservoir

Bores

- Seal any gaps in the borehead with silicone or other sealant
- Fix fencing to exclude animals
- Arrange for repair of any leaks

Reservoirs

- Seal the reservoir as soon as possible (e.g. replace vermin proofing, seal small holes, replace any missing bolts etc)
- Conduct thorough inspection of reservoirs looking for evidence of contamination
- Contact Treatment Supervisor and Engineer to report breeches that cannot be immediately fixed
- Engineer to arrange repairs e.g. welder/ roofing contractor
- Visually inspect reservoir daily until breach rectified

Targets

Bore head sealed

Reservoir Secure and vermin proof

Bores

- Inspect Bore site monthly
  - Check fencing around bore intact
  - Check all penetrations into bore head to ensure they are sealed
  - Check for any leakage indicating infrastructure damage

Reservoirs

- Monthly Reservoir integrity inspection
  - Ensure hatches are sealed and locked
  - Check vermin proofing is intact
  - Check for water leak/ pooling/ other signs of deterioration
  - Check for evidence of animals/ birds nesting
  - Inspect fencing and ladders for security
- 12 monthly reservoir maintenance (external)
- Record details in the plant diary

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8 CUMBORAH SUPPLY SYSTEM

8.1 Description

Figure 7 provides a process flow diagram of the Cumborah drinking water supply system.

Source Water

The system sources raw water from the GAB Shallow Groundwater Source via the Cumborah Bore. The Cumborah Bore (Licence 85BL241927) was constructed in 2004 to a depth of 773m. The water is stored in two tanks at Cumborah.

Water Treatment

The Cumborah water supply is not treated or disinfected.

Distribution

The village of Cumborah is provided with bore water for drinking water purposes. The water supply is not reticulated through the township but provided via a standing pipe in the town centre. Most residents rely on privately owned rain water tanks for drinking water purposes.

8.2 Schematic

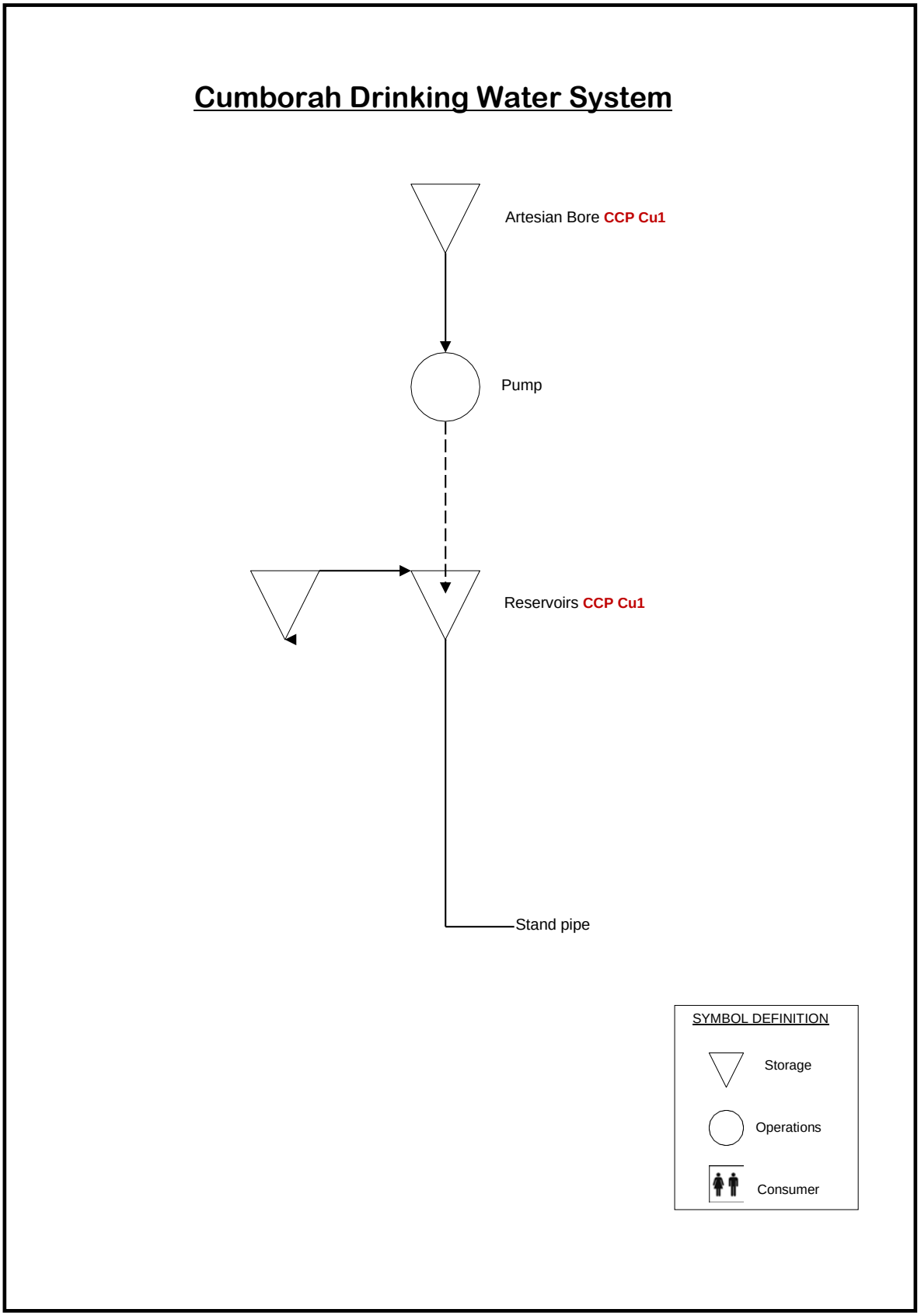

Figure 7: Cumborah Drinking Water Supply Process Flow Diagram

8.3 Monitoring

Cumborah scheme has a range of monitoring including:

- Verification monitoring
  - The verification data from 2012-2017 is shown in Table 27.Furthermore, the sites, analytes and performance summary are detailed in sections 10 & 12.
- 1 dedicated CCP (for more information see the CCP on the following pages)
  - CCP Cu1: Bore and Reservoir Integrity (Integrity of asset)
- Operational monitoring

A summary of the various monitoring schedules and results is provided below.

Table 24 Operational Monitoring Regime for Cumborah

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Catchment	Rainfall, storms, flooding	Potential flooding at borehead	Daily	Online (Bureau of Meteorology)
Reticulation – Bore/Reservoir	Integrity of asset	As per CCP	Monthly Monthly	Walk around Detailed inspection

Table 25 Verification Monitoring Regime for Cumborah

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Reticulation (NSW Health monitoring)	Microbial Chemical	≥ 1 cfu/ 100 ml > ADWG 2011	Weekly 6 Monthly	Grab sample – analysed by external lab

Table 26 Verification Monitoring Locations for Cumborah

NSW Health Drinking Water Monitoring Program
Cumborah
1: Cumborah – on reservoir

Table 27 Cumborah Scheme (Verification data 2012-2017)

Characteristic	Guideline Value	Units	Count	Min	Max	Average
Total Coliforms	0	mpn/100 mL	60	0	200	37.5
E. coli	0	mpn/100 mL	60	0	3	0.1
True Colour	15	Hazen Units (HU)	9	0.5	8.0	2.7
Turbidity	5	NTU	17	0.0	1.0	0.3
pH	6.5 - 8.5		14	0.2	8.7	7.8
Aluminium	0.2	mg/L	9	0.0	0.0	0.0
Antimony	0.003	mg/L	9	0.001	0.001	0.001
Arsenic	0.01		9	0.00	0.00	0.00
Barium	2	mg/L	9	0	0	0
Boron	4	mg/L	9	0	1	1
Cadmium	0.002	mg/L	9	0.000	0.000	0.000
Calcium	10000	mg/L	9	1	2	2
Chloride	250	mg/L	9	64	84	68
Chromium	0.05	mg/L	9	0.00	0.01	0.00
Copper	2	mg/L	9	0	0	0
Fluoride	1.5	mg/L	9	0.6	1.0	0.7
Iodine	0.5	mg/L	9	0.0	0.1	0.0
Iron	0.3	mg/L	9	0.0	0.2	0.1
Lead	0.01		9	0.00	0.00	0.00
Magnesium	10000	mg/L	9	0	0	0
Manganese	0.5	mg/L	9	0.0	0.0	0.0
Mercury	0.001	mg/L	9	0.000	0.000	0.000
Molybdenum	0.05	mg/L	9	0.00	0.00	0.00
Nickel	0.02	mg/L	9	0.01	0.01	0.01
Nitrate	50	mg/L	9	1	2	1
Nitrite	3	mg/L	9	0	0	0
Selenium	0.01		9	0.00	0.00	0.00
Silver	0.1		9	0.0	0.0	0.0
Sodium	180	mg/L	9	222	292	249
Sulfate	500	mg/L	9	1	1	1
Total Dissolved Solids (TDS)	600	mg/L	9	3	677	501
Total Hardness as $CaCO_3$	200	mg/L	9	4	7	5
Zinc	3	mg/L	9	0	0	0

Cumborah Bore and Reservoir Integrity

Critical Control Point Procedure

CCP Cu1

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Reservoir Integrity	Weekly reservoir walk around, monthly detailed inspection	Reservoir integrity	Pathogens	Note inspections in the plant diary

Critical Limit

Evidence of contamination or vermin identified

- Immediately report breach to Engineer.
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to report to Director Engineering
- Sample reservoir and reticulation for *E coli*
- If *E coli* detected, follow NSW Health Protocol - Microbiological Quality

Adjustment Limit

Possible points of ingress identified for bore or reservoir

Bores

- Seal any gaps in the borehead with silicone or other sealant
- Fix fencing to exclude animals
- Arrange for repair of any leaks

Reservoirs

- Seal the reservoir as soon as possible (e.g. replace vermin proofing, seal small holes, replace any missing bolts etc)
- Conduct thorough inspection of reservoirs looking for evidence of contamination
- Contact Treatment Supervisor and Engineer to report breeches that cannot be immediately fixed
- Engineer to arrange repairs e.g. welder/ roofing contractor
- Visually inspect reservoir daily until breach rectified

Targets

Bore head sealed

Reservoir Secure and vermin proof

Bores

- Inspect Bore site monthly
  - Check fencing around bore intact
  - Check all penetrations into bore head to ensure they are sealed
  - Check for any leakage indicating infrastructure damage

Reservoirs

- Monthly Reservoir integrity inspection
  - Ensure hatches are sealed and locked
  - Check vermin proofing is intact
  - Check for water leak/ pooling/ other signs of deterioration
  - Check for evidence of animals/ birds nesting
  - Inspect fencing and ladders for security
- 12 monthly reservoir maintenance (external)
- Record details in the plant diary

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9 CARINDA SUPPLY SYSTEM

9.1 Description

Source Water

This is an artesian bore that accesses the GAB. The water is stored in two tanks at Carinda.

Water Treatment

This supply is not treated or disinfected.

Distribution

There are two reservoirs for storage and the water is reticulated through the town by a booster pump. The Carinda Water Supply station has a shed and pump (installed/replaced in 2014).

9.2 Schematic

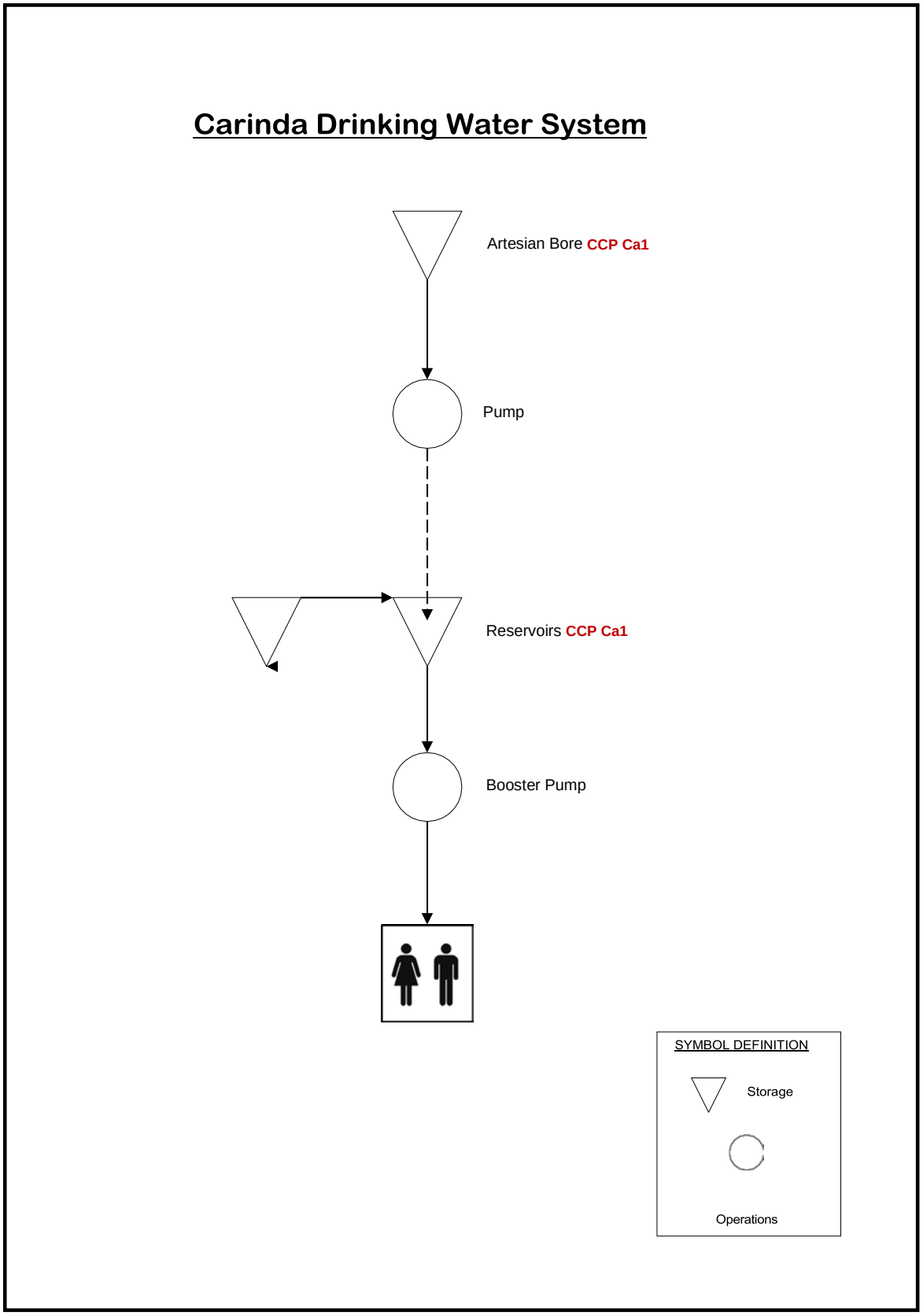

Figure 8 Carinda Schematic

9.3 Monitoring

Carinda scheme has a range of monitoring including:

- Verification monitoring
  - The verification data from 2012-2017 is shown in Table 31. Furthermore, the sites, analytes and performance summary are detailed in sections 10 & 12.
- 1 dedicated CCP (for more information see the CCP on the following pages)
  - CCP Ca1: Bore and Reservoir Integrity (Integrity of asset)
- Operational monitoring

A summary of the various monitoring schedules and results is provided below.

Table 28 Operational Monitoring Regime for Carinda

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Catchment	Rainfall, storms, flooding	Potential flooding at borehead	Daily	Online (Bureau of Meteorology)
Reticulation – Bore/Reservoir	Integrity of asset	As per CCP	Weekly Monthly	Walk around Detailed inspection

Table 29 Verification Monitoring Regime for Carinda

Monitoring Point	Parameters	Trigger Levels	Frequency	Sampling Method
Reticulation (NSW Health monitoring)	Microbial Chemical	≥ 1 cfu/ 100 ml > ADWG 2011	Monthly 6 Monthly	Grab sample – analysed by external lab

Table 30 Verification Monitoring Locations for Carinda

NSW Health Drinking Water Monitoring Program		
Carinda	3: Schools Residence	8: Bore Head
1: Colin Street – Park or Garage	5: Police Station	
4: Golf Club	2: Pool Grounds	9: Shire Depot

Table 31 Carinda (Verification data 2012-2017)

Characteristic	Guideline Value	Units	Count	Min	Max	Average
Total Coliforms	0	mpn/100 mL	95	0	200	6.3
E. coli	0	mpn/100 mL	95	0	0	0.0
True Colour	15	Hazen Units (HU)	10	0.5	1.0	0.8
Turbidity	5	NTU	24	0.1	2.2	0.5
pH	6.5 - 8.5		23	8.1	8.6	8.3
Aluminium	0.2	mg/L	10	0.0	0.0	0.0
Antimony	0.003	mg/L	10	0.001	0.001	0.001
Arsenic	0.01		10	0.00	0.00	0.00
Barium	2	mg/L	10	0	0	0
Boron	4	mg/L	10	0	0	0
Cadmium	0.002	mg/L	10	0.000	0.000	0.000
Calcium	10000	mg/L	10	2	3	2
Chloride	250	mg/L	10	41	49	44
Chromium	0.05	mg/L	10	0.00	0.01	0.00
Copper	2	mg/L	10	0	0	0
Fluoride	1.5	mg/L	10	1.0	1.4	1.2
Iodine	0.5	mg/L	10	0.0	0.0	0.0
Iron	0.3	mg/L	10	0.0	0.1	0.1
Lead	0.01		10	0.00	0.00	0.00
Magnesium	10000	mg/L	10	1	1	1
Manganese	0.5	mg/L	10	0.0	0.0	0.0
Mercury	0.001	mg/L	10	0.000	0.000	0.000
Molybdenum	0.05	mg/L	10	0.00	0.00	0.00
Nickel	0.02	mg/L	10	0.01	0.01	0.01
Nitrate	50	mg/L	10	1	2	1
Nitrite	3	mg/L	10	0	0	0
Selenium	0.01		10	0.00	0.00	0.00
Silver	0.1		10	0.0	0.0	0.0
Sodium	180	mg/L	10	256	300	280
Sulfate	500	mg/L	10	2	3	3
Total Dissolved Solids (TDS)	600	mg/L	10	159	656	563
Total Hardness as $CaCO_3$	200	mg/L	10	7	10	9
Zinc	3	mg/L	10	0	0	0

Carinda Bore and Reservoir Integrity

Critical Control Point Procedure

CCP Ca1

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Reservoir Integrity	Weekly reservoir walk around, monthly detailed inspection	Reservoir integrity	Pathogens	Note inspections in the plant diary

Critical Limit

Evidence of contamination or vermin identified

- Immediately report breach to Engineer.
- On breach of CCP, Engineer to:
  - Contact Far West and Western PHU (08) 80882126 or 0409746311 (Jason) or 0409462137 (David)
  - Contact DoI Water 0417458247 (Trent)
  - Take actions as advised
- Engineer to report to Director Engineering
- Sample reservoir and reticulation for *E coli*
- If *E coli* detected, follow NSW Health Protocol - Microbiological Quality

Adjustment Limit

Possible points of ingress identified for bore or reservoir

Bores

- Seal any gaps in the borehead with silicone or other sealant
- Fix fencing to exclude animals
- Arrange for repair of any leaks

Reservoirs

- Seal the reservoir as soon as possible (e.g. replace vermin proofing, seal small holes, replace any missing bolts etc)
- Conduct thorough inspection of reservoirs looking for evidence of contamination
- Contact Treatment Supervisor and Engineer to report breeches that cannot be immediately fixed
- Engineer to arrange repairs e.g. welder/ roofing contractor
- Visually inspect reservoir daily until breach rectified

Targets

Bore head sealed

Reservoir Secure and vermin proof

Bores

- Inspect Bore site monthly
  - Check fencing around bore intact
  - Check all penetrations into bore head to ensure they are sealed
  - Check for any leakage indicating infrastructure damage

Reservoirs

- Monthly Reservoir integrity inspection
  - Ensure hatches are sealed and locked
  - Check vermin proofing is intact
  - Check for water leak/ pooling/ other signs of deterioration
  - Check for evidence of animals/ birds nesting
  - Inspect fencing and ladders for security
- 12 monthly reservoir maintenance (external)
- Record details in the plant diary

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10 WATER QUALITY SUMMARY

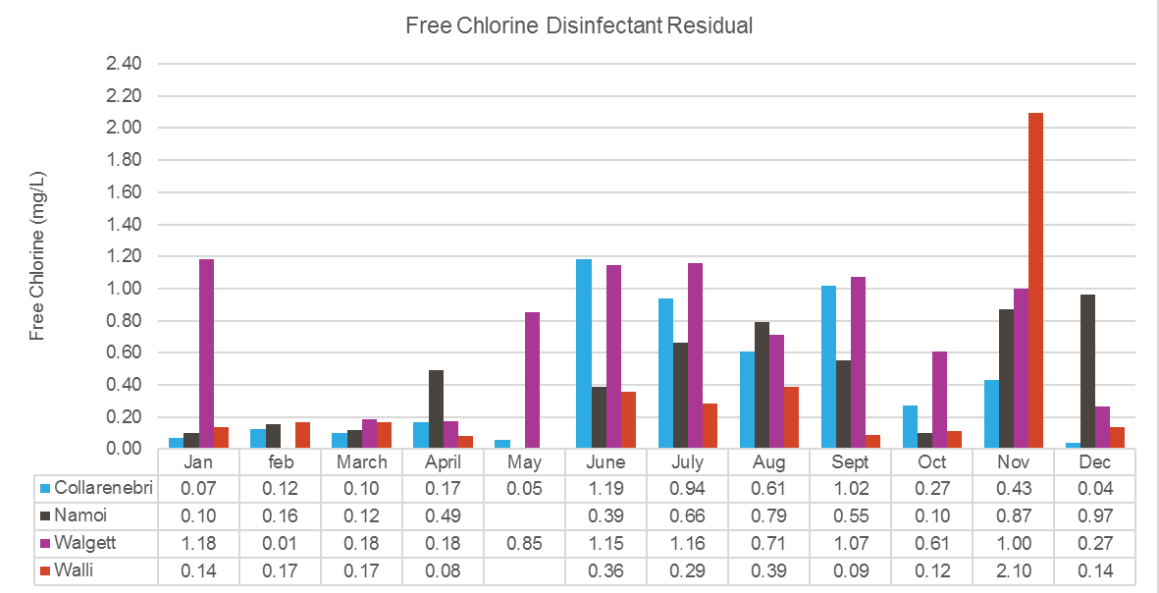
A summary of minimum, maximum and average values are within the scheme sub sections. Table 32 provides a high-level summary of the key water quality issues per scheme.

Table 32: Water quality summary by scheme (2012-17)

Scheme	Key Water Quality Hazards or Issues
Walgett	Elevated total coliforms
Namoi	*Elevated total coliforms*
Gingie	*3x E.coli detection (Oct 2013- Feb 2014)* *Elevated total coliforms (>10mpn/100mL) – an average concentration of 15.54mpn/100mL* *Low free chlorine concentration* *High TDS – an average concentration of 616mg/L (this is still considered fair water quality – up to 900mg/L).*
Carinda	Elevated total coliforms
Collarenebri	There is a history of *E.coli* detections (8 in 5 years), two exceedances in 2017. There have been boil water alerts issued (i.e. a boil water was issued in April 2017 and lifted in 15th May 2017). High colour - the average colour is 9.27HU. Elevated metals (Aluminium, Iron)
The Walli	*1x E.coli detection (March 2015)* *Free chlorine exceedance (5.94) on 28/11/2017.*
Cumborah	1x *E.coli* detection 01/17 Elevated total coliforms (>10mpn/100mL) – an average concentration of 37.45mpn/100mL High colour
Lightning Ridge	5x *E.coli* detection; 3x Butterfly Avenue and 2x Pandora St. Two of these detections were in 2017. Elevated total coliforms
Rowena	2x *E.coli* detection (both in 2014 in April-May) Elevated total coliforms – an average concentration of 15.34mpn/100mL 1x result of high chloride (257mg/L), aesthetic guideline is 250mg/L
All schemes	All schemes have elevated sodium (exc. Collarenebri, Walgett and Namoi); the average for all schemes is 318mg/L, the aesthetic guideline is 180mg/L. This concentration may lead to taste and odour complaints. Note: Medical practitioners treating patients with severe hypertension or congestive heart failure should be made aware of the concentration if it is greater than 20mg/L. There are total coliform exceedances through all schemes. The worst performing areas are Cumborah, Gingie and Rowena. There are known seasonal impacts; during Feb the average total coliform concentration across all scheme is 20mpn/100mL, whereas during the winter months (June, July, August) it reduces to <5mpn/100mL. These elevated total coliforms may be a result of re-growth within the network (i.e. biofilm); their presence is not necessary indicative of contamination, however at high concentrations corrective actions should be undertaken. Many the schemes (Carinda, Collaranebri, Cumborah, Gingie and Rowena) all have had TDS concentrations greater than the 600mg/L, however on average they are below the 600mg/L and generally considered “good quality” re: TDS concentration. Above 8.5 pH can cause taste and scale issues. Several the schemes have high pH bordering on 8.5 (Inc. Collarenebri, Carinda, Gingie and Lightning Ridge). In June 2013 Collarenebri two results of >11 were recorded.

10.1 Disinfectant performance

The graph below highlights the average free chlorine concentration across the 2 disinfected schemes (or 4 sub schemes). LWU circular 18 requires providers to maintain 0.2mg/L free within distribution networks to limit biological regrowth and maintain a disinfection residual. During the summer months (Feb, March) the disinfectant residual is very low across all schemes. Walgett over the year averages 0.74mg/L, however during Feb, March and April the average is below 0.2mg/L. Collarenebri is also below <0.2mg/L in Jan, Feb, March, April, May and Dec.



	Jan	feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Collarenebri	0.07	0.12	0.10	0.17	0.05	1.19	0.94	0.61	1.02	0.27	0.43	0.04
Namoi	0.10	0.16	0.12	0.49		0.39	0.66	0.79	0.55	0.10	0.87	0.97
Walgett	1.18	0.01	0.18	0.18	0.85	1.15	1.16	0.71	1.07	0.61	1.00	0.27
Walli	0.14	0.17	0.17	0.08		0.36	0.29	0.39	0.09	0.12	2.10	0.14

Figure 9 Free chlorine performance

10.2 Turbidity performance

Nearly a quarter (24%) of the turbidity exceedances (>1NTU) are in Walgett. Followed by Namoi, Walli and Gingie. Furthermore, there were 3 results >5NTU which may have caused a noticeable change in clarity to the affected customers in Walli, Lightning Ridge and Collarenebri.

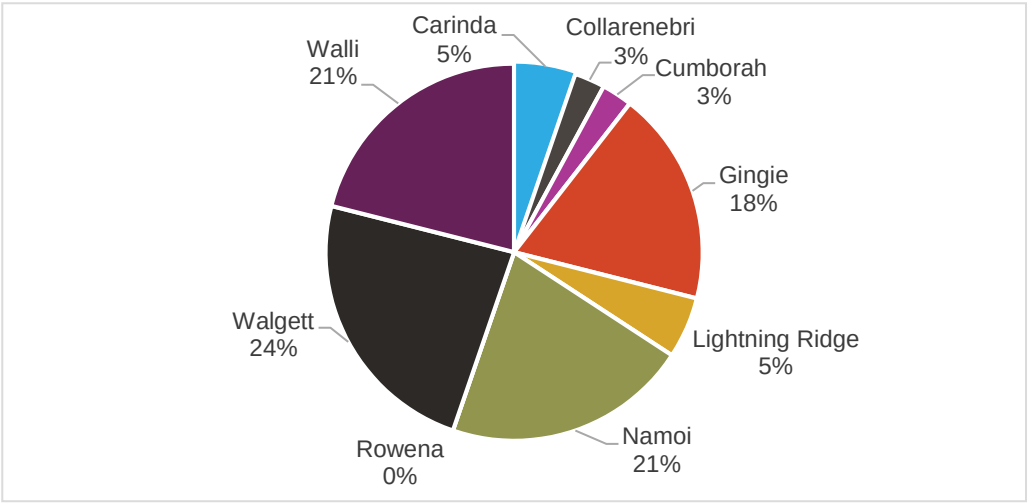


Figure 10: Turbidity performance

10.3 Radiological

Radiological baseline assessments in the form of alpha and beta activity were undertaken 5 June 2011 at Gingie Aboriginal Community and 6 June 2011 at the Namoi Village Aboriginal Community and The Walli Aboriginal Community. All results were below the detection limit for both Alpha and Beta analysis.

Further information can be found in Appendix A of the Drinking Water Analysis document written by Hydroscience in June 2014.

10.4 Pesticides

Pesticide sampling was undertaken over a 2-year period from February 2004 to April 2005, then May 2005 to August 2006. Samples were analysed for Organochlorine Pesticides, Organophosphorus Pesticides, Synthetic Pyrethoids, Acidic Herbicides, Triazine / Phenylureas, Amitraz and Metolachlor. Metolachor was detected, however it was below the ADWG health guideline.

Further information can be found in Appendix B of the Drinking Water Analysis document written by Hydroscience in June 2014.

10.5 Disinfection by products

Disinfection by-product monitoring was undertaken on twelve occasions from 2010 to 2012 at Namoi Village Aboriginal Community (Walgett WTP) and The Walli Aboriginal Community (Collarenebri WTP)

The results indicated that THMs concentration in the water supply system was within the ADWG 2011 criteria, with the following exceptions:

- Namoi Community – THM on one occasion (Chloroform 0.68 mg/L on 13/12/11)
- The Walli Community – THM on one occasion (Total THM 0.34 mg/L on 10/10/11)

It is considered that THMs concentrations fluctuating occasionally up to 1 mg/L are unlikely to pose a significant health risk.

Further information can be found in Appendix C of the Drinking Water Analysis document written by Hydroscience in June 2014.

11 RISK MANAGEMENT AND CONTROLS

11.1 Risk Assessment and Preventive Measures

The risk assessment was undertaken on the 4th and 5th July 2017 for Walgett, Collarenebri and Lightning Ridge, and updated in November 2017 to include the smaller schemes. The previous risk assessment was undertaken in 2013.

The objectives of the risk assessment were to:

- Identify drinking water hazards that may impact water quality in the Walgett, Collarenebri and Lightning Ridge Schemes
- Identify if there are any additional hazards that should be risk assessed
- Assess any drinking water hazardous events that are considered relevant
- Risk assess the new Walgett WTP, and consider the impact of now having 2 sources.
- Capture comments that contextualise the risk assessment
- Review the target limits, alarm limits and critical limits for Critical Control Points (CCPs)
- Identify if there is a need for further mitigation measures
- Identify the risk management improvement items that are required to reduce mitigated risks to an acceptable level

Table 33 Risk assessment team 2017

Name	Position
Dilip Tiwari	Engineer
Sam Lenkaak	Project Officer
Antony Leeder	Team Leader – Lightning Ridge Urban Services
Tom Thurston	2IC Water and Sewerage
Roy White	Urban Services Coordinator
Jason Harwood	West and Far West Health Service Public Health Unit
Trent Betts	Crown Lands and Water
Michael Lawrence (Bligh Tanner)	Facilitator

11.2 Methodology

The risk assessment methodology is based upon the Australian Drinking Water Guidelines 2011 methodology.

Unmitigated risks were assessed to determine the risk of drinking raw water directly from either the river or bore water sources.

In the case of chemicals that are added to the water supply (e.g. chlorine/ fluoride), the unmitigated risk assumes dosing with no control.

Normally, the mitigated risk is considered as the sum of all processes. In the case of Collarenebri, the risk was assessed sequentially, to demonstrate that, at present, the coagulation and media filtration steps do not reduce risk.

Where a mitigated risk is rated as "High" or "Very High", risk improvement items were identified, that when complete should lower the risk to an acceptable level.

Public Health Risk Matrix Likelihood	Consequence	Insignificant	Minor	Moderate	Major	Catastrophic
		Insignificant impact, little disruption to normal operation, low increase in normal operational cost	Minor impact for a small population, some manageable operational disruption, some increase in operating cost	Minor impact for a large population, significant modification to normal operation, but manage-able, operational costs and monitoring increased	Major impact for a small population, systems significantly compromised and abnormal operation, if at all, high level of monitoring required	Major impact for large population, complete failure of systems
Almost Certain	Is expected to occur in most circumstances	Medium	High	Very High	Very High	Very High
Likely	Will probably occur in most circumstances	Medium	Medium	High	High	Very High
Possible	Might occur or could occur at some time	Low	Medium	Medium	High	High
Unlikely	Could occur at some time	Low	Low	Medium	Medium	High
Rare	May only occur in exceptional circumstances	Low	Low	Low	Medium	Medium

Figure 11: Risk assessment table matrix

Table 34: Risk acceptability

Risk Level	Statement
Low	Manage for continuous improvement (acceptable)
Medium	Implement improvement measures as opportunities arise, and factor risk reduction measures into forward planning (acceptable)
High	Implement risk reduction measures in the short term. Longer term risk reduction measures need to be a priority (unacceptable)
Very High	Implement risk reduction measures immediately. Implementation of longer term risk reduction measures must be given highest priority (unacceptable)

11.3 Critical Control Points

Critical Control Points (CCPs) are activities, procedures or processes where the operator can apply control, and are essential processes in reducing risks to an acceptable level. In order to distinguish acceptable from unacceptable performance at each CCP, target levels, adjustment limits and critical limits have been identified for the Walgett, Collarenebri, Lightning Ridge, Rowena, Carinda and Cumborah drinking water supply system.

Three different limits have been set for the Walgett Shire Council drinking water supply system:

1. **Target Level:** Representing day-to-day operational limits and procedures. This is what the WTP aims to achieve
2. **Adjustment Limit:** Deviation from the Adjustment Limit indicates a trend towards loss of control and corrective actions should be immediately taken to resolve the problem and restore control to the Drinking Water Supply System
3. **Critical Limit:** Deviation from the Critical Limit indicates loss of control and the potential of unacceptable health risks. If the critical limit is exceeded, incident and emergency plans should be immediately activated

11.4 Maintaining Key Barriers

Lands and Water issued Circular LWU 18 '*Assuring the safety of drinking water supplies*', (4 June 2014) with corresponding protocols that are to be implemented by all local water utilities providing a drinking water supply. The Circular is available in Appendix C. Council must meet the minimum requirements in order to achieve the key barriers outlined below (NSW Office of Water, 2014):

- Effective disinfection to kill or remove pathogens in the raw water
- Ensure distribution system integrity to prevent contamination
- Maintenance of free chlorine residual in the reticulation system

Council is required to ensure the SOPs meet the minimum requirement for each key barrier as outlined by NSW Office of Water.

12 OVERVIEW OF MONITORING

12.1 Operational Monitoring

Walgett Shire Council undertakes monitoring of water quality at Walgett, Collarenebri, Lightning Ridge, Rowena, Carinda and Cumborah drinking water supply systems. The monitoring schedule undertaken by Council is detailed in each scheme sub section.

12.2 Verification of Drinking Water Management

The verification of drinking water quality supplied to the consumer assesses the overall performance of the system. Verification provides an important link back to the operation of the water supply system and additional assurance that the preventive measures and treatment barriers have worked and are supplying safe quality water.

Council monitors water quality at various points of supply as part of the *NSW Health Drinking Water Monitoring Program* which provides ongoing independent verification of the treatment process. The locations and frequency of sampling are based on population, and are detailed in each scheme sub-section. The program assesses the microbial, physical and chemical properties of the water as detailed in Table 33. The results are accessed at: www.drinkingwaterdb.nsw.gov.au

Walgett Shire Council staff is responsible for the collection of samples for the *NSW Health Drinking Water Monitoring Program*.

Samples are submitted in accordance with the *"Guide for Submitting Water Samples to FASS for Analysis"* (Sydney West Area Health Service, 2010) and Council procedures for samples.

Table 35 NSW Health Drinking Water Monitoring Program Parameters

Parameters			
Microbial			
E. coli		Total Coliforms	
Disinfection			
Free Chlorine		Total Chlorine	
Physical			
pH		Total Dissolved Solids (TDS)	
True Colour		Total Hardness as $CaCO_3$	
Turbidity			
Chemicals			
Aluminium	Chloride	Magnesium	Selenium
Antimony	Chromium	Manganese	Silver
Arsenic	Copper	Mercury	Sodium
Barium	Fluoride	Molybdenum	Sulphate
Boron	Iodine	Nickel	Uranium
Cadmium	Iron	Nitrate	Zinc
Calcium	Lead	Nitrite	

12.3 Short Term Evaluation of Results and Corrective Action

Council evaluates water quality data on receipt of monitoring results. Water quality results from NSW Health are reported to Council's Director of Engineering/Technical Services and Director of Environmental Services.

Drinking water quality results are assessed against the ADWG. Any exceedances are immediately reported to the Council's personnel Director of Engineering/Technical Services and Director of Environmental Services.

Drinking water quality exceedances from NSW Health drinking water monitoring triggers a notification by the laboratory to Council's Director of Engineering/Technical Services. Immediately the exceedances are reported to the Director of Engineering/Technical Services and appropriate operators.

Any exceedances are recorded and acted upon immediately with the appropriate regulatory authorities notified. All test results are recorded in the NSW Health Drinking Water Database which is completely independent of Walgett Shire Council.

13 OPERATIONAL PROCEDURES AND PROCESS CONTROL

13.1 Operational Procedures and Corrective Actions

The operational procedures and corrective actions for the Walgett, Collarenebri, Lightning Ridge, Cumborah, Carinda and Rowena CCPs are available the relevant sub sections.

13.2 Equipment Capability and Maintenance

Walgett Shire Council has an existing Asset Management Policy (Feb 2010) and an Asset Management Strategy (Jun 2012). The policy stated that an inspection regime will be used as part of asset management to ensure that agreed levels of service are maintained and to identify asset renewal priorities based on the condition assessment model. Council uses *Confirm* Asset Management Information System to manage the integrity of asset data.

Council is currently investigating service contracts for equipment calibration and maintenance.

13.3 Materials and Chemicals

Council conforms to the *Plumbing Code of Australia,* the *AUS-SPEC 0071 water supply – Reticulation and pump stations* (Design) (NATSPEC, year unknown) and the Australian Standards (AS/NZ4020 – Testing of products for use in contact with drinking water) in the purchasing of materials and chemicals.

The use, including transport and storage, of chemicals listed as “Dangerous Goods” under the Work Health and Safety Regulation 2012 (NSW), including chlorine and fluoride, is dictated by the provisions of the Work, Health and Safety Regulation and Work Cover. Storages and trucks are licensed according to the Work, Health and Safety Regulation 2012.

Chemical suppliers should be evaluated and selected on their ability to supply product in accordance with required specifications. Documented procedures for the control of chemicals, including purchasing, verification, handling, storage and maintenance, should be established to assure the quality of the chemicals at the point of application. Responsibilities for testing and quality assurance of chemicals should therefore be clearly defined in purchase contracts by Council.

NSW Health recommends that all chemical deliveries are attended by a trained water treatment plant operator, and that the following procedures are followed:

- A certificate of analysis is provided by the supplier at the time of delivery for each batch of chemical supplied and that the chemical satisfies the criteria specified in Chapter 8 of the Australian Drinking Water Guidelines, prior to the commencement of unloading
- The correct chemical is being delivered into the appropriate storage
- If relevant, check that the correct concentration has been supplied

Chemicals used in the supply of drinking water at Walgett, Collarenebri and Lightning Ridge are listed in their relevant sub sections. No treatment or disinfection is applied at Rowena, Carinda and Cumborah.

14 MANAGEMENT OF INCIDENTS AND EMERGENCIES

14.1 Incident and Emergency Response Protocols

Councils Drinking Water Emergency Response Plan is attached as Appendix A.

This plan details the emergency levels, response actions, responsibilities and key templates (i.e. NSW Health Response Protocols and Boil Water Alert template).

The Council ERP has three (3) different emergency response levels;

1. Emergency or Disaster, e.g. implement EMPLAN or DISPLAN
2. Incidents, e.g. requires immediate remedial action and regulatory reporting
3. Operator Adjustments – e.g. linked to CCP actions

14.2 Communication

Council's contacts and responses for water quality incidents are noted in the Emergency Response Plan.

15 SUPPORTING REQUIREMENTS

15.1 Employee Awareness and Training

Council aims to provide an environment of equal opportunity in its workplace and is committed to the development of skilled, knowledgeable and dedicated staff. Staff training is an important and essential element of corporate development and Council supports this through on-going on and off-the-job training for all employees.

The current water treatment plant operators employed by Walgett Shire Council, at the time of writing, have not completed the water treatment operator course or the fluoridation of public water supplies course. These courses are provided by the DPI Water in conjunction with TAFE NSW. It is highly recommended that Council ensures that all their water treatment plant operators have undertaken this course.

To promote employee awareness, Council conduct an annual review of employee performance to ensure that Council goals are aligned with employee goals.

15.2 Community Involvement and Awareness

WSC's Community Strategic Plan (2010) was developed in conjunction with community consultation through public exhibition. The plan addresses community strategies in social, environmental, economic, infrastructure and governance areas.

In the Community Strategic Plan (2010), it has been identified the following strategies relevant to water supply services. They include:

- to consider supplying water to outside urban areas where there is significant merit and public benefit
- to support the Catchment Action Plan to ensure the quality of surrounding waterways is not adversely affected by development
- to develop a comprehensive Water Management Plan to set the direction for providing service level requirements to the community
- To ensure urban water supply systems are sustainable and appropriate by on-going monitoring and maintaining water potable quality in accordance with ADWG

The Walgett Shire Council website has some basic information under the Councils water and sewerage program. Water quality statistics are not provided.

15.3 Consumer Satisfaction

Council has customer service staff to handle complaints and requests. The call centre records all requests, which are forwarded to the appropriate staff.

Council uses EnviroCAR for all customer complaints. Written complaints are assigned to the relevant person and actioned. Emergencies and health related water quality complaints are responded to as soon as possible. For all non-urgent complaints: personal complaints are responded within two working days; written complaints are responded to within five working days.

16 RESEARCH AND DEVELOPMENT

16.1 Investigative Studies and Research Monitoring

The following items have been identified as requiring additional investigative projects:

- Optimising treatment process in the Collarenebri WTP. High turbid loads in the source water and no settling or clarification can lead to excessive backwashing. It is considered that a clarifier, or settling pond, would optimise the filtration process and provide another barrier for the protection of the water supply

Council can access investigative monitoring programs through the NSW Health Drinking Water Monitoring Program if required. Council also receives the Public Health Bulletin and is a member of the Local Government Water Directorate through which projects can be undertaken collectively and information.

16.2 Validation of Processes and Equipment

Validation requires the evaluation of system processes and equipment to prove the performance under all conditions expected to be encountered during operations. Validation should be undertaken when there is a:

- Change in raw water quality
- Modification to the water treatment processes
- Change to the delivery, storage and distribution systems of treated and untreated water
- Change in the use of treated water
- Change in water quality standards
- New research/understanding of water quality issues
- Receipt of information that indicates a health risk associated with the quality of the drinking water

Validation of new or upgraded processes and equipment will be undertaken by qualified, experienced engineers and operators for Walgett Shire Council drinking water supply system through:

- System design according to industry guidelines and standards
- Individual process/equipment specification against CCP target limits
- Procurement of equipment/chemicals from approved suppliers
- Market pre-validation by suppliers, particularly associated with water treatment chemicals
- Verification on start-up by monitoring at each process with reference to CCP limits
- Ongoing validation processes to ensure safe and acceptable drinking water is supplied to the customer are:
- Review of scientific literature on treatment processes and industry best practice
- Evaluation of the effectiveness of CCPs in controlling risks
- Assessment of research and development work to ensure CCP limits remain appropriate
- Ongoing verification processes are undertaken throughout the drinking water supply system to ensure safe and acceptable drinking water supply are:
- Review of water quality at the point-of-supply against ADWG
- Review and response to customer water quality complaints register

17 DOCUMENTATION AND REPORTING

17.1 Management of Documentation and Records

The DWMS documents information pertinent to all aspects of drinking water quality management for the Walgett Shire Council drinking water supply system. Council uses the electronic document and records management system TRIM for document control.

The DWMS is a living document and should be maintained in-line with actual operations and management. Any changes to the drinking water supply system should be updated and documented within this DWMS.

17.2 Reporting

Council undertakes reporting as required by NSW Health and NSW Office of Water. In line with Council's responsibilities the following reports are produced:

Council Annual Report and Quarterly Performance Reports: available in hardcopy at the Council office and electronically on Council's website

NSW Health compliance reporting for drinking water quality monitoring: The drinking water quality is monitored, and the results are recorded in the NSW Health Drinking Water Database accessible via the NSW Health website. Water quality reports can be produced from the NSW Drinking Water Database: http://www.drinkingwaterdb.nsw.gov.au

Water Supply and Sewerage NSW Performance Reporting: Council's water supply service performance is detailed in the NSW Water Supply and Sewerage Performance Monitoring Report annually. This report is available for public access from the NSW Office of Water

Daily water quality monitoring results are logged and are reviewed by operators and exceedances reported to Council supervisors, NSW Health and Lands and Water as required.

18 REVIEW AND AUDIT

18.1 Evaluation and Audit

Water quality results are recorded in electronic format so Council may analyse and observe trends in water quality over time. This will allow Council to optimise treatment processes across seasonal variations and continually improve the quality of the drinking water system.

An annual internal audit will be undertaken by Councils Director of Engineering/Technical Services of the DWMS focussing on:

- CCPs and their exceedances
- Improvement Plan
- Record keeping
- NSW Performance Monitoring
- Levels of Service

A Lands and Water Inspector carries out an external assessment of the WTPs on a four-monthly basis. DPI Water and the Public Health Water Unit may check key elements of the DWMS. The NSW Health Regulation allows NSW Health to review a DWMS at any time.

18.2 Review by Senior Management

As part of the requirements of the reporting procedures, Council's Director of Engineering/Technical Services will review the effectiveness of the DWMS and the underlying policies.

A complete review of the DWMS will take place every 4 years.

NSW Health has requested that the DWMS will be externally reviewed through an annual meeting with NSW Health, Lands and Water and Council staff.

19 IMPROVEMENT PLAN

Improvement actions for the Walgett Shire Council water supplies are listed below. Priorities have been developed from the risks as identified through the workshop process.

The Director of Engineering/Technical Services of Walgett Shire Council is responsible for the Improvement Plan. The Improvement Plan is used by the Council to monitor the implementation of the drinking water management system. The Improvement Plan is subject to an annual review by the Director of Engineering/Technical Services of WSC.

Table 36 Improvement Plan

Priority	Objective	Reference	Action	Timeframe
		Walgett drinking water supply system		
High	Water Treatment	W18	Develop operational protocol to switch to bore at any time that treatment is impacted by raw water quality	Completed
			Clear water pump #2 installation – will require careful planning	
High		W19	Ensure chlorine CCP is implemented in SCADA	Completed
Medium		W21	Investigate ability to feed bore either into clearwater or town reticulation. (Possibly a flexible hose and connection points.)	
Medium		W22	Train additional operators to allow for succession.	
Medium		W23	Standby clear water pump to be plumbed in to be duty/standby. Develop list of critical spares.	
			SCADA requires external maintenance 360 consider contract	
Medium		W10	Town bore is not operational in automatic mode – need to arrange repairs.	
			Investigate external servicing and calibration of all online instrumentation.	
Medium		W20	6 monthly service contract with Prominent for chlorine system	
Medium		W25	Develop pH OCP to mitigate likelihood of high pH due to caustic overdose	

Priority	Objective	Reference	Action	Timeframe
Collarenebri drinking water supply system				
Very High	Water Treatment	Co13	Consider extending pipework to allow more contact time prior to media filters so that floc will have formed. There is a risk that in doing so that the media filters may exceed the solid loading capacity. EOI to Safe and Secure Water supply for investigation into clarifiers or other pre-treatment.	
Very High		Co14, Co15	Pre-treatment options to be investigated to ensure turbidity effectively reduced prior to UF.	
High		Co17, Co18	EOI for Safe and Secure Water program Consider auto changeover of pumps, and SCADA monitoring and control of chlorine. Replace chlorine pumps with degassing models.	
High		Co19	Start a project for THM monitoring.	
High		Co21	Telemetry to send alarms to operators, and then escalate. Budget item for 2017/18. Need more online instrumentation to have visibility of water quality parameters	
Medium	Service Reservoir	Co24	Reservoir inspection projects through Lower Macquarie alliance, Budget for repair of gaps at hatch in 2017/18.	
Medium	Regulatory	Co28	Investigate alternate opportunities for reuse	
Lightning Ridge drinking water supply system				
Medium	Water Treatment	LR6	Investigate ability to either bypass reservoirs from new bore or alter reticulation to feed town on low(er) pressure	This was confirmed to already be possible
Medium		LR7	Aeration along with chlorination budgeted	
High	Service Reservoir	LR9	Chlorination of Lightning Ridge budgeted - sodium hypochlorite system and an aerator. Will have community consultation prior to commissioning.	

Priority	Objective	Reference	Action	Timeframe
Medium		LR11	Chlorination of Lightning Ridge budgeted - sodium hypochlorite system and an aerator. Will have community consultation prior to commissioning.	Safe And Secure application made
High	Reticulation	LR12	Trade waste with new developments, meters now installed on majority of supplies, illegal connections being identified and removed. Backflow devices installed, no testing program at present.	
Carinda/ Cumborah/ Rowena drinking water supply systems				
High	Bores	CCR4	Seal the Rowena bore head, and inspect Cumborah bore for integrity – rectify if not sealed.	
High	Reservoir	CCR8,CCR10	consider floating calcium hypochlorite tablets - aim for chlorine residual leaving the reservoirs	
High	Reticulation	CCR11	Consider need to replace water meters/ install backflow prevention on higher risk premises	
High	Reticulation	CCR12	Develop mains break SOP	

20 REFERENCES

- ANZECC, Conservation Council and ARMCA&NZ (2000)
- NATSPEC (year unknown) AUS-SPEC 0071 Water Supply – Reticulation and pump stations (Design), NATSPEC, Sydney
- NHMRC, NRMMC (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy.* National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.
- NSW Department of Health (01 January 2004) NSW Health Response Protocol: for the management of physical and chemical quality

  http://www.health.nsw.gov.au/environment/water/Pages/nswhrp-chemical.aspx (accessed 16 January 2018)
- NSW Department of Health (01 July 2008) NSW Health Response Protocol: following failure in water treatment or detection of giardia or cryptosporidium in drinking water

  http://www.health.nsw.gov.au/environment/water/Pages/response.aspx (accessed 16 January 2018)
- NSW Department of Health (2011) New South Wales Code of Practice for Fluoridation of Public Water Supplies. Gladesville, NSW Department of Health
- NSW Department of Health (25 November 2011) NSW Health Response Protocol: for the management of microbiological quality of drinking water (Version 2)

  http://www.health.nsw.gov.au/environment/water/Pages/nswhrp-microbiological.aspx (accessed 16 January 2018)
- Sydney West Area Health Service (2010) Guide for Submitting Water Samples to the Division of Analytical Laboratories for Analysis. Sydney West Area Health Service, Lidcombe

21 GLOSSARY

Table 37 Glossary

ADWG	Australian Drinking Water Guidelines, published by the National Health and Medical Research Council (NHMRC).
CAP	Catchment Action Plan
CMA	Catchment Management Authority
catchment	Area of land that collects rainfall and contributes to surface water (streams, rivers, wetlands) or to groundwater.
CCP	Critical control point - a point, step or procedure at which control can be applied and which is essential to prevent or eliminate a hazard or reduce it to an acceptable level.
critical limit	a prescribed tolerance that must be met to ensure that a critical control point effectively controls a potential health hazard; a criterion that separates acceptability from unacceptability
C.t	The product of residual disinfectant concentration (C) in milligrams per litre determined before or at taps providing water for human consumption, and the corresponding disinfectant contact time (t) in minutes.
DBP	Disinfection By-Product
DISPLAN	Local Disaster Management Plans, often prepared by Councils in compliance with the State Emergency and Rescue Management Act, 1989.
DWMS	Drinking Water Management System
drinking water supply system	Drinking Water Supply System
EPA	Environment Protection Authority
GAB	Great Artesian Basin
HU	Hazen Unit (colour)
HACCP	Hazard Analysis Critical Control Point - a systematic methodology to control safety hazards in a process by applying a two-part technique: first, an analysis that identifies hazards and their severity and likelihood of occurrence; and second, identification of critical control points and their monitoring criteria to establish controls that will reduce, prevent, or eliminate the identified hazards.
IWCM	Integrated Water Cycle Management
LEP	Local Environmental Plan
NPWS	National Parks and Wildlife Service
NTU	Nephelometric Turbidity Units
OSSM	On-site sewage management
PAC	Powdered Activated Carbon

ADWG	Australian Drinking Water Guidelines, published by the National Health and Medical Research Council (NHMRC).
R&D	Research and development
RACC	Regional Algal Coordinating Committee
SBP	Strategic Business Plan
SCADA	Supervisory Control and Data Acquisition system used to monitor, control and alarm water treatment plants.
STP	Sewage Treatment Plant
SWL	Standing Water Level
TBL	Triple Bottom Line
THM	Trihalomethanes
WTP	Water Treatment Plant
WU	Water Utility
WSC	Walgett Shire Council

22 APPENDIX A

22.1 Emergency Response Plan

Walgett Shire Council
Drinking Water
Emergency Response Plan

Introduction

The Walgett Shire Shire Council Emergency response plan is intended to be a simple plan that clearly describes the actions and accountabilities of key operational, managerial and executive staff. It refers to other documents where appropriate and is intended to show the communication pathways and key actions at each level. Each incident or emergency will require a considered individual response.

Emergency Levels

Walgett Shire Shire Council uses 3 different emergency response levels. The lower 2 levels align to the critical control points at each water scheme (adjustment actions and critical actions) whilst the highest level is aligned to the Walgett Shire Shire Council EMPLAN and DISPLAN.

Level 3	**Activation of EMPLAN or DISPLAN**
Level 2	**Critical Control Point or ADWG health guideline exceedences**
Level 1	**Operator Adjustments to processes**

Linkages to Critical Control Point Procedures

All key operational processes such as filtration, disinfection, fluoridation and reticulation are managed as critical control points.

The CCP wall charts are present at each water treatment plant or dosing location so that operators are able to implement the appropriate corrective actions as soon as possible.

The actions identified in the coloured boxes next to the traffic lights are the actions that the operators are required to take when the adjustment or critical limits are exceeded. This includes reference to the required escalation and communication pathway.

Response Actions

Level 1 - Operator Adjustment

At the level 1 operational actions are required to manage the issue and prevent escalation.

Issues at this level are normally identified by the water treatment plant operators through operational or verification monitoring.

Corrective actions will be taken to ensure processes are brought back to target levels, a note made in WTP diary (WTP exceedances) and the Treatment Supervisor informed as requried, or escalated immediately if the problem cannot be rectified.

Note: Exceedances of upper and lower alarms are considered to be within the scope of normal operation of the management plan, and do not automatically escalate unless the situation warrants. For example, a high chlorine level (below the critical limit) that is reacted to before the chlorine level exceeds the critical limit or the ADWG Health Guideline value is dealt with as a "Level 1" action.

If the ADWG Health Guideline values are exceeded, the issue is a "Level 2" incident.

Level 2 - Incident

At this level, there is a potential for an adverse public health impact.

These issues are identified through either operational or verification monitoring of the processes and water quality, or where there has been a significant widespread treatment or reticulation network failure resulting in the loss (or likely loss) of water supply for a period >6 hours.

When identified, these issues are immediately communicated to the Engineer. In most cases, it will be reported immediately to the local PHU.

Appropriate corrective actions will be identified, and implemented as soon as practicable to minimise the effect of the incident.

Level 3 – Emergency or Disaster

This level emergency or disaster requires coordination across departments and may require external resourcing and support from agencies, such as Department of Emergency Services, Department of Department of Health, Department of Primary Industries and emergency responders.

In these cases the Council Business Continuity Plan, EMPLAN, or DISPLAN will be activated.

Key management responses and responsibilities

Level	Description	Key management response(s)	Position(s) responsible
Level 3 **Disaster or Emergency**	+ Emergency Management Plan activated or natural disaster declared. + Examples include flood, drought, bushfire and sabotage	+ External assistance requested to manage emergency or disaster + Effective communication with community	+ General Manager
Level 2 **Incidents**	+ Exceedance of ADWG health guideline value + Exceedence of CCP critical limit + Outbreak of waterborne disease + Unable to provide treated water + Loss of water supply for >6 hours	+ Ensure all control measures identified in the DWQMP are functioning effectively	+ Treatment Supervisor + Engineer + Director Engineering + General Manager
Level 1 **Operator Adjustments**	+ Exceed Action Limit for CCPs + Effectively managed by the water treatment operators undertaking actions in CCP document.	+ Implement CCP actions to return to operational target + Check and act upon operations and maintenance records and procedures + Take appropriate actions to rectify situation	+ Treatment Operator + Treatment Supervisor

Incident and emergency summary of actions

Level	Key management response(s)	Brief summary of actions	Documented Plans & Procedures
Level 3 **Emergency or Disaster**	+ External assistance requested to manage emergency or disaster	+ Works Engineer - Maintenance to notify Director Engineering/Technical Services and General Manager + Coordinate internal notification, investigation and response of water related aspects + Consider what community notification is needed e.g. do not drink alert, boil water alert or bottled/emergency water distribution + Liaise closely with NSW Health, DPI Water or other agencies to resolve issues	+ Business Continuity Plan, EMPLAN, DISPLAN
Level 2 **Incidents**	+ Ensure all preventive measures are functioning effectively.	+ Notify Engineer + Engineer to Notify PHU and DPI water as required + Operators to ensure all control measures identified in the CCPs are functioning effectively + Commence investigation + Arrange for re-samples to be taken (where required) + Implement appropriate immediate remediation actions, (this may include manual dosing of reservoirs, flushing of mains, or isolation of affected areas) + Review associated laboratory reports and operational records + In case of customer complaints, coordinate investigation and resolution, including obtaining water samples where required + Determine if community notification required	+ Incident response plan (this document)
Low: **Operator Adjustments**	+ Implement all CCP Alert level actions that are relevant.	+ Notify Coordinator and Project Officer as required in CCP. + Implement rectification actions immediately + Increase monitoring frequency to ensure issue is resolved	+ CCPs for each process + Procedures as developed

Response Protocols

NSW Health Response protocol - Management of the microbiological quality of drinking water

This protocol is derived from the Australian Drinking Water Guidelines (the Guidelines) to guide Public Health Units (PHU) and water utilities in their joint response following rapidly changing source water quality, treatment failure, or microbial contamination.

Under Section 22 of the Public Health Act 2010, the Chief Health Officer has the power to issue advice, for the benefit of the public, concerning the safety of available drinking water and any possible risks to health involved in the consumption of that water. This may include a boil water alert. These powers are delegated to Public Health Unit Directors. A supplier of drinking water must issue to the public the advice provided under the Public Health Act, if so directed.

A regional water utility may issue a boil water alert of its own accord.

However, before issuing a boil water alert, the water utility should liaise with their local PHU to discuss the situation.

Escherichia coli testing

Testing drinking water for specific pathogens is impractical and can be unreliable. For this reason tests are carried out for bacteria, which are present in faeces and indicate contamination. The Guidelines recommend monitoring microbiological quality by testing for *Escherichia coli (E. coli)*. *E. coli* is the most reliable and specific indicator of recent faecal contamination in drinking water. The presence of *E. coli* in drinking water indicates recent faecal contamination because the organism generally does not multiply in drinking water systems.

Testing for *E. coli* can help verify the adequacy of preventive measures. However, water utilities should not rely solely on end point testing. The implementation of a comprehensive risk-based drinking water management plan is the most reliable way to protect drinking water quality.

Total coliform testing

NSW Health laboratory methods routinely provide total coliform as well as *E. coli* results. The Guidelines note that total coliforms are a poor indicator because they are normal inhabitants of soil and water, and can grow in water distribution systems. Total coliforms should generally not be detected in water sampled immediately after disinfection.

While total coliforms are not a reliable indicator of faecal contamination, their presence may suggest regrowth or possible ingress of foreign material. If detected, water utilities should check that disinfectant concentration is adequate, and that operation of the treatment plant and supply system is normal. Water utilities may set system specific targets for total coliform bacteria.

Further information on the microbiological quality of drinking water is available in the Guidelines (Chapters 5 and 10).

a) Action on the detection of *E. coli* or coliform bacteria

The water utility is responsible for carrying out all necessary investigation and resampling as specified in this response protocol.

The water utility and the Public Health Unit (PHU) should be notified of the contamination by the testing laboratory (this must be immediate notification if *E. coli* is detected). Water utlities must record the chlorine concentration (free and total) and, if possible, pH and turbidity on the NSW Health sample label. Take a separate sample for these tests. Do not use the microbiology sample, as it will become contaminated.

If total coliforms are detected (but not *E. coli*), the water utility should ensure adequate disinfectant concentration, check that the treatment plant and supply system are operating normally, and resume normal sampling. The next scheduled sample would normally be sufficient as follow-up. The water utility should consider system characteristics and analyse historical results when setting system specific targets for total coliforms.

If *E. coli* is detected, the water utility should immediately investigate possible sources of contamination and increase disinfection (if inadequate). Check disinfection, treatment, source and supply system are operating normally, rectify any parameters that are not normal. Sources of contamination might include a treatment breakdown or malfunction (including failure to meet turbidity targets), a mains break, interruption to the supply, surges in water or power supply, or deliberate or accidental contamination of the system. The investigation may include an inspection of

the system and associated service reservoirs by trained personnel. When found, the source of contamination should be rectified.

In some cases, *E. coli* may lodge in biofilm and be released at a later time. Flushing and resampling may be necessary to confirm whether contamination is persistent.

The water utility should resample at the same site using NSW Health Repeat Labels and record chlorine (free and total) and if possible pH and turbidity information. The sample should be submitted to a NSW Health Laboratory or other NATA accredited laboratory for analysis. Make sure that the laboratory knows that this is a repeat samples investigating possible contamination.

Note: If immediate resampling is not possible the water utility and Public Health Unit should assess the situation and agree on the necessary actions.

If disinfection, treatment, source or supply system is not operating normally, consult PHU regarding boil water alert and rectification. For example, if treated water turbidity is >1 NTU disinfection may be ineffective. The PHU should consider the need for a boil water alert if the water utility cannot provide timely confirmation of normal operation, including an adequate disinfection concentration.

If *E. coli* is not detected in the repeat sample and no problem is found, resume normal sampling.

If *E. coli* is detected in the repeat sample and/or a problem is identified through the investigation, consult PHU regarding boil water alert and rectification. Confirm adequate disinfectant concentration, resample at same site and other sites in the distribution system, conduct full sanitary survey and assess need for boil water alert (Section d).

PHU Environmental Health Officers and Director should consult with the Water Unit and provide the findings of the water utility's investigation, when determining the need for a boil water alert. The NSW Office of Water should also be advised.

b) Action in response to a failure in treatment or disinfection, or poor or rapidly changing source water quality

The water utility should immediately rectify the treatment or disinfection failure (i.e. failure to meet disinfectant or turbidity targets) and investigate possible cause of contamination. Additional operational or source water monitoring changes may be necessary.

The water utility should assess source water changes:

+ Determine if there is rapidly changing raw water turbidity that cannot be improved (e.g. by changing the level of offtake or source).
+ Determine if there has been a recent inflow of water from a contaminated source in the catchment (even if raw water turbidity is not rapidly changing).

If the treatment or disinfection failure cannot be corrected in a timely manner and there is not an adequate volume of treated water in storage, the water utility should contact the local PHU and collect an additional microbiology sample of the drinking water using NSW Health Repeat/Additional Labels and record chlorine (free and total) and if possible pH and turbidity information. The sample should be submitted to a NSW Health Laboratory or other NATA accredited laboratory for analysis. Make sure that the laboratory knows that this is a repeat samples investigating possible contamination.

If the treatment or disinfection failure has been corrected and no *E. coli* is detected, resume normal sampling.

If the treatment or disinfection failure cannot be corrected and/or *E. coli* is detected in the repeat sample, consult the local PHU regarding boil water alert and rectification. Confirm adequate disinfectant concentration, resample at same site and other sites in the distribution system, conduct full sanitary survey, and assess need for boil water alert (Section d).

PHU Environmental Health Officers and Director should consult with the Water Unit and consider investigation/risk assessment outcomes in determining need for a boil water alert. NSW Office of Water should also be advised.

c) Corrective actions following the detection of contamination or treatment/disinfection failure:

Corrective action may include one, or more, of the following:

+ Increase disinfection at the treatment plant
+ Correct treatment failure if possible
+ Optimise treatment processes at the treatment plant
+ Increase/add chlorine at points in the distribution system
+ Clean, flush, and disinfect mains

d) Contamination investigation and sanitary survey - assessing the need for a boil water alert.

The contamination investigation should aim to:

+ Determine the origin of the contamination (e.g. is contamination present in water leaving the treatment plant or localised to one section of the distribution system?; is there evidence of pre- or post-treatment contamination?)
+ Time and scale of contamination (i.e. the extent and likely recency of contamination)
+ The sanitary survey should consider whether barriers to contamination are adequate and whether treatment processes, including disinfection, are effective.

Barriers to the transmission of pathogenic microorganisms should include most, if not all, of the following:

+ Selection of water sources which are protected from contamination by human and animal faecal material, and chemicals, and maintenance of an active catchment protection program
+ Pre-treatment, such as detention and settling in reservoirs for sufficient time for pathogen die off
+ Protection of water storages
+ Extraction management
+ Treatment (eg coagulation, settling, filtration)
+ Disinfection of the water before it enters the distribution system
+ Maintenance of adequate residual concentrations where chemical disinfection is used
+ Security of the distribution system against re-contamination

Ensure the effectiveness of disinfectant concentration through particular attention to the following:

+ Frequent (daily or continuous) monitoring of operational factors (e.g. pH, disinfectant residual, turbidity)
+ No directly visible plant or animal material
+ Minimum total chlorine residual of 0.5 mg/L after 30 min (if chlorination is used)
+ Low turbidity, preferably <1 NTU
+ pH optimised to suit the disinfectant used (subject to the need to minimise corrosion)
+ Adequate maintenance of the reticulation system
+ Frequent monitoring of disinfectant residual in the distribution system.
+ If water temperature >30oC, monitor for amoebae

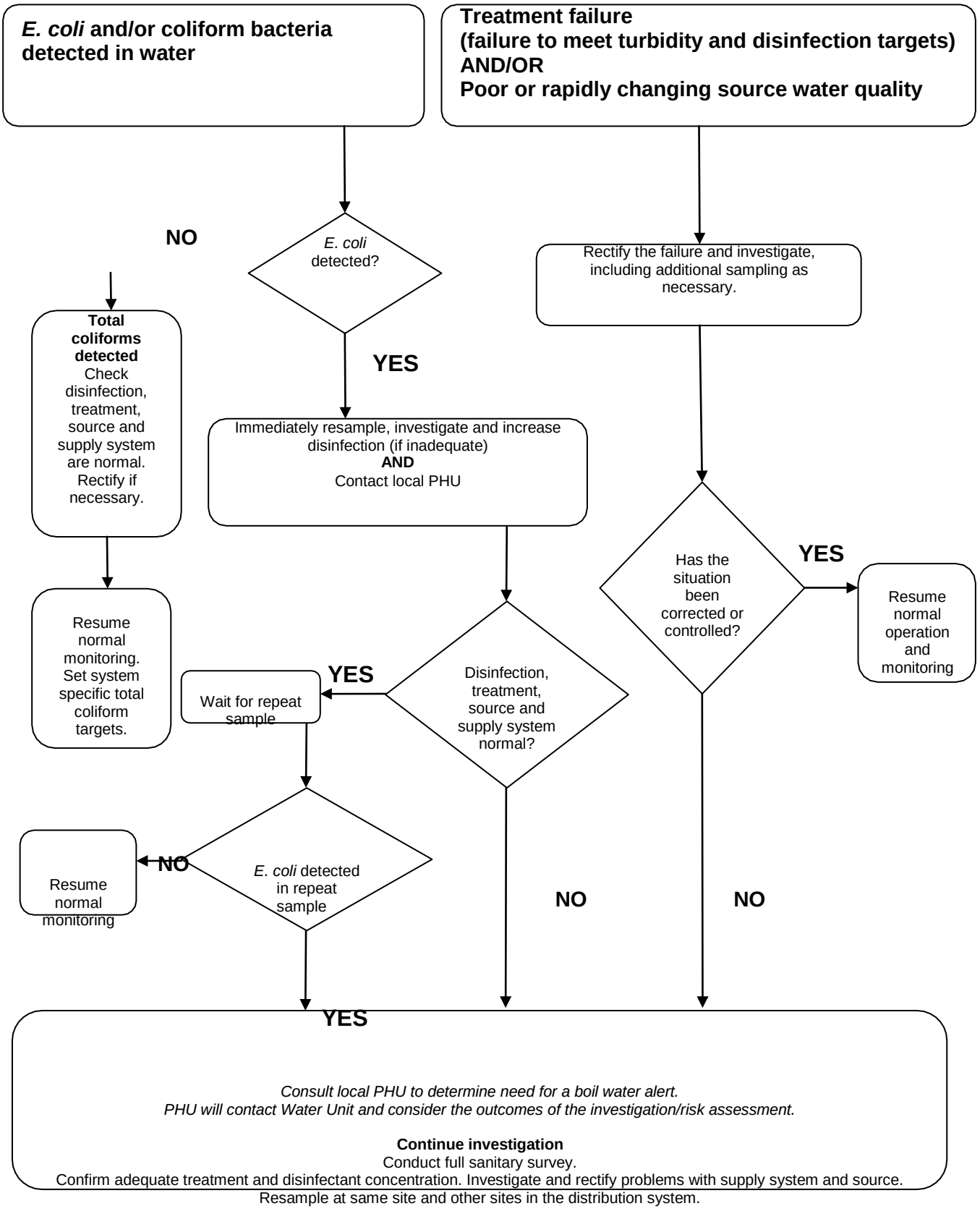
Factors to consider before issuing a boil water alert:

The PHU, Water Unit and/or Chief Health Officer will consider the following when determining the need for a boil water alert or an alternative supply:

+ Are people exposed to an ongoing risk that could be prevented with a boil water alert?
+ The findings of the contamination investigation and sanitary survey
+ The effectiveness of current disinfection
+ Likelihood of identification and correction of the problem
+ Evidence of increased illness in present or previous events. The PHU should consider the need for enhanced surveillance
+ Exposure
+ Estimate daily water consumption levels.
+ Determine if the samples are representative of water that is actually consumed?
+ Exposure duration and scale (how long and how many people been consuming the water?)
+ Have there been any complaints about water quality or health?
+ Are any vulnerable populations receiving the water? (i.e. dialysis patients, immunocompromised, etc.)
+ Will rectification measures affect any vulnerable populations? (i.e. disinfection changes and dialysis patients)
+ Whether proper sample collection and analysis techniques were used
+ Whether a NATA accredited laboratory analysed the samples
+ Availability of an alternative supply
+ Notification of consumers that may receive carted water from the affected system.
+ The need to communicate accurate and appropriate information to the public in a timely manner
+ The best means to communicate the information
+ The community impact of any public health action

e) Lifting a boil water alert

The PHU, Water Unit and/or Chief Health Officer will consider the factors listed in Section d as well as reviewing available test results. Where a water utility has issued a boil water alert it should consult the Public Health Unit about lifting the alert. The NSW Office of Water should also be advised



E. coli response flow chart

NSW Health Response Protocol

Management of Physical and Chemical Quality

Chemical Parameters

This protocol is derived from the Australian Drinking Water Guidelines (the Guidelines) to be used by Public Health Units (PHU) and water utilities to guide their joint response following the detection of physical and chemical water characteristics that exceed the Guidelines.

Under Section 22 of the Public Health Act 2010, the Chief Health Officer has the power to issue advice, for the benefit of the public, concerning the safety of available drinking water and any possible risks to health involved in the consumption of that water. This may include a recommendation for the provision of an alternative supply of water or a "do not drink" advice. These powers are delegated to Public Health Unit Directors. A supplier of drinking water must issue to the public the advice provided under the Public Health Act, if so directed.

The Australian Drinking Water Guidelines have set aesthetic and health related guideline values for physical and chemical characteristics. Aesthetic guideline values are set at the concentration that ensures water is aesthetically pleasing in terms of taste and odour, and can be used without causing corrosion of plumbing or staining. Health-related guideline values are set at the concentration that, based on current knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption.

Further information on the physical and chemical quality of drinking water is available in the Guidelines (Chapters 6 and 10). Where both aesthetic and health-related guideline values are exceeded, consider health related characteristics first and then aesthetic characteristics.

Action on the exceedance of guideline values

The water utility is responsible for carrying out all necessary investigation and resampling as specified in this response protocol.

The water utility and the Public Health Unit (PHU) should be notified of the contamination by the testing laboratory.

The water utility and the PHU should determine if a potential acute health risk exists. Consider the type of guideline value (health-related or aesthetic) exceeded, the concentration, and potential causes such as a major contamination event or treatment failure.

Further information is available in the fact sheets for physical and chemical water quality in the Guidelines.

If a potential acute health risk exists, the water utility should consult with the PHU and the NSW Office of Water (NOW) regional inspector regarding immediate action such as rectification, alternative supply, public warnings, and investigation and sampling. The PHU should contact the Water Unit.

If no acute health risk is present the water utility should conduct an investigation, in consultation with the local PHU and the NOW regional inspector, to determine the possible sources of contamination. These might include a treatment breakdown or malfunction (e.g. chemical overdose), a mains break, corrosion, interruption to the supply, surges in supply, or deliberate or accidental contamination of the system. The investigation may include a visual inspection of the system and associated service reservoirs by trained personnel. When found, the source of contamination should be rectified.

The water utility should resample at the same site upon advice from the PHU using NSW Health Repeat Labels, unless specific project labels are issued. The sample should be submitted to a NSW Health Laboratory or a NATA accredited laboratory for analysis. Make sure that the laboratory knows that this is a repeat samples investigating possible contamination.

If the repeat sample meets the guideline value resume normal sampling.

If the repeat sample exceeds the guideline value use available data to assess risk (see Risk assessment).

If the risk assessment does not indicate an ongoing risk, resume normal sampling.

If the risk assessment indicates an ongoing risk, the water utility should consult with the PHU and the NOW regional inspector regarding rectification (e.g. flushing, system maintenance, etc.), alternative supply, public warnings, and investigation and sampling. PHU Environmental Health Officers and Director should contact the Water Unit.

Risk assessment and considerations for public notification

Risk assessment

The Water Utility, PHU, and NOW Regional Inspector should consider the following when conducting the risk assessment:

+ Routine sampling frequency.
+ Water utilities that collect two routine chemistry samples per year for the affected supply system should discuss, with the PHU, the need for a sampling investigation either through a project or change in the routine sampling frequency.
+ Statistical analysis of available data or sampling investigation results.
+ For health-related guideline exceedances, calculate the 95th percentile of results over (at least) the last twelve months.
+ For aesthetic guideline exceedances, calculate the mean of results over (at least) the last twelve months.
+ Exposure.
+ Estimate daily water consumption levels.
+ Determine if the samples are representative of water that is actually consumed?
+ Exposure duration (how long have people been consuming the water?
+ Have there been any complaints about water quality or health?
+ Are flow-on effects possible? Such as low pH causing lead and copper contamination through corrosion of plumbing.
+ Are any vulnerable populations receiving the water? (i.e. dialysis patients, immunocompromised, infants, etc.)

Further information on conducting health risk assessments is available in Section 3.2.3 of the Australian Drinking Water Guidelines and via enHealth's list of environmental health publications.

Public notification considerations

The PHU, Water Unit and/or Chief Health Officer will consider the following when determining the need for public notification, a do not drink advice, or an alternative supply:

+ The outcomes of the risk assessment.
+ Whether proper sample collection and analysis techniques were used
+ Whether a NATA accredited laboratory analysed the samples
+ Availability of an alternative supply
+ Notification of consumers that may receive carted water from the affected system.

Templates for Boil Water Alerts

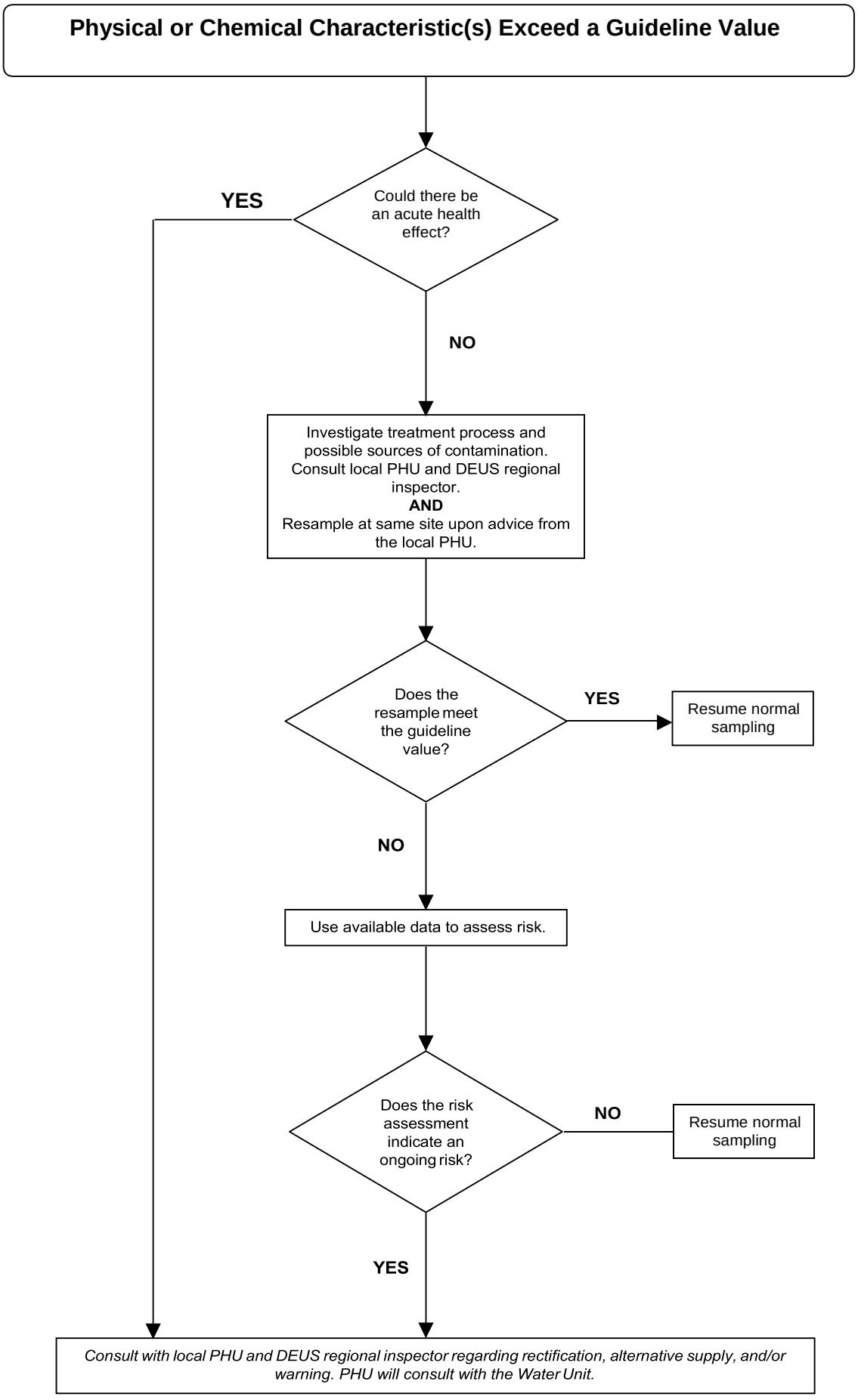
The following pages include draft templates for boil water alerts and do not drink alerts.

The boil water alert template only requires editing to identify the location where customers need to boil their water, and a decision as to who is the appropriate contact.

The do not drink alert will require further information and input from NSW Health. This template may be used, for example, if there has been a significant contamination event in the catchment that has resulted in a contaminant being present at levels that present an immediate (acute) health risk.

Examples include pesticides, fuel, fire fighting foam etc.

As the public health impacts for each contaminant will vary, the advice in the do not drink template needs to be tailored to the specific incident.



Physical or chemical exceedence response flow chart

Communications Lists - General

	Title	Person	Office	Mobile
Regulatory				
Public Health Unit	Environmental Health Officer	Jason Harwood	0880801486	0409746311
NSW Health - Water Unit	Project Officer	Wendy Henderson	07 9391 9973	
Department Primary Industries Water	Regional Inspector, Western Region	Trent Betts		0417458247
EPA	Pollution Hotline		131555	

Media Contacts

	Title	Person	Office	Mobile
ABC Western Plains			02 6881 1811	
NOWFM/2VM			02 6752 1155	
Opal FM			02 6829 2777	
2WEB			02 6872 2333	
The Spectator			02 6828 1008	

Contacts - Walgett

	Title/ Category	Person	Office	Mobile
Multi Purpose Service	Health		02 6828 6000	
Aboriginal Medical Centre	Health		02 6820 3777	
Walgett Drs Surgeries	Doctors		02 6828 2133	
The Whiddon Group	Aged Care		1300 738 388	
Kookaburra Court	Aged Care		02 6828 1966	
Home Care Service NSW	Aged Care		02 6828 1338	
Dialysis patients				
Walgett Community College	Primary School		02 6828 1077	
Walgett Community School	High School		02 6828 1022	
St Josephs College	School		02 6828 1060	
Koolangarra	Preschool/ Day Care		02 6828 1759	
Coolibah Kids	Preschool/ Day Care		02 6828 3387	
Key Suppliers	Reason	Contact	Office	Mobile
Company name	Coagulant (PACl)			
	Poly			
	Soda ash			
	Chlorine Gas			
	Pump Supplier			
	Electrician			
	Online instruments			
	PLC			

Contacts - Collarenebri

	Title / Category	Person	Office	Mobile
Health Services	Hospital and Doctors		02 6756 4800	
Medical Centre	Hospital and Doctors		02 6756 4836	
Multi Purpose Services	Aged Care		02 6756 4888	
Central School	School		02 6756 2204	
Dialysis patients				
Key Suppliers	Reason	Contact	Office	Mobile
Company name	Coagulant (PACl)			
	Sodium Hypochlorite			
	Electrical			
	Plumbing			
	Online Instruments			
	Pump Supplier			
	Membrane Supplier			

Contacts - Lightning Ridge

COMMUNITY	Title/Category	Person	Office	Mobile
Multipurpose Health Service	Hospital		02 6829 9999	
Medical Centre	Doctors		02 6829 1188	
Central School	School		02 6829 0511	
Little Diggers PreSchool	Preschool/ Day Care		02 6829 2929	
Opal	Caravan Park		02 6829 4884	
Outback Resort	Caravan Park		02 6829 0304	
Holiday Park	Caravan Park		02 6829 0532	
Crocodile	Caravan Park		02 6829 0437	
Key Suppliers	Reason	Contact	Office	Mobile
Company name	Chlorine			
	Electrical			
	Plumbing			
	Pumps			

Boil Water Alert

DD/MMM/YEAR

E. coli bacteria contamination

Walgett Shire Shire Council regularly monitors drinking water to ensure its safety. Regular monitoring has detected *E. coli* bacteria in the <<INSERT AFFECTED COMMUNITY>> water supply. *E. coli* itself is generally not harmful but its presence in drinking water is associated with sewage and animal wastes. These bacteria indicate that the water may be contaminated with organisms that may cause gastrointestinal disease.

As a precaution you are advised that water used for consumption should be brought to a rolling boil. Water should then be allowed to cool and stored in a clean container with a lid and refrigerated.

Boiled or bottled water should be used for:

Drinking, cooking, washing uncooked foods (such as seafood or salads), making ice, personal hygiene, pet's drinking water, washing hands, cleaning teeth, gargling, face washing of young children, washing toys and children's utensils.

Dishes should be washed in hot soapy water or in a dishwasher. Children should take boiled or bottled water to school.

Walgett Shire Shire Council is working to alleviate the problem.

For further information contact:

<<Council Contact Details>>

‘Boil Water Alert’ precautions for schools and child care centres

DD/MMM/YEAR

A “Boil Water Alert” has been issued for <<INSERT AFFECTED COMMUNITY>>. Until further notice, children and employees should not consume water, ice or drinks made with water, or raw foods rinsed with water that has not been boiled or filtered.

When possible, parents and caregivers should provide their children with boiled or bottled water, bottled juices or juices prepared with boiled water from home.

Access to drinking fountains should be restricted or turned off where possible, so that students do not drink unboiled water by mistake.

Water should flow unrestricted to toilets and washrooms. Signs should be placed in the washrooms indicating that the water is not for drinking.

Students and staff are advised to thoroughly wash their hands with soap and running warm tap water after using the toilet and handling food. Hands should then be dried thoroughly.

Walgett Shire Shire Council is working to alleviate the problem.

For further information contact:

<<Council Contact Details>>

Boil Water Alert

DD/MMM/YEAR

Cryptosporidium (and or Giardia) contamination

Walgett Shire Shire Council has detected *Cryptosporidium (and or Giardia)* in the <<INSERT AFFECTED COMMUNITY>> water supply. These organisms may cause gastrointestinal disease.

Anyone in the identified area with symptoms such as diarrhoea, abdominal pain, slight fever or vomiting should contact their doctor. As a precaution you are advised that water used for consumption should be brought to a rolling boil. Water should then be allowed to cool and stored in a clean container with a lid and refrigerated.

Boiled or bottled water should be used for:

Drinking, cooking, washing uncooked foods (such as seafood or salads), making ice, personal hygiene, pet's drinking water, washing hands, cleaning teeth, gargling, face washing of young children, washing toys and children's utensils.

Dishes should be washed in hot soapy water or in a dishwasher. Children should take boiled or bottled water to school.

Special care is advisable for certain consumers at this time, these include; people with severely weakened immune systems (the immunosuppressed), individuals receiving dialysis treatment, and aged individuals. Please contact your doctor or local Public Health Unit for more information.

Walgett Shire Shire Council is working to alleviate the problem.

For further information contact:

<<Council Contact Details>>

Lifting of Boil Water Alert

DD/MMM/YEAR

Residents in <<INSERT AFFECTED COMMUNITY>> no longer need to boil their drinking water.

Walgett Shire Shire Council advises that any residents that restricted their water usage run their kitchen and bathroom taps for 5 (or more?) minutes to flush any stagnant water from their household plumbing.

THIS STATEMENT MAY NOT BE APPLICABLE – CHECK WITH MANAGER WATER PRIOR TO RELEASE

Walgett Shire Shire Council apologies for the inconvenience, and thanks you for your cooperation.

23 APPENDIX B

23.1 Risk Register

Unmitigated Risk Assessment

Hazard	Hazardous event	Likelihood	Consequence	Risk
Aesthetic only parameters	Water quality (outside of ADWG limits) in the aquifer i.e. sodium	Almost Certain	Insignificant	Medium
All Hazards	Loss of trained operators due to sickness, leave etc.	Likely	Catastrophic	Very High
Bacteria and Virus - Artesian bores	Chlorine sensitive pathogens - sealed bores	Rare	Catastrophic	Medium
Bacteria and Virus - sub artesian bores	Chlorine sensitive pathogens - sealed bores	Possible	Catastrophic	High
Bacteria and virus (reservoirs)	Faecal contamination (access by vermin eg birds, rats)	Possible	Catastrophic	High
Bacteria and Viruses	Onsite Sewage Management System failure and discharges, animals access river, human access to weirs	Almost Certain	Catastrophic	Very High
Chlorine	Overdose	Possible	Moderate	Medium
Colour	high colour in water supply retic	Almost Certain	Insignificant	Medium
Cyanotoxins	Toxins in drinking water supply due to Cyanobacterial (blue green algae) outbreak	Likely	Moderate	High
Debris	Inlet - Coarse screen failure / blockage	Unlikely	Minor	Low
Disinfection byproducts	Formation of THMs in treated water	Likely	Moderate	High
Heavy Metals (Lightning Ridge/ Walgett Bore)	Infrastructure (pipe work, linings of valves, pump,) leach components of materials due to chemical reaction	Possible	Moderate	Medium
Heavy Metals (Surface Water)	Infrastructure (pipe work, linings of valves, pump, ,leach components of materials due to chemical reaction	Unlikely	Moderate	Medium
Hydrocarbons	Point sources e.g. service stations	Possible	Moderate	Medium
Hydrogen Sulphide	Bores are high in sulphide, but issue usually only apparent in winter	Likely	Minor	Medium
Iron	Turnover of weir - elevated pathogens and metals	Possible	Minor	Medium
Loss of Supply	Power failure	Possible	Moderate	Medium
Manganese	Turnover of weir - elevated pathogens and metals	Possible	Moderate	Medium
MIB, Geosmin, Taste and Odour	Cyanobacterial (blue green algae) outbreak	Likely	Minor	Medium
Naeglaria	Opportunistic pathogens in water supply	Rare	Major	Medium
Pathogens	Sabotage / Vandalism at reservoir (unauthorised access)	Rare	Catastrophic	Medium
Pesticides	Farming practices leading to pesticides above health guidelines	Unlikely	Moderate	Medium
Protozoa	Onsite Sewage Management System failure and discharges, animals access river, human access to weirs	Almost Certain	Catastrophic	Very High
Regulatory Issues	Unable to meet regulatory requirements	Possible	Moderate	Medium
Toxic Chemical	Sabotage / Vandalism at reservoir (unauthorized access)	Rare	Moderate	Low
Turbidity	River water change in flow (storm/ release/ low level water)	Almost Certain	Minor	High

Walgett Risk Assessment

Scheme Component	2017 Hazard	Hazardous event	Unmitigated Risk	Preventive Measures	Residual Risk			Monitoring & Control	Notes/Recommendations	Improvements	Reference
					Likelihood	Consequence	Risk				
Catchment	Protozoa	Chlorine resistance pathogens	Very High	Filtration, coagulation, flocculation	Rare	Catastrophic	Medium		Several feedlots a long way upstream 20 rural dwellings upstream, no STP discharge to Namoi		W1
	Bacteria and Viruses	Chlorine sensitive pathogens	Very High	Filtration, coagulation, disinfection	Rare	Catastrophic	Medium				W2
	Pesticides	Chemical spill	Medium	PAC, stop pumping (provided river is running), an alternative water supply (bore not connected)	Rare	Moderate	Low	Operator daily visual inspection at intake, WSC spill notification	stock pile of chemicals in farms may be affected during floods traces of metal found in the past (during floods) - metolachlor but below Health limits, herbicides past pesticides testing over a 2 years period (WSC to provide data) on Barwon and Namoi Health also has past pesticide data		W3
	Pesticides	Farming practices	Medium	PAC, coagulation, filtration	Rare	Minor	Low	NSW Health Drinking Water Monitoring Program	herbicides, insecticides aerial spraying for crops e.g. cotton, wheat, chickpea credited company practice following guidelines refer to Health testing results contamination in flood events		W4
	Turbidity	Bushfire, low water level leading to increased turbidity	High	Coagulation, filtration	Unlikely	Minor	Low	Operator daily visual inspection at intake, turbidity monitoring, filtration pressure gauge monitoring	Minimal effects to WTP from bushfires, river usually turbid, and can be highly turbid in flow events. Carp stir up sediment.		W5
	Colour	Flooding event, storm flows	Medium	Filtration, coagulation, disinfection, (PAC for potential chemicals in river)	Rare	Insignificant	Low	Operator daily visual inspection at intake, turbidity monitoring, filtration pressure gauge monitoring	floods flow into Namoi affects WTP		W6
	Cyanotoxins	Toxins in drinking water supply due to Cyanobacterial (blue green algae) outbreak	High	PAC, visual inspection at WTP, at intake, coagulation & filtration, disinfection	Rare	Moderate	Low	Operator daily visual inspection at intake. NSW Office of Water notification	Algae common, WTP operators get notification from Council, 10 mg/L PAC dosing** check.		W7
	MIB, Geosmin, Taste and Odour	Taste and odour issues due to Cyanobacterial (blue green algae) outbreak	Medium	PAC, visual inspection at WTP, at intake, coagulation & filtration, disinfection	Unlikely	Minor	Low	Operator daily visual inspection at intake, NSW Office of Water notification	PAC dosing increased if customer complaints received for taste and odour		W8
	Toxic Chemical	Malicious / deliberate contamination	Low	River dilution, Alternate source	Rare	Moderate	Low				W9
Bores	Protozoa	Contamination of bores	Very High	Positive pressure, concrete collar at bore	Rare	Catastrophic	Medium		2 artesian bores - bores in combination can produce 20L/s so can operate in peak demand and supply Walgett.	Town Bore is only operational on manual mode - requires service.	W10
	Aesthetic only parameters	Water quality (outside of ADWG limits) in the aquifer i.e. sodium	Medium		Almost Certain	Insignificant	Medium		sodium is not a health risk		W11
Water Treatment	Debris	Inlet - Coarse screen failure / blockage	Low	Visual inspection, periodic maintenance	Unlikely	Minor	Low	Operator daily visual inspection at intake, turbidity monitoring, filtration pressure gauge monitoring	clean logs and sticks when river is low, screen around intake, depending river flow, 1-2 times a year		W12
	Loss of Supply	Break in raw water rising main	Medium	Can switch to bore source	Rare	Moderate	Low		AC rising main needs replacement Investigating ability to feed bores into clearwater tank. This would also bypass disinfection.		W13 W14
	MIB, Geosmin, Taste and Odour	PAC dosing failure	Medium	River inspections - PAC used when raw water is poor quality.	Unlikely	Minor	Low		PAC dosing not required at all times. Would result in customer complaints.		W15
	Cyanotoxins	Prechlorination	High	PAC and post chlorination are main barrier	Rare	Moderate	Low		Venturi issues suggest that sizing is incorrect.		W16
	Protozoa	Clarifier Failure (loss of process, dosing failure)	Very High	Visual inspection, filtration CCP will identify	Rare	Catastrophic	Medium	Turbidity and filtration pressure gauge operation monitoring at WTP	build-up of sludge, need manual sludge withdrawal (every hour) when river water @ 1000 NTU. Online monitoring off clarifier. Can change to bore if there are issues. Recycling of supernatant at up to 10% (regardless of source).		W17
	Protozoa	Filter Failure	Very High	Operator visual inspection on filters and pressure gauge, air scouring before backwash, disinfection	Unlikely	Catastrophic	High	Turbidity and filtration pressure gauge operation monitoring at WTP	Backwash on turbidity, headloss and time, air scouring. Can change to bore if there is a major issue. Filters ripening water is directed into clear water tank.	Develop operational protocol to switch to bore at any time that treatment is impacted by raw water quality	W18
	Bacteria and Viruses	chlorination - ineffective Dose Failure (under dose)	Very High	Chlorine CCP	Unlikely	Catastrophic	High	Spare cylinders in stock	Gas chlorine system, autoshutdown on leaks, manual changeover of cylinders.	Ensure chlorine CCP is implemented in SCADA	W19
	Chlorine	Chlorine overdose	Medium	Daily monitoring, respond to customer complaints	Unlikely	Moderate	Medium	Chlorine CCP		Require service contract with Prominent	W20
	Loss of Supply	Power failure	Medium	Hire an emergency backup generator	Unlikely	Moderate	Medium	12 hours supply from reservoir during summer		Investigate ability to feed bore either into clearwater or town reticulation. (Possibly a flexible hose and connection points.)	W21
	All Hazards	Loss of trained operators due to sickness, leave etc.	Very High	Backup (not fully trained for WTP) operator + team leader to assist, WTP O&M procedures doc	Possible	Moderate	Medium		WSC currently does not have a training/succession process for Walgett WTP, DT and SL have knowledge on WTP operation	Train additional operators to allow for succession.	W22
	Loss of Supply	Loss of supply due to lack of maintenance/ availability of spares	Medium	Maintenance schedule, some spare equipment	Unlikely	Moderate	Medium	SCADA control of reservoir levels	May not have all spares for actuated valves, but have most spares for smaller items. Bore source can be used if bypass option installed.	standby clear water pump to be plumbed in to be duty/standby. Develop list of critical spares.	W23
	Manganese	pre chlorination dose failure (at Clarifier) @ 0.1 mg/L - under dosing	Medium	Post chlorination, filtration	Possible	Insignificant	Low		Manganese could be an issue in river, bore water has low Mn.		W24
	Bacteria and Viruses	high pH due to caustic overdosing	Very High	SCADA alarms and shutdown pH >10	Rare	Catastrophic	Medium	pH OCP to be developed	Target pH 7.8, alarms for pH. Bore pH typically 8.5-8.6. River water typically 7.2 - 7.3. Overdose with river water more of a concern. Dosing shutdown at pH 8.5	develop pH OCP	W25

Scheme Component	2017 Hazard	Hazardous event	Unmitigated Risk	Preventive Measures	Residual Risk			Monitoring & Control	Notes/Recommendations	Improvements	Reference
					Likelihood	Consequence	Risk				
Service Reservoir	MIB, Geosmin, Taste and Odour	PAC dosing failure	Medium	Water Treatment Plant	Rare	Minor	Low	Operator visual inspection at intake	PAC dosed based on algal alerts, not always required.		w36
	Bacteria and virus (reservoirs)	Faecal contamination (access by vermin eg birds, rats)	High	Pitched roof treated water reservoir, well-sealed gaps, locked and secured hatch, bird wire inside the hatch, roof wielded on, collar goes up to a screwed on steel hatch	Rare	Catastrophic	Medium	Chlorination CCP	Reservoir inspection projects through Lower Macquarie alliance in 2017/18		w37
	Naeglaria	opportunistic pathogens in reticulation	Medium	Chlorine above 0.5 in reservoirs	Rare	Major	Medium		Risk is as low as possible - consequence is still Major, but exceedingly rare.		w38
Reticulation	Bacteria and Viruses	Sabotage / Vandalism at reservoir (unauthorised access)	Very High	Enclosure locked, hatch not locked, absence of access ladder	Rare	Catastrophic	Medium	Chlorination CCP	locked, secured reservoir perimeter		w39
	Bacteria and Viruses	Breach of pipelines through breaks, inappropriate maintenance, new or service works etc.	Very High	Maintain positive pressure in mains, existing chorine residual, flush if possible	Rare	Catastrophic	Medium		regular service mains, PVC, mains break 50 a year same tools for water and sewerage breaks		w40
	Bacteria and Viruses	Contaminating treated water due to back flow & cross connection (e.g. water carters)	Very High	All new meters, all new rainwater tank have back flow prevent device (dual check valve) new houses are inspected Stand pipes/filling station have air gap	Rare	Catastrophic	Medium	Backflow prevention device	illegal connection, new rainwater tank connection does not require Council approval		w41

Collarenebri Risk Assessment

Scheme Component	Hazard	Hazardous event	Unmitigated 2017	Preventive Measures	Residual Risk			Monitoring & Control	Notes/Recommendations	Improvements	Reference
					Likelihood	Consequence	Risk				
Catchment	Protozoa	Onsite Sewage Management System failure and discharges	Very High	River dilution, media filtration, ultrafiltration, GAC,	Rare	Catastrophic	Medium	OSSM inspection upon complaints	Minimum impact because OSSM are mostly inside town levee. Council collects wastewater, solid waste gets pumped out by contractors. Rural septic overflows tend to remain onsite.		Co1
	Protozoa	Chlorine resistance pathogens in source	Very High	Filtration, carting water	Rare	Catastrophic	Medium	CCP for GAC filters, and develop OCP for UF	E.g. crypto in water supply. Filters may fail. No stock yard, dairy or feed lots located in inner catchment (no feed lots within 60 km)		Co2
	Bacteria and Viruses	Chlorine sensitive pathogens e.g. wildlife, cattle	Very High	Filtration, disinfection	Rare	Catastrophic	Medium	Chlorination CCP	Reservoir fills from a couple of meters from the ground. Separate reservoir off take is couple of meters from the ground.		Co3
	Pesticides	Chemical spill (from farms e.g. pesticide)	Medium	Council incident mant procedures, fire brigade notifies Council, GAC, river dilution, carting water	Rare	Moderate	Low		In the event of spill, Council, Health, fire brigade or police, will be notified. Weir pool is about 12 foot deep, 3 miles wide. It hasn't happened in Collarenebri, happened once on Walgett Road.		Co4
	Hydrocarbons	Point sources e.g. service stations	Medium	Submerged river intake, river dilution, GAC	Rare	Moderate	Low	Operator visual inspection at intake	There are no dips, no mining. Service station is downstream of the pump site, 350 m from river , but may leak into the weir		Co5
	Pesticides	Farming practices leading to pesticides above health guidelines	Medium	River dilution, farming best - practice, GAC	Rare	Moderate	Low		Lots of aerial spraying but farming pesticide spraying operators aware of wind direction etc. In diluted dose and Best Practice Mant. NSW Office of Water did source water/pesticide testing in the past.		Co6
Weir	Protozoa	Swimming and primary contact	Very High	Filtration, disinfection, river dilution	Rare	Catastrophic	Medium	CCP for GAC filters, and develop OCP for UF	fishing, boating, swimming activities, swimming below the pumps		Co7
	Manganese	Turnover of weir - elevated pathogens and metals	Medium	Filtration, disinfection, membrane filter pressure gauge warning lights and alarm at WTP	Rare	Moderate	Low	visual inspection at intake	inversion in winter or late autumn, doesn't affect water supply		Co8
	Cyanotoxins	Cyanobacterial (blue green algae) outbreak	High	GAC, chlorination, activated carbon replacement & maintenance program (every 3 years base on manufacturer recommendations)	Unlikely	Minor	Low	Walgett Shire DWMP. Monthly tests for BG algae when river is v.low. Rep does report every 2 weeks on blue green algae tests.	WSC has signage out for alert. 1-2 events in 2012. Happens over long dry period.		Co9
	Turbidity	Bushfire, mainly grass fires	High	Filters - membrane filter pressure gauge warning lights and alarm at WTP	Unlikely	Insignificant	Low	Walgett Shire DWMP	Grass fire does not affect the river		Co10
	Colour	Flooding event, storm flows	Medium	Filtration, GAC,	Unlikely	Insignificant	Low	2 x day turbidity monitoring, membrane filter pressure gauge warning lights and alarm at WTP, NSW Health monitoring	Reservoirs hold 1.5 ML raw water, 0.5 ML treated, 1 day supply. Flood water from Moonie River has high iron content depending on source of flood water and period of advance notice (e.g. 3 - 4 days' notice) last Big flood was 8.34 m, evacuation plan was in place 2010 flood, chemical ran out, chemical supply were air lifted in		Co11
	All Hazards	Malicious / deliberate contamination	Very High	River dilution, GAC	Rare	Moderate	Low				Co12
Water Treatment Plant	Protozoa	Coagulation	Very High	Coagulation, then multiple filtration steps	Almost Certain	Catastrophic	Very High	GAC CCP	ACH dose rate at 20% dilution needs ~50% dosing rate of pump. However, there are only a few seconds of contact time before filtration. Floc does not form in this time, so media filters unable to lower turbidity.	Consider extending pipework to allow more contact time prior to media filters so that floc will have formed. There is a risk that in doing so that the media filters may exceed the solid loading capacity. EOI to Safe and Secure Water supply for investigation into clarifiers or other pre treatment.	Co13
	Protozoa	Media Filters Failure	Very High	downstream further filtration	Almost Certain	Catastrophic	Very High		Risk is assessed immediately after the media filters. Media filters only reduce turbidity by ~10%. Hydraulically overloaded, coagulation is not effective as floc does not form given short contact time. Backwash not effective in reducing turbidity as backwash is with media filtered water. Alternative low turbidity water source would also assist.	Pretreatment options to be investigated to ensure turbidity effectively reduced prior to UF.	Co14

Scheme Component	Hazard	Hazardous event	Unmitigated 2017	Preventive Measures	Residual Risk			Monitoring & Control	Notes/Recommendations	Improvements	Reference
					Likelihood	Consequence	Risk				
Water Treatment Plant	Protozoa	UF failure	Very High	GAC CCP	Unlikely	Catastrophic	High	UF OCP	Some membranes have been breached after 18 months due to high turbidity. Estimated lifespan was supposed to be > 5 years. High turbidity off media filters has severely impacted membrane life. Membrane integrity test only undertaken infrequently ~monthly. Ideally the MIT Is conducted every 24 hours of operation, and turbidity off the membranes should consistently and continuously achieve < 0.15 NTU.	Pretreatment options to be investigated to ensure turbidity effectively reduced prior to UF.	Co15
	Protozoa	GAC filter failure	Very High	GAC CCP	Rare	Catastrophic	Medium	GAC CCP	Water quality after GAC generally good. Indicates that the combination of UF/ GAC can reduce turbidity to acceptable levels for disinfection.		Co16
	Bacteria and Viruses	chlorine dose failure causing ineffective disinfection	Very High	Daily manual dose chlorine, monitoring, can be up to 3 / day (at plant, in town etc.) sodium hypo supply storage duration ~ 3 weeks.	Possible	Catastrophic	High	Chlorine residual warning lights and alarm at WTP, Reservoir and reticulation chlorine CCPs	2 chlorine dosing pumps, manual changeover, extreme heat affects chlorine effectiveness, high chlorine demand in treated water.	EOI for Safe and Secure Water program Consider autochangeover of pumps, and SCADA monitoring and control of chlorine. Replace chlorine pumps with degassing models	Co17
	Chlorine	Chlorine overdose	Medium	Daily monitoring, respond to customer complaints	Unlikely	Moderate	Medium	Chlorine CCP from Res and retic		EOI for Safe and Secure Water program SCADA monitoring and control of chlorine.	Co18
	Disinfection byproducts	Disinfection byproducts	High	no current control	Likely	Moderate	High		High dose rate and high chlorine demand raises concern of THM formation. Probable only way to manage will be to get effective reduction of chlorine demand e.g. from effective coagulation.	Start a project for THM monitoring.	Co19
	MIB, Geosmin, Taste and Odour	GAC failure	Medium	Replace GAC (every 3-5 year,) algae alert	Rare	Minor	Low		aged GAC, overused GAC		Co20
	All Hazards	alarm failure	Very High	automatic plant shut down, but no alarms to operators	Possible	Catastrophic	High		No alarms to operators - but some automated shutdowns	Telemetry to send alarms to operators, and then escalate. Budget item for 2017/18. Need more online instrumentation to see water quality parameters	Co21
	Loss of Supply	Power failure	Medium	Plant shut down at power failure, automatic restart when power resumes, hire a backup generator from Walgett. 1-2 days supply	Rare	Moderate	Low	Reservoir level alarm will be sent if plant has not restarted.	Frequent brownout, infrequent blackout (e.g., lightning) lose half a day supply during summer. Collarenebri is near end of power distribution but power resumes quickly. Have been issues where chlorine dosing has not restarted with plant.		Co22
	Loss of Supply	Loss of trained operators due to sickness, leave etc.	Medium	Collarenebri has 2 backup operators, non-consecutive leave, O&M procedures doc, qualified operators from other WSC WTP, ongoing unofficial training from Veolia	Rare	Moderate	Low		Ensure operators continue to have Certificate training		Co23
Service Reservoir	Bacteria and virus (reservoirs)	Faecal contamination (access by vermin eg birds, rats)	High	Chlorine residual. Well sealed treated water reservoir, gaps has been covered, well-constructed and secured hatch, disinfection, manual hypo top up	Rare	Catastrophic	Medium	Monthly reservoir inspections. monitor chlorine residual		Reservoir inspection projects through Lower Macquarie alliance, Budget for repair of gaps at hatch in 2017/18.	Co24
	All Hazards	Sabotage / Vandalism at reservoir (unauthorized access)	Very High	Fence, locked, secure reservoir enclosure secure tank access	Rare	Major	Medium	Walgett Shire DWMP, regular visual inspection, community complaints			Co25
	Pathogens	PLC loss of memory	Medium	Plant auto-shut down, water carting,	Rare	Catastrophic	Medium				Co26
	Naeglaria	opportunistic pathogens in reticulation	Medium	Chlorine above 0.5 in reservoirs	Rare	Major	Medium		Risk is as low as possible - consequence is still Major, but exceedingly rare.		Co27
	Regulatory Issues		Medium	Use for roadworks, evaporation	Possible	Moderate	Medium			Investigate alternate opportunities for reuse	Co28
Reticulation	Bacteria and Viruses	Inadequate chlorine residual	Very High	Flushing mains, manually dose at WTP, manually top up at reservoir	Rare	Catastrophic	Medium	Monitor chlorine daily at WTP, weekly at supply	No long length of distribution, but Depot line can be low residual. Increased flushing will assist.		Co29
	Bacteria and Viruses	Breach of pipelines through breaks, new or service works, inappropriate maintenance, etc.	Very High	Chlorine residual, Fix pipe, clean pipe	Rare	Catastrophic	Medium	Monitor chlorine daily at WTP, weekly at supply	Extreme change in temp (5 breaks/ month) coming into summer and winter. Mains flushed after repairs.		Co30
	Bacteria and Viruses	Contaminating the treated water due to back flow & cross connection (e.g. water carters)	Very High	Air gap is set up at filling stations, there is backflow prevention device on all new meters (new meters in the last 12 months in Walgett Shire)	Rare	Catastrophic	Medium	Plumbing inspections	No illegal connections considered, cross connection between raw water and treated water (not an issue). no leak between raw water and treated water reservoirs		Co31
	Colour	high colour in water supply retic	Medium	UF and GAC	Unlikely	Insignificant	Low				Co32

Lightning Ridge Risk Assessment

Scheme Component	Hazard	Hazardous event	Unmitigated 2017	Preventive Measures	Residual Risk			Monitoring & Control	Notes/Recommendations	Improvements	Reference
					Likelihood	Consequence	Risk				
Bores	Protozoa	STP overflows / leaks contaminating bores	Very High	Positive pressure, concrete collar at bore, bores lined, levee	Rare	Catastrophic	Medium	Operator visual inspection	Sewerage effluent evaporating ponds adjacent to supplementary bore (~ 2 ft deep). Bore is under pressure, so rare source of contamination.		LR1
	Aesthetic only parameters	Water quality (outside of ADWG limits) in the aquifer i.e. sodium	Medium		Almost Certain	Insignificant	Medium		sodium is not a health risk		LR2
	Loss of Supply	Flooding at bore	Medium	Existing levee, supplementary bore is above flood level	Rare	Moderate	Low	WSC flood monitoring	Bores are artesian, and under pressure. Flooding can impact ability to get to original bore site, but should not pose a public health risk.		LR3
	Bacteria and Virus - bores	Contamination of the bore	Medium	Positive pressure, concrete collar at bore, bores lined, levee	Rare	Catastrophic	Medium		Can manually dose reservoir if required. Bore contamination unlikely as bore is artesian.		LR4
Water Treatment	Heavy Metals (Lightning Ridge/ Walgett Bore)	Infrastructure (pipe work, linings of valves, pump, oils,) leach components of materials due to chemical reaction	Medium	Using appropriate materials AS4020, plumbing codes, maintenance	Rare	Moderate	Low		PVC & AC mains, Steel, DI. Some galvanised pipe.		LR5
	Loss of Supply	Power failure	Medium	Emergency hiring a backup generator, 3 days of water supply in reservoir	Rare	Catastrophic	Medium	supply level monitoring	Reservoir has 3 days of supply of water for summer. locked/ secure site, water restrictions in place	Investigate ability to either bypass reservoirs from new bore or alter reticulation to feed town on low(er) pressure.	LR6
	Hydrogen Sulphide	Hydrogen sulphide	Medium	New bore has H2S, old bore has to run at maximum extraction in summer. Prefer to use old bore, but sometimes require new bore	Likely	Minor	Medium			Aeration along with chlorination budgetted	LR7
	Loss of Supply	Loss of trained operators due to sickness, leave etc.	Medium	3 trained staff	Rare	Catastrophic	Medium		Manuals for bores/ power.		LR8
Service Reservoir	Bacteria and virus (reservoirs)	Faecal contamination (access by vermin eg birds, rats)	Very High	Monitoring control, ensure to maintain & seal all entry points	Possible	Catastrophic	High	Infrequent monitoring by operator	Gaps at the hatch at the top of reservoirs. Lifting of one area of the reservoir roof, potentially allowing ingress. Reservoir inspection projects through Lower Macquarie alliance, Budget for repair of gaps at hatch in 2017/18.	Chlorination of Lightning Ridge budgetted - sodium hypochlorite system and an aerator. Will have community consultation prior to commissioning.	LR9
	All Hazards	Sabotage / Vandalism at reservoir (unauthorized access)	Very High	Secure enclosure, locked access ladders	Rare	Moderate	Low				LR10
	Naeglaria	opportunistic pathogens in reticulation	Medium	reservoir integrity	Rare	Major	Medium		No current management. Warm waters may be ideal to host Naeglaria or Legionella. Chlorination will manage	Chlorination of Lightning Ridge budgetted - sodium hypochlorite system and an aerator. Will have community consultation prior to commissioning.	LR11
Reticulation	Bacteria and Viruses	Illegal connections	Very High	Positive main/pipe pressure legal/offence	Unlikely	Catastrophic	High	Planning approvals	possible cross connections with rain water tank, possible illegal connection at poly line which has no backflow prevention, polyline also has lower pressure, pipes are buried 600m below ground. Rec: zone water metering (including backflow device), check usage at spur line	Trade waste with new developments, meters now installed on majority of supplies, illigal connections being identified and removed. Backflow devices installed, no testing program at present.	LR12
	Bacteria and Viruses	Breach of pipelines through breaks, inappropriate maintenance, new or service works etc.	Very High	Dig a sump next to the main, fix main, repairing live i.e. positive pressure	Unlikely	Catastrophic	High		Past main breaks 2 per year (depending on weather).flushing after repair until clear, no separate repair tools for water and sewerage, potential cross contamination during repair.		LR13
	Bacteria and Viruses	Contaminating the treated water due to back flow & cross connection (e.g. water carters)	Very High	Air gap is set up at filling stations, there is backflow prevention device on all new meters (new meters in the last 12 months in Walgett Shire)	Rare	Catastrophic	Medium	Plumbing inspections	No illegal connections considered, cross connection between raw water and treated water (not an issue). no leak between raw water and treated water reservoirs		LR14

Carinda, Cumborah and Rowena Risk Assessment

Scheme Component	Hazard	Hazardous event	Unmitigated 2017	Preventive Measures	Residual Risk			Monitoring & Control	Notes/Recommendations	Improvements	Reference
					Likelihood	Consequence	Risk				
Bores	Aesthetic only parameters	Water quality (outside of ADWG limits) in the aquifer i.e. sodium	Medium		Almost Certain	Insignificant	Medium		sodium is not a health risk		CCR1
	Loss of Supply	Flooding at bore	Medium	Existing levee, supplementary bore is above flood level	Rare	Moderate	Low	WSC flood monitoring	Bores are artesian, and under pressure. Flooding can impact ability to get to original bore site, but should not pose a public health risk.		CCR2
	Protozoa, Bacteria and Virus - Carinda	Contamination of the bore	Medium	Positive pressure	Rare	Catastrophic	Medium	Monthly inspection	If borehaed is compromised it will leak, difficult to contaminate		CCR3
	Protozoa, Bacteria and Virus - Cumborah and Rowena	Contamination of the bore	High	pumped bores, raised bore head	Unlikely	Catastrophic	High		Rowena bore is not fully sealed, Cumborah unknown	Seal the Rowena borehead, and inspect and seal Cumborah if integrity compromised	CCR4
Water Treatment	Heavy Metals	Infrastructure (pipe work, linings of valves, pump, oils,) leach components of materials due to chemical reaction	Medium	Using appropriate materials AS4020, plumbing codes, maintenance	Rare	Moderate	Low		PVC & AC mains, Steel, DI. Some galvanised pipe.		CCR5
	Loss of Supply	Power failure	Medium	Emergency hiring a backup generator some supply in reservoirs	Rare	Catastrophic	Medium	supply level monitoring	May need to cart water from closest community		CCR6
	Loss of Supply	Loss of trained operators due to sickness, leave etc.	Medium		Rare	Catastrophic	Medium	supply level monitoring	Schemes typically run unattended		CCR7
Service Reservoir	Bacteria and virus (reservoirs)	Faecal contamination (access by vermin eg birds, rats)	Very High	Monitoring control, ensure to maintain & seal all entry points	Possible	Catastrophic	High	Infrequent monitoring by operator	Rowena reservoir has missing hatch. Others uncertain.	consider floating calcium hypochlorite tablets - aim for chlorine residual leaving the reservoirs	CCR8
	All Hazards	Sabotage / Vandalism at reservoir (unauthorized access)	Very High	Secure enclosure, locked access ladders	Rare	Moderate	Low		Rowena bore very isolated -		CCR9
	Naeglaria	opportunistic pathogens in reticulation	Medium	reservoir integrity	Rare	Major	Medium		No current management. Warm waters may be ideal to host Naeglaria or Legionella. Chlorination will manage if sufficient penetration into reticulation	consider floating calcium hypochlorite tablets - aim for chlorine residual leaving the reservoirs	CCR10
Reticulation	Bacteria and Viruses	Illegal connections (Carinda and Rowena)	Very High	Positive main/pipe pressure legal/offence	Unlikely	Catastrophic	High	Planning approvals	possible backflow from old connections	Consider need to replace water meters/ instal backflow prevention on higher risk premises	CCR11
	Bacteria and Viruses (not CUmborah)	Breach of pipelines through breaks, inappropriate maintenance, new or service works etc.	Very High	trained labourers for main break repair	Unlikely	Catastrophic	High		infrequent mains breaks. Flushing is standard	develop mains break SOP	CCR12
	Bacteria and Viruses	Contaminating the treated water due to back flow & cross connection (e.g. water carters)	Very High	Cumborah standpipe for reticualtion	Rare	Catastrophic	Medium	Plumbing inspections			CCR13

24 APPENDIX C

24.1 Lands and Water Circular LWU 18

Department of Primary Industries
Office of Water

WS14/109

Circular No. LWU 18
Date 4 June 2014
Contact Bill Ho
Phone 8281 7326
Fax 8281 7351
E-mail bill.ho@water.nsw.gov.au

Assuring the safety of drinking water supplies

This Circular has been prepared to advise NSW local water utilities (LWUs) of an important new protocol for assuring the safety of all drinking water supplies in regional NSW. The protocol is robust and cost-effective and must be implemented by all LWUs providing a drinking water supply.

Protocol

Following its review of a number of recent boil water alerts[1] in regional NSW, the NSW Office of Water, in consultation with NSW Health and the NSW Water Directorate, has developed the new protocol, which is set out in Attachment 2 – Appendix E of the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* (www.water.nsw.gov.au). Appendix E documents the minimum requirements for ensuring each potable water supply is safe from microbial contamination. Under this protocol, each LWU will need to ensure that the **standard operating procedures (SOP)** for its water supply systems meet these requirements in order to achieve the following three key barriers:

> **Barrier 1** – **Effective disinfection** to kill, inactivate or remove pathogens in the water supply prior to distribution.
>
> **Barrier 2** – Ensure **distribution system integrity** to prevent contamination.
>
> **Barrier 3** – **Maintain free chlorine residual** in the water in the distribution system to help protect against minor contamination and as an indicator of a potential breach in distribution system integrity.

Together, these 3 barriers operate to assure the safety of each water supply and to prevent microbial contamination.

The *Public Health Act (2010)* requires each LWU to develop and implement a risk based Drinking Water Management System in accordance with the *NSW Guidelines for Drinking Water Management Systems*, NSW Health and NSW Office of Water, 2013. Activities related to disinfection and distribution system integrity should be clearly defined in each water utility's Drinking Water Management System, in accordance with the above Appendix E.

[1] Attachment 1 is a copy of page 10 of the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* which provides examples of recent failures of integrity of water supply distribution systems.

Once a water supply is effectively disinfected (Barrier 1), enteric pathogens should not reappear within the distribution system, unless there is a failure of the integrity of the distribution system. Maintaining the integrity of the distribution system (Barrier 2) is therefore the most important barrier to prevent contamination of a disinfected water supply. To verify and maintain integrity of all its distribution systems, each LWU must carry out the actions identified in section E3 of Appendix E as a matter of priority within **the next 12 months.** These actions include the following and need to be repeated at frequencies appropriate for each system, but no less than every **four (4) years.**

Carry out a careful and **detailed examination** of each service reservoir to ensure:

(1) the reservoir and its roof are secured from entry by birds, animals, vermin and windborne contaminants;

(2) rainwater cannot enter into the reservoir (i.e., no leaking roof or holes in the reservoir wall or gaps around the openings on the roof);

(3) roof is adequately drained especially near the openings and landings. The roof should extend beyond the reservoir wall;

(4) all inspection hatches are closed and locked at all times; and

(5) the reservoir site and roof are secured from unauthorised access.

Where reservoir cleaning has been a routine activity for a water utility, reports from past cleaning episodes should be reviewed to find any reservoir integrity problems that have been identified but not corrected. Recent reports from experienced reservoir cleaners may satisfy the requirement for a detailed examination.

Any **deficiency in the roof or mesh design** will need to be **rectified** by the LWU following such examination.

Action

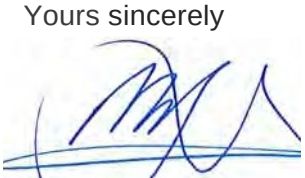
Each LWU will need to extend the standard operating procedures (SOP) for its water supply systems to meet the minimum requirements in Appendix E (Attachment 2) and to carry out the actions in section E3 of Appendix E within the next 12 months in order to ensure the integrity of its distribution systems and the safety of its water supplies.

Reporting

Each LWU will need to complete the attached Summary Report (Attachment 3) following its detailed examination of the integrity of each of its water supply distribution systems in accordance with Appendix E (Attachment 2).

Further information on this matter is available from the NSW Office of Water by contacting Mr Bill Ho, Manager Water and Sewerage on 8281 7326 or bill.ho@water.nsw.gov.au.

Yours sincerely



M ha ullen
A/Deputy Director General, Water

Encl. Attachments:

1 Copy of page 10 of 2012-13 NSW Benchmarking Report

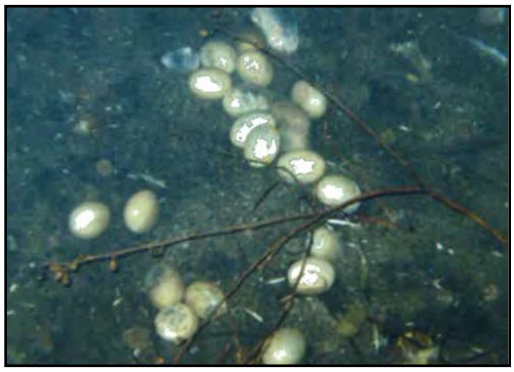
2 Appendix E - Effective disinfection of a potable water supply and assuring integrity of the distribution system to prevent contamination of the supply

3 Summary Report - Distribution System Integrity

Examples of Failure of Integrity of Distribution Systems

Photo 1 (right) shows the **hatch** of a 20m high service reservoir, which has inadvertently been **left open** for a few weeks. The result was repeat detections of *E. coli* in the reticulated water supply and the need to issue a boil water alert.

Photos 2 and 3 below are underwater photos in the above service reservoir showing evidence of contamination by birds – **bird eggs** (left) and **dead birds** (right).



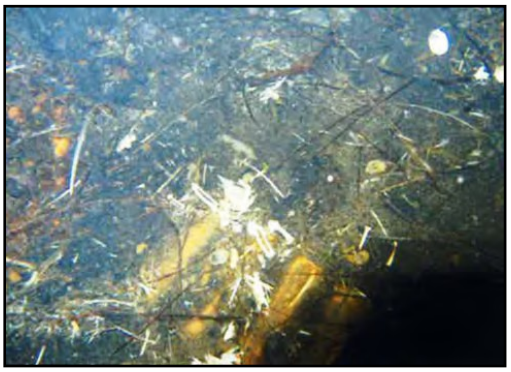
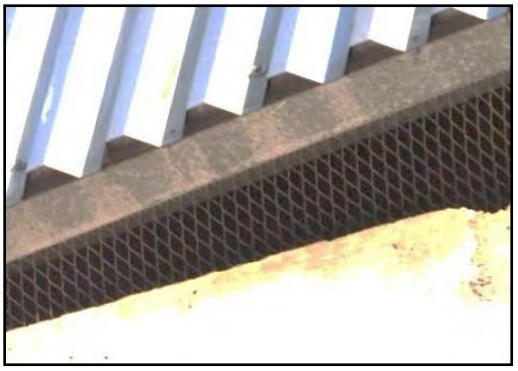


Photo 4 (below left) is a service reservoir where the **mesh openings** are **too large** and the roof design is deficient, allowing the entry of small birds, rainwater and windblown material to contaminate the stored water. The reservoir roof needs to be modified so that roof runoff and windblown material cannot contaminate the stored water. **Photo 5** (below right) shows mesh openings that are also too large, allowing entry of vermin, such as wasps and windblown material.



The continued detection of *E. coli* in reticulated water supplies and boil water alerts in the **last 2 years** have highlighted the need for a strategic approach for assuring the integrity of the distribution system to prevent contamination of a water supply that has been effectively disinfected. The recommended approach in Appendix E on page 277 was developed by the NSW Office of Water and NSW Health in consultation with the NSW Water Directorate and LWUs to provide a robust basis for assuring the safety of a water supply. As noted in the box on page 9, each LWU needs to review its present standard operating procedures (SOP) to ensure they address the minimum requirements in Appendix E for achieving safe water supplies:

> Barrier 1 – **Effective disinfection** to kill, inactivate or remove pathogens in the water supply prior to distribution.
>
> Barrier 2 – Ensure **distribution system integrity** to prevent contamination.
>
> Barrier 3 – **Maintain free chlorine residual** in the water in the distribution system where practicable, to help protect against minor contamination and as an indicator of a potential breach in distribution system integrity.

Appendix E: Effective disinfection of a potable water supply and assuring integrity of the distribution system to prevent contamination of the supply

E1 Overview

This appendix highlights the key requirements for ensuring the effective disinfection[1] and assuring the safety of a potable water supply. Each NSW Local Water Utility (LWU) needs to ensure that the **standard operating procedures (SOP)** for its water supply systems **meet** these minimum requirements, in order to achieve the following three key barriers:

> **Barrier 1** – **Effective disinfection** to kill, inactivate or remove pathogens in the water supply prior to distribution.
>
> **Barrier 2** – Ensure **distribution system integrity** to prevent contamination.
>
> **Barrier 3** – **Maintain free chlorine residual** in the water in the distribution system to help protect against minor contamination and as an indicator of a potential breach in distribution system integrity.

Guiding principle 1 of the *Australian Drinking Water Guidelines* (below[1]) highlights the risks to consumers from pathogenic organisms and the paramount importance of protecting water sources and water treatment.

For **free chlorine** disinfection, **Figure 1** on page 283 shows how the above 3 barriers work together to provide a safe water supply.

In addition, as indicated in the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* (page 9) each utility needs to develop and implement a risk based Drinking Water Management System in accordance with the *NSW Guidelines for Drinking Water Management Systems*, NSW Health and NSW Office of Water, 2013. These systems should include reference to sound standard operating procedures (SOP) in accordance with this Appendix and are required from 1 September 2014 under the *Public Health Act 2010*. Activities related to disinfection and distribution system integrity need to be clearly defined in each water utility's Drinking Water Management System (DWMS).

The *NSW Guidelines for Drinking Water Management Systems* is based on the Framework for the Management of Drinking Water Quality outlined in the *2011 Australian Drinking Water Guidelines* (ADWG) to assure the safety and quality of the water supplied to the consumers.

Effective disinfection of the source water and ensuring the integrity of the distribution system with or without a residual disinfectant are separate barriers (ADWG and above).

Effective disinfection of a water supply is essential to kill, inactivate or remove any pathogens in the water supply prior to distribution (Barrier 1 above). This could be achieved through a number of disinfection systems. Disinfection is a **critical control point** and must be appropriately monitored (ADWG).

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[1] Guiding principles 1 to 6 in Chapter 1 of the 2011 ADWG are listed below to provide an overall context to this Appendix:

- The greatest risks to consumers of drinking water are pathogenic microorganisms. Protection of water sources and treatment are of paramount importance and must never be compromised.
- The drinking water system must have, and continuously maintain, robust multiple barriers appropriate to the level of potential contamination facing the raw water supply.
- Any sudden or extreme change in water quality, flow or environmental conditions (e.g. extreme rainfall or flooding) should arouse suspicion that drinking water might become contaminated.
- System operators must be able to respond quickly and effectively to adverse monitoring signals.
- System operators must maintain a personal sense of responsibility and dedication to providing consumers with safe water, and should never ignore a consumer complaint about water quality.
- Ensuring drinking water safety and quality requires the application of a considered risk management approach.

Preventing ingress of contaminants at vulnerable points within the distribution system is a key **system integrity** barrier (Barrier 2). Service reservoir integrity is a critical control point for water supply that has been effectively disinfected and should be appropriately monitored (section E3).

Maintaining a disinfectant[2] **residual** throughout the distribution system (Barrier 3) helps protect the reticulated water against minor contamination, and is an indicator of a potential breach in distribution system integrity.

Sound operational monitoring and verification monitoring[3] programs are needed to assure that the minimum requirements in sections E2, E3 and E4 below for these three barriers[4] are met. The monitoring frequency for each water supply system is dependent on its key characteristics identified through analysis and should be reviewed as part of a comprehensive risk assessment. The guidance in sections E2, E3 and E4 provides the minimum requirements for each barrier for inclusion in each LWU's standard operating procedures (SOP) for its water supply systems. Following risk assessment for its systems, a LWU should include additional requirements in its SOP where warranted.

E2 Barrier 1 – Effective Disinfection

Disinfection is the single process that has had the greatest impact on drinking water safety. In Australia the common disinfection systems used include chlorination, chloramination, ultraviolet (UV) light irradiation and ozonation. The advantages and disadvantages for each of these systems are discussed in detail in ADWG.

When chlorination is used, a water supply is effectively disinfected when the required C.*t* values have been achieved (ADWG 2013, page 186). However, the C.*t* values used in the design of chlorine disinfection systems in Australia are generally higher than those required for effective disinfection (ADWG and WHO general recommendation is 0.5 mg/L of free chlorine residual after 30 minutes). The C.*t* values can be achieved by adjusting the chlorine dose or the contact time to provide a minimum C.*t* value of 15 mg/L/minute. The LWU should check and document the contact times for its systems for setting appropriate chlorine doses to achieve the required C.*t* values.

To achieve effective disinfection of a water supply with **free chlorine**, monitoring of the following parameters prior to the distribution of the water should be included in your LWU's SOP, as some variations in these parameters could affect disinfection efficiency and/or effectiveness:

- Maintain appropriate levels of free chlorine residual above 0.5 mg/L[5] prior to the first consumer for the available[6] contact time to provide a C.*t* value greater than 15 mg/L/minute.
- pH, temperature[7] and turbidity.

[2] Refer to page 186 of ADWG (Version 2.0, December 2013), under 'managing water supplies with no disinfection residual'.

[3] Each LWU's drinking water monitoring program testing for *E. coli* (i.e. sampling location, frequency and number of samples tested) needs, as a minimum, to be in accordance with the NSW Health requirements. These requirements are consistent with ADWG and the number of annual samples allocated for each LWU is shown in Appendix D1, *2012-13 NSW Water Supply and Sewerage Benchmarking Report.* Appendix D1 shows that the required number of samples has been collected and tested for almost all LWUs. Each water utility should assess its monitoring requirements to determine whether additional monitoring above this minimum is needed.

[4] For very small communities, typically serving a population of about 30, with a high quality source water such as groundwater from a confined aquifer, it may be cost-effective for the LWU to complete the actions outlined in section E3 on page 279 at 4-monthly intervals, rather than consistently maintaining a positive free chlorine residual disinfectant as long as the regular *E. coli* tests results continue to comply with ADWG. Refer also to the 4th paragraph of section E4 on page 281.

[5] Part IV Information Sheet 1.3, Disinfection with Chlorine, ADWG.

[6] If the source water does not contain pathogens (e.g., a good quality groundwater from a confined aquifer), no chlorine contact time is required.

[7] Efficiency of chlorine disinfection increases with increasing temperature. Monitoring of temperature is warranted for water of temperature < 10^{o} C.

- For a filtered supply, keep turbidity as low as practicable as defined in the filtration critical control point (generally <1 NTU[8] is desirable for effective disinfection). Turbidity higher than 1 NTU is acceptable for unfiltered systems where the source water is free from faecal contamination or where the effectiveness of chlorination has been validated[9].
- Keep pH <8.5[10]

Disinfection is a **critical control point** and must be adequately monitored, preferably continuously, to ensure effective disinfection (refer section E1). For **free chlorine** disinfection, in addition to an appropriate operational monitoring program, the minimum requirements to be included in the SOP are as follows:

1. For a filtered water supply, check that turbidity of the water being disinfected remains below the critical limits for the system. Take appropriate corrective actions if the critical limits are exceeded.
2. Check the chlorine demand of the water supply being chlorinated as the raw water quality changes and adjust the chlorine dose rate accordingly to achieve effective disinfection.
3. Check the pH of water to be disinfected where a pH correction facility has been provided.
4. Confirm correct functioning of each chlorination plant.
5. Verify that the required chlorine dose rate has been added to the water supply[11].
6. Provide continuous monitoring and/or daily testing of free chlorine residual at representative sampling points after the appropriate chlorine contact time.

For other types[12] of disinfection systems appropriate SOPs need to be developed to ensure effective disinfection.

E3 Barrier 2 - Distribution System Integrity

Once a water supply is effectively disinfected (Barrier 1), enteric pathogens should not reappear within the distribution system unless there is a failure of the integrity of the distribution system (ADWG 2013, page 186). Maintaining the integrity of the distribution system (Barrier 2) is therefore the most important barrier to prevent contamination of a disinfected water supply. To verify and maintain integrity of all its distribution systems, each LWU must carry out the following actions as a matter of priority within **the next 12 months**. Thereafter, **repeat** these actions at frequencies appropriate for each system but no less than every **four (4) years**.

a. Carry out a careful and **detailed examination**[13] of each service reservoir to ensure:

[8] Table 10.5, ADWG.

[9] Implementation of the requirements of this Appendix and monitoring test results which consistently find no *E. coli* in a water supply would validate the safety of the supply.

[10] For efficient disinfection pH should be as low as possible, but this needs to be tempered by the need for corrosion control. In most cases a pH of 7.8 to 8.2 is desirable.

[11] Check to ensure the storage tanks or cylinders have adequate chlorine. For sodium hypochlorite dosing plants complete a drop test to verify the accuracy of the chlorinator dosing rate as in some instances the released oxygen could interfere with the actual dosage rate. Also check the concentration of the sodium hypochlorite solution in the storage tank and adjust the dosage rate to allow for any loss of chlorine strength.

[12] Refer to Part IV Information Sheets 1.4 to 1.8 of ADWG.

[13] Note that the careful and detailed examination of each service reservoir in steps (1) to (5) on page 280 should be carried out in addition to the routine inspections identified in LWU Drinking Water Management Systems. The process described here is a detailed examination of each reservoir to detect and rectify any breaches of reservoir integrity that may not be identified during routine inspections.

It is essential all service reservoirs are designed and constructed to prevent ingress of contaminants. Additionally, for each service reservoir, a careful examination of the reservoir roof, wall and mesh is essential in order to detect any breaches to the reservoir's

(1) the reservoir and its roof are secured from entry by birds, animals, vermin and windborne contaminants;

(2) rainwater cannot enter into the reservoir (i.e., no leaking roof or holes in the reservoir wall or gaps around the openings on the roof);

(3) roof is adequately drained especially near the openings and landings. The roof should extend beyond the reservoir wall;

(4) all inspection hatches are closed and locked at all times; and

(5) the reservoir site and roof are secured from unauthorised[14] access.

Where reservoir cleaning has been a routine activity for a water utility, reports from past cleaning episodes should be reviewed to find any reservoir integrity problems that have been identified but not corrected. Recent reports from experienced reservoir cleaners may satisfy the requirement for a detailed examination.

Any **deficiency in the roof or mesh design** needs to be **rectified** by the LWU following such examination.

b. Check the air valves and ensure they are functioning in accordance with the manufacturer's standard operating procedures.

c. Check any testable backflow prevention devices[15] and ensure they are operating in accordance with the manufacturer's standard operating procedures, tested in accordance with AS3500 and there is no cross contamination.

d. Check and ensure all potable water connections with a risk of cross contamination such as connections to sewerage facilities (pumping station, treatment works, etc.), livestock watering and other non-drinking uses are provided with appropriate backflow prevention devices and are regularly tested in accordance with AS3500.

e. Check and ensure all potable water connections to top up alternative water systems such as rainwater tanks/automatic switching device on premises are provided with backflow prevention devices (refer to Circular LWU 17) and are operating in accordance with the manufacturer's standard operating procedures, tested in accordance with AS3500 and there is no cross contamination.

f. Review the reservoir maintenance standard operating procedures to ensure they are sound and fit for purpose[14, 16].

g. Review the standard operating procedures for repair and re-instatement of distribution system infrastructure that comes into contact with potable water such as mains and reservoirs to ensure the procedures are sound and fit for purpose[16]. Thoroughly clean and super-chlorinate before use, all new and repaired distribution system infrastructure, such as mains and reservoirs, that is in contact with potable water.

h. Undertake all remedial works to assure system integrity as a matter of **priority**.

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integrity. In most cases the breach of reservoir integrity has been found to be not visible from ground level and required use of mobile lifting equipment in order to detect the breach.

A confirmed detection of ***E. coli*** in a microbiological test sample should **trigger** a careful **review** by the LWU of whether the requirements of section E3 above have been met.

[14] Where access to third parties (e.g., telephone companies, SES, NSW Police, etc.,) has been given to install equipment, appropriate written reinstatement and communication protocols need to established between the LWU and each third party to ensure the reservoir integrity is not compromised. The LWU must conduct regular audits to ensure the protocols are being effectively implemented. Similar protocols should also be effected between the LWU and any service providers authorised by the LWU to access its service reservoir. A financial penalty should be imposed for any failures to comply with the protocol as these may breach the distribution system integrity and result in contamination of the supply and the need for a boil water alert. A model 'service reservoir integrity protocol' will be prepared by the NSW Office of Water to assist LWUs.

[15] Annual testing of any testable backflow devices such as a Reduced Pressure Zone (RPZ) device or a double check valve assembly is required in accordance with section 4.4.6 of AS3500. Such testing does not generally apply for a household rainwater tank, where a standard air gap is generally used for backflow prevention (section 4.4.6 of AS3500).

[16] As noted in section E2 on page 278, ensure your LWU's standard operating procedures including contracts with service providers include super chlorination and effective disinfection of any new and repaired or replaced water mains and other distribution system infrastructure that is in contact with potable water before the infrastructure is commissioned or the water service is reinstated.

A LWU should maintain records (including photos) of all distribution system examinations and inspections undertaken, the results obtained, any deficiencies identified, and the rectification works implemented.

E4 Barrier 3 – Maintain a Free Chlorine Residual in the Water in the Distribution System

A residual disinfectant such as chlorine is maintained in the water within the distribution system to help protect against minor contamination due to a breach in the distribution system integrity. Where there is a significant risk of *Naegleria fowleri* and water temperature exceeds 30^{o}C, a free chlorine residual of 0.5 mg/L or higher will control *N. fowleri*, provided the disinfectant residual persists throughout the distribution system (ADWG 'Disinfection with Chlorine' Information Sheet, page 191). **Monitoring of free chlorine residual** of the water in a distribution system on at least a weekly basis provides one of the key indications of the proper operation of the chlorination system, of system integrity, and provides data to help the utility to carry out timely corrective action. More frequent monitoring will provide more information to make better and timely decisions on changes to chlorine dosage required to protect public health. On-site testing of free and total chlorine residual (and if possible pH and turbidity) should be carried out and recorded each time a microbiological sample is collected for testing by the NSW Health Drinking Water Monitoring Program. The ADWG suggests that:

- a minimum free chlorine residual of about 0.2 mg/L[17] be maintained in the water throughout the distribution system. Re-chlorination may be necessary to achieve this chlorine residual in very extensive water supply distribution systems with long detention times.
- a sudden large drop in free chlorine residual in water in the distribution system may be an indicator of an increase in the chlorine demand of the water, a major breach in distribution system integrity, or a fault in the chlorination system,

When it is difficult to maintain the desired target free chlorine residual level of ≥ 0.2 mg/L at the extremities of your system, your LWU should using a trial and error process, increase the free chlorine concentration at the dosing points. Increased chlorine concentration can lead to community complaints about taste and odour. Advice can be given to community members about storing water in clean vessels before use so that the chlorine taste dissipates. Increased chlorine concentrations in systems that have routinely experienced low concentrations may lead to marked biofilm sloughing, leading to dirty water complaints. These problems should not last for long, especially if adequate chlorine concentrations are maintained and some flushing is carried out.

Once the desired free chlorine residual of the dosed water has been achieved and if the free chlorine residual at the extremities of the distribution system continues to consistently remain below 0.2 mg/L but not less than 0.05 mg/L with *E. coli* test results showing 100% compliance[3], then the LWU should undertake the actions outlined in section E3 on an **annual**[18] basis.

If however, the free chlorine residual level is consistently below 0.05 mg/L at the extremities of the distribution system, with *E. coli* test results showing 100% compliance[3,19] and the LWU can demonstrate the continuous integrity of the water supply distribution system, the LWU should then undertake the actions outlined in section E3 on a **four monthly**[18] basis and should also complete the following:

1. inspect and flush as needed the extremities of the system to remove 'stagnant' water.

[17] Example in Table A1.10 on page A-20, ADWG. Such a chlorine residual can normally be achieved for the vast majority of consumers supplied by a water supply distribution system. However, as noted in the 2nd paragraph of section E4 above, it may be difficult to maintain such a residual at the extremities of a distribution system.

[18] The first action in section E3 [action 'a. (1)' on page 280] may be undertaken from ground level using a telescope, binoculars, etc.

[19] If the microbiological test samples regularly fail for *E. coli* then the LWU must investigate the reasons for the failures and consider maintaining a free chlorine residual of about 0.2 mg/L on a consistent basis. This could be achieved by one of many options such as early warning control/communication systems, secondary chlorination plants, sub-system cleaning including air scouring/swabbing of the pipeline, super chlorination, etc. It is expected the preferred option would be chosen on the basis of a cost-benefit analysis.

2. opportunistically install pipe loops to any existing dead-end mains (i.e. as part of your LWU's repair and/or renewal work).

The measures in the 2 preceding paragraphs are warranted in order to minimise capital and operating expenditure, while assuring safety of the water supply.

E5 Develop a Verification Monitoring Program

Water Utilities should comply with the sampling frequency and sample site advice set out in the NSW Health Drinking Water Monitoring Program: http://www.health.nsw.gov.au/environment/water/Documents/october-2011-dwmp-booklet.pdf The verification monitoring program developed by a LWU for each distribution system should include the following:

- Parameters to be monitored (e.g. disinfectant residual, pH and turbidity)[20].
- Sampling frequency.
- Sampling locations including system extremities[21].
- Sampling methods and equipment.
- Schedules for sampling.
- Methods for quality assurance and validation of sampling results.
- Requirements for checking and interpreting results.
- Responsibilities and necessary training[22] of staff including induction of contractors.
- Requirements for documentation and management of records, including how monitoring results will be recorded and stored.
- Requirements for reporting and communication of results.

E6 Field Tests

- Test kits for measuring chlorine residual, pH and turbidity are available.
- Chlorine residual, pH and turbidity measurements need to be done in the field.
- Ensure the operators have a thorough understanding of the field test kits, especially the range they can measure, detection limits, error and interference tolerances.

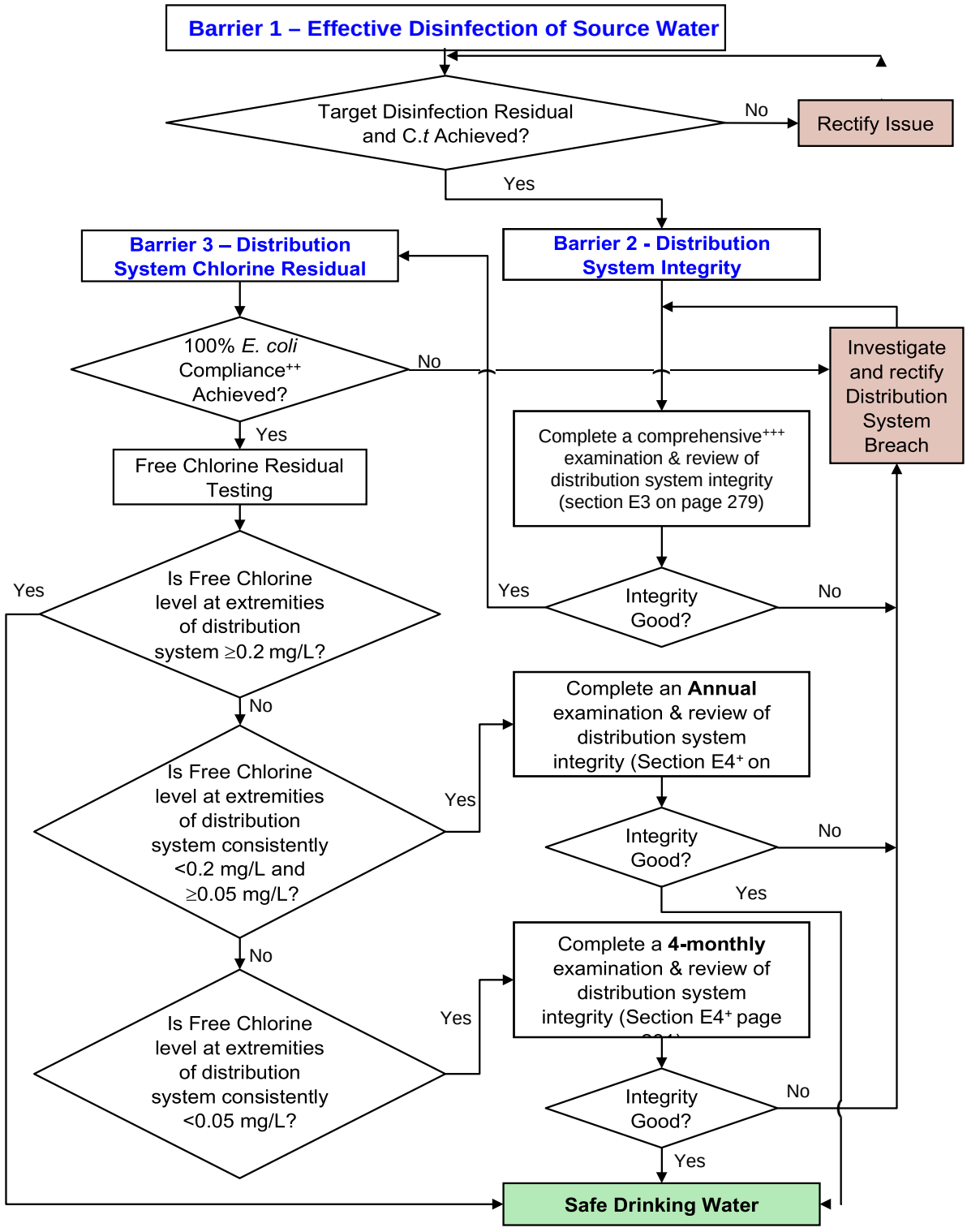
If you wish to discuss any aspects covered in this Appendix, please contact the Manager Water and Sewerage, NSW Office of Water on telephone: (02) 8281 7326 or email: bill.ho@water.nsw.gov.au.

[20] All filtered water supplies should meet the filtration critical control point target for the supply (generally <1 NTU is desirable for effective disinfection).

[21] Each LWU's sampling locations for monitoring microbiological water quality for reporting in the NSW Water Quality Database would be suitable for this purpose.

[22] LWU water treatment operators need to have appropriate skills and qualifications in accordance with page 23 of the NSW Guidelines for Drinking Water Systems, 2013. Refer also to page 35 of the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* (www.water.nsw.gov.au) in regard to National Certification of Water Treatment Operators.

Figure 1 – Effective disinfection[1] of a potable water supply and assuring integrity of the distribution system to prevent contamination of the supply



+++ The first comprehensive examination and review of water supply system integrity should be completed within 12 months in order to assure system integrity.

++ The 100% *E. coli* compliance requirement refers to test results where any failures in distribution system integrity have been detected and rectified by the LWU.

\+ The actions in the 3rd and 4th paragraphs of section E4 on page 281 should be undertaken by the LWU over the next 12 months or 4 months respectively in order to assure continuing distribution system integrity. These actions are only applicable for the extremities of a distribution system where the free chlorine residual is consistently below 0.2 mg/L.

1 Figure 1 is on the basis of disinfection with free chlorine.

ATTACHMENT 3

SUMMARY REPORT[1] ON ASSURING INTEGRITY & SAFETY OF WATER SUPPLY DISTRIBUTION SYSTEMS

LWU -
Contact Officer -

Date -
Phone -
Email -

- Water Supply Distribution **System** -

- Detailed examination of service **reservoirs** :

  - Date completed -

  - Key **Deficiencies** Identified -

  - **Rectification** Works Completed -

- Addressed all the requirements of **Circular LWU 18**? Y/N Date -

- Standard Operating Procedures (**SOP**) updated to address the requirements of Circular LWU18? Y/N Date -

[1] This summary report has been prepared in response to NSW Office of Water Circular LWU18 of 4 June 2014 and is to be retained in your LWU's records.

The first Summary Report prepared by a LWU for each of its water supply distribution systems is to emailed to: Bill.Ho@water.nsw.gov.au

25 APPENDIX D

25.1 Gingie Aboriginal Water & Sewerage Management Plan

Gingie Aboriginal Water & Sewerage

Management Plan

Contents

Purpose of Management Plan

The purpose of this Management Plan is to bring together information, in order to help achieve optimal performance and provide water and sewerage to the local community at an equivalent standard to the wider community.

This will be achieved by:

- Considering the needs of consumers, regulators and employees;
- Documenting local policies and procedures not covered by the general Service Agreement;
- Documenting activities, so their effectiveness can be monitored and reviewed by the Local Water Utility, Local Aboriginal Land Council, NOW's Water & Sewerage Inspector and NSW Health;
- Using a risk-based approach to manage quality at all points from water source to consumer to wastewater removal to release back to the environment;
- Assigning roles and responsibilities for on-going operation, maintenance, management and incident response.

Acknowledgements

This document has drawn on the Community Water Planner by the National Health and Medical Research Council, 8th December 2005 and Riverina Water's Water Quality Management System – HACCP Manual, 20 November 2008.

Document Updates

Document	Update	Responsible
Water & Sewerage Management Plan	Important changes: Anytime.	BHC Plumbing (in agreement with LWU, LALC & NOW)
	Periodic Reviews: After 1st year, then every 2 years.	NOW

Document Control

Date	Version	Actions	Issued To
5 Jun 10	V1 (draft)	Issued for comments after workshop 1&2 June 10.	LALC, WSC, BHC, NOW, Health, AA & NSW ALC.
26 Jul 11	V2 (Final)	Issued after comments.	
23 Nov 11	V3 (1st Yr)	Issued after 1st Year Review on 16 Nov	

Glossary

ADWF: Average Dry Weather Flow

ADWG: *Australian Drinking Water Guidelines* 2004 published by National Health and Medical Research Council and Natural Resource Management Ministerial Council.

BHC: BHC Plumbing Pty Ltd

Critical Control Point: a point, step or procedure at which control can be applied and which is essential to prevent or eliminate a hazard or reduce it to an acceptable level. A critical control point requires:

- an operational parameter that can be measured and for which critical limits can be set to define the operational effectiveness of the activity;
- an operational parameter that can be monitored frequently enough to reveal any failures in a timely manner (online and continuous monitoring is preferable); and
- procedures for corrective action that can be implemented in response to deviation from critical limits.

Critical Limits: the acceptable range (or prescribed tolerance) that must be met to ensure that a critical control point effectively controls a potential health hazard.

Hazard: biological, chemical, physical or radiological agent that has potential to cause harm.

Hazardous event: is an incident or situation that can lead to the presence of a hazard.

LALC: Local Aboriginal Land Council

LALC - CEO: Local Aboriginal Land Council – Chief Executive Officer

LWU: Local Water Utility (often the local shire council).

NOW: NSW Office of Water

Operational Monitoring (OM): regular observations and tests to confirm that individual barriers and preventive strategies for controlling hazards are functioning effectively.

Operational Procedure (OP): tasks essential to ensure the provision of consistently good quality drinking water or effluent. It provides detailed procedures required for the operation of all processes and activities (both ongoing and periodic), including preventive measures, operational monitoring and verification procedures, and maintenance requirements.

Preventive Measure (PM): any planned action, activity or process used to prevent hazards occurring or reduce them to acceptable levels.

PWWF: Peak Wet Weather Flow

Risk: the likelihood of a hazard to cause harm and the severity of the consequences.

Target criteria: performance goals for each preventive measure. These criteria can be quantitative (numerical) or qualitative (descriptive).

Verification Monitoring (VM): monitoring used to assess the overall performance of the system (including quality of drinking water or effluent, and monitoring of consumer satisfaction).

Summary

Table 1: Contacts

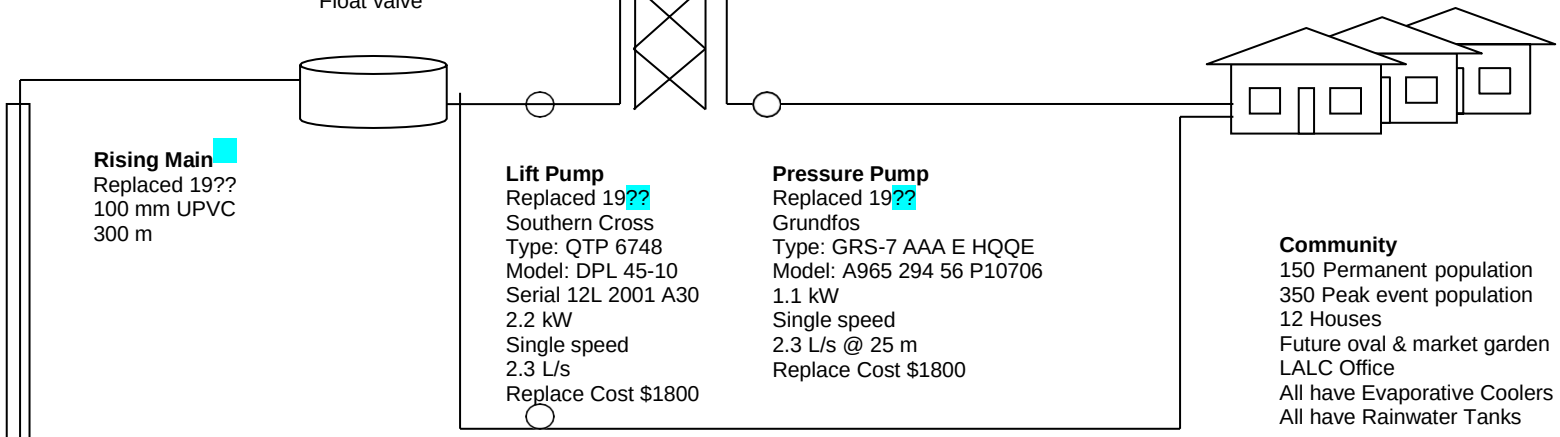
Agency or Business	Person	Phone
Emergency	**000**	**000**
Ambulance	000	131 233
Police	Walgett	**T:** (02) 6828 6899
Fire	000	000
Aboriginal Medical	Walgett	**T:** (02) 6828 1611
Local Aboriginal Land Council	John Shipp (A/CEO)	**M:** 0428 466 933
BHC Plumbing	Anthony Burke	**T:** (03) 5024 2252 **M:** 0407 164 995
Walgett Shire Council	Water & Sewerage On -call	**T:** 0419 841 228
	K. C. – Utilities Engineer	**M:** 0458 279 877
NSW Office of Water	Trent Betts - Operations	**M:** 0417 458 247
	Bala - Policy & Approvals	**T:** 02 8281 7332 **M:** 0428 201 446
NSW Health	David Ferrall	**T:** (08) 8080 1504 **M:** 0409 462 137
Aboriginal Affairs	Lesley Houston	**M:** 0457 742 617
NSW Aboriginal Land Council	Joe Flick	**T:** (02) 6885 7000 **M:** 0428 101 577

Table 2: Roles & Responsibilities

Stakeholder	Roles & Responsibilities
Aboriginal Community	Report issues asap to Local Aboriginal Land Council - CEO.
Local Aboriginal Land Council – CEO (LALC – CEO)	Advise **BHC Plumbing** immediately when an issue arises. Be the 1st point of contact for all community issues. Maintain a Community Issues Register (see Appendix A). Participate in 4-monthly review meetings.
Walgett Shire Council (WSC)	Provide water and sewerage services to the same extent as Walgett, except as specifically varied. Maintain regular communication and consultation with the community (via LALC - CEO), LALC, NOW and NSW Health. Participate in 4-monthly review meetings. Recommend updates this Management Plan. Obtain financial approvals from NOW before proceeding.
BHC Plumbing	As for WSC, except financial approvals go through WSC.
NSW Office of Water (NOW)	Provide Program Management and Financial approvals. Provide technical support on investigation, design, construction, operation, maintenance and management. Conduct and minute 4–monthly meetings (see Appendix B).
NSW Health	Provide technical support on health issues. Participate in 4–monthly reviews by either attendance or prior written advice to the other attendees.

Schematic: Drinking Water Scheme

Delivery Train – Deep bore → Rising Main → Ground Tank – 2 elevated Storage Tanks → Reticulation → Community



2 Elevated Tanks
Built 19??
Each tank:-
42,900 litres
Steel
Roofed
5.10m dia.
2.38m high
2.10m full
9.5 m above ground
TWL (RL) ?? m
Float valve

Ground Tank
Built 19??
52,700 litres
Galv
Roofed
6.58 m dia.
1.97 m high
1.55 m full
TWL (RL)
Float valve

Drinking Reticulation
Built 19??
?? m 80mm UPVC
?? Meters assemblies
?? Backflow devices
?? Fire Hydrants
?? Isolation valves

Rising Main
Replaced 19??
100 mm UPVC
300 m

Lift Pump
Replaced 19??
Southern Cross
Type: QTP 6748
Model: DPL 45-10
Serial 12L 2001 A30
2.2 kW
Single speed
2.3 L/s
Replace Cost $1800

Pressure Pump
Replaced 19??
Grundfos
Type: GRS-7 AAA E HQQE
Model: A965 294 56 P10706
1.1 kW
Single speed
2.3 L/s @ 25 m
Replace Cost $1800

Community
150 Permanent population
350 Peak event population
12 Houses
Future oval & market garden
LALC Office
All have Evaporative Coolers
All have Rainwater Tanks

Bore
Built 1994
License: 85BL153295
Depth 676 m
Screens
- 4 sections of 9 m ea
Artesian
6.0 L/s at ground level
1.9 L/s into ground tank
(150mm in 44m 23s)

Fire Pump
Replaced 19??
Grundfos
Serial: 0706 31/1
Model: 2RPGAE1C
Constr. Code: C1/21/SS
Single speed
?? L/s each
Replace Cost $??

Fire Reticulation
Built 19??
?? m 100mm UPVC
?? Backflow devices
?? Fire Hydrants
?? Isolation valves

Table 3: Water Supply – Routine Operation, Maintenance & Monitoring

Table No.	Ref. No	Location	Activity No.	Activity	Target or Critical Limit	Corrective Action	Who	Continuously	Daily	Weekly	Fortnightly	1-monthly	4-monthly	6-Monthly	12-Monthly
10	7	**Bore**	R	Check bore plinth, casing, etc	Bore protected from run-off.	Repair or replace.	BHC								√
10	12	**Rising Main**		Check pipeline for leaks or damage.	No leaks, damage or shrubs/trees.	Repair or weed spray as required.	BHC				√				
10	16	**Drinking Reservoirs**	BE	Check no entry points for pests.	No signs of entry or interference	See CCP-1	BHC				√				
10	20		BF	Fences, hatches, floats & leaks.	Security intact & all good.	See CCP-1 and repair.	BHC				√				
10	22		BG	Check for sediment build-up	Sediments not drawn into outlet.	Hose from outside or get divers.	BHC								√
10	24		BH	Review water level readouts.	Nil odd. Daily recovery to 100%.	Check anything odd. See CCP-3	BHC	√			√				
10	28	**Lift, Pressure & Fire Pumps**	Z	Check pumps & valves.	Look & sound okay. No leaks.	Repair/replace as necessary.	BHC				√				
10	29		AA	Read hours, amps & starts	Nothing out of the ordinary.	Investigate everything unusual.	BHC				√				
14	1 - 4			Flow rate test on bore & all pumps	Meet spec's & maximum demand.	Repair or replace.									√
10	34	**Distribution System**	BJ	Leaks, sign posts, lids.	Everything in good condition.	Repair as necessary.	BHC				√				
10	35		BK	1 to 2 am night leakage test.	Leakage <100L or 10% avg hour.	Find and repair leaks.	BHC							√	
10	39			Read & check meters, if installed.	All meters operate continuously.	Repair/replace immediately.	BHC						√		
10	40			Cross-connection check in houses.	No tap flow when meter tap is off.	Find & remove cross-connection.	BHC								√
10	44		BM	Disinfect/ flush after repairs.	Contaminants don't enter supply.	See CCP-4	BHC								
10	46		BN	Flush mains	Customers don't get dirty water.	Flush til clear. Repair hydrants.	BHC								√
				Check & flow test hydrants	Flow > 10 L/s & 150 kpa										
10	60	**Water Tests**	BT	Chlorine in elevated reservoirs.	Limits: 0.2 - 1.0 mg/L, Target: 0.5	Refer to CCP-2	BHC					√			
				Water temperature	Bore, ground & elevated tanks	Record and send to NOW	BHC				√				
10	61		BV	Radiological - 5 yearly.	Routine schedule.	Contact NSW Health	BHC								5
10	62		BW	Microbiological	Routine schedule.	Contact NSW Health	BHC					√			
10	63		BY	Chemical mthly for 12, then 6 mthly	Routine schedule.	Contact NSW Health	BHC					√		√	
10	64		BZ	Pesticides mthly for 12, then tba.	Routine schedule.	Contact NSW Health	BHC					√			√
10	65		CA	Disinfection by-products, mthly for 12mths then tba.	Routine schedule.	Contact NSW Health	BHC					√			√
		Management		Attend 4-monthly meetings	See Appendix B for Agenda	Advise early if cancellation.	All						√		

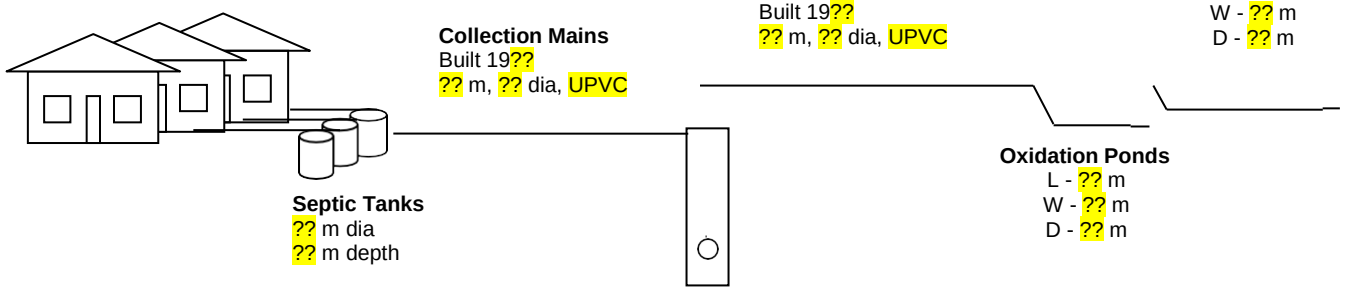
Table 4: Water Supply – Action Sheet

Action No	Priority	Table No.	Ref.	Actions	Who	When	Progress
1				Page 8. Complete information in blue Schematic.	WSC		Delete. Moved into Action 2.
2	M			Page 8. Complete information in Schematic.	WSC	16 Mar 12	WSC can't find anything. BHC to send what they have. WSC map W&S – Action 47.
3				Page 9. Review & add isolation valves to Schematic.	WSC (BHC)		Delete. Moved into Action 2.
4	L	9	-	Recheck the Gingie bore flow without ball valve restrictions.	WSC (BHC)	16 Mar 12	Still to be done
5		9	-	Get specification and flow rate for Lift Pump	BHC		Done
6	M	9	-	Get specification and flow rate for Fire Pump	WSC	16 Dec 11	Continuing.
7	L	9	-	Measure pressure in reticulation.	BHC	16 Dec 11	Continuing.
8	M			Page 17. Ensure fire-fighting meets AS 2419.1	WSC	16 Dec 11	Continuing.
9				Page 17. Find contact in Dept of Ag to advise LALC on soils	Warwick		Done.
10		10	5	Construct new reinforced concrete slab around bore.	WSC		Done. Ok, but needs grout.
11		10	6	Check if backflow protection is needed on bore.	Warwick		Done. Dual check needed.
12		10	15	Raise hatch 100 mm above roof & seal against roof run-off.	BHC		Done.
13		10	17	Improve ladder & tower security, so people can't climb up.	WSC (BHC)		Defer extra work. Has security fence. Will change with new tank arrangement.
14		10	18	Treat rust on tanks, stands, pipes, pumps & fittings.	WSC (BHC)		Delete. Tanks to be replaced.
15		10	19	Repair security fence, clear soil & treat for rust/corrosion.	WSC (BHC)		Delete. Tanks to be replaced.
16	L	10	21	Develop Tank Cleaning Procedure, unless just hosing from outside or using divers.	BHC	16 Dec 11	Done. Resend to Council
17	M	10	23	Council install telemetry to send alert to BHC.	WSC	16 Mar 12	Defer, 'til WSC new system.
18		10	26	Reconfigure arrangement of bore, pumps and reservoirs for better redundancy/backup. See table 10 Item 26 and schematic on page 9 for details.	BHC		Delete. New arrangement needed now that tanks must be replaced.
19		10	27	Check pumps for auto shut-down if they overheat or run dry.	BHC		Done. okay
20	H	10	31	Install bulk water meter with data logger set to hourly readings to check for leaks. Later, revert to daily readings.	WSC (BHC)	16 Dec 11	BHC sent info. WSC to advise.
21		10		Get dwgs of Fire and Water Retics. Try the new Con Hagis.	Ian B		Delete.
22	L	10	37	Advise between water meters & double check valves.	LALC-CEO	16 Dec 11	LALC advise in writing about meters or dual checks.
23	H	10	38	Install water connection assemblies.	WSC (BHC)	16 Mar 12	
24	L	10	41	Educate community to be responsible for meters.	LALC-CEO	16 Mar 12	LALC advise if help needed
25		10	43	Confirm CCP-1 is workable to disinfect/flush after repairs.	BHC		Done.
26	L	10	45	Eliminate dead ends by laying extra pipes to form loops.	WSC (BHC)	16 Mar 12	BHC check if price went to WSC & if there's other issues.
27		10	51	Check fire-fighting meets AS 2419, eg min. 10 L/s with 150 kpa residual pressure and supply for 4 hours at 10 L/s.	Ian B		Probably meets 10 L/s at 150 kpa but not enough storage because Fire Pump is only hooked to ground tank. Will address with new tanks.
28		10	53	Ask Local Fire Authority to do pump flow test on hydrants.	BHC		Delete. BHC will do Hydrant tests. See Action 51.
29		10	54	Educate community LALC-CEO is now 1st point of contact.	LALC-CEO		Done. WB sent Flyer 23 Nov.

Action No	Priority	Table No.	Ref.	Actions	Who	When	Progress
30	L	10	55	Develop a water strategy for when sports area and community gardens go ahead.	LALC-CEO	16 Jun 12	Continuing.
31		12	2	Insert amount of Sodium Hypochlorite needed in Table 12.	BHC		Done. 1 Litre of Hypo to 22kL to achieve 5 mg/L.
32	M	13	1	Document Testing Procedures	WSC (BHC)	16 Jan 12	All paperwork in Jan.
33	M	13	2	Develop O&M Manual & supply copies to LALC NOW WSC	WSC (BHC)	16 Jan 12	
34	L	15	-	Complete Table 15 - Water Supply Asset Management	WSC	16 Mar 12	
35	M	24	-	Provide appropriate Water Supply Training	WSC (BHC)	16 Mar 12	Trent send info to Ccl & BHC.
36	M	25	-	Provide appropriate Sewerage Training	WSC (BHC)	16 Mar 12	Trent send info to Ccl & BHC.
37		26	1	Advise community 1st point of contact is CEO.	Anne D		Done.
38		26	2	Advise community installation of meters or double check valves protect unhealthy backflow and tracks water losses.	Anne D		Done.
39		26	3	Advise community to conserve water, especially in summer & power outages.	Anne D		Done.
40		26	4	Raise awareness that improper disposal to sewer can cause backflow into houses and cause sickness.	Anne D		Done.
41		26	5	Reservoirs are normally inactive, so they need Chlorine for protection. Chlorine taste will also be a warning of excessive consumption because reservoirs are only for backup.	Anne D		Delete. No longer applicable.
42				Repair erosion damage around slab for ground tank	BHC		Done. But could do with gravel back to access track. Include in capital works.
43				One-off service of all isolation valves, then include in routine checks.	BHC		Done.
44				Find who pays electricity bill as it's in Murdi Paaki's name.	Warwick B		Done. Put into WSC's name.
45				Ask Murdi Paaki to give preference to BHC for plumbing.	Anne D		Deleted. Murdi Paaki is out.
46	H			WSC send template for BHC invoices.	WSC	16 Dec 11	
47	M			Map all the water & sewerage services.	WSC	16 Mar 12	
48	M			Consider an information board, similar to Bellbrook	LALC/Health	16 Mar 12	
49	H			Brief Public Works to replace all 3 corroded tanks, while simplifying the tank and pumping arrangements, plus gravel to the access track.	NOW	16 Dec 11	
50	H			BHC resend info to WSC, then WSC apply to NOW for Chlorine Tablets to temporarily fix mozzie & E Coli failures.	WSC (BHC)	16 Dec 11	
51	H			Check all Hydrant and do flow tests	WSC (BHC)	16 Dec 11	
52	M			WB send Bellbrook Brochures to LALC & Health	NOW	16 Dec 11	Done. WB sent 23 Nov 11.
53	M			WB send info on Water Meters to LALC.	NOW	16 Dec 11	Done. WB sent 23 Nov 11.
54	M			WB send employment discussions to NSWALC	NOW	16 Dec 11	Done. WB sent 23 Nov 11.
55	M			Health send info on Chlorine for LALC to talk to community.	Health	16 Dec 11	
56	L			Trent send WSC & BHC info on Water & Sewerage Courses	NOW	16 Dec 11	

Schematic: Sewerage Scheme

Train - Community → Septic Tanks → Collection Mains → Pump Station → Rising Main → Oxidation Ponds → Evaporation



Community
150 Permanent population
350 Peak event population
12 Houses
Future oval & market garden
LALC Office

Septic Tanks
?? m dia
?? m depth

Collection Mains
Built 19??
?? m, ?? dia, UPVC

Pump Station
Built 19??
Diameter – ?? m
Depth - ?? m
2 Pumps
Submersible
Wet well
Auto Duty/standby
Single speed
?? l/s each

Rising Main
Built 19??
?? m, ?? dia, UPVC

Oxidation Ponds
L - ?? m
W - ?? m
D - ?? m

Evaporation Area
L - ?? m
W - ?? m
D - ?? m

Table 5: Sewerage – Routine Operation Maintenance & Monitoring

Table No.	Ref. No	Location	Activity No.	Activity	Target or Critical Limit	Corrective Action	Who	Continuously	Daily	Weekly	Fortnightly	1-monthly	3-monthly	6-Monthly	12-Monthly
18	3	**Households**	SA	Check Boundary Shafts.	As per Plumbing Code.	Get LALC approval to fix.									√
18	7	**Septic Tanks**	SF	Inspect sludge level.	Sludge volume < 30%.	Pumpout. See CCP-1									√
18	12	**Collection Mains**	SH	Externally inspect access holes.	No sign of overflow or damage.	Repair as required.						√			
18	13		SI	Internally inspect access holes.	No roots. No damage. No inflow or infiltration.	Repair. Clean & CCTV problem sewers.									√
18	15		SJ	Security check of access holes.	No evidence of tampering.	Install more secure lids and/or locks.					√				
18	19	**Pump Station**	SK	Check pits, probes, pumps & pipes.	Look & sound okay. No leaks.	Repair.					√				
18	20		SL	Read pump hrs, amps & starts.	For ADWF, hrs < ? /day, amps < ?, starts < ?.	Check and repair.					√				
18	21		SM	Check security.	Security stays intact.	Repair.					√				
18	22		SN	Monitor high level alarm.	High level is not exceeded, except in extreme wet weather.	Reduce I/I < 5 x ADWF and/or repair/upsize pumps.		√							
18	23		SO	Drop test & record pump rate.	Pump rate stays > Design PWWF.	Repair or upgrade.									√
18	17	**Rising Main**	SP	Leaks, damage & re-growth.	No leaks, damage or re-growth.	Repair or spray as required.					√				
18	32	**Ponds**	SP	Blockages, erosion, weeds, fences & access tracks.	All in good working condition.	Repair or spray as required.					√				

Table 6: Sewerage – Action Sheet

Action No	Priority	Table No.	Ref.	Actions	Who	When	Progress
1				Page 9. Obtain drawings for sewerage scheme.	Ian B		Not available. WSC map services. See Action 30.
2				Page 9. Where possible measure & complete Schematic.	BHC		Delete. See Action 30.
3	L	5, 10	20	Complete "For ADWF, hrs < ? /day, amps < ?, starts < ?."	WSC (BHC)		Continuing.
4		17	-	Do drop test and pump spec to establish pump flowrate.	BHC		Delete. Can't - pumps are agitating. See Action 31.
5		17	-	Establish ADWF pump run time & check against Table 17	BHC		Delete.
6		17	-	Check flow velocity after flow rate is provided.	WB		Delete. Fix pumps first.
7		18	1	One-off check all surcharge gullies are working correctly.	BHC		Done
8		18	8	Send WSC & Trent design of new septic tanks – highlighting security, ease of maintenance and height adjustment.	BHC		Done.
9	L	18	8	Report on 4 septics & apply for funding if required.	WSC	16 Mar 12	Report on Septic Tanks.
10		18	10	Community Education Program about disposal to sewer.			Refer LALC & Health
11	H	18	11, 24	Clean & CCTV sewer mains and rising main to ponds.	WSC (BHC)	16 Mar 12	BHC price the 3 Villages. Include main to septic tank.
12	L	18	20	Install telemetry for high level alarm to alert BHC of failure.	WSC	16 Jun 12	Deferred.
13		18	21	Check pumps for auto shut-down if they overheat or run dry.	WSC		Done
14		18	25	Clear rising main of threatening trees & shrubs.	BHC		Delete action.
15		18	26	Install pipeline markers along rising main to ponds.	BHC		Delete.
16	L	18	29	Repair pond fences and improve locking mechanism to exclude unauthorised access	WSC (BHC)	16 Mar 12	BHC to send price to WSC.
17	L	18	30	Repair overflow weirs at ponds.	WSC (BHC)	16 Mar 12	BHC to send price to WSC.
18		18	31	Weed clearing program.	BHC		Complete.
19		18	35	Advise BHC of pumpout requirements, if any, to ensure BHC Plumbing is a qualified & licensed contractors.	WSC		Complete
20		18	36	Get NOW's opinion on disposal to back ponds.	Trent B		Done. Council ask Rob Mitchell.
21	M	18	37	Erect warning signs, stating fines, on fence.	WSC		WSC also looking at signage elsewhere at present.
22		18	38	BHC develop safe work method statements, include spills.	BHC		Done.
23	M	21	1	Develop an Operation & Maintenance Manual and supply copies to LALC, NOW & WSC. See Table 21 for details.	BHC	16 Feb 12	Expect in Jan 2012.
24		21	2	Develop Biosolids Handling & Pumpout Procedure	BHC		Done.
25		21	3	Employee Induction, Awareness & Involvement Program	BHC		Done
26	L	22	1	Recommend the interval between major pump services.	WSC	16 Mar 12	Continuing.
27	L	23	-	Complete Table 23 – Sewerage Asset Management	WSC	16 Mar 12	
28	M			Ask R Mitchell about disposal of biosolids in last pond.	Warwick B	16 Dec 11	Done. Email sent 23 Nov 11.
29	M			WSC approve the preferred disposal option.	WSC	16 Mar 12	
30	L			WSC map water & sewerage services.	WSC	16 Mar 12	
31	H			Repair or replace the Gingie sewage pumps.	WSC (BHC)	16 Dec 11	About $2k extra for new.

1 Water Supply

1.1 Water Demand

Table 7: Indicative Demand Calculation (including future growth)

			Annual		Peak Day	
Consumer Type	**Qty**	**Unit**	**Rate***	**Total**	**Rate***	**Total**
Indoor Use						
Permanent population	150	persons	55 kL/pers.	8.3 ML/yr	200 L/pers	30.0 kL
Peak visitor numbers (assuming 2 days p.a.)	200	persons	0.1 kL/pers.	0.0 ML/yr	100 L/pers.	20.0 kL
LALC Office (30 events/yr)	20	visitors	0.8 kL/pers	0.0 ML/yr	50 L/pers.	0.1 kL
Evaporative Coolers	13	coolers	100 kL/unit	1.3 ML/yr	1,000 L/unit	13.0 kL
Outdoor Use						
House gardens	12	dwelling	200 kL	2.4 ML	2,000 kL	24 kL
Future Sports Area	0.2	Ha	10 ML/Ha	2.0 ML	250 kL/Ha	50 kL
Future Garden	0.2	Ha	10 ML/Ha	2.0 ML		50 kL
Total				**16 ML/yr**		**187 kL/day**
					Over 22 hrs	**2.4 L/s**
Instantaneous Demand	17	Connections			0.15 L/conn.	**2.6 L/s**

* Insert typical Shire rates if available.

Table 8: Past Usage

	2005	2006	2007	2008	2009
Annual Scheme Use (ML p.a.)	Not available				
Peak Day Scheme Use (ML / day)**	Not available				

** Install a data-logger on the Bulk Water to verify the indicative PPD is representative.

Table 9: Capacity Checks

Scheme Element	Amount	Indicative Capacity Guide*	Comments
Water Restrictions	Nil	5:10:20 rule	
Bore flowrate	1.9 L/s	2.4 L/s (PDD) or 10 L/s (fire)	BHC double check
Ground Reservoir	52.7 kL	144 kL (fire)	Fire system needs checking.
Lift Pumps	2.3 L/s	2.4 L/s (PDD)	
Pressure Pump	2.3 L/s	2.6 L/s (Instantaneous Demand)	Okay, based on indicative guide.
Elevated Reservoirs (total)	85.8 kL	187 kL (PDD) or 144 kL (fire)	Okay, without sport/garden areas
Minimum water pressure	?? m	12 m head	Check pressure.

* For more information, refer to Water Supply Investigation Manual, NSW Public Works, 1990.

Conclusion

The average Australian home uses 260 litres/day/person with 160 litres used inside the home. The World Health Organization estimates 100 litres is required per day per person for personal hygiene, washing, cooking & drinking. The bore and scheme appears capable of easily satisfying the existing

demands and should be capable of supplying either the proposed sport area or community garden both not at their proposed size. A bulk meter with a datalogger needs to be installed to verify the real demand pattern.

Future peak day demand (PDD) is estimated at 187 kL/day and comprises of:

i. 43 kL for households
ii. 20 kL for visitors
iii. 24 kL for residential gardens & lawns
iv. 100 kL for the proposed sports area and community garden.

The elevated reservoirs (85.8 kL) meet the indicative guide of 1 day's peak day demand for current use (87 kL). The proposed sports area and community garden will have a significant impact if they go ahead. They will more than double peak day demand to reach 187 kL. Care should therefore be taken to minimise the irrigated area and apply restrictions to protect the more important residential needs.

The ground tank is not be sufficient for fire-fighting. A minimum of 144 kL is normally required but the ground tank only holds 52.7 kL. The bore flowrate currently estimated at 1.9 L/s is insufficient to make up the shortfall, so the elevated tanks need to be connected to the fire pump. The flow rate from the bore should be double-checked.

Water Quality

Comments
indicator bacteria (*E. coli*, total coliforms) – generally very good. No problems on record
algae, cyanobacteria and toxins (for surface water) – n/a to bore water
physical characteristics – 270 Na, TDS 580-600 mg/L. Hardness quite low. No taste issues.
inorganic chemical characteristics (including chlorine) – no issues.
Pesticides – will get samples.
disinfection by-products (for chlorinated supply) – no chlorine.
Radioactivity – will get samples.

Conclusion

The bore water provides good quality for drinking and residential purposes.

Total dissolved solids are higher than suggested for taste reasons by the Australian Drinking Water Guidelines. However the taste is very acceptable to locals. Hence, it's not an issue.

The only issue with water quality is it's less suitable for lawns and gardens than the previous supply that used river water. The Department of Primary Industries (formerly Department of Agriculture) will be consulted for potential solutions.

1.2 Risk Assessment

The table below and the Risk Matrix in Appendix C are used to evaluate the risk for Hazardous Events with the Existing Controls. If Additional Controls are needed, they are noted and recurring actions are further detailed in the Operation, Maintenance & Monitoring Schedule.

Table 10: Water Supply – Hazardous Events & Controls

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)	Operation, Maintenance & Monitoring				Who	When
								Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action		
	Bore											
1	Health characteristics of water outside ADWG, eg, Arsenic, Barium, Fluoride, Uranium.	No issues identified to date. Need to do pesticides & radiological.	1	E	L							
2												
3	Non-health characteristics of water outside ADWG, eg, Iron & Manganese causing staining and taste; or high TDS affecting water heaters, plumbing and taste.		1	E	L							
4												
5	Surface run-off entering bore.	Artesian pressure is about 100 kpa, so its unlikely run-off can get into the bore. Appears to be well constructed, i.e. no leaks. Concrete plinth is badly cracked and has no reo. No backflow protection, though it seems un-necessary with the positive artesian head.	1	E	L	BHC construct new reinforced concrete slab.						
6						WB check if backflow protection is needed.						
7						Regularly check integrity of bore, i.e. check construct to Minimum Construction Requirements for Water Bores in Australia, including 2m dia concrete plinth around bore, concrete seal 3m deep, extend seals 30cm above ground, screen air-vents and extend above1 in 100yr flood, cap and seal monitoring bores in the	R	Check bore plinth, casing, etc	Bore protected from run-off.	Repair or replace.		Annually

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)		Operation, Maintenance & Monitoring: Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action	Who	When
						vicinity.						
8	Livestock and animal droppings, on permeable soils or fractured rock, can contaminate shallow bores springs & wells.	N/A – bore is extremely deep and artesian. Rarely any stock grazing in the area.										
9	Septic Tanks or sewage effluent seeping into aquifer.	N/A – bore is extremely deep and artesian.										
10	Intensive agriculture or Industry that may have leached wastes into aquifer.	N/A										
11	Secured areas are breached by people or animal, potentially leaving contaminants.	N/A										
	Rising Main											
12	Tree roots enter pipe joins, causing blockages and damage.	No history of blockages and line is cleared of trees and shrubs.	1	E	L	Regularly patrol pipeline to check for leaks, damage or threatening re-growth.		Drive pipeline for leaks and damage.	No leaks or damage.	Repair as required.		Monthly
	Drinking Reservoirs											
13	Water short-circuits, especially if the inlet and outlet use a common pipe, leading to loss of disinfection and growth of harmful bacteria.	N/A - not chlorinated										
14	Animals, birds, reptiles or their droppings enter through small openings and contaminate the water with harmful bacteria and protozoa – leading to illness and odours.	Roofs fit quite tightly against top of wall. Hatches can let roof run-off into reservoirs. Consider UV Disinfection if disinfection ever becomes an issue.	2	D	L	Ensure the roof doesn't drain into the tank.						
15						Raise hatch to 100 mm above roof and seal against entry of roof run-off.						
16						Check the tank & roof	B	Check no entry points for	No signs of entry or	See CCP-?		Fortnightl

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)	Operation, Maintenance & Monitoring				Who	When
								Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action		
						regularly to ensure all openings and overflows are screened or sealed against pests. (See BE)	E	pests.	interference			y
17	Human access, whether unauthorised such as swimming or authorised maintenance, can cause microbial contamination of water supply and damage infrastructure.	Has been a problem in the past but not now. Roof is bolted down and hatches are locked. Security fence around the compound but needs maintenance. Ladder need to be access-proofed.	3	C	H	Improve ladder and tower security, so unauthorised people cannot climb up.						
18						Treat rust on tanks, stands, pipes, pumps & fittings.						
19						Repair security fence, clear soil off the fence and treat rust/corrosion.						
20						Regularly check security of fences, ladders and hatches. (See BF)	B F	Fences, hatch, floats & leaks.	Security intact & all good.	Shut-off 'til tests clear. Repair.		Fortnightly
21	High Chlorine residuals, after cleaning and disinfecting a storage, may enter the water supply – causing irritation of mucous membranes and tastes and odours.	Cleaned for rubbished and gritty sandy material, but not much sludge.	2	D	L	Develop a Tank Cleaning Procedure to minimise customer disruptions and ensure water quality and free Chlorine residual is within acceptable range prior to returning a reservoir to service. Perhaps, hosing from the outside is sufficient or get divers.						
22	Sediments, containing micro-organisms and slime, may be disturbed – causing odours and loss of disinfection – if reservoir is not kept clean.	Don't get much sediments. No tree around to drop. Well sealed against birds and dust. Bore water very clean	1	D	L	Inspect storages regularly and clean as necessary. Also, minimise dust entry.	B G	Check for sediment build-up	Sediments are not drawn into outlet.	See Hose from outside is sufficient. Or get divers.		Annually
23	Sediments may re-suspended and flow into the reticulation, if minimum levels in the reservoirs are not	All tanks work on float valves. No monitoring	2	B	H	Council install telemetry to send alert to BHC.						
24		Reservoirs run out in summer when taps left on				Regularly review auto-readouts on water levels.	B H	Review water level readouts.	Level always > ??%. Daily recovery & nothing			Continuous or Weekly

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)		Operation, Maintenance & Monitoring: Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action	Who	When
	maintained.	& kids use sprinklers.				(See BH).			odd.			
25	For dual water supplies, cross-connections may cause pressure from one system to fill a reservoir in the other system.	N/A.										
	Lift Pump Station											
26	Pump malfunction due to failure of equipment or power supply.	Elevated tanks give 24 hrs storage now & 10 hrs, if sports area and community gardens setup. Power is very reliable – no long outages. Pressure & lift pumps are cannot substitute for each other. Artesian pressure could supply water in an emergency if pipework is installed. Have run out of water during non-summer due to main break and float jammed in tank. Possibility for Fire-Fighting pumps.	3	E	M	Reconfigure arrangement of bore, pumps and reservoirs for better redundancy & backup by : - backflow protection at the bore; - automated connection of bore to retic during power outages & manual by-pass in the event of fire pump breakdown; - supply to pressure pump from ground tank and outlet to elevated tank and retic simultaneously; - replace lift pump with a 2nd pressure pump; - upgrade electricals to connect the 2 pressure pumps in a duty/standby arrangement.		See draft layout in Summary Section.			BHC	
27						Check pumps have auto shut-down for overheating & dry running.						
28						Regularly check equipment and alarms. (See Z, AA & AB)	Z	Check pumps & valves.	Look & sound okay. No leaks.	Repair as necessary.		Fortnightly
29							AA	Read hour & amp meters	Nothing usual.	Find and repair.		Fortnightly
30												

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)	Operation, Maintenance & Monitoring				Who	When
								Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action		
	Distribution System											
31	Leaky pipes and fittings can allow contaminants to backflow into the mains, if there is a system failure. Mains near sewers, septic tanks and stormwater are especially vulnerable to high levels of contamination.	Suspect the system may be fairly leaky. Sewer lines and WS are generally several meters apart. Fire fighting is a separate reticulation but shares the same water source. Fire Service was installed new in the last few years. At the same time, service connections were ungraded.	3	D	M	Install bulk water meter with data logger set to hourly readings, while looking for leaks. (Revert to daily readings afterwards).						
32						Obtain drawings of Fire and Water Supply reticulation. Ian Burton to try the new Con Hagis.						
33						After getting drawings, investigate combining the two reticulations to: - reduce redundant and potentially leaky pipelines; - provide better flushing after repairs via hydrants on drinking retic; - enable fire system to access elevated storages, as ground storage is inadequate for fire-fighting; - avoid confusion as hydrants may be found on both retics but have different capacities.						
34						Establish a Procedure for leak detection and preventive maintenance to reduce leaky pipes and fittings, especially in high risk areas. (See BJ & BK)	BJ	Leaks, sign posts, lids.	Everything in good condition.	Repair as necessary.		Fortnightly
35							BK	Do night leakage test.	1 to 2 am Leakage < 100L or 10% avg hr.	Find and repair leak.		6-mthly
36	Failure of booster pumps or power supply can lead to loss of pressure and potential for contaminated backflow, plus cause	N/A										

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)	Operation, Maintenance & Monitoring				Who	When
								Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action		
	critical disruptions to consumers and industry.											
37	Cross-connections and lack of backflow prevention can allow contaminants to enter mains, especially from industries and houses with rainwater tanks, swimming pools, garden ponds, irrigation systems and pumps.	All rainwater tanks fitted with pressure pumps. No water meters.	3	C	H	LALC to advise whether to install water meters (with double check valves) or just double check valves.						
38						Install meters or double checks, depending on advice from LALC						
39						Read meters, if installed.		Read meters				4-mthly
40						Do internal house checks for cross-connection with rainwater tank.		Internal house checks for cross-connections.				12-mthly
41						Educate community to be responsible for connections and meters.						
42						Maintain minimum levels in drinking reservoirs. (See BH)						
43	Repairs, maintenance and new mains can introduce soil, construction debris, micro-organisms and chemicals to contaminate the water supply.	CCP1 is the draft procedure.	2	C	M	Confirm CCP-1 provides a workable procedure to disinfect and flush mains after repairs.						
44						Disinfect and flush after repairs or new work. (See BM)	BM	Disinfect repairs & new work.	See CCP-??			Event
45	Low flows and dead-end mains can lead to stagnant water, deposits of sediment, and loss of Chlorine – causing tastes & odours.	A few deadends which could be built out.	1	C	L	Eliminate dead ends by laying extra pipes to form loops.						
46						Regularly flush mains. (See BN)	BN	Flush mains & check hydrants	Mains clean & hydrants good.			12-Mthly
47	Floods may introduce contaminants, particularly through air valves and hydrants.	N/A. Retic is protected by flood levee.										

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)	Operation, Maintenance & Monitoring				Who	When
								Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action		
48	High temperatures (> 25 C) in above ground pipes can grow Legionella, Nagleria & mycobacteria – causing serious illness through inhalation or contact.	N/A.				Consider Chloramination to provide a persistent residual, if it ever becomes a problem.						
49	Cement pipes can leach, especially during low flows, causing high pH to irritate eyes and skin; and damage house plumbing.	N/A										
50	Unauthorised access can damage infrastructure & contaminate water mains.	N/A for retic. Only the water tower.										
51	Poorly designed and maintained fire fighting systems can damage mains and fail in fire fighting situations.	Upgraded in the last few years.	2	C	M	Check fire-fighting capacity as per AS 2419, eg min. 10 L/s with 150 kpa residual pressure and supply for 4 hours at 10 L/s.						
52						Request to Local Fire Authority to do pump flow test on hydrants.						
53						BHC conduct regular hydrant inspections. (See BN)						
54	Individuals not aware how to register their concerns.		2	C	M	Community education program about first point of contact not longer being Murdi Paaki.						
55	Large consumers threaten to exceed the scheme's capacity to supply water at critical times.	Proposed sports area and community garden will cause stress on the water supply during summer. Refer to section 1.1 above for details.	3	C	H	Develop a water strategy to ensure sports area and community gardens don't take too much water away from the more important residential needs, if they go ahead.						

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (if existing controls are insufficient)	Operation, Maintenance & Monitoring				Who	When
								Activity	Target or Critical Limit (Bold indicates a CCP)	Corrective Action		
	Consumers											
56	Individuals not aware how to register their concerns.		2	C	M	Educate community LALC-CEO is now 1st point of contact.						
57	Large consumers threaten to exceed the scheme's capacity to supply water at critical times.	Sports area and community gardens could easily impact on water supply without a water management strategy.				Develop a water strategy for when sports area and community gardens go ahead. See 1.1 Conclusion, above about the issue.						
	Visitor season & events											
58	Insufficient water to meet increased demands – leading to poor hygiene and dehydration.	Seldom run out of water and usually from excess water usage rather than visitors.	1	D	L							
59	Increased usage may dislodge biofilm and re-suspend sediments – leading to taste, odours and discoloured water.	N/A.										
	Water Tests											
60	Operational tests					Operational tests. (See BT).	BT	Chlorine in Reservoirs & Retic.	Res: 0.5 - 1.5 mg/L	Refer to CCP-2		
61	Verification tests					Verification tests under the NSW Health Drinking Water Monitoring Program. (See BV, BW, BY, BZ & CA)	BV	Radiological - 5 yearly.	Routine schedule.	Contact NSW Health	BHC	5 Yearly
62							BW	Microbiological	Routine schedule.	Contact NSW Health	BHC	Monthly
63							BY	Chemical mthly for 12, then 6 mthly	Routine schedule.	Contact NSW Health	BHC	Yearly
64							BZ	Pesticides mthly for 12, then tba.	Routine schedule.	Contact NSW Health	BHC	Monthly
65							CA	Disinfection by-products, mthly for 12mths then tba.	Routine schedule.	Contact NSW Health	BHC	Monthly

1.3 Critical Control Points (CCPs)

See **Glossary** for definition of CCP.

Table 11: Summary of CCPs

LOCATION	CCP NUMBER	CCP & CONTROL MEASURE (Examples)
Reservoir	CCP-1	Exclusion of outside influences: the ability to maintain water quality by isolating it from potential contaminants.
Reservoir	CCP-2	Disinfection: to control free chlorine levels to limit growth of microbiological contaminants to safe levels.
Reservoir	CCP-3	Maintain pressure: to prevent contaminants entering the system when pressure is lost.
Distribution	CCP-4	Repair/ maintenance/ installation of mains: control of work practices to prevent contaminants being introduced into the mains during works.

Note: Some of the above CCPs were developed from Riverina Water's Water Quality Safety Plan.

Table 12: Details of CCPs

No	CCP	Monitoring	Critical Limits	Corrective Action
1	Location: Reservoir CCP: Maintain against entry of pests, contaminants an unauthorised people.	What: Inspect potential entry points. Who: BHC Operator. Where: Hatches & joins between roof & tank. When: Fortnightly. Records: Log Sheets How: Visual	No evidence of entry or interference by pests or unauthorised people.	When: Immediately after evidence of breach. What: 1) If contamination is suspected, close reservoir until tests clear or empty and clean. 2) Obstruct entry until a permanent repair is made. Who: LWU Operator Records: Non-Conformance Report.
2	Location: Elevated Reservoirs CCP: Maintain Chlorine in the rarely used reservoirs because the pressure pump supplies all the village's needs. Being idle increases the chance of contamination.	What: Chlorine residual. Who: BHC Operator Where: Two Elevated Reservoirs. When: Monthly. Records: Log sheets How: HACH Chlorine pocket colorimeter.	Free Chlorine residual in reservoir. Limits: 0.5 – 1.5 mg/l Target: 1.0 mg/L	When: As soon as limits are breached. What: 1. Retest. 2. Add 1 L of Hypo to raise a 22kL tank by 5.0 mg/L. Who: LWU Operator. Records: Log sheet and Non-Conformance Report.
3	Location: Reservoir CCP: Maintain pressure in reticulation to avoid contaminated backflow from entering mains.	What: Low Level alarm Who: BHC Operator Where: Via telemetry. When: Continuously. Records: Log sheets How: Transducers in reservoir.	Reservoir: > 80 % full (Set low level alarm as high as practical to avoid false alarms while also giving plenty of time to find and fix problems, before the reservoir is completely drained.)	When: As soon as a critical limit is breached. What: 1. Visit site to find cause. 2. If serious, alert LALC to stop garden watering to save water. Who: LWU Operator. Where: Call from site. Records: Log Sheet and Non-conformance Report.

No	CCP	Monitoring	Critical Limits	Corrective Action
4	Location: Distribution CCP: Taking care so contaminants don't reach consumers during or after work on mains.	What: Isolation valves, cleaning & flushing. Who: BHC Operator. Where: Along affected section. When: Before main goes into service. Records: Log sheet. How: Visual.	Isolation valves: Keep relevant mains valves and consumers valves closed during works. Cleaning: Thoroughly clean and disinfect all potentially contaminants surfaces. Flushing: While keeping downstream main valve closed, flush minimum of 20 pipe volumes at maximum velocity through downstream hydrant. Then, flush consumer valves, starting upstream and working downstream.	When: Procedure is not followed. What: 1. Repeat Isolation, Cleaning & Flushing Procedures. 2. Issue Boiled Water Alert until test for E Coli is clear. Who: BHC Supervisor. Where: Affected section of pipeline. Records: Log sheet.

1.4 Operational Procedures

Operational Procedures outline a series of steps and methods to operate and maintain equipment and processes.

Table 13: Operational Procedures

No	Operational Procedures	Document Status
1	Document Testing Procedures (BHC with advice from Health)	
2	Develop an Operation & Maintenance Manual and supply copies to LALC, NOW, WSC & Health. Include: specifications, parts list and O&M Manuals for all mechanical components; wiring diagrams for electricals; reticulation and pipework drawings; forms, procedures and information needed by operators.	
3	Employee Induction, Awareness and Involvement Plan	

1.5 Equipment Capability & Maintenance

Refer to Operations and Maintenance Manual and the following table.

Table 14: Equipment Capability & Maintenance Schedule

No	Equipment	Activity	Frequency	Issues/Notes
1	Bore	Flow rate test	12 months	
2	Pressure Pump	Pump Flow rate test	12 months	
		Overhaul or replace	As needed.	
3	Lift Pumps	Pump Flow rate test	12 months	
		Overhaul or replace	As needed.	
4	Fire pumps	Capacity Flow rate Test	12 months	
		Overhaul or replace	As needed.	

Table 15: Water Supply Asset Management Table

Component	Capacity	Date Built	Design Life	Estimated Renewal Date	Estimated Renewal Cost	Comments
Bore	??	??	??	??	??	
Rising Main	??	??	??	??	??	
Ground Tank	??	??	??	??	??	
Pressure pump 1	??	??	??	??	??	
Pressure pump 2	??	??	??	??	??	
Fire pump	??	??	??	??	??	
By-pass valve	??	??	??	??	??	
Bulk meter	??	??	??	??	??	
Electricals	??	??	??	??	??	
Elevated Tanks	??	??	??	??	??	
Reticulation	??	??	??	??	??	
Isolation valves	??	??	??	??	??	
Fire Hydrants	??	??	??	??	??	
Meter Assemblies	??	??	??	??	??	

Note any future improvements or investigations (eg installation of water filtration):

1.6 Chemicals and Materials

No requirements found specific to the scheme.

1.7 Verification Monitoring

Verification monitoring is used to assess the overall performance of the system and, ultimately, the quality of the drinking water being supplied to consumers.

Verification provides confidence for consumers about the quality of the water and it is a useful indication of problems within the water supply system that may need correction or an incident/emergency response.

The monitoring program should be developed in consultation with the local Public Health Unit. Refer to Table 3 for the general requirements.

The person responsible for sampling is nominated in Table 3. The person must be trained how to take the samples, package them and send them to the laboratory in a timely manner.

The service provider/water utility must ensure that the laboratory will notify the local Public Health Unit immediately of any monitoring result that exceeds a health guideline value.

2 Sewerage

2.1 System Checks

Table 16: Indicative NSW Sewage Design Loadings

Characteristic	Value	Unit		Value	Unit
Population			**Loading Rates per EP**		
Current Permanent Population	150	EP	Average Dry Weather Flow (ADWF)	240	L/EP/d
Future Permanent Population	150	EP	Peak Wet Weather Flow (PWWF)		
Peak population (eg events)	350	EP	- UPVC pipe schemes	1,050	L/EP/d
Other significant loads	-	EP	Biological Loading Rate (BOD5)	70	g/EP/d
Adopted Design Population	150	EP	Suspended Solids Rate (SS)	60	g/EP/d
Tenements			Total Nitrogen Rate (TN)	13	g/EP/d
Adopted Design Tenements			Total Phosphorous Rate	2.8	g/EP/d

Table 17: Indicative Design Checks (Sewerage)

Scheme Element	Capacity	Indicative Guide*	Comments
Main Pump Station			
Design or actual flow rate	?? L/s	1.8 L/s (PWWF for each pump)	
Duty/Standby	Yes	Yes, automatic alternating.	
ADWF pump run time	?? hr/d	3 - 5 hrs/day	
Rising Main (PS to STP)			
Flow velocity	?? m/s	0.9 m/s desirable for short 100mm.	Calc after flow rate is provided.
		0.6 m/s minimum.	
Oxidation, Maturation & Evaporation Ponds			
Not checked because they are clearly oversized and there are no odour issues.			

* For more detailed information, refer to Manual of Practice – Sewer Design, Public Works 1987 and Manual of Practice – Pump Station Design, 1986. Also, refer to Appendix H for Sewage Flow Monitoring Records.

2.2 Risk Assessment

The table below and the Risk Matrix in Appendix C are used to evaluate the risk for Hazardous Events with Existing Controls. If Additional Controls are considered necessary, they are noted and recurring actions are detailed in the Operation, Maintenance & Monitoring Schedule.

Table 18: Sewerage – Hazardous Events & Controls

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (If existing controls are insufficient)	Operation, Maintenance & Monitoring Schedule				Who	When
							No.	Activity	Target or Critical Limit (**Bold** indicates CCP)	Corrective Action		
	Households											
1	Roof stormwater is incorrectly plumbed to the sewer leading to overflows of sewage in homes and public areas.	Not aware of any household overflows.	4	E	H	One-off check that all surcharge gullies are working correctly.						
2	Disposal of inappropriate items in toilets, sinks & shafts - leading to blocked pipes, damaged pumps and overflows of raw sewage in homes and public areas.	Not aware of any household overflows.	4	E	H	Check septic if no boundary shaft.						
3						Ensure Boundary Shafts are properly installed & secure. (See SA)	SA	Check Boundary Shafts.	As per Plumbing Code.	Get LALC approval to fix.	BHC	Annually
	Visitor Events & Transient Populations											
4	Insufficient hydraulic or treatment capacity to meet increased demands - leading to sewer overflows and/or discharge of poorly treated effluent to the environment.	Not aware of any overloading of sewerage system during events.	2	D	L							

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (If existing controls are insufficient)	Operation, Maintenance & Monitoring Schedule				Who	When
							No.	Activity	Target or Critical Limit (**Bold** indicates CCP)	Corrective Action		
	Business & Industry											
5	Disposal of inappropriate wastes to sewer, causing: Health and safety risks; Infrastructure damage; Loss of treatment; Environmental harm.	N/A										
6	Chemical spills into sewers, especially from mining and industries – like wool scouring, tanneries and, automotive industries that store or transport chemicals nearby. The spills may lead to health and safety risks to Council Staff and the Public, plus it may damage the sewerage system and kill essential bacteria at treatment plant.	N/A										
	Septic Tanks & On-site Systems											
7	Septic tank not pumped out, leading to overflows.	Pump outs occur every 12 months.	4	E	H	Organise pumpout program.	SF	Inspect sludge level.	Sludge volume < 30%.	Pumpout. See CCP-?	BHC	Annually
8	On-site treatment system incorrectly constructed or maintained.	Most have been replaced and locals very happy with limited access. 3 nearing end of life.	4	D	H	Replace 4 septics. Send WSC and Trent the design of the replacement septic tanks – highlighting security, ease of maintenance and height adjustment. Then, apply to John Bourke for funding.						

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (If existing controls are insufficient)	Operation, Maintenance & Monitoring Schedule				Who	When
							No.	Activity	Target or Critical Limit (**Bold** indicates CCP)	Corrective Action		
	Collection Mains											
10	Mains become blocked from ingress of roots, or obstruction or pipe collapse, especially after rain, causing overflow of access holes into public areas.	Recently replaced VC with UPVC, though root intrusion is known to be a problem.	4	D	H	Conduct Community Education Program on disposal to sewer.					Anne / David	
11						Clean & CCTV.					BHC	
12						Regularly inspect access holes for signs of overflow, especially after rain. (See SH)	SH	Externally inspect access holes.	No sign of overflow or damage.	Repair as required.	BHC	Monthly
13						Regularly inspect all access holes over say a year for structural integrity and water tightness.	SI	Internally inspect access holes.	No roots. No damage. No inflow or infiltration.	Repair. Clean & CCTV problem sewers.	BHC	Annually
14	Floods or rising rivers overload system, causing overflows of untreated sewage.	N/A										
15	Poor security of access points, especially at secluded locations, potentially leading to inappropriate disposal of wastes, vandalism or sabotage.	No problems for a long time now.	2	D	L	Regularly patrol access points, especially secluded ones.	SJ	Security check access points.	No evidence of tampering.	Install locks or increase security.	BHC	Fortnightly
16	Deterioration of sewer mains leading to ground collapses, rising ground water, damage to roads & buildings, excessive wear on pumps & pipes from grit, hydraulic overload of STP from excessive infiltration.	Sewer mains about 25 yrs old. Will assess risk after CCTV.	?	?	?	Conduct CCTV					BHC	

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (If existing controls are insufficient)	Operation, Maintenance & Monitoring Schedule				Who	When
							No.	Activity	Target or Critical Limit (**Bold** indicates CCP)	Corrective Action		
	Pump Stations											
17	Pump malfunction due to failure of equipment or power supply or unauthorised access.	Good condition. A Public Works design. Reliable power supply. Estimate at least ½ day storage. Currently doing, fortnightly inspections.	4	D	H	WSC install telemetry to high level alarm to alert BHC of failure.					WSC	
18						Check pumps have auto shut-down for overheating & dry running.					WSC	
19						Regularly check equipment, alarms & security	SK	Check pits, probes, pumps & pipes.	Look & sound okay. No leaks.	Repair.	BHC	Fortnightly
20							SL	Read pump hrs, amps & starts.	For ADWF, hrs < ? /day, amps < ?, starts < ?.	Check and repair.	BHC	Fortnightly
21							SM	Check security.	Security stays intact.	Repair.	BHC	Fortnightly
22	Insufficient capacity to manage peak wet weather flows (PWWF) due worn pump or increased inflow and infiltration.	No monitoring records to access PWWF and condition of pump.	4	D	H	Monitor high level alarm to detect when inflows exceed pump capacity.	SN	Monitor high level alarm.	High level is not exceeded, except in extreme wet weather.	Reduce I/I < 5 x ADWF and/or repair/upsize pumps.	BHC	Continuous
23						Regularly do capacity check on pumps.	SO	Drop test & record pump rate.	Pump rate stays > Design PWWF.	Repair or upgrade.	BHC	Annually
	Rising Main											
24	Tree roots enter pipe joins, causing blockages and damage.	Once it crosses road, there are numerous trees. Built 1987? Locals frequent the area so could be exposed if a break occurs.	3	D	M	Do CCTV inspection					BHC	
25						Clear threatening trees & shrubs on pipeline route.					BHC	
26						Install pipeline markers.					BHC	
27						Regularly patrol pipeline to check for leaks, damage and threatening re-growth.	SP	Leaks, damage & regrowth.	No leaks, damage or regrowth.	Repair or spray as required.	BHC	Monthly
28	Pipe breaks or leaks can release contaminants, especially near water supply or stormwater pipes.	Pipeline runs through bushland well clear of waterways and no run-off back to village.	3	D	M	As for immediately above.						

Ref.	Hazardous Event (An event exposing a risk.)	Existing Controls & Comments	Consequence	Likelihood	Risk Score	Additional Controls (If existing controls are insufficient)	Operation, Maintenance & Monitoring Schedule				Who	When
							No.	Activity	Target or Critical Limit (**Bold** indicates CCP)	Corrective Action		
	Oxidation, Maturation & Evaporation Ponds											
29	Plants, animals and unauthorised access cause screens and pipes to block, or banks to erode.	Motor bike riders and unauthorised people are known to enter. Locks were recently cut. Overflow weirs are damaged. Program of weed clearing is in progress.	3	C	H	Repair fences and improve locking mechanism to exclude unauthorised access					BHC	
30						Repair overflow weirs.					BHC	
31						Weed clearing program.					BHC	
32						Keep ponds free of water plants and regularly check screens & pipework for blockages and damage.	SP	Check blockages, erosion, weeds & fences.	All in good working condition.	Repair as necessary.	BHC	Fortnightly
33	Excessive odours due to pond turnover, blue-green algae or excessive biosolids.	Really hot days may get odours but very seldom.	1	C	L							
34	Evaporation pond discharges too frequently to the environment.	N/A. Massive pond system. Never discharged & never likely.										
	Biosolids Management											
35	Safe handling and disposal procedures are followed, especially to protect staff, the public and livestock during & after handling.	BHC is registered with EPA. Currently disposing to back ponds that are always dry. Signs warning of fines. Consider disposal in first ponds if odour or safety is an issue.				WSC advise the requirements, if any, to ensure BHC Plumbing is a qualified & licensed contractors for pumpouts.					WSC	
36						Get NOW's opinion on disposal to back ponds.					Trent B	
37						Erect warning signs, stating fines, on fence.						
38						BHC to develop safe work method statements, include spill management.					BHC	

2.3 Critical Control Points

A CCP is defined as an activity, procedure or process at which control can be applied and which is essential to prevent a hazard or reduce it to an acceptable level. Refer to Glossary for more detail.

Table 19: Summary of CCPs

Location	CCP Number	CCP & Control Measure (Examples)
Collection & transfer	CCP-1	Septic Tank Pumpout: the ability to control build-up of solids to avoid blockages in transpiration area and inappropriate discharges.

Table 20: Details of CCPs (examples)

No	CCP	Monitoring	Critical Limits	Corrective Action
1	Location: Septic Tanks CCP: Control biosolids build-up to avoid uncontrolled discharges – affecting community health and the environment.	What: Level of Biosolids Who: BHC Operator Where: Inside septics When: 12 monthly Records: Log Book How: Probe.	Target: < 20% full Limit: < 60% full	When: Critical Limit is breached. What: Arrange pump-out tanker immediately. Who: LWU Operator Records: Log Book and non-conformance.

2.4 Operational Procedures

Operational Procedures outline a series of steps and methods to operate and maintain equipment and processes.

Table 21: Operational Procedures

No	Operational Procedures	Document Status
1	Develop an Operation & Maintenance Manual and supply copies to LALC, NOW, WSC & Health. Include: specifications, parts list and O&M Manuals for all mechanical components; wiring diagrams for electricals; reticulation and pipework drawings; forms, procedures and information needed by operators.	
2	Develop Biosolids Handling & Pumpout Procedure	
3	Employee Induction, Awareness & Involvement Program	

2.5 Equipment Capability & Maintenance

Refer to Operation and Maintenance Manual and the following table.

Table 22: Equipment Capability & Maintenance Schedule

No	Equipment	Activity	Frequency	Issues/Notes
1	Main Pumps	Drop down test	12 months	
		Major service	?? years	

Table 23: Sewerage Asset Management Table

Component	Quantity/ Capacity	Date Built	Design Life	Estimated Renewal Date	Estimated Renewal Cost	Comments
Septic Tanks	??	??	??	??	??	
Collection Mains	??	??	??	??	??	
Pump Station	??	??	??	??	??	
Rising Main	??	??	??	??	??	
Oxidation Ponds	??	??	??	??	??	

Note any future improvements (eg upgrade of effluent reuse scheme):

3 General

3.1 Customer Satisfaction

Monitoring of customer satisfaction can provide valuable information on potential problems that may not be obvious from normal monitoring.

Issues raised by the community, and the response given back to them, need to be recorded in order to assess types and patterns of issues over time.

The CEO of the Local Aboriginal Land Council will be the 'First Point of Contact" for the community and the 'Manager of the Issues Register'.

Immediately, upon receipt of an issue, the CEO will notify the Service Provider. The Service Provider will be responsible to respond to the issue and advise relevant authorities and non-community parties.

The LALC - CEO will provide a copy of the Issues Register at the 4–monthly meetings.

3.2 Short-term Evaluation of Results

Operators will use the Critical Limits and Target Parameters to evaluate results.

Operators will immediately advise senior management of:

- All exceedances of a Critical Limit;
- 3 near exceedances of Critical Limits;
- Regular exceedences of Target Parameters;
- any potential threat to public health or the environment.

Operators will respond as per the Corrective Action. Senior management will determine if further action is required or invoke Incident or Emergency Plans.

Senior Mgt will immediately contact the relevant authority to outline the exceedance value and the Corrective Action. Senior management will also contact the authorities, if further action is proposed.

3.3 Management of Incidents

Background

Some events can not be predicted or controlled. Or, they are too costly and unlikely to justify installation of preventive measures.

Examples of emergency situations may include:

- Chemical spills in the catchment or incorrect dosing at the treatment plant;
- Equipment breakdown or failure;
- Prolonged power outage;
- Extreme weather events, like flash floods causing contamination of water supply;
- Natural disasters, like earthquakes and lightning damage;
- Human causes, like serious error, sabotage or strikes.

Incident & Emergency Response

The service provider/water utility should review preparedness to manage incidents. Effective communication must be maintained between the community, service provider, the Public Health Unit and NOW.

Refer to Water Utility's Emergency Response Plan and NSW Health's website for the following Response Protocols.

- Response Protocol – Physical and Chemical Quality
- Response Protocol – Microbiological Quality.

3.4 Employee awareness and training

BHC Plumbing is currently developing an induction & on-going awareness program to ensure all employees are aware of:

- Water Utility's drinking water policy;
- the Preventive measures and multiple barrier in the water supply system;
- regulatory and legislative requirements;
- roles and responsibilities of employees and departments;
- how employees can impact on water quality and public health.

Table 24: Employee Training - Water Supplies

(only for non-LWU service providers)

	Staff Member & Year Certification Completed					
Certification	**Staff 1**	**Staff 2**	**Staff 3**	**Staff 4**	**Staff 5**	**Staff 6**
Sampling	1999	2003				
Laboratory Skills	2000	2004				
Confined Space Entry	2004	2003	2005	2005	2006	

Note: NOW is the NSW Office of Water.

Table 25: Employee Training - Sewerage

(only for non-LWU service providers)

	Staff Member & Year Certification Completed					
Certification	**Staff 1**	**Staff 2**	**Staff 3**	**Staff 4**	**Staff 5**	**Staff 6**
Sampling	1999	2003				
Laboratory Skills	2000	2004				
Confined Space Entry	2004	2003	2005	2005	2006	

Note: NOW is the NSW Office of Water.

3.5 Community Consultation & Communication

The Local Aboriginal Land Council – CEO will, in consultation with the Service Provider, be responsible for all Community Consultation and Communication.

The Service Provider is required to:

- Notify customers by letterbox drop ?? days prior to disruptions to services or commencement of an extended period of works;
- Obtain clearance from the resident or LALC – CEO prior to entering a property.

Refer to the following table for specific communication issues identified during the workshop.

Table 26: Communications

No.	Issue	Action Required	Who	When	Progress
1	First point of contact for residents is CEO.	Advise community.	Anne Dennis	ASAP.	
2	Installation of meters or double check valves for health and tracking water losses.	LALC decide and advise community.	Anne Dennis		
3	Need to conserve water, especially in summer & power outages.	Advise community.	Anne Dennis		
4	Raise awareness that improper disposal to sewer can backflow into house and cause sickness.	Advise community.	Anne Dennis		
5	Chlorine in dead storage for protection.		Anne Dennis		

3.6 Medium & long-term evaluation

Activity	Frequency
NOW Inspector conduct site Audits	4 - monthly
Local Public Health Unit review & advise verification monitoring results prior to audit.	4 - monthly
LALC, LWU, & NOW meet to discuss issues and actions	4 - monthly
Document Updates - Refer to Page 6.	Annual

Appendix A – Community Issues Register (example)

Gingie Water and Sewerage
Community Issues Register

Time & Date	Name & Phone	Issue	Response
9:30 am Fri 12/2/2010	John Smith 0406 531 687	Dirty water at 25 Garden Place.	Council saw John's wife and flushed mains.
5:00 pm Tues 16/2/2010	Grace Jones Daughter's mobile 0777 888 999	Sewer overflow at 36 Eden Court.	Council visited Grace on Wed. Rodded sewer and found tree roots. Council now plan to root trench the offending tree.

e

Appendix B – Agenda/Minute for 4-monthly meetings

Agenda/Minutes for 4-monthly Meetings	
Time:	
Date:	
Venue:	
Attendees:	
Apologies	
Confirmation of previous minutes	
Water Supply	
Previous Action Sheet (NOW)	
Review Issues Register (BFHC)	
Health issues (Health)	
Site Inspection Report (NOW)	
Current issues (SW)	
Community Consultation (all)	
Amendments to Mgt Plan (SW)	
Sewerage	
Previous Action Sheet (NOW)	
Review Issues Register (BFHC)	
Health issues (Health)	
Site Inspection Report (NOW)	
Current issues (SW)	
Community Consultation (all)	
Amendments to Mgt Plan (SW)	
Other Business	
Set next meeting date, time & venue	

Typical attachments to minutes:

- NOW Inspector's Report & covering letter
- Copy of Issues Register for last 4 months
- Updated Action Sheet for Water Supply
- Updated Action Sheet for Sewerage
- Email from NSW Health

Core Invitees: Anne Dennis (LALC-CEO), Anthony Burke (Contractor), Trent Betts (NOW Inspector).

Other Invitees (optional to attend): K.C. (LWU), Thadd Nagas (Health)

Distribution List: As above, plus Bala (NOW), Sandy Leask.

Appendix C - Risk Matrix

Table 27: Risk Matrix

Likelihood	Consequence				
	Insignificant *(Almost undetectable)* **1**	**Minor** *(Minor impact on small number of people)* **2**	**Moderate** *(Minor impact on large number of people)* **3**	**Major** *(Major impact on small number of people)* **4**	**Catastrophic** *(Major impact on large number of people)* **5**
Almost certain *(Weekly or daily)* **A**	Moderate	High	Very High	Very High	Very High
Likely *(Monthly)* **B**	Moderate	High	High	Very High	Very High
Possible *(yearly)* **C**	Low	Moderate	High	Very High	Very High
Unlikely *(every 10 years)* **D**	Low	Low	Moderate	High	Very High
Rare *(>every 10 years)* **E**	Low	Low	Moderate	High	High

Appendix D – Monthly Record Sheet

Community: _____ **Month:**_____ **Year:**_____

Completed by Name:_____ **Organisation:** _____

Date	Operational Monitoring Results		Work done by Water Utility, Community or Contractors Or Interruptions to Service
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		
	Sample Site		
	pH		
	Free chlorine		
	Turbidity		

General comments on water and sewerage systems

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At end of each month, fax or email to (02) 9816 0377 or WATEROUAL@doh.health.nsw.gov.au

Any questions contact NSW Health Water Unit on (02) 9816 0589

Instructions for Completing the Monthly Record Sheet

Please record information in the monthly record sheet:

1) During each visit to a community
2) When work is reported to the Local Water Utility/Shoalhaven Water by the community or another agency

Please ensure notes are made on all work that has been carried out. Works may include the installation or commissioning of chlorination equipment, installation of new sewer pumps, flushing mains, cleaning reservoirs and servicing AWTS or any other works.

Be sure to record who has carried out the work and when it was completed.

Please use additional pages if required.

If you wish to modify this form please contact the NSW Health Water Unit on (02) 9816 0589 or by email **WATERQUAL@doh.health.nsw.gov.au**.