


Greater Hume Shire Council



Risk-Based Drinking Water Management System Culcairn and Villages Water Supply Systems

November 2016

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The original DWMS was prepared by NSW Public Works with support from NSW Health.

The DWMS was comprehensively reviewed in October 2016 through a review workshop and version 2.0 was prepared by: Viridis Consultants Pty Ltd [www.viridis.net.au], with support from NSW Health.

Executive summary

Plan purpose

This document and the supporting systems demonstrate Greater Hume Shire Council's compliance with the requirements in the *Public Health Act 2010* (NSW) to develop a drinking water management system that addresses the twelve elements of the "Framework for Drinking Water Quality Management" provided in the *Australian Drinking Water Guidelines 2011 by 1st September 2014*. This document acts as the framework for the activities that Council undertakes to ensure the provision of safe drinking water to its customers. This document includes or references other supporting processes, procedures, registers, policies and systems that collectively form council's DWMS, including the key ones listed below:

- Drinking Water Quality Policy
- *Risk Assessment Workshop - Output Paper, Greater Hume, 2014.*
- Critical Control Point (CCP) and Standard Operation Procedures (SOPs), 2016.
- Drinking Water Quality Incident and Emergency Response Plan, 2016.
- Incident Contacts and Stakeholders Register
- *Drinking Water Quality Improvement Plan – Greater Hume, 2016.*

Critical Control Points

The day to day safety of the water is maintained by monitoring critical control points. The critical control points are referenced in this document.

Improvement plan

An Improvement Plan, which demonstrates council's continual improvement process has been developed as an excel spreadsheet, and is part of the DWMS (key supporting document). It includes actions identified through the risk assessment, reviews, audits and incident investigations. The actions are assigned to staff members, and if necessary, external contractors/consultants to follow-up. The improvement plan is to be reviewed regularly as actions are completed and at least annually when the DWMS Annual Report is compiled.

Drinking Water Management System review

This management system is reviewed internally on an annual basis and comprehensively by an independent party every 4 years (comprehensive review is to be undertaken in 2018).

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Introduction

Overview

The *NSW Public Health Act 2010* (the Act) was passed by Parliament at the end of 2010 and came into effect on 1 September 2012. The Act includes the requirement for water suppliers to produce a drinking water management system that complies with the Public Health Regulation 2012 (NSW) (The Regulation). This document forms Greater Hume Shire Council's drinking water management system and is based on the 12 Elements, 32 Components and 76 Actions of the "Framework for the Management of Drinking Water Quality" provided in the *Australian Drinking Water Guidelines (ADWG) 2011*.

Purpose

This document acts as the framework for the activities that Council undertakes to ensure the provision of safe drinking water to its customers.

The document is supported by a range of procedures, registers, data management systems, flow diagrams and process and instrumentation diagrams which are all referenced at appropriate points in this document.

This Drinking Water Management System and the supporting documentation are living documents that should be reviewed and updated in a timely manner.

The implementation of this management system and the supporting documents, the Critical Control Point procedures, Standard Operating Procedures, Drinking Water Quality Incident and Emergency Response Plan and Improvement Plan, will assist Greater Hume Shire Council to ensure that the water supplied is safe for human consumption.

Drinking Water Management System structure

The following sections describe how Greater Hume Shire Council meets the requirements of the twelve elements of the Framework for the Management of Drinking Water Quality. This document is supported by several reference documents which are referenced.

1 Element 1: Commitment to Drinking Water Quality Management

1.1 Drinking water quality policy

- Formulate a drinking water quality policy, endorsed by senior executives, to be implemented throughout the organisation.
- Ensure that the policy is visible and is communicated, understood and implemented by employees.

Council's drinking water quality policy statement is provided below.

The policy will be adopted by council to demonstrate compliance with drinking water quality management.

The policy intent has been effectively communicated and is understood by staff through the DWMS review workshop in October 16.

Greater Hume Shire Council is committed to managing its water supply effectively to provide a safe, quality product that consistently meets appropriate drinking water standards developed in accordance with the *Australian Drinking Water Guidelines* and other regulatory requirements.

To achieve this, **Greater Hume Shire Council** will implement and maintain a *Drinking Water Management System* to effectively manage the risks to drinking water quality.

In partnership with relevant stakeholders, **Greater Hume Shire Council** will:

- manage water quality at all points, from catchment (where possible) through to treatment, storage and distribution;
- use a risk-based approach in which potential threats to water quality are identified and balanced;
- develop incident response processes to deal with any water quality issues identified;
- ensure that employees and any contractors involved in the supply of drinking water understand their responsibility and are appropriately trained to implement the *Drinking Water Management System*;
- routinely monitor the quality of drinking water; use effective reporting mechanisms to provide relevant and timely information; and promote confidence in the water supply and its management;
- comply with the regulatory requirements of the Public Health Act 2010 (NSW) and associated Public Health Regulation 2012; and
- continually improve our practices by assessing performance against criteria stated in the *Drinking Water Management System*.

All managers and employees involved in the supply of drinking water are responsible for understanding, implementing, maintaining and continuously improving the *Drinking Water Management System*.

1.2 Regulatory and formal requirements

- Identify and document all relevant regulatory and formal requirements.
- Ensure responsibilities are understood and communicated to employees.
- Review requirements periodically to reflect any changes.

Regulatory and formal requirements are communicated to staff as required through toolbox talks or monthly meetings, which are minuted as appropriate.

Notifications of changes to regulatory and formal requirements are communicated by InfoXpert throughout Council and also automatically delivered to Manager Water & Wastewater who signs off as having seen it. The Manager Water & Wastewater then informs staff of changes.

Table 1 is reviewed annually when the DWMS Annual report is compiled.

Table 1: Sample of a stakeholder register

INSTRUMENT	JURISDICTION	TYPE	RELEVANCE
<i>Plumbing and Drainage Act 2011</i>	NSW	Statute	Largely for management of the distribution system including legislative requirements for plumbing and drainage works
<i>Plumbing and Drainage Regulation 2012</i>	NSW	Regulation	Largely for management of the distribution system including legislative requirements for plumbing and drainage works
<i>AS/NZS 3500 Plumbing and Drainage Set</i>	National	Standard	Largely for management of the distribution system including standards for plumbing and drainage issues
<i>Plumbing Code of Australia 2013</i>	National	Standard	Largely for management of the distribution system including standards for plumbing and drainage issues
<i>Australian Drinking Water Guidelines 2011</i>	National	Guideline	Sets frameworks and guidance for the provision of safe, quality drinking water
<i>Local Government Act 1993</i>	NSW	Statute	Urban water services and management/review of on-site sewage management systems; Have only persons licensed or certified under the <i>Home Building Act 1989</i> (or supervised by such a person) carry out any water supply work, sewerage work or stormwater drainage work. Preparation of Asset Management Plans
<i>Public Health Act 2010</i>	NSW	Statute	Protection of public health, follow any advice issued from the Chief of Health regarding drinking water safety to the public; sample drinking water in accordance with NSW Health recommendations. Prepare a drinking water management system.
<i>Public Health Regulation 2012</i>	NSW	Regulation	Requirement to prepare a drinking water management system in accordance with the ADWG Framework for Management of Drinking Water Quality. Requirement to keep records of all water carters supplied.
<i>Protection of the Environment Operations Act 1997</i>	NSW	Statute	Environmental protection including licensed discharges.

INSTRUMENT	JURISDICTION	TYPE	RELEVANCE
<i>NSW Water and Sewerage Strategic Business Planning Guidelines</i>	NSW	Guidelines	Prepare Strategic Business plans including a review of the operating environment and IWCM which should identify key water quality issues in the catchment.
<i>NSW Health Drinking Water Monitoring Program</i>	NSW	Guidelines	Free-of-charge testing for water supply system monitoring of indicator bacteria and health-related inorganic chemicals. Includes NSW Health Response Protocols for chemical and microbial quality, treatment failure and <i>Cryptosporidium</i> and <i>Giardia</i> .

1.3 Engaging stakeholders

- Identify all stakeholders who could affect, or be affected by, decisions or activities of the drinking water supplier.
- Develop appropriate mechanisms and documentation for stakeholder commitment and involvement.
- Regularly update the list of relevant agencies.

Key stakeholders relevant to drinking water quality management include:

- NSW Health
- DPI Water
- Albury City Council (ACC)

Other stakeholders are involved when and as required, for example, vulnerable customers, water testing laboratory, emergency contacts.

The contact details for all stakeholders, including when they are involved/contacted is maintained in an Incident Contacts and Stakeholders register (excel spreadsheet), which is reviewed annually when the DWMS Annual report is compiled.

2 Element 2 – Assessment of the drinking water supply system

2.1 Water supply system analysis

- Assemble a team with appropriate knowledge and expertise.
- Construct a flow diagram of the water supply system from catchment to consumer.
- Assemble pertinent information and document key characteristics of the water supply system to be considered.

The Risk Assessment Team composition is shown in Table 2; other stakeholders are invited as required. When a risk assessment is undertaken, the workshop participants are recorded in the respective Risk Workshop report.

The original Risk Assessment Workshop was held on 5th-6th February 2014.

Table 2: Risk Assessment Team Composition

Organisation	Role
Greater Hume Shire Council	Manager Water & Wastewater
Greater Hume Shire Council	Overseer Water & Wastewater
Greater Hume Shire Council	Operators - Water & Wastewater)
NSW Health, Public Health Unit	Environmental Health Officer
DPI Water	Water and Sewerage Inspector
Contractor	Workshop Facilitator

Flow diagrams of the water supply system from catchment to consumer are shown in Figure 1 and Figure 2 for Culcairn and Villages Water Supplies respectively.

2.1.1 Overview

Greater Hume Shire Council (GHSC) is a Local Government Area (LGA) formed in 2004, incorporating Culcairn Shire, the majority of Holbrook Shire and part of Hume Shire.

Greater Hume Shire includes 5 towns which are Holbrook, Culcairn, Henty, Jindera and Walla Walla and seven villages which are Morven, Brocklesby, Bungowannah, Burrumbuttock, Gerogery, Gerogery West and Walbundrie. The shire population in 2012 was 10,423 (ABS 2012). **Figure 1** shows GHSC boundaries.

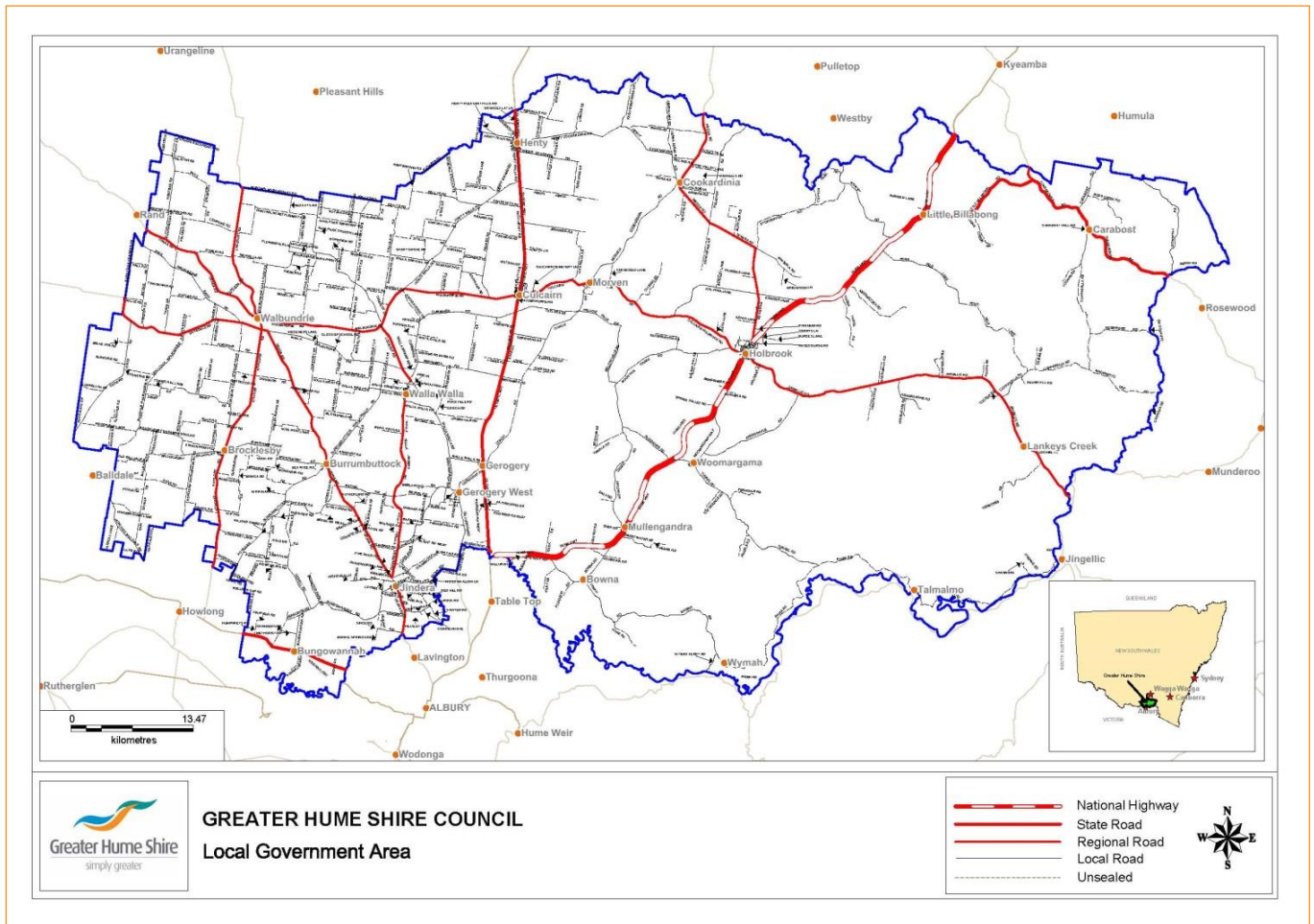


Figure 1: Greater Hume Shire Local Government Area

2.1.2 General description of catchment:

Greater Hume Shire is situated in the Riverina Region of southern New South Wales. The Shire occupies an area of 5,929 km² and is approximately 110 km from east to west and 60 km north to south. (GHSC Asset Management Policy, June 2009).

The majority of the Shire is comprised of rural land, and the predominant use of rural land is agriculture and more specifically dryland cropping and grazing; the main crops are cereal and canola with sheep and cattle grazing. In the ABS Agricultural Census for 2011 (ABS 2011), Greater Hume was recorded as having 444,094 ha of agricultural land. Some areas along large gullies have been fenced off to protect native vegetation (Department of Sustainable Natural Resources 2003).

The Shire contains two national parks and five nature reserves, including the Woomargama National Park located 25 km south east of Holbrook. This park is the largest protected area west of the Great Dividing Range in south-eastern NSW.

2.1.3 Greater Hume Shire Council Water Supply Schemes

Greater Hume Shire Council is responsible for two water supply schemes:

- Culcairn Water Supply - urban area only
- Villages Water Supply (Jindera, Burrumbuttock, Brocklesby, Gerogery, Gerogery West, and connected rural areas).

Water Supply for the townships of Henty, Holbrook, Morven, Walla Walla, Walbundrie, and Woomargama is provided by Riverina Water.

Culcairn Water Supply

The Culcairn Water Supply, independently owned and operated by Greater Hume Shire Council, was originally constructed in 1932 and supplies water to approximately 1300 people in the urban area of Culcairn. This water supply is sourced from groundwater (one primary bore in use, and one bore is for emergency use only) fitted with submersible pumps and treatment of water from these sources is undertaken at the Culcairn Water Treatment Plant. The system comprises two reservoirs and 21 km of reticulation.

Villages Water Supply

The Villages Water Supply, also independently owned and operated by Greater Hume Shire Council, was constructed in 1983 and supplies water to approximately 3200 people within the townships and villages of Jindera, Burrumbuttock, Brocklesby, Gerogery, Gerogery West and many rural properties in between. Bulk treated water for the Villages Water Supply is sourced via the Albury City Council's supply system.

All townships and villages have a single reticulation water supply system comprising of filtered water only. GHSC operates five reservoirs with 71 km of trunk mains, 54 km of reticulation mains within the villages and the pump station which receives the water from Albury.

The following figure shows the main supply route and reticulation plans for Jindera, Burrumbuttock, Brocklesby, Gerogery and Gerogery West.

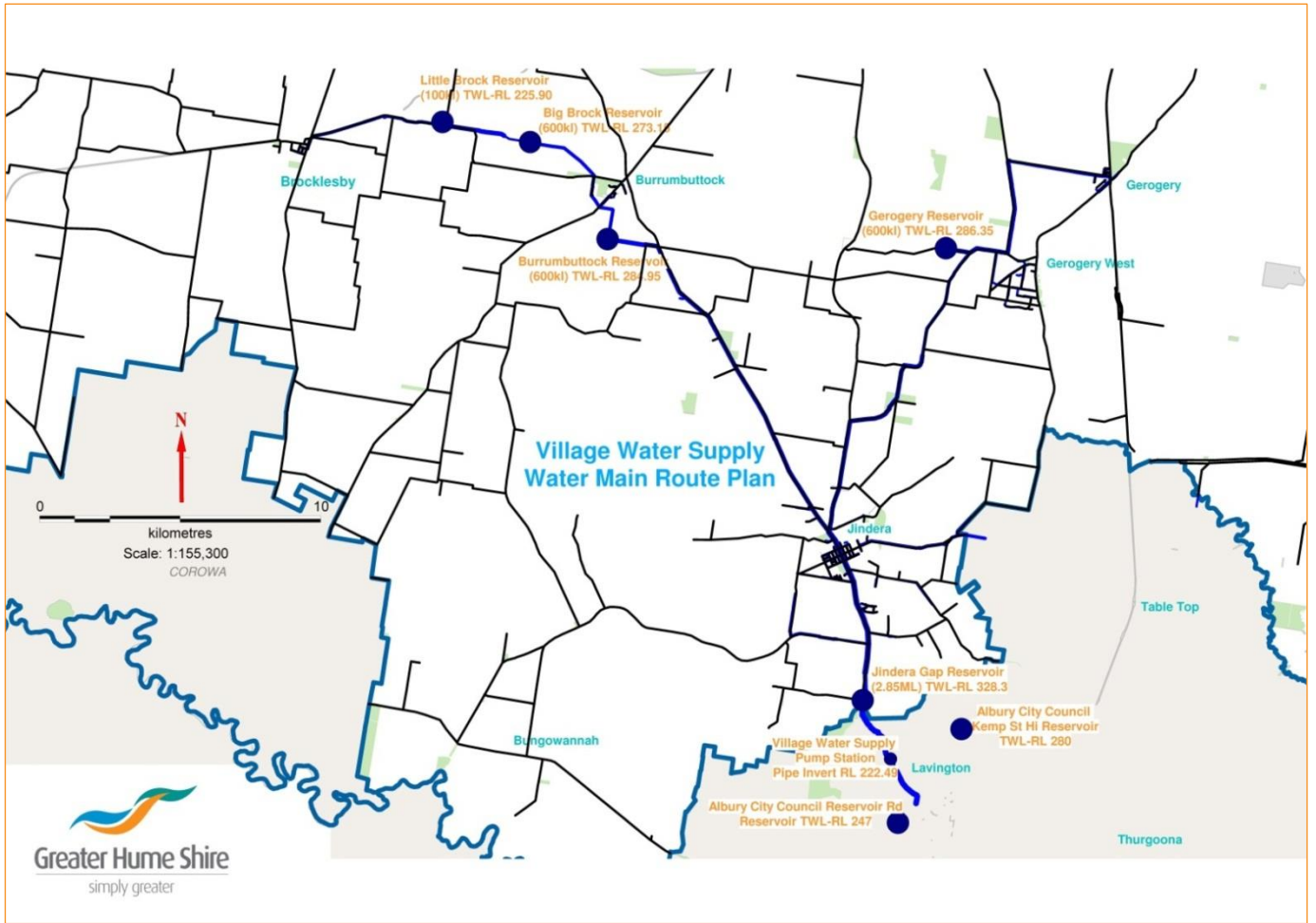


Figure 2: Villages Water Supply Main Route Plan

2.1.4 Culcairn Water Supply

Water treatment plant

The Culcairn Water Treatment Plant is owned and operated by GHSC. It is located in Water Works Road Culcairn and supplies drinking water to 1300 residents in the Culcairn township urban area. Water is sourced from a ground water bore. The aquifer is located at approximately 80m below ground level and is considered to be a secure supply.

The current plant operates 7 days a week and can process up to 2.5ML/d peak production capacity. Average daily demand is 0.45ML/d and the historical peak daily demand between 2003 and 2008 was 1.4ML/d. The plant does not run continuously; it runs for anywhere between 3 and 12 hours a day depending on demand.

The capacity of Culcairn water treatment plant and its current water allocation of 450ML/y are sufficient to supply water in the foreseeable future (GHSC 2012).

The treatment process

Groundwater is pumped from the primary bore located approximately 120m south of the water treatment plant. Water is transferred at 30L/s through a forced draft, totally enclosed segregated aeration tower. This process oxidises the iron, and removes the carbon dioxide which increases the pH and stabilises the water.

Just prior to the aeration tower, the water is disinfected by dosing sodium hypochlorite. From the aeration tower, the water enters the treated water storage (100kL) tank. The water treatment plant is attended every day to conduct maintenance and operational water quality monitoring for pH, turbidity, free and total chlorine residuals.

Water distribution system

The Culcairn Water Supply distribution system consists of 4km trunk rising mains, 17km reticulation mains and two reservoirs, Gordon Street reservoir (378kL) and Black Street Reservoir (1000kL).

Treated water is transferred by the relift pump from the water treatment plant storage tank, north into Culcairn township reticulation and reservoirs via a 200mm x 4km trunk rising main.

The reticulation system in Culcairn is a ring main system with 17 km pipeline. Water is stored in the Gordon Street reservoir while the Black Street reservoir is filled indirectly through the town's reticulation. Both reservoirs are roofed and bird-proofed. They are inspected periodically and are maintained at full level.

Every 3 years the reservoirs are cleaned, inspected and reported upon by a diving crew company (Aqua Lift). Any repairs are budgeted for and carried out promptly.

The Gordon Street reservoir has point to point telemetry with the WTP which controls the relift pump to transfer water to the Culcairn Township. A data logger is located at the WTP to continuously monitor flows, power failures, pump faults, high and low level alarms. The data logger has backup batteries in case of power failure. Operators can check reservoir levels and receive alarms on their mobile phones.



Culcairn Water Supply WTP Process, Distribution System Flow Diagram & Water Quality Monitoring Sites

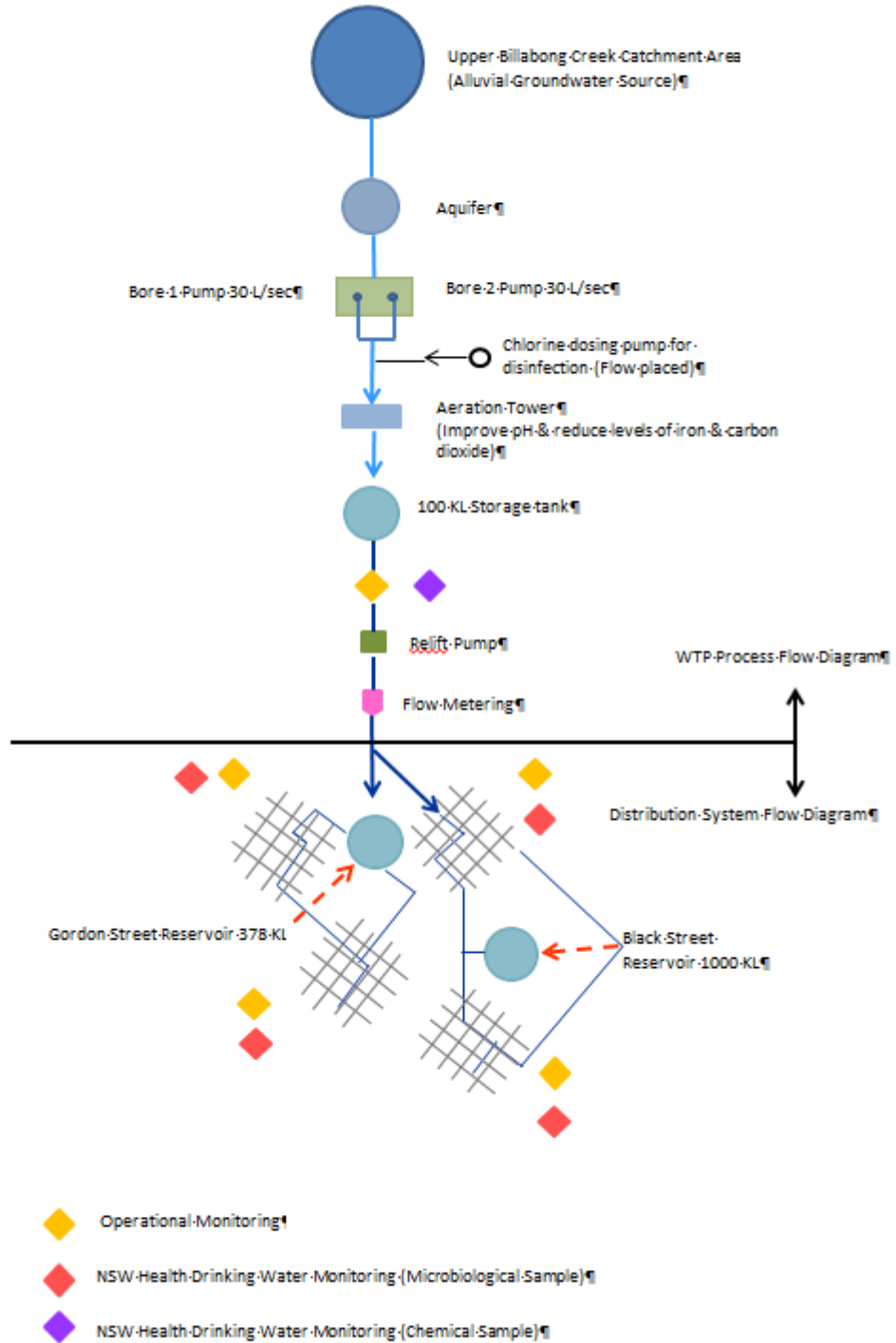


Figure 3: Culcairn Water Supply WTP Process, Distribution System Flow Diagram & Water Quality Monitoring Sites

2.1.5 Villages Water Supply Filtration and Treatment

Bulk treated water for the Villages water supply is received from Albury City Council.

Filtration and Treatment

The filtration and treatment process is owned and operated by Albury City Council. The filtration plant is located in Water Works and Boundary Roads East Albury. The plant operates 24 hours a day, 7 days a week and can process 140ML of water per day, which is the equivalent of 56 Olympic-sized swimming pools.

The Treatment Process

The following information is from Albury City Council website (ACC 2013).

Raw (untreated) water is pumped directly from the Murray River by one of three pump stations located directly opposite the water filtration plant, and approximately 1.3km and 4.2km upstream of the plant. The pumps are strategically located at these points on the river to ensure that pumps can draw the best quality water available at any particular time.

When the raw water arrives at the plant, it goes through the various treatment processes. Specific chemicals are added to improve water quality. For example:

- Powdered activated carbon is added to remove algal toxins and control the smell of the water by reducing the levels of methylisoborneol (commonly known as MIB) and geosmin.
- Alum (aluminium sulfate) and polyelectrolyte (a non-ionic polymer) are added to assist with the coagulation and flocculation process. Essentially, these chemicals cause the dirt particles to stick together so that it is easier to filter them out.
- Lime is added to remove the acidity caused by the alum.
- Fluoride is added to improve dental health.
- Chlorine gas is used as a disinfectant to kill any micro-organisms.

The water is then passed through a filter medium consisting of layers of gravel and sand, topped with a layer of anthracite (a hard filter coal), to remove dirt particles.

The filters must be cleaned every 8 to 24 hours depending upon the quality of the raw water. To clean the filters, clean water is pumped back through the filters to remove accumulated dirt. The backwash water is then discharged to one of the four sludge lagoons, where the dirt settles. The return water is then pumped back to the filtration plant and mixed with the incoming raw water. Approximately every 12 months, the lagoon is allowed to dry out and the dried sludge is either disposed off-site or spread over the facility grounds as topsoil.

Water Distribution System

The Village Water System, owned and operated by GHSC is a series of trunk mains, reticulation mains and service reservoirs that supply the southern township/villages of GHSC LGA. Filtered water is supplied to approximately 3200 people within the township and villages of Jindera, Burrumbuttock, Brocklesby, Gerogery, Gerogery West and many rural properties in between. Refer to **Figure 4** for the Village Water Supply flow diagram.

Filtered water is sourced via the Albury City Council (ACC) supply system at two locations – Jindera Gap WSPS and the point at which the two LGA boundaries meet on Dights Forest Road, where Albury City Council Table Top Water Supply Scheme and Greater Hume Shire Council Village Water Supply Scheme trunk mains link together.

The Village Water Supply (VWS) and Table Top Water Supply (TTWS) Scheme were originally owned and operated by the previous Hume Shire Council. These two schemes were linked together to balance the system as the Jindera Gap and Table Top reservoir top water level are the same. When the new Council (GHSC) was formed in 2004 it took over the VWS and ACC took ownership of the TTWS. A meter was installed at the new LGA boundary by ACC to measure the flow of water in both directions.

The Jindera Gap WSPS, owned and operated by GHSC, is located along Urana Road, Lavington and is GHSC's main source of water from ACC. Filtered water gravitates from ACC Kemp Street High level reservoir to Jindera Gap WSPS. Two 90kW pumps transfer the water at 60L/s along a rising trunk main (2.2km x 250mm dia), to the Jindera Gap 2.85ML concrete reservoir. GHSC supplies water to 10 ACC residents whose properties are connected to the rising trunk main. These residents are rated by ACC.

The water is then transferred by gravity trunk mains from the Jindera Gap reservoir to each of the townships/villages through a network of trunk mains (71km), reticulation mains (54km) and four other reservoirs. The other reservoirs are situated along the main trunk lines and are located on the downstream side of each village. These are Burrumbuttock reservoir (600kL), Big Brock reservoir (600kL), Little Brock reservoir (100kL) and Gerogery reservoir (600kL).

All reservoirs are roofed and bird-proofed and are inspected and monitored twice weekly, with periodic detailed inspections. Depending on chlorine demand, calcium hypochlorite tablets are added to each reservoir for disinfection. Every three years the reservoirs are cleaned, inspected and reported upon by a diving crew company (Aqua Lift). Any repairs are budgeted for and carried out promptly.

The Jindera Gap reservoir has telemetry which controls the Jindera Gap WSPS and also continuously monitors high and low level alarms. This reservoir also has a backup dialler to monitor any telemetry failure.

For operational monitoring the Village Water Supply Scheme is divided into 4 zones:

Zone 1 – from Jindera Gap WSPS, Jindera Gap reservoir, Jindera village and to Burrumbuttock and Gerogery inlet side of reservoir.

Zone 2 – from and including Burrumbuttock reservoir, Burrumbuttock village, Big Brock reservoir and to the inlet side of Little Brock reservoir.

Zone 3 – from and including Little Brock reservoir and to Brocklesby village.

Zone 4 – from and including Gerogery reservoir, Gerogery West and to Gerogery village.

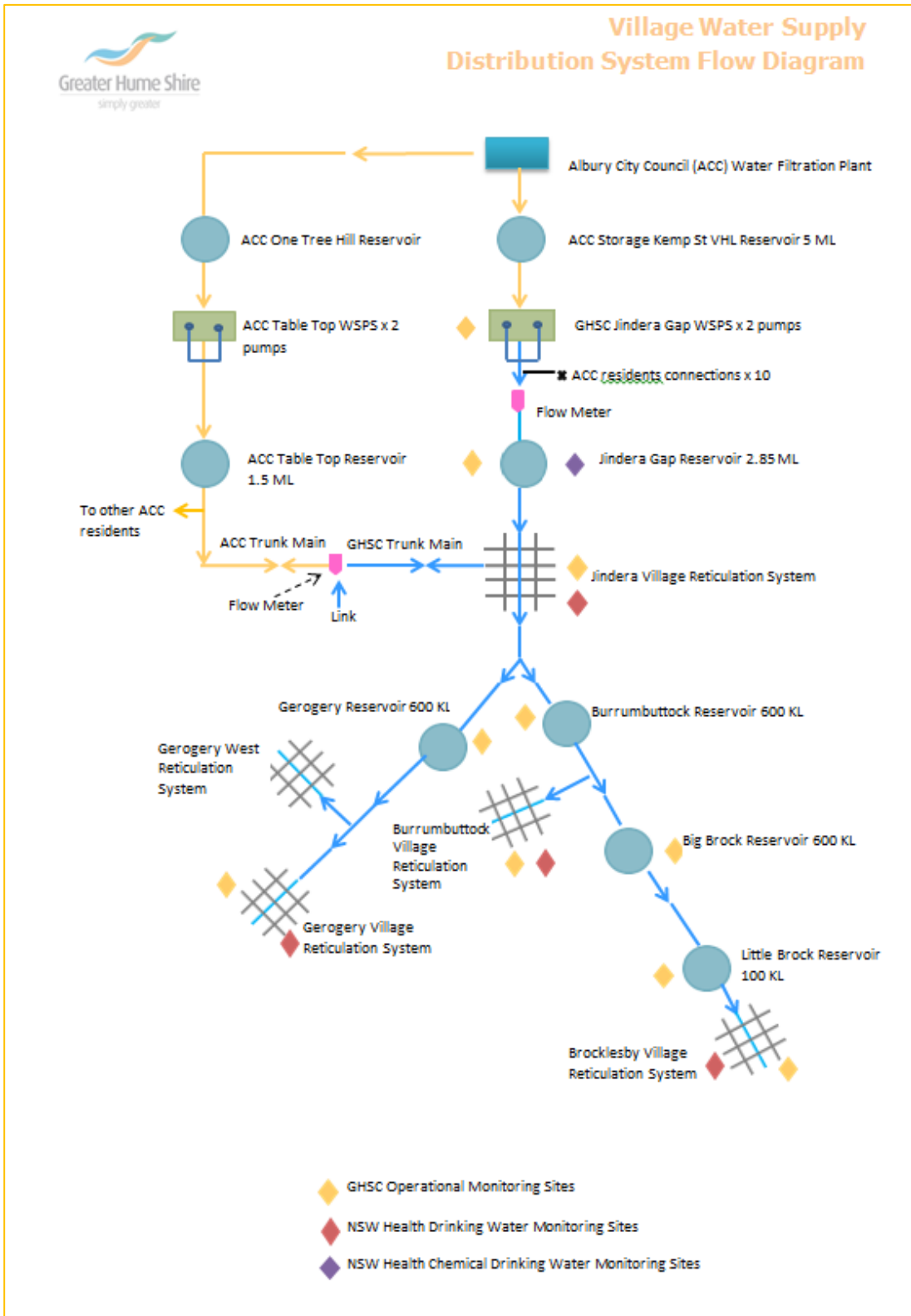


Figure 4: Village Water Supply Distribution System Flow Diagram

2.1.6 Other Notes:

Council has undertaken a joint Integrated Water Cycle Management plan (IWCM) evaluation study in March 2010, which also includes Riverina Water County Council, Wagga Wagga City Council, Lockhart Shire Council and Urana Shire Council.

Council also has a drought management plan 2014. A demand management plan was developed in 2012.

Council's annual operations plan is contained in the following documents:

- Delivery Plan - Budget - Water Fund
- Water Supply Asset Management Plan
- Delivery Program and Operational plan

Council has a septic tank register called OSMS Inspection Register, which contains a list of all septic tanks, with information on location, owner, date of inspection, date of approval and risk rating.

Council is continuing inspections of septic tanks, with the tanks rated as having a higher risk being inspected first.

2.2 Assessment of water quality data

- Assemble historical data from source waters, treatment plants and finished water supplied to consumers, over time and following specific events.
- List and examine exceedances.
- Assess data using tools such as control charts and trends analysis to identify trends and potential problems.

Long term historical water quality data relevant for each scheme are analysed prior to the risk assessment workshop, the results of which are captured in the respective Risk Workshop Report (e.g. Risk Assessment Workshop – Output Paper for Greater Hume, 2014).

2.3 Hazard identification and risk assessment

- Define the approach and methodology to be used for hazard identification and risk assessment.
- Identify and document hazards, sources and hazardous events for each component of the water supply system.
- Estimate the level of risk for each identified hazard or hazardous event.
- Evaluate the major sources of uncertainty associated with each hazard and hazardous event and consider actions to reduce uncertainty.
- Determine significant risks and document priorities for risk management.
- Periodically review and update the hazard identification and risk assessment to incorporate any changes.

The approach and methodology used for the risk assessment is included in the *Water Quality Risk Assessment Workshop Output Paper*. Risks were assessed as both uncontrolled (i.e. inherent risk) and controlled (i.e. residual risk). The hazards and hazardous events identified as having a “high” or “very high” residual risk are listed in **Table 3** below. Detailed assessment is presented in the risk report.

The risk assessment will be reviewed comprehensively every 4 years (with the next review due in 2018), unless there is a significant change to the supply schemes (e.g. treatment processes).

Table 3: Hazardous events with very high and high residual risks

Culcairn Water Supply

Residual risk	Hazard	Hazardous event
Very high	RESERVOIR	
	Biological contamination	Long residence time in Black Street Reservoir (common inlet/outlet).
High	SOURCE	
	Chlorine resistant pathogens	Contamination from 1 in 100 year flood event.
	Chlorine sensitive pathogens	Contamination from an incident.
	Turbidity	High turbidity at bore startup. This has been alleviated now with the new bore. Refer to DWMS Annual Report 2015/16.
	Selenium	Reticulated water contains selenium. This has been alleviated now with the new bore. Refer to DWMS Annual Report 2015/16.
	TREATMENT PLANT	
	Chlorine-sensitive pathogens	Underdose of chlorine due to equipment failure and/or operator error. CCP is being implemented now, no issues observed.
	Chemical contamination	Sabotage at plant.
	RESERVOIR	
	Biological contamination	Contamination into reservoir. Dust can enter.

Villages Water Supply

Residual risk	Hazard	Hazardous event
Very high	OFFTAKES	
	Chlorine sensitive pathogens	Low free chlorine residuals at offtakes.
High	OFFTAKES	
	Water not meeting ADWG.	Non-compliant water from Albury City Council.
	RESERVOIR	
	Biological contamination	Contamination into reservoir.
	Biological contamination	Short circuiting due to bottom inlet outlet.
	Chemical contamination	Sabotage

3 Element 3: Preventive measures for drinking water quality management

3.1 Preventive measures and multiple barriers

- Identify existing preventive measures from catchment to consumer for each significant hazard or hazardous event and estimate the residual risk.
- Evaluate alternative or additional preventive measures where improvement is required.

This was assessed as part of the Drinking Water Quality Risk Assessment Workshop on the 5th-6th February 2014 and the barriers were listed for possible hazards (Refer to Drinking Water Quality Risk Assessment Workshop-Output Paper). Gaps identified in the workshop were noted and are included in the Improvement Plan.

3.2 Critical Control Points

- Assess preventive measures from catchment to consumer to identify critical control points.
- Establish mechanisms for operational control.
- Document the critical control points, critical limits and target criteria.

This was assessed as part of the Drinking Water Quality Risk Assessment Workshop on the 5th-6th February 2014.

For a point to satisfy the requirements of a CCP it must:

- Control hazards that represent a significant risk and require elimination or reduction to assure supply of safe drinking water
- Have a parameter (surrogate) that can be measured in a timely manner for the hazardous event
- Be able to have a correction applied in a timely manner in response to a deviation in the process

The CCPs were reviewed in October 2016 to ensure consistency with the definition of a CCP. There is one primary disinfection CCP for Culcairn. There are no CCPs identified for the Village scheme as it is only a bulk treated water distribution system.

However, note that there are important operational monitoring parameters and detailed reservoir inspections, which are undertaken as part of the operational monitoring plan.

Table 4: Critical Control Point Summary Tables**Culcairn Water Supply**

Control Point	Hazard	Control Parameter	Operational Target	Adjustment Limit	Critical Limit
CCP1 – Primary Disinfection Hypochlorite	Chlorine sensitive pathogens.	Free chlorine	0.5 mg/L to 1.5 mg/L	<0.5 or >1.5 mg/L at Relift Pump discharge	<0.3 mg/L or >5 mg/L at Relift Pump discharge

4 Element 4: Operational Procedures and Process Control

4.1 Identify procedures required for processes and activities from catchment to consumer

- Document all procedures and compile into an operations manual.

Procedures have been identified for processes and activities from catchment to consumer. The table below lists all the operational procedures available to control significant risks for the supply schemes. The procedures are part of the CCP and SOPs document (supporting document of the DWMS). The procedures which need to be developed are part of the Improvement Plan.

Table 5: Operational Procedures

Process Control	Procedure(s)	Status
Bore field / incoming bulk treated water	<ul style="list-style-type: none"> Septic inspection program 	Ongoing through planning section
	<ul style="list-style-type: none"> Water supply agreement (with water quality considered) 	To be discussed with ACC and developed
Extraction	<ul style="list-style-type: none"> Licence (bore) DPI customer account number 29704 450 ML/year 	Available
Culcairn WTP operation	<ul style="list-style-type: none"> Daily Inspections 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Topping up sodium hypochlorite tank 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Adjustment of sodium hypochlorite dose 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Pump drop test 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Hypochlorite dosing pump instruction sheets 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Testing sodium hypochlorite strength 	Available – CCP and SOPs document
Culcairn Disinfection	<ul style="list-style-type: none"> CCP Chlorination 	Available – CCP and SOPs document
Village supplies	<ul style="list-style-type: none"> Routine inspections 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Calcium hypochlorite dosing at reservoirs 	Available – CCP and SOPs document
Monitoring	<ul style="list-style-type: none"> Sample collection 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> In-house testing 	Equipment manual
	<ul style="list-style-type: none"> Monitoring plan 	Available, part of DWMS

Process Control	Procedure(s)	Status
Protection and Maintenance of Distribution System	<ul style="list-style-type: none"> Reservoir inspection 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Reservoir cleaning 	External contractor every 4 years
	<ul style="list-style-type: none"> Mains flushing 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> New mains commissioning 	Available – CCP and SOPs document
	<ul style="list-style-type: none"> Backflow policy 	To be developed
Chemical Procurement and delivery	<ul style="list-style-type: none"> Chemical control procedure 	Financial procurement process
	<ul style="list-style-type: none"> Chemical Safety and Handling 	Available – CCP and SOPs document
Calibration of equipment	<ul style="list-style-type: none"> Calibration schedule and records 	To be developed
Water Carting	<ul style="list-style-type: none"> Water carters register and process 	Available
Customer complaints	<ul style="list-style-type: none"> Responding to customer complaints 	Available, CRM used

4.2 Operational monitoring

- Develop monitoring protocols for operational performance of the water supply system, including the selection of operational parameters and criteria, and the routine analysis of results.
- Document monitoring protocols into an operational monitoring plan.

Council maintains water quality records of water produced from Culcairn WTP, and the reservoirs and reticulation systems of the Villages Water Supply. Council has a record of all sampling points. Council’s operators maintain daily records of raw water flow rate, pH, turbidity, bore run times and number of startups on logsheets. These are delivered every month to the Manager Water & Wastewater. Council’s Manager Water & Wastewater regularly reviews these results at least once a month and maintains more frequent informal communications with operators.

Council has no online water quality monitoring equipment currently.

The operational and verification (Element 5) monitoring plan for the schemes are described in Table 6 and Table 7.

Table 6: Water quality monitoring plan for the Culcairn Water Supply

Type of Monitoring	Location	Site (if applicable)	Parameters being measured	Frequency of measurements	Triggers for action
Operational monitoring	Culcairn Water Treatment	N/A	pH Turbidity Free chlorine Total chlorine	Daily	pH >8.0 Turbidity >1 NTU Chlorine – refer to CCP procedure
Operational monitoring	Culcairn distribution system (Retic – 4 locations)	5 South Street Culcairn 45 McBean Street Culcairn 101 Munro Street Culcairn Wattle Street Culcairn	pH Turbidity Free chlorine Total chlorine	All locations per week	pH <6.5 or >8.5 Turbidity >2 NTU Free chlorine <0.2 mg/L
Operational monitoring	Service reservoirs	All service reservoirs	Detailed reservoir inspection	6 monthly	Refer to SOP on reservoir inspection
Verification - NSW Health Drinking Water Monitoring	Culcairn distribution system (Retic)	GH02002 5 South Street Culcairn GH02003 45 McBean Street Culcairn GH02004 101 Munro Street Culcairn GH02005 Wattle Street Culcairn	Microbiological (<i>E.coli</i> & Total Coliforms)	One location per week	<i>E. coli</i> – not detected. As per ADWG and advised by the testing laboratory
Verification - NSW Health Drinking Water Monitoring	Culcairn Water Treatment Plant	GH02001	Physical & Chemical Quality	6 Monthly	As per ADWG and advised by the testing laboratory

Table 7: Water quality monitoring for the Village Water Supply

Type of Monitoring	Location	Site (if applicable)	Parameters being measured	Frequency of measurements	Triggers for action
Operational monitoring	Jindera Gap WSPS, Urana Road Lavington	N/A	pH Turbidity Free chlorine Total chlorine	Weekly	pH >8.0 Turbidity >1 NTU Free chlorine <0.2 mg/L Contact ACC.
Operational monitoring	Village Water Supply distribution system (Reservoirs)	<u>Zone 1</u> Jindera Gap Reservoir <u>Zone 2</u> Burrumbuttock Reservoir <u>Zone 3</u> Little Brock Reservoir <u>Zone 4</u> Gerogery Reservoir	pH Turbidity Free chlorine Total chlorine	One location from each zone is monitored weekly	pH >8.5 Turbidity >1 NTU Free chlorine <0.5 mg/L, add chlorine tablets. Maintain chlorine target close to 0.5 mg/L.
Operational monitoring	Service reservoirs	All service reservoirs	Detailed reservoir inspection	6 monthly	Refer to SOP on reservoir inspection
Operational monitoring	Village Water Supply distribution system (Retic)	<u>Zone 1</u> Pioneer Park Jindera Jindera Hall Farm 'Springhurst' Urana Road Jindera <u>Zone 2</u> Burrumbuttock Hall Greschke Park Burrumbuttock Big Brock Reservoir <u>Zone 3</u> Brocklesby Hall Brocklesby School <u>Zone 4</u> Gerogery Park Gerogery Hall	pH Turbidity Free chlorine Total chlorine	One location from each zone is monitored weekly	pH >8.5 Turbidity >5 NTU Free chlorine <0.2 mg/L, add chlorine tablets. Maintain chlorine target between 0.2-0.5 mg/L.

Type of Monitoring	Location	Site (if applicable)	Parameters being measured	Frequency of measurements	Triggers for action
NSW Health Drinking Water Monitoring	Village Water Supply distribution system (Retic)	GH01004, Zone 1, Jindera Pioneer Park, Urana Road Jindera GH01002, Zone 2, Burrumbuttock Hall, Urana Road Burrumbuttock GH01001, Zone 3, Brocklesby Hall, Main Street Brocklesby GH01003, Zone 4, Gerogery Park, Main Street Gerogery	Microbiological (<i>E.coli</i> & Total Coliforms)	One location per week	<i>E. coli</i> – not detected. As per ADWG and advised by the testing laboratory
NSW Health Drinking Water Monitoring	Jindera Gap WSPS, Urana Road Lavington	GH01999	Physical & Chemical Quality	6 monthly	As per ADWG and advised by the testing laboratory

4.3 Corrective action

- Establish and document procedures for corrective action to control excursions in operational parameters.
- Establish rapid communication systems to deal with unexpected events.

The corrective actions associated with the CCP, is documented in the respective CCP procedure. Corrective actions for deviation from operational limits in Table 6 and Table 7 include: resampling, changing dose rates, system investigation, and communication with supervisor and/or Manager Water and Wastewater.

The Drinking Water Quality Incident and Emergency Response Plan (IERP), section 6.0, also includes communication protocols to deal with unexpected events.

4.4 Equipment capability and maintenance

- Ensure that equipment performs adequately and provides sufficient flexibility and process control.
- Establish a program for regular inspection and maintenance of all equipment, including monitoring equipment.

Council employs an electrical contractor to perform annual preventative maintenance. Calibration of testing equipment is undertaken by the operators.

Further, Council has engaged an external contractor to undertake reservoir maintenance and inspections every 4 years. Inspections assess reservoirs in terms of WH&S, structural, water quality

and security. Critical improvement actions are summarised for Council. Dates of the last cleaning, the next cleaning date, the next inspection date and the depth of sediment deposited is recorded.

4.5 Materials and chemicals

- Ensure that only approved materials and chemicals are used.
- Establish documented procedures for evaluating chemicals, materials and suppliers.

Council maintains a list of chemicals used in the process with information on suppliers, when the delivery is made and where it is used. The chemicals are calcium hypochlorite and sodium hypochlorite, which are approved for use in drinking water by the NHMRC.

Council also has a chemical safety and handling SOP.

5 Element 5: Verification of drinking water quality

5.1 Drinking water quality monitoring

- Determine the characteristics to be monitored in the distribution system and in water as supplied to the consumer.
- Establish and document a sampling plan for each characteristic, including the location and frequency of sampling.
- Ensure monitoring data is representative and reliable.

Greater Hume Shire Council participates in the NSW Health Drinking Water Monitoring Program that provides ongoing verification of the treatment process. Results are recorded in the NSW Drinking Water Database. Water samples are sent to NSW Health's NATA accredited laboratory for testing and Council is informed of any non-compliant test results. Samples are collected in accordance with the *Guide for Submitting Water Samples to FASS (DAL) for Analysis*.

Additional information on the NSW Drinking Water Monitoring Program, as well as a link to the drinking water database and may be found here:

<http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx>

The verification monitoring plan is shown in Table 6 and Table 7.

The sampling locations were reviewed in October 2016 and it was agreed that they are representative.

5.2 Consumer satisfaction

- Establish a consumer complaint and response program, including appropriate training of employees.

Council has a Complaints Handling Policy which details how complaints are captured, assigned to relevant staff, closed off and the customer informed of results. Council's Manager Water & Wastewater is responsible for monitoring complaints. Council's Manager Water & Wastewater will respond to the complainant within 10 days of a complaint being lodged. The complainant is informed in writing at the conclusion of the investigation into the complaint.

Council has internal processes whereby Division Directors and Public Officers, review complaints and Council's response. The review is undertaken every month.

The reporting on water quality customer complaints is part of the DWMS Annual Report.

5.3 Short term evaluation of results

- Establish procedures for the daily review of drinking water quality monitoring data and consumer satisfaction.
- Develop reporting mechanisms internally, and externally, where required.

Daily review of water quality data is undertaken by operators, with reference to trigger limits in Table 6 and Table 7, when testing is undertaken. Council records quantities and water quality for treated water and water in reticulation systems.

Monthly meetings are held to discuss water (and sewer) issues, including data trends from the water quality data recording excel spreadsheets and CCP breach. Actions arising from these meetings are minuted.

For verification monitoring results, the local PHU and Manager Water, Wastewater are notified of sampling results where there is a deviation from ADWG guideline values. Response actions are then enacted by GHSC as per section 6.0 (Element 6).

Council's Complaints Handling Policy explains the process for reviewing, responding to and closing off complaints. Council's Manager Water & Wastewater is responsible for monitoring complaints.

5.4 Corrective action

- Establish and document procedures for corrective action in response to non-conformance or consumer feedback.
- Establish rapid communication systems to deal with unexpected events.

Customer complaints and feedback is managed as explained in section 5.2.

Drinking water quality incidents are managed according to section 6 of this document.

6 Element 6: Management of incidents and emergencies

6.1 Communication

- Define communication protocols with the involvement of relevant agencies and prepare a contact list of key people, agencies and businesses.
- Develop a public and media communications strategy.

Council has informal and constant communication with relevant agencies and stakeholders.

GHSC maintains an Incident Contacts and Stakeholders list (excel spreadsheet) in case of water quality incidents/emergencies, including for vulnerable customers.

The emergency contact list is reviewed annually when the DWMS annual report is compiled.

Details on notification to the public (consumers) and communication is present in council's Drinking Water Quality Incident and Emergency Response Plan (IERP).

6.2 Incident and emergency response protocols

- Define potential incidents and emergencies and document procedures and response plans with the involvement of relevant agencies.
- Train employees and regularly test emergency response plans.
- Investigate any incidents or emergencies and revise protocols as necessary.

Incident and emergency response protocols are regarded as a priority. GHSC uses their Drinking Water Quality Incident and Emergency Response Plan (IERP) for water quality incident management, including staff training on incident management and response actions/investigations to undertake. These are based on the NSW Health protocols.

Water quality incidents and emergencies are reported to the local NSW Health PHU and DPI Water, as required. The need to issue (and withdraw) a boil water alert is assessed in consultation with the local PHU (explained in the DWQ IERP).

7 Element 7: Employee awareness and training

7.1 Employee awareness and involvement

- Develop mechanisms and communication procedures to increase employees' awareness of and participation in drinking water quality management.

Council has an accepted method of operation which staff understand. Some of these methods are documented and laminated copies are visible at the Culcairn WTP. These laminated copies also include the revision date.

Water quality issues are communicated in toolbox meetings and monthly team meetings. Council's Manager Water & Wastewater is also in constant communication with their operators.

7.2 Employee training

- Ensure that employees, including contractors, maintain the appropriate experience and qualifications.
- Identify training needs and ensure resources are available to support training programs.
- Document training and maintain records of all employee training.

Council staff are formally trained and ongoing training occurs. Qualifications held by the water system staff are:

- Part 1 – Water Operating Training Course (PWD) pre 2010
- Part 2 – Water Operating Training Course (PWD) pre 2010
- Part 1 – Water Operating Training Course (OOW) post 2010
- Part 2 – Water Operating Training Course (OOW) post 2010
- Licenced Plumber
- Backflow Prevention Course
- Asbestos Handling Training Course
- Confined Space Entry
- Chemical Handling

Council undertakes a yearly performance review with their staff during which training needs, including refresher training, are identified.

Records are maintained in staff personnel files in Council's HR department.

8 Element 8: Community involvement and awareness

8.1 Community consultation

- Assess requirements for effective community involvement.
- Develop a comprehensive strategy for community consultation.

Council has a documented Community Consultation Plan which is reviewed annually. The Plan comprises the following:

- Holding Council meetings in Culcairn, Holbrook and holding a minimum of 2 annual meetings in other towns, about which the community is informed of well in advance.
- Using the community newsletter to inform the public of Council's activities.
- The use of modern communication methods to engage with the public.

8.2 Communication

- Develop an active two-way communication program to inform consumers and promote awareness of drinking water quality issues.

Council informs households on water quality issues with flyers, information packs sent with bills and included on their website. As an example Council informed households on how water meters are read.

Council has a Public and Media Policy as well as a complaints handling policy.

9 Element 9: Research and development

9.1 Investigative studies and research monitoring

- Establish programs to increase understanding of the water supply system.
- Use information to improve management of the water supply system.

Council engages external consultants and contractors to optimise and rectify operation of its water supply systems.

Previously, Council has engaged an external consultant to undertake an investigation into Culcairn Water Standpipe remediation and an inspection of Culcairn Water Tower.

Further, external consultants have prepared Council's IWCM, Demand Management Plan, Drought Management Plan and Strategic Business Plan.

Findings from investigative studies are discussed between Manager Water & Wastewater and Director of Engineering. Improvements are considered through the standard budget process.

Council also has access to investigate monitoring capacity through the NSW Drinking Water Monitoring Program special projects.

The risk assessment process is also used as one of the means to initiate or undertake investigative activities or research, as necessary. These are identified when the risk workshop is undertaken or risk assessment is reviewed and delivered through the implementation of the Improvement Plan respective action. Other R&D work can be identified through audit outcomes and water quality incident de-briefs.

9.2 Validation of processes

- Validate processes and procedures to ensure that they are effective at controlling hazards.
- Revalidate processes periodically or when variations in conditions occur.

Validation of new or upgraded processes and equipment should be undertaken through:

- Industry guidelines and standards
- Procurement from approved suppliers
- Risk assessments
- Pre-validation by suppliers in accordance with established standards
- Checking the available chlorine contact time (C.t). The Australian Drinking Water Guidelines recommends 15mg/L.min. The current C.t at Culcairn WTP is 39 mg/L.min.

GHSC will be revalidating processes when the risk assessment is comprehensively reviewed. The assessment of CCP performance during the compilation of the DWMS Annual report also assists with revalidation.

9.3 Design of equipment

- Validate the selection and design of new equipment and infrastructure to ensure continuing reliability.

Council follows its 30 year business plan for the upgrade of its assets. Small scale and routine upgrades are carried-out in-house. For large-scale upgrades, Council sources external consultants.

Council's Manager Water & Wastewater carries out an informal assessment of the selection and design of new equipment.

On-going validation should be undertaken through:

- Review of scientific literature;
- Assessment of research and development work; and
- Obtaining Section 60 approvals for upgrade works.

10 Element 10: Documentation and record keeping

10.1 Management of documentation and records

- Document information pertinent to all aspects of drinking water quality management.
- Develop a document control system to ensure current versions are in use.
- Establish a records management system and ensure that employees are trained to fill out records.
- Periodically review documentation and revise as necessary.

Council uses the following software and systems for the business functions listed below:

Area	Information Held
Asset Management System (ESCAM)	BizeAsset
Geographic Information System (GIS) (Enlighten)	MapInfo. MapInfo is combined with its Asset Management System
Verification monitoring data	NSW Health database
Consumer request management system (CSR)	Practical system (CAR)
Operational monitoring data / Operator log sheets	Excel spreadsheets
Contractor reports	InfoXpert
Employee training records	HR systems
DWMS and supporting documents, registers, plans	TRIM

Council staff are trained to make accurate records on the above-mentioned systems.

Operators are trained to correctly fill hardcopy logsheets for recording information on water supplies. These logsheets are then uploaded into InfoXpert.

Manager Water & Sewer carries out an informal review and revises records as necessary.

The development of the DWMS Annual Report provides the opportunity to ensure procedures, registers, processes are current or in need of revision.

10.2 Reporting

- Establish procedures for effective internal and external reporting.
- Produce an annual report to be made available to consumers, regulatory authorities and stakeholders.

Council provides water quality and performance monitoring data annually to DPI Water as a Performance Report. Furthermore, Council provides statistics on water use to the Australian Bureau of Statistics (ABS) and information on the flow of bulk water to State Water.

GHSC also prepares the DWMS Annual Report annually (financial year) summarising the implementation of the DWMS and water quality performance. This report is submitted to the local PHU and DPI Water.

11 Element 11: Evaluation and audit

11.1 Long term evaluation of results

- Collect and evaluate long-term data to assess performance and identify problems.
- Document and report results.

Water quality data is stored in excel spreadsheets which are held on InfoXpert.

Long term water quality data is available through the NSW Health Water Quality Database. This data was used as part of the drinking water risk assessment workshop in February 2014.

Further, GHSC uses the NSW Drinking Water Database for long-term (12 months) evaluation of distribution water quality results, and includes it in the DWMS Annual report. The performance of CCPs is also evaluated and included in the DWMS Annual report.

11.2 Audit of drinking water quality management

- Establish processes for internal and external audits.
- Document and communicate audit results.

Internal and external audits of the DWMS are required.

Internal audits should address:

- Implementation of CCPs and response to exceedances
- Operational control
- Progress against the improvement plan
- Record keeping

GHSC uses the process for the development of the DWMS Annual Report as a means to simulate the internal audit. Refer to section 12.1 for details.

The frequency of external audits of the Drinking Water Management System will be determined in consultation with the local Public Health Unit. Audits will be carried out by an independent auditor approved by NSW Health.

12 Element 12: Review and continual improvement

12.1 Review by senior executive

- Senior executive review of the effectiveness of the management system.
- Evaluate the need for change.

This Drinking Water Management System and its implementation need to be reviewed regularly (at least annually) to ensure that it maintains currency with the water supply operation and management.

The Manager Water and Wastewater (or designate) is responsible for reviewing the effectiveness of the management system, its implementation and for keeping the DWMS current, in discussions and consultation with relevant staff (e.g. Overseer, water operators).

The following are reviewed annually and included in the DWMS Annual report:

- any changes to the regulatory and formal requirements table (section 1.2)
- any changes to the Incident Contacts and Stakeholders register
- supply system details, including schematics (section 2.1.4 and 2.1.5). Update schematic, if required
- drinking water quality performance (section 11.1)
- CCP performance (implementation of CCPs and documented response to any exceedances)
- outcomes of drinking water quality incidents and emergencies
- any changes to the risk register
- concerns of consumers (customer complaints)
- audit outcomes (section 11.2)
- improvement plan progress
- any concerns from NSW Health and DPI Water

If the DWMS is changed as a result of this review, then the updated DWMS is submitted to the PHU.

The DWMS Annual Report is shared with the senior executives to keep them updated and for continued support for the implementation of the DWMS.

12.2 Drinking water quality management improvement plan

- Develop a drinking water quality management improvement plan.
- Ensure that the plan is communicated and implemented, and that improvements are monitored for effectiveness.

An Improvement Plan (Excel register, supporting document) is used by GHSC for continuous improvements and to address identified needs for full implementation of the DWMS.

It is the overall responsibility of the Manager Water and Wastewater to ensure that the Improvement Plan is implemented. The Improvement Plan is kept up-to-date and communicated to relevant water staff by the Manager Water and Wastewater. Specific actions are delegated to responsible positions.

The Improvement Plan captures the gaps identified in the DWMS as a result of the risk assessment undertaken and the improvements noted as part developing/updating this document. The Improvement Plan includes indicative dates and the nominated responsible party.

The Improvement Plan is periodically reviewed (and at least annually when the DWMS Annual Report is compiled) to ensure actions implemented are closed out, and new actions added to it, from outcomes of audits, reviews, incident management, advice from PHU/DPI Water etc, as necessary.

Each action in the Improvement Plan is prioritised as Very High, High, Medium or Low (risk based as agreed within the risk team). Very High risks are addressed urgently, and as such, these actions are addressed first. The due dates allocated correspond to this.

13 References

- NSW Public Works, 2. *Risk Assessment Workshop - Output Paper, Greater Hume, 2014.*
- Greater Hume Shire Council, *Critical Control Point (CCP) and Standard Operating Procedures (SOPs), Greater Hume, 2016.*
- Greater Hume Shire Council, *Drinking Water Quality Improvement Plan – Greater Hume, 2016.*
- Greater Hume Shire Council, *Drinking Water Quality Incident and Emergency Response Plan, Greater Hume, 2016.*
- National Health and Medical Research Council (NHMRC) & National Resource Management Ministerial Council (NRMMC), Commonwealth of Australia, *National Water Quality Management Strategy, Australian Drinking Water Guidelines, Paper 6, 2011, Canberra.*