



RISK-BASED DRINKING WATER MANAGEMENT SYSTEM

Version 1

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EXECUTIVE SUMMARY

PLAN PURPOSE

The NSW *Public Health Act 2010* (the Act) was passed by Parliament at the end of 2010. The Act (and its supporting regulation) includes the requirement for water suppliers to produce a *Quality Assurance Program* (QAP), which is based on the *Framework for Management of Drinking Water Quality* in the Australian Drinking Water Guidelines (NHMRC/NRMMC, 2011). For the purposes of implementation, this QAP is termed a Risk-based Drinking Water Management System (DWMS).

This document forms Regional Water Corp’s response to the development of a DWMS and is based on the 12 Elements, 32 Components and 76 Actions of the Framework.

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

CRITICAL CONTROL POINTS

The Regional Water Corp system has the following CCPs (Appendix B):

CONTROL POINT	HAZARD	CONTROL PARAMETER	TARGET	OPERATIONAL LIMIT	CRITICAL LIMIT
Plant inlet	Turbidity Pathogen	Turbidity of raw water	No target	Above usual level	WTP design level
Filtration	Turbidity Pathogen	Turbidity of filtered water	0.3 NTU	0.5 NTU	1 NTU
Primary disinfection system	Pathogens	Residual chlorine level at clear water tank outlet	1.7 mg/L	1.5 mg/L	1.3 mg/L
Post chemical (alkali) dosing system	Pathogens	pH at clear water tank outlet	7.8-8.2	<7 or >8.5	> 8.5 after adjustment
Fluoridation	TBD once in place				
Distribution Reservoirs	TBD once procedures and monitoring are established				

INCIDENTS AND EMERGENCIES

Incidents and emergencies are covered as follows:

- By specific procedures where required
- By Emergency Response Procedures For Drinking Water Quality and the Business Continuity Plan for the business as a whole

ACTION PLAN

An action plan is presented in Appendix C.

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1 INTRODUCTION

The Australian Drinking Water Guidelines (ADWG) (NHMRC/NRMMC, 2011) set out a holistic approach to drinking water management including:

- Six guiding principles:
 - *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.*

- Where sources of contamination may arise and how contamination may find its way to the consumer:
 - Framework for the Management of Drinking Water Quality (the Framework; Figure 1-1).

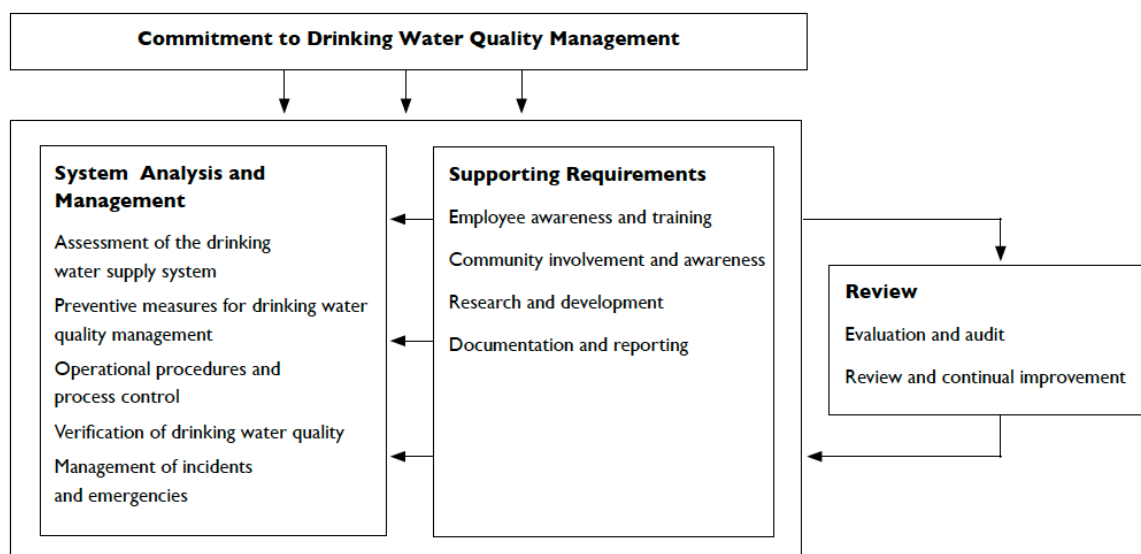


FIGURE 1-1. FRAMEWORK FOR MANAGEMENT OF DRINKING WATER QUALITY (NHMRC/NRMMC, 2011).

2 PURPOSE

As stated in the Australian Drinking Water Guidelines (NHMRC/NRMMC, 2011):

“The most effective means of assuring drinking water quality and the protection of public health is through adoption of a preventive management approach that encompasses all steps in water production from catchment to consumer.”

The NSW Government has encompassed this philosophy within recent legislation. The NSW *Public Health Act 2010* (the Act) was passed by Parliament at the end of 2010. The Act includes the following requirement:

Section 25 Quality assurance programs

(1) A supplier of drinking water must establish, and adhere to, a quality assurance program that complies with the requirements prescribed by the regulations.

The Public Consultation Draft of the Regulation (Public Health Regulation 2011) states the following:

Part 5 Safety measures for drinking water

Clause 27 Quality assurance programs

(1) For the purposes of section 25 (1) of the Act, a quality assurance program must address the elements of the Framework for Management of Drinking Water Quality (as set out in the Australian Drinking Water Guidelines published by the National Health and Medical Research Council) that are relevant to the operations of the supplier of drinking water concerned.

(2) A supplier of drinking water must provide a copy of its quality assurance program to the Director-General.

(3) The Director-General may arrange for the review of a quality assurance program of a supplier of drinking water at any time.

(4) The Director-General may make quality assurance programs and any reviews of such programs publicly available.

This document therefore forms RWC’s response to the development of a Quality Assurance Program and is based on the 12 Elements, 32 Components and 76 Actions of the Framework.

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

3 ELEMENT ROADMAP

This section shows how Regional Water Corp (RWC) is addressing its requirements against each element of the Framework. Where opportunities have been identified to improve compliance against the Elements, actions are captured in detail in the Action Plan (Appendix C).

3.1 ELEMENT 1: COMMITMENT TO DRINKING WATER QUALITY MANAGEMENT

3.1.1 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.

RWC's Management Plan (2011-2015) contains the following Strategic Objective:

- To provide safe drinking water

Of which a performance indicator will be:

- Compliance with the Australian Drinking Water Guidelines

The commitment to the provision of safe drinking water is not yet articulated into a comprehensive policy statement that would be considered compliant with the above component of the Framework nor is the commitment (as stated above) communicated throughout the organisation. Both these actions are captured in the Action Plan.

In the interim, RWC has formally agreed to implement and communicate this DWMS as a statement of its commitment to drinking water quality management.

3.1.2 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.

There is no compliance document in place for identifying drinking water regulatory and formal requirements. Actions relating to this component are captured in the Action Plan.

In the interim, RWC has agreed to communicate regulatory and formal requirements on an annual basis to the relevant staff.

3.1.3 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.

RWC has identified various stakeholders involved in its activities in general through the Management Plan (2011-2015), and in particular from a health perspective:

- Vision Statement:
 - Creating a healthy community providing opportunities and facilities for a healthy lifestyle.
- Strategies:
 - H1 – Providing health services which meet the needs of the community.
 - H2 – Developing partnerships with a range of stakeholders to facilitate healthy lifestyles.
 - H3 – Providing safe drinking water.

RWC also engages stakeholders on drinking water issues through the Project Reference Group as part of the Integrated Water Cycle Management process and is part of the Farmers River Customer Council.

Other drinking water specific stakeholder engagement is undertaken through internal and external reporting including:

- To Councillors (via the Water Report provided to Councillors at the tri-weekly meetings)
- RWC’s Strategic Water Committee
- RWC Management Plan Annual Report
- Via State of the Environment reporting

Service Level Agreements are in place with divisions of RWC for works required, however, the agreements do not have specific water quality awareness provisions.

Actions relating to development of a drinking water specific Stakeholder Register and communication methods are captured in the Action Plan.

For the purposes of this first version of the DWMS, those involved in the Risk Workshop reflect the first draft of stakeholders for this system (Table 3-1).

TABLE 3-1. PRELIMINARY STAKEHOLDER REGISTER.

NAME	ROLE	ORGANISATION
Helen Ptolemy	EHO	NSW Health
Ron Bouwman	South Western Area Health Service	NSW Health
Peter Ledwos	Principal Urban Water Manager	NSW Office of Water (Wollongong)
Sandy Leask	Water Quality and Health	NSW Health
Marnie Page	EHO	NSW Health
Paul Beed	Inspector	NSW Office of Water
Pradeep Kumar	Water Treatment Specialist	NSW Office of Water
Bill Ho	Manager Water and Sewerage	NSW Office of Water
	Water and Wastewater Manager	RWC
	Supervisor Plant and Pump Stations	RWC
	Supervisor	RWC
	Water Operator	RWC
	Group Manager Environmental and Development	RWC
	General Manager	RWC
	EHO	RWC
	Water and Wastewater Engineer	RWC
	Trainee Civil Engineer	RWC
	Principal Engineer	NSW Public Works
	Chemical Engineer	NSW Public Works
	Workshop Facilitator/Recorder and Risk Expertise	Risk Edge
	Workshop Facilitator/Recorder and Water Supply Systems Expertise	Atom Consulting

3.2 ELEMENT 2 - ASSESSMENT OF THE DRINKING WATER SUPPLY SYSTEM

3.2.1 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 core water quality team currently consists of the:

- Water and Wastewater Engineer
- Water and Wastewater Manager
- Water Treatment Plant Operators
- Treatment Plant and Pump Stations Supervisor

To improve compliance with this component, RWC has captured an action within the Action Plan to develop a clear team details' table to show current positions and responsibilities for drinking water quality.

A Powerpoint™ flow diagram was developed for the risk assessment workshop (1 September 2011) and is reviewed and kept current as part of this process (Figure 3-1, Figure 3-2). The flow diagram is supported by other diagrams such as a:

- Process and Instrumentation Diagram for the plant

Responsibility for maintaining currency of the conceptual system flow diagram has been captured within the Action Plan.

A conceptual flow diagram for the system is shown in Figure 3-1 and for the water treatment plant in Figure 3-2.

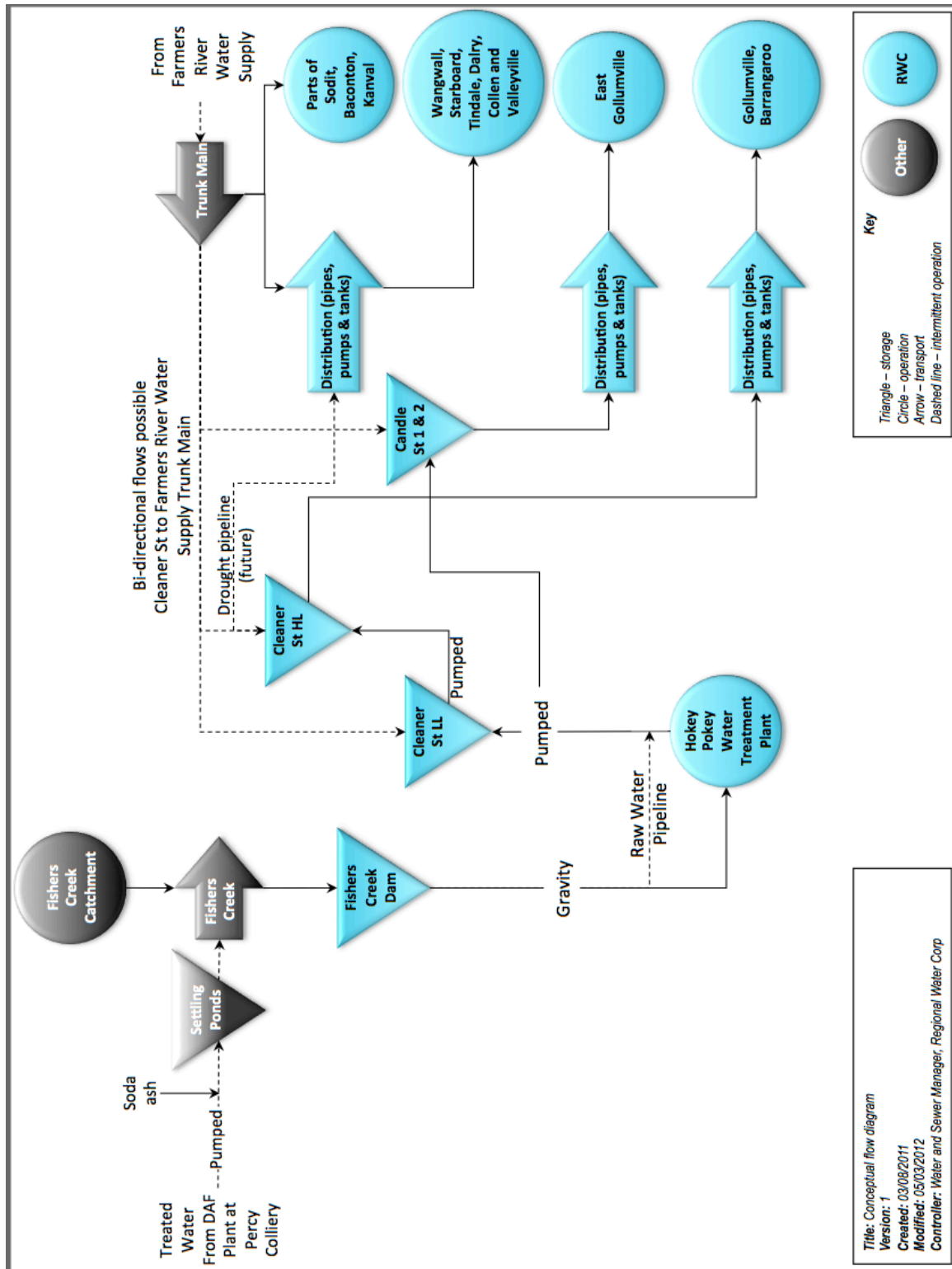


FIGURE 3-1. WATER SUPPLY SYSTEM – CONCEPTUAL SYSTEM FLOW DIAGRAM.

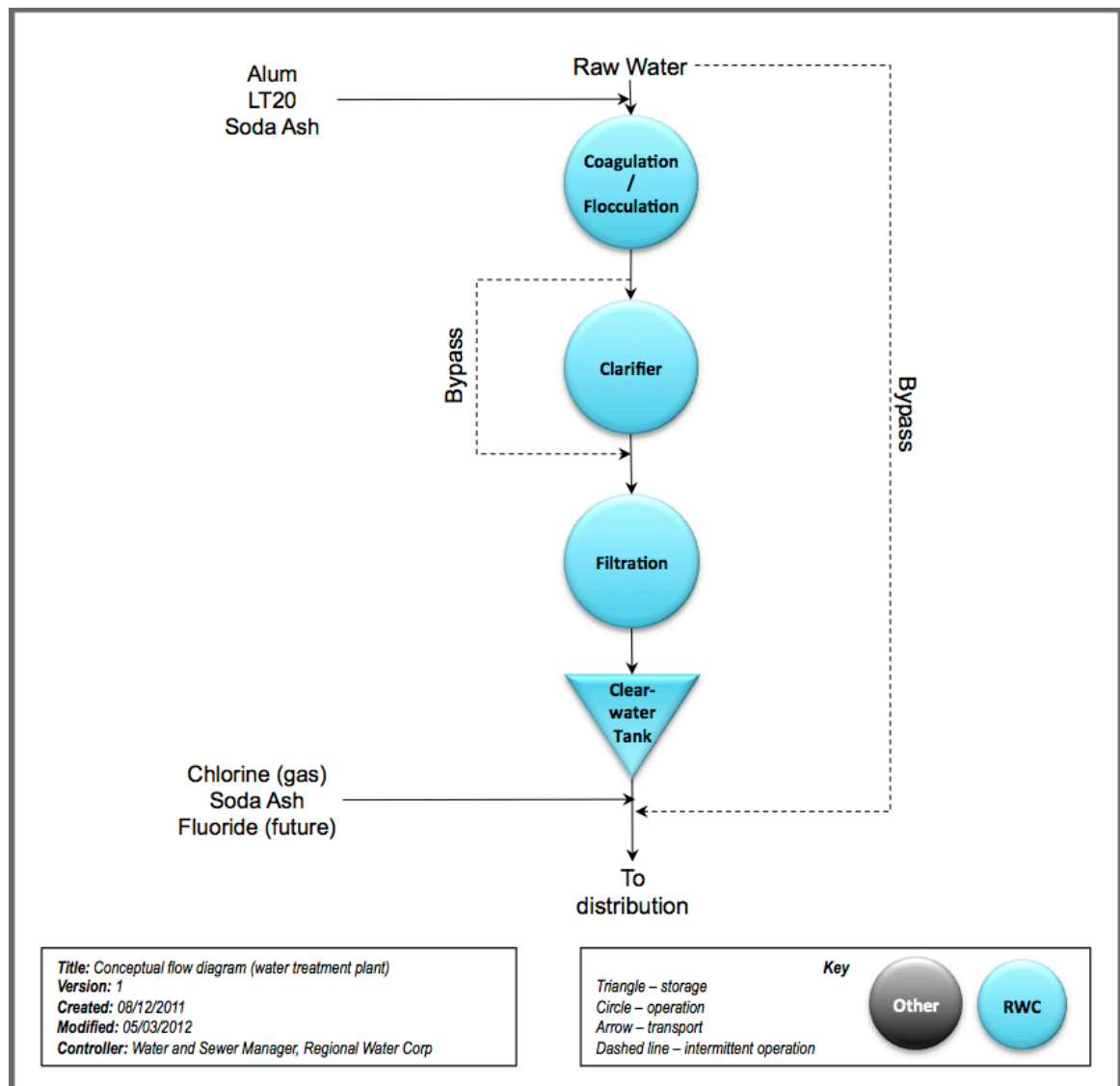


FIGURE 3-2. WATER SUPPLY SYSTEM – CONCEPTUAL SYSTEM FLOW DIAGRAM TREATMENT.

Analysis of the water supply system has been carried out previously in the following documents:

Wangwall and Starboard Water Supply Reticulation Analyses. Prepared for Regional Water Corp Report No. WS 44 May 1988 (Public Works)

Gollumville Water Supply Augmentation Reticulation Analysis Report. Prepared for Regional Water Corp. Report No. 200 October 1983 (Public Works).

Gollumville Water Supply Water Treatment Strategy. Prepared for: Regional Water Corp. Report No. 95131 March 1996 (Public Works).

A recycled water system is being considered by Regional Water Corp but is not yet in place and therefore, has not been included in this iteration of the DWMS. Taraville is served by a raw water system as detailed within the Risk Workshop Summary Paper.

A summary of the overall system description is provided below in Table 3-2.

TABLE 3-2. WATER SUPPLY SYSTEM – OVERVIEW DESCRIPTION.

SYSTEM COMPONENT	DESCRIPTION
POPULATION SERVED	The population of approximately 21,000 comprises Regionalville, Wangwall, Starboard, Dalry, Valleyville, Collen, and Barrangaroo. Some part of Sodit and Baconton and Kanval are supplied directly from the Fishers River Water Supply trunk main. Taraville is served by a raw water scheme, this water is not intended for drinking.
WATER SOURCE	Surface water: Fishers Creek and the Farmers River and Paddymolloy River (via the Farmers River Water Supply Scheme operated by Bulk Water Corp). Ground water: None used directly as a source in the RWC-managed scheme (see below for Percy Colliery groundwater). Other Water: Excess treated (chemical dosing, DAF and pH correction) groundwater from Percy Colliery via Percy Colliery Water Transfer Scheme (CWTS) via Fishers Creek.
WATER STORAGE	Fishers Creek Dam (operated by RWC). Titania Dam and Paddymolloy Weir (operated by Bulk Water Corporation).
WATER TREATMENT	Raw water from Fishers Creek Dam is treated at the Hokey Pokey Water Treatment Plant as follows: Soda ash for pH correction Alum for coagulation and polyelectrolyte (LT20) as a coagulant aid Flocculation Clarification (horizontal flow) Filtration (mono media) Disinfection (chlorine gas) and stabilization (soda ash) Fluoridation (step not yet active, project in progress)
STORAGE AFTER TREATMENT	Clear water tank then distribution reservoirs at Cleaner St and Candle St.
DISTRIBUTION OF PRODUCT	Via pressurised pipes of various diameters (352 km), pumps (30) and tanks (17).
ANY SPECIAL CONTROLS REQUIRED	Booster chlorination (re-chlorination occurs at the Priest Street PS and the outlet of the Wangwall and Tindale Reservoirs). Quality of chemicals, materials etc used in the production and delivery of the product. Manual verification sampling of water from the distribution network. Backflow prevention and trade waste management. Operation and maintenance of all infrastructure to prevent recontamination.

Rainwater tanks (a potential backflow issue) installed in the LGA are logged through Proclaim although <10 KL tanks are only captured if individuals apply for a subsidy.

RWC holds an Environment Protection Licence (EPL) No. XXXX for its Hokey Pokey Water Treatment Plant premises for discharge of Miscellaneous Licensed Discharge to Waters (at any time) for filter backwash water.

Gollumville receives water from the Farmers River Water Supply Scheme operated by Bulk Water Corp and receives water from Percy Colliery, operated by LoCoal, to supplement water in the Fishers Creek Dam when required. A Supply Agreement is in place with the Farmers River Water Supply Scheme (Bulk Water Corp), which details some water quality parameters (but not bacterial indicators, specifically *E. coli*).

There is no formal water quality agreement in place with LoCoal.

Condition reporting of assets is undertaken on a contractual basis by Aqualift. Risk-based reports are generated by Aqualift and their findings are used to help direct the capital expenditure program. A

Security Assessment was also conducted on Gollumville's assets as part of the Climate Change Risk Assessment Draft Adaptation Report April 2010. The Asset division of RWC undertakes facility maintenance and is instructed to report back to an appropriate person (Water and Wastewater Manager or similar) if something potentially impacting assets is sighted. However, a log is only made of a report if something is noted after hours.

RWC keeps GIS records of its assets.

RWC has undertaken an Integrated Water Cycle Management evaluation of its system in 2010.

Trade waste is managed through the following policy:

Policy XX.4 DISCHARGE OF LIQUID TRADE WASTE TO THE SEWERAGE SYSTEM

Records are held in RWC's record management system (Dataworks) and also via Proclaim.

3.2.2 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.

RWC undertakes drinking water monitoring under the NSW Health Drinking Water Monitoring Program. Analyses are stored within the NSW Health Drinking Water Database. Summaries of data can be generated from that database. RWC also undertakes operational monitoring, such as grab samples and jar tests, the results of which are recorded at the plant on monitoring sheets and then transcribed to Excel spreadsheets.

There is no algal monitoring of Fishers Creek Dam itself.

Telemetry (SCADA) is used to monitor and log data.

RWC undertakes State of the Environment reporting, which includes water quality components. Water quality details are also included in the Management Plan.

Water quality data were analysed for the Risk Assessment Workshop (1 September 2011), results of which are recorded in the Workshop Summary Paper.

3.2.3 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 Risk Assessment Workshop Summary Paper (December 2011, Appendix A) includes documentation of:

- The risk assessment methodology adopted
- Risk Register (also kept separately within an Excel spreadsheet to allow for ease of currency maintenance)

Actions for maintaining the currency of the Risk Register are captured in the Action Plan (Appendix C).

3.3 ELEMENT 3: PREVENTIVE MEASURES FOR DRINKING WATER QUALITY MANAGEMENT

3.3.1 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.

Existing preventive measures were captured at the Risk Workshop and detailed within the Risk Register. Where gaps were noted with the existing system, actions to address the gaps were logged in the Risk Register and transcribed to the Action Plan.

RWC uses codes and standards to underpin its DWMS including, but not limited to:

- *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011*
http://www.health.nsw.gov.au/resources/aboutus/legal/pdf/code_of_practice.pdf (for design and operation once fluoridation is operational at Hokey Pokey Water Treatment Plant)
- Current version of the New South Wales Code of Practice for Plumbing and Drainage (generally reflects AS/NZS 3500, but also allows for NSW variations and additional provisions to cater for local conditions within the state)
- AS/NZS 2927 The storage and handling of liquefied chlorine gas
- Water Supply Code of Australia

RWC has an Onsite Sewage Management Strategy in place.

3.3.2 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.

Critical control points for the water supply system were identified at the Risk Workshop 1 September 2011 and are identified in Appendix B.

3.4 ELEMENT 4: OPERATIONAL PROCEDURES AND PROCESS CONTROL

3.4.1 Identify procedures required for processes and activities from catchment to consumer.

- Document all procedures and compile into an operations manual.

RWC has the following manuals and procedures:

- Water and Wastewater Chemical Data and Safety Manual (undated)
- Hokey Pokey Water Treatment Plant Instrumentation and Control Nominated Sub-contract No. 83189 Operation and Instruction Manual (undated)
- *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011*
http://www.health.nsw.gov.au/resources/aboutus/legal/pdf/code_of_practice.pdf (for operation once fluoridation is operational at Hokey Pokey Water Treatment Plant)
- NSW Water Directorate's Manuals
 - Operations and Maintenance Manual for Water Supply Service Reservoirs – June 2002 - Revised June 2010
 - Backflow and Cross Connection Prevention Guidelines
 - Blue-Green Algae Management Protocols
 - Reuse of Sludge and Wastewater at WTPs Guidelines - August 2003
 - O&M Manual for Water Reticulation – September 2001 – Revised October 2003
 - O&M Manual for Chlorination Installations – April 2001 – Revised April 2003
- Standard Operating Procedures for the following tasks
 - Plant security and maintenance
 - Filter and backwash inspections
 - Dry feeder drop test
 - Walkaround and vis inspections
 - Reservoir Inspections

3.4.2 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.

RWC has the following guidance and forms in place for operational monitoring:

- *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011*
http://www.health.nsw.gov.au/resources/aboutus/legal/pdf/code_of_practice.pdf (for operation once fluoridation is operational at Hokey Pokey Water Treatment Plant) (Form 4) fluoride monitoring forms as per the *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011* (to be implemented when fluoridation operational)
- Jar testing record form (untitled)
- Plant diary for the following characteristics:
 - Raw water:
 - Colour
 - Turbidity
 - pH

- Fluoride
- Nickel
- Cobalt
- Iron
- Aluminium
- Manganese
- Treated:
 - Colour
 - Turbidity
 - pH
 - Chlorine Residual Free
 - Chlorine Residual Total
 - Fluoride
 - Iron
 - Aluminium
 - Manganese
- Filtered:
 - Colour
 - Turbidity
 - pH
- SCADA
- Standard operating procedures for the following sampling and monitoring
 - WTP water sampling and testing.
 - Chlorine residual testing and microbiological and chemistry sampling - DAL sampling guide
http://www.health.nsw.gov.au/publichealth/environment/water/drinkwater_nsw.asp

Actions to increase compliance with this component are noted in the Action Plan. Certain procedures are also included in Appendix A.

3.4.3 Corrective Action

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

As above at 3.4.2.

The NSW Health Drinking Water Monitoring Program and Code of Practice for the Fluoridation of Public Water Supplies has guidance on how to deal with excursions and events.

RWC has made a commitment to ensure that the NSW Health Response Protocols on treatment failure, *Cryptosporidium* and *Giardia* and microbial quality, physical and chemical quality are followed.

Information on Critical Control Points is included at Appendix A.

3.4.4 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.

RWC has the following laboratory instruments in place:

- Turbidimeter 2100p Hach
- Spectrophotometer dr2800
- Chloro sense palintest
- Iron tptz test kit Hach
- Manganese hr test kit Hach
- Aluminium test kit Hach
- Sension 1 pH meter Hach
- Sension 2 Fluoride meter Hach
- Conductivity meter aqua
- 4 paddle stirrer
- 2 magnetic stirrer Selsius

There is no online water quality monitoring

Each piece of measuring apparatus is calibrated externally by ABB Instrumentation on an annual basis.

pH probes are calibrated once monthly or on exception by the operators using the manufacturers' instructions (e.g. Hach).

The *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011* has guidance on how to deal with equipment capability and maintenance.

RWC prepares Asset Management Plans, which evaluate the condition of its assets and inform maintenance and capital works programs for those assets.

There is a specific operational and maintenance focus on critical water treatment equipment.

Actions to improve compliance with this element are captured in the Action Plan.

3.4.5 Materials and chemicals

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

RWC orders chemicals as required. Chemicals used at Hokey Pokey Water Treatment Plant are:

- Chlorine Gas supplied by Orica
- Alum supplied by Omega
- Soda Ash supplied by Redox
- Polyelectrolyte (LT20) supplied by BASF Australia

Chemicals are supplied with a certificate of compliance but are not further checked by the operators.

The *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011* has guidance on chemical quality.

RWC has a general Purchasing and Procurement Policy in place although water quality issues are not specifically mentioned.

Chapter 8 of the Australian Drinking Water Guidelines (NHMRC/NRMMC, 2011) include guidance on acceptable levels and calculation of contaminants in chemicals used in drinking water production.

Actions to improve compliance with this element are captured in the Action Plan.

3.5 ELEMENT 5: VERIFICATION OF DRINKING WATER QUALITY

3.5.1 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.

RWC participates in the NSW Health Drinking Water Monitoring Program

RWC takes bacteriological samples weekly and chemical monthly from various points in the reticulation system. Measurements for free chlorine in the reticulation system are also taken weekly.

RWC undertakes periodic testing for THMs and pesticides.

All samples are sent to Sydney to NSW Health's NATA accredited laboratory and both NSW Health and RWC are sent results from analysis. RWC has specific formal protocols in place with the laboratory in the event of non-compliant results.

The *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011* has guidance on monitoring.

Disinfection of Drinking Water Information Sheet 1 in the Australian Drinking Water Guidelines includes information on disinfection residual maintenance and monitoring.

For this first draft, RWC commits to examine and respond to exceedances of ADWG levels and actions to improve compliance with this element are captured in the Action Plan.

3.5.2 Consumer satisfaction

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

RWC uses the Proclaim system for logging and tracking consumer requests. Call receivers are trained to take and log the requests but are not specifically trained in water quality issues. Action Request forms are forwarded to the appropriate person in RWC to deal with the issue (water quality to Water and Wastewater Engineer/Manager, plumbing to the Supervisor).

Formalised written complaints are logged in Dataworks.

A Resident Feedback Register is in operation at RWC with which residents can register all types of feedback including on drinking water quality issues e.g. fluoridation of supply.

Actions to improve compliance with this element are captured in the Action Plan.

3.5.3 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.

Water quality data are recorded in the NSW Drinking Water Database and can be accessed by RWC on demand.

Data are recorded daily at the Water Treatment Plant and analysed weekly by the Water and Wastewater Engineer.

A SCADA system used for monitoring the distribution system (parameters monitored include reservoir levels and pump station operation (running, off and fault status)) is checked by the operators with alarms to duty officer.

Consumer requests can be accessed for analysis through Proclaim.

The *New South Wales Code of Practice for Fluoridation of Public Water Supplies* 2011 has guidance on evaluation.

It is acknowledged that water quality data recorded in the NSW Drinking Water Database should also be reviewed on a regular basis (e.g. monthly) and following the submission of each sample and actions to improve compliance with this element are captured in the Action Plan.

3.5.4 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.

The follow-up of customer complaints is tracked in Proclaim.

The NSW Health Drinking Water Monitoring Program provides response protocols relating to microbiological quality, physical and chemical quality, treatment failure and *Cryptosporidium* and *Giardia*.

For this first draft, RWC commits to a timely response to adverse sampling results or other events e.g. dirty water, and/or public complaints including appropriate investigation, and corrective actions and notification/discussion with the Public Health Unit.

Actions to improve compliance with this element are captured in the Action Plan.

3.6 ELEMENT 6: MANAGEMENT OF INCIDENTS AND EMERGENCIES

3.6.1 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

An Emergency Response Procedures (ERP) For Drinking Water Quality (July 2010, Issue 1) is in place for water quality incidents. An emergency contacts list is in place in the ERP.

Events are logged by Customer Services and provided to the appropriate officer as an Action Request through Proclaim.

Farmers River Water Supply issues are dealt with in the same way, i.e. in the event of an Farmers River Water Supply incident, an officer will provide details to Farmers River Water Supply staff.

A Business Continuity Plan is in existence for RWC but does not include water and sewer.

RWC is a member of the Regional Algal Coordinating Committee but all incidents thus far have occurred downstream of Fishers Creek Dam.

There is currently no formal media communication policy in place at RWC. Individual officers within RWC create a media release on RWC's media template, which is then approved by the General Manager prior to release.

Information within the NSW Health Drinking Water Monitoring Program is generally used by officers.

The *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011* has guidance on incidents and emergencies.

Actions to improve compliance with this element are captured in the Action Plan.

3.6.2 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

RWC has an OH&S Incident Register but it does not include water quality incidents – these are managed through Dataworks and Proclaim.

The *New South Wales Code of Practice for Fluoridation of Public Water Supplies 2011* has guidance on incidents and emergencies.

An Emergency Response Procedures (ERP) For Drinking Water Quality (July 2010, Issue 1) is in place for water quality incidents. An emergency contacts list is in place in the ERP. The ERP contains instructions to contact the area health service immediately if the situation causes or threatens to cause a serious or material health impact. RWC follows NSW Health protocols for NSW Health response protocols, when applicable, for microbiological quality, physical and chemical quality, treatment failure and *Cryptosporidium* and *Giardia*.

Actions to improve compliance with this element are captured in the Action Plan.

3.7 ELEMENT 7: EMPLOYEE AWARENESS AND TRAINING

3.7.1 Employee awareness and involvement

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

Daily (x 7) morning meetings are held by the operators but currently only for OH&S issues. A daily risk assessment/tool box meeting form is also completed at these meetings.

XXXROC (of which RWC is a member) has a Supervisors' and Operators' Group which meets every 2 months. Water quality issues are considered at the meeting and 'guest' speakers are invited to talk including from NSW Health and NSW Office of Water.

RWC is a member of the Local Government Water Directorate.

Operators use the Water Industry Operators' Association website for updates.

Contracts are in place with service providers but there are no specific water quality awareness and protection clauses in the contracts.

RWC makes a commitment to increase employee awareness of the potential risks to the public from poor water quality or a contamination event and actions to improve compliance with this element are captured in the Action Plan.

3.7.2 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

RWC operators attend conferences and workshops. Examples of training include the following:

- Dangerous Goods Handling/Hazardous Substances competencies as part of Certificate II in Transport and Logistics
- Competencies as part of Certificate III in Process Manufacturing
- Worker Traineeship for Certificate III in Laboratory Operations – Laboratory Skills
- Risk Management and Risk Investigation Course
- Fluoridation of Public Water Supplies (TAFE)
- NSW Department of Water and Energy Operator Competency in Operation of Water Treatment Works
- NSW Department of Water and Energy Operator Competency in Operation of Chemical Dosing Systems for Water Treatment Works
- Chlorine operator training
- Occupational Health and Safety Induction

Certificates are kept on record with the Human Resources department of CouRWCncil.

RWC also has a Training Plan for required skills and currencies as well as including water quality requirements within Position Descriptions.

RWC understands the need to keep staff aware of emerging issues and for the opportunity for staff to attend relevant training on a regular basis and actions to improve compliance with this element are captured in the Action Plan.

3.8 ELEMENT 8: COMMUNITY INVOLVEMENT AND AWARENESS

3.8.1 Community consultation

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

RWC uses a number of avenues with which to involve the community in drinking water planning and strategy including:

- The 'Save Water Alliance' (mainly quantity focussed but helps to raise awareness of water issues)
- Public access to RWC meetings
- Strategic Water Committee
- Integrated Water Cycle Management process through the Project Reference Group
- Policy 4.12 Community Liaison: Complaints and Procedures

- Policy 4.13 Community Liaison: Customer Service Policy

RWC regularly reminds customers where non-potable water is supplied (in accordance with NSW Health policy).

3.8.2 Communication

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

RWC uses a number of avenues with which to communicate with the community including:

- Local media – for instance, the risk workshop held on 1 and 2 September 2011 was advertised in the local newspaper
- Occasional use of flyers sent out in rates notices
- State of the Environment Reporting
- RWC column in the local newspaper
- Letterbox drops
- Website
- Residents on non-potable supplies are informed at connection that the water is not intended for drinking and other potable uses.

Actions to improve compliance with this element are captured in the Action Plan.

3.9 ELEMENT 9: RESEARCH AND DEVELOPMENT

3.9.1 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.

RWC can access investigative monitoring programs through the NSW Health Drinking Water Monitoring Program if required.

Investigative programs with which RWC has been involved include:

- Trial of a new coagulant at the Hokey Pokey Water Treatment Plant
- Aqualift contractor review of assets and implementation of the corrective actions arising from those findings
- NSW Office of Water inspector reports and implementation of the correction actions arising from those reports
- One-off samples taken in response to customer requests when considered necessary
- Working with the Sydney West Area Health Service (2009) to investigate drinking water quality.

RWC receives the Public Health Bulletin and is a member of the Local Government Water Directorate through which projects can be undertaken collectively and information disseminated to members.

RWC commits to establishing a process for the regular review and analysis of water quality trends and actions to improve compliance with this element are captured in the Action Plan.

3.9.2 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.

RWC can access investigative monitoring programs through the NSW Health Drinking Water Monitoring Program if required.

RWC will be revalidating processes through the critical control point process initiated through the development of this DWMS.

RWC will need to review system changes such as the design of the Percy Colliery transfer pipe and how it interacts with the Farmers River Water Supply System at the handover points into RWC's system.

Actions to improve compliance with this element are captured in the Action Plan.

3.9.3 Design of equipment

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

RWC is currently in the process of installing fluoridation equipment at the plant.

RWC will also need to check the water quality impacts of the design and location of the Percy Colliery pipeline before the infrastructure is built.

RWC is currently reviewing the method of coagulation and filtration at the Hokey Pokey Water Treatment Plant.

Actions to improve compliance with this element are captured in the Action Plan.

3.10 ELEMENT 10: DOCUMENTATION AND RECORD KEEPING

3.10.1 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.

RWC has the following policy:

- Policy XXX: Governance: Records Management Policy (based on the following act and other requirements *State Records Act 1998* (NSW)).

RWC contributes to the annual performance data collection and reporting required by the NSW Office of Water.

RWC records information pertinent to water quality within a system called Dataworks but there is currently no standard operating procedure in place for the naming of files.

RWC currently does not have a Laboratory Information Management System in place but uses a system of Excel spreadsheets for data recording. The spreadsheets are sent from the plant to the water quality team every Monday and backed up on the RWC server.

The NSW Health Drinking Water Database is used as a records' management system for RWC's water quality results that are collected as a part of that program.

Consumer requests are managed through RWC's Proclaim system with other information (letters etc) being recorded in Dataworks.

An Accident and Incident Register is in place but water quality incidents are not yet captured on this register.

Information collected by Aqualift contractors is stored on Aqualift's system and RWC is able to access that information through specific login details.

Operator logs and spreadsheets are kept at the Hokey Pokey Water Treatment Plant.

RWC's website is also used as a vehicle for the storage and communication of information.

RWC will commit to reviewing the NSW Health website for the most recent documents and protocols on information management and actions to improve compliance with this element are captured in the Action Plan.

3.10.2 Reporting

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

RWC contributes to the annual performance data collection and reporting required by the NSW Office of Water.

Reports on water quality can be generated through the NSW Drinking Water Database.

Other internal and external reporting includes:

- To Councillors (via the Water Report provided to Councillors at the tri-weekly meetings)
- RWC's Strategic Water Committee
- Management Plan Annual Report
- State of the Environment reporting

3.11 ELEMENT 11: EVALUATION AND AUDIT

3.11.1 Long term evaluation of results

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

Long term trending of data was carried out for the risk assessment workshop 1 September 2011 and is captured within the Risk Assessment Workshop Summary Paper from that workshop.

RWC will use the NSW Drinking Water Database for long-term evaluation of results.

Historic water quality trend analysis is used to direct budgets.

Aqualift reviews and reports are used to help direct asset budgets – specifically for reservoirs. Examples of Aqualift’s findings are presented in the Risk Assessment Workshop Summary Paper.

The Annual Triple Bottom Line reporting is underway but not yet finalised.

The Annual Report includes information on water quality.

Reports are also provided by the Water Engineer to RWC’s tri-weekly meeting.

Actions to improve compliance with this element are captured in the Action Plan.

3.11.2 Audit of drinking water quality management

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

An external Gap Analysis audit of the water supply system was undertaken by a certified¹ auditor on 18 August 2011. The results of the Gap Analysis were used to facilitate development of this document.

The NSW Health Drinking Water Database is used to document water quality results and was interrogated as part of the preparation for the risk assessment workshop on 1 September 2011.

Works for the water supply system are presented to RWC and are prioritised for action by the executive management team.

Informal inspections of the system are carried out by operators.

External inspections of the system are carried out by NSW Office of Water inspectors on a 6 monthly basis – reports of findings are provided by the inspectors and are used to help direct works.

Aqualift inspects all reservoirs inside and out every 2 years.

The internal and external audit frequency will be determined in consultation with the Public Health Unit (PHU). For external audit, RWC will engage an independent auditor approved by the PHU.

Actions to improve compliance with this element are captured in the Action Plan.

3.12 ELEMENT 12: REVIEW AND CONTINUAL IMPROVEMENT

3.12.1 Review by senior executive

- Senior executive review of the effectiveness of the management system.

¹ Auditor with RABQSA (DWQMS) Auditor Drinking Water QMS scheme (Certificate No. 023268).

Approved benchmarking auditor and moderator for the *Aquality* WSAA drinking water quality Framework implementation assessment system.

- Evaluate the need for change.

The Annual Report includes information on water quality.

Quarterly reports are also provided by the Water Engineer.

Works for the water supply system are presented to RWC and are prioritised for action by the executive management team.

Reviews of the system and actions for improvement are captured and targeted for action within the Management Plan (2011-2015).

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

3.12.2 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.

Actions to improve risk management in the water supply system were identified in the risk workshop 1 September 2011 and the procedures workshop 2 September 2011. Actions were also identified during the Gap Analysis 18 August 2011. All actions are captured within Appendix D.

A prioritisation plan, including the assignation of responsibilities, will be developed for implementation of the actions.

4 REFERENCES

NHMRC/NRMMC (National Health and Medical Research Council/ Natural Resource Management Ministerial Council) (2011) Australian Drinking Water Guidelines (ADWG) National Water Quality Management Strategy. ISBN Online: 1864965118.

APPENDIX A – RISK ASSESSMENT PAPER

APPENDIX B – CCPs AND OPERATIONAL INFORMATION

Critical Control Points

Critical Control Points Quick Reference Guide

These are the critical parameters for safe management of your system.
Ensure that these parameters are monitored regularly

	Operational Target	Adjustment Limit	Critical Limit
Raw Water Turbidity	No target	Above usual level	WTP design limit
Filtered Water Turbidity	0.3 NTU	0.5 NTU	1 NTU
Treated Water Chlorine	1.7 mg/L	1.5 mg/L	1.2 mg/L
Treated Water pH	7.8 – 8.2	<7 or >8.5	>8.5 after adjustment
Reservoir Integrity	Secure and Vermin Proof	Evidence of Breaches	Breach not Rectified, or Serious Breach

Operational Target This is where you should be operating. Aim to keep the system operating at this value

Adjustment Limit If you reach this limit, refer to CCP management sheet and try to get back to the operational target. Increase monitoring until returned to normal.

Critical Limit If you reach this limit, you have lost control of your system. Refer to CCP management sheet and try to return to operational target as a matter of urgency.

CCP 1 – Plant Inlet - Raw Water Turbidity

What is the control point?	Plant Inlet
What are the hazards?	Turbidity, pathogens
What is being measured?	Raw Water Turbidity (daily sampling and testing)
How do you control	Selective pumping if possible (Little control)

<p>Operational Target No target</p> <ul style="list-style-type: none"> WTP Water sampling and testing Plant walkaround and visual inspection Equipment checks Instrument calibration 	<p>Adjustment Limit Above usual level</p> <ul style="list-style-type: none"> Contact (XXXX XXX XXX) Carry out jar test Adjust dosages if necessary Test combined filtered water turbidity hourly, and other parameters as needed 	<p>Critical Limit WTP design limit</p> <ul style="list-style-type: none"> Contact (XXXX XXX XXX) Investigate dam and catchment area Sample and test turbidity from dam Change off-take point from dam Consider plant shutdown
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Note: Operators have very little control over the Raw Water Turbidity; this sheet presents steps to manage increases in turbidity above normal

CCP 2 – Filtration - Filtered Water Turbidity

What is the control point?	Filtration
What are the hazards?	Turbidity, pathogens
What is being measured?	Combined Filtered water turbidity (daily sampling and testing)
How do you control	Optimise coagulation and filtration process

Operational Target 0.3 NTU

- WTP Water sampling and testing
- Plant walkaround and visual inspection
- Equipment checks
- Dosing rate checks
- Instrument calibration

Adjustment Limit 0.5 NTU

- Contact (XXXX XXX XXX)
- Inspect filters, backwash if necessary
- Test turbidity from each filter to determine if problem is isolated
- Inspect clarifier and floc size, carry out jar test if necessary
- Inspect dosing systems, drop test dosing pumps
- Test combined filtered water turbidity hourly, and other parameters as needed

Critical Limit 1 NTU

- Contact (XXXX XXX XXX)
- Full plant analytical investigation
- Extended manual backwash
- Consider plant shutdown

CCP 3 – Primary disinfection system - Free Chlorine

What is the control point?	Primary disinfection system
What are the hazards?	Chlorine sensitive pathogens
What is being measured?	Clear Water outlet Free Chlorine (daily sampling and testing)
How do you control	Adjust the chlorine dosage

<p>Operational Target 1.7 mg/L</p> <ul style="list-style-type: none"> • WTP Water sampling and testing • Plant walkaround and visual inspection • Equipment checks • Dosing rate checks • Instrument calibration 	<p>Adjustment Limit 1.5 mg/L</p> <ul style="list-style-type: none"> • Contact (X XXX XXX) • Inspect chlorine dosing system • Increase chlorine dosage • Inspect coagulation and filtration for issues • Sample and test clear water free chlorine half-hourly, and other parameters as needed 	<p>Critical Limit 1.2 mg/L</p> <ul style="list-style-type: none"> • Contact (XXXX XXX XXX) • Contact local PHU (XXXX XXXX) • Full plant analytical investigation • Change chlorine feed to spare drum • Increase chlorine dosage • Consider manual dosing of NaOCl • Sample and test reservoir and reticulation free chlorine • Consider direct NaOCl dosing into reservoirs • Consider plant shutdown
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Contact time in the clearwater tank at full plant capacity = 35 min (approximately)

CCP 4 – Post dosing system - Filtered Water pH

What is the control point?	Post chemical dosing system
What are the hazards?	Chlorine sensitive pathogens
What is being measured?	Clear Water pH (daily sampling and testing)
How do you control?	Adjust post chemical dosage

Operational Target 7.8 – 8.2

- WTP Water sampling and testing
- Plant walkaround and visual inspection
- Equipment checks
- Dosing rate checks
- Instrument calibration

Adjustment Limit <7 or >8.5

- Contact (XXXX XXX XXX)
- Inspect both pre and post soda ash dosing systems
- Switch feeder if necessary
- Sample and test pH of raw water, coagulation, filtered water, clear water to isolate problem.
- Sample and test problem location/s half hourly
- Adjust soda ash dosage
- Inspect coagulation and filtration for issues

Critical Limit >8.5 after adjustment

- Contact (XXXX XXX XXX)
- Full plant analytical investigation
- Sample and test reservoir and reticulation free chlorine and pH
- Consider wasting clear water to lagoons
- Consider plant shutdown

CCP 5 – Distribution Reservoir Integrity

What is the control point?	Distribution Reservoirs
What are the hazards?	Chlorine sensitive pathogens (recontamination)
What is being measured?	Integrity of Reservoirs (weekly visual inspection)
How do you control	Inspect and maintain reservoirs in good condition

<p>Operational Target Secure and vermin proof</p> <ul style="list-style-type: none"> • Visual reservoir inspection • Annual Aqualift inspection and report • Regular reservoir maintenance • Reservoir security procedures 	<p>Adjustment Limit Evidence of breaches</p> <ul style="list-style-type: none"> • Contact (XXXX XXX XXX) and organise for repairs • Conduct thorough reservoir inspection • Sample and test reservoir for free chlorine and pH • Sample reservoir water for bacto testing, send to DAL and/or Sonic Labs • Monitor daily until rectified 	<p>Critical Limit Breach not rectified</p> <ul style="list-style-type: none"> • Contact (XXXX XXX XXX) • Arrange for urgent repairs • Continue adjustment actions
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Plant Security & Maintenance

Description:	Regular inspection of plant security, fences, buildings and grounds
To be carried out by:	Plant Operator
Frequency:	Weekly

1. Perimeter Security

- a. Check main gate padlocks and chain are present
- b. Walk all the way around the fence line, and check fence for any holes, lifted wire, cut barbs etc

2. Building security

- a. Check storage and dosing sheds are locked
- b. Check all doors on main building open and close correctly, and are locked if required
- c. Check outdoor security lighting comes on at night

3. Building condition - shed, main building and DAF building

- a. Check for any damage caused by thrown objects like rocks, bullets
- b. Check for evidence of pests like rats (rat poo), spiders (cobwebs)
- c. Check for any broken or blocked guttering

4. Grounds

- a. Check grounds near fence line for any signs of dumped rubbish, broken bottles, etc
- b. Check for any signs of animals grazing or nesting on the site
- c. Check for long grass, high plants etc

Filter and Backwash Inspection

Description:	Regular filter visual inspection, including initiation and observation of automatic backwash, and return to service.
To be carried out by:	Plant Operator
Frequency:	Daily

Insert picture of filter

1. Inspection of Filter Control Console

- a. Check if backwash selector is manual or auto
- b. Check inlet penstock is open
- c. Check Besta (filter outlet) valve is open
- d. Check head loss indicator
 - i. If greater than 3m, investigate why
 - ii. Visually check water level in filter to estimate head loss
 - iii. If 2.5m+, initiate backwash

2. Inspection of filter during backwash

- a. Check air scour rate, should be (xx)
- b. Inspect bubble distribution at top of filter for even distribution
 - i. If not even, investigate why

Insert picture of filter during air scour showing normal bubble distribution

- c. Look for mudballs in sand during air scour
- d. Check backwash water rate, should be XXXX
- e. Look for media carryover into backwash trough
- f. Look for backwash water to turn from brown to clear
- g. Allow backwash to complete
- h. Check filter returns to online

3. Inspection of filter returning to service

- a. Inspect media surface, should be smooth and even level
- b. Check sand media level has risen
- c. Check water level rises to standard operating level
- d. Check inlet and outlet valves open

Dry Feeder (Soda Ash) Drop Testing

What:	Drop testing of soda ash dry feeders to ensure they are dosing correctly
Who:	Plant Operator
How often:	Daily

Insert picture of soda ash feeder

1. Get the following equipment from lab
 - a. Drop test recording sheet, scales, stopwatch, tray, safety glasses, safety gloves, dust mask
 - b. Write down current feeder setting (%) from plant diary on recording sheet
2. If plant is running check all feeders are switched to Auto. If plant not running, switch selected feeder to manual.
3. Remove guards from feeder

Standard Operating Procedures 003

4. Inspect feeder tube for powder build-up and binding
 - a. If needed, stop feeder, remove tube, use brush or screwdriver to remove build-up, replace tube, switch back on

Insert close up picture of feeder tube with powder build-up

5. Check feeder setting (%) matches number written in diary
6. Tare weigh (zero) collection tray on scales
7. Hold collection tray under powder drop for 1 min, time on stopwatch
8. Remove tray, weigh on scales, record weight on recording sheet
9. Pour powder from tray back into dissolving tank
10. Repeat twice more, record all results. Check consistency of readings and retest if necessary
11. Replace guards
12. If feeder is in manual, return to auto
13. Clean and return equipment to lab
14. Calculate average weight per minute (grams / minute), write answer on results sheet.
15. Compare results with current setting and calibration curve in lab
 - a. If point is not on curve, carry out calibration and derive new curve

Standard Operating Procedures

Plant Walkaround and Visual Inspection

Description:	Regular visual inspection of whole WTP and basic equipment, and checking of listed systems
To be carried out by:	Plant Operator
Frequency:	Daily

1. Whole of plant inspection

- a. Plant security
- b. Water leaks
- c. Chemical leaks

2. Filters

- a. See **Filter Inspection SOP**

3. Flocculation system inspection

- a. Dosing points
- b. Flash mixers
- c. Flocculator drives
- d. Floc size

4. Mechanical equipment

- a. Blowers
- b. Backwash pumps
- c. Compressors

Standard Operating Procedures

5. Chemical systems

- a. Soda ash system
- b. Coagulant system
- c. Chlorine
- d. Dosing pump and feeder drop tests (each pump once weekly)
 - i. See **Dosing Pump Drop Test SOP**
 - ii. See **Dry Feeder Drop Test SOP**

6. Switchboard

- a. Faults
- b. SCADA

Reservoir Inspection

Description:	Regular inspection of treated water service reservoirs for any signs of damage, forced entry, or animals.
To be carried out by:	Reticulation Crew/Council Rangers/Operators
Frequency:	Weekly

Insert pictures of reservoirs

1. Inspection of security at reservoir

- a. Check gate is closed and padlocked
- b. Check fence for any holes, lifted wire, cut barbs etc
- c. Check ladders and ladder cages are padlocked

2. Inspection of reservoir grounds

- a. Check for overhanging branches, overgrown grass, other plants
- b. Check ground for any signs of thrown items, such as big rocks, smashed glass bottles, bullets
- c. Check ground for any animal poo or other signs of animals

Standard Operating Procedures – S005

3. Inspection of reservoir – walk all the way around

- a. Check for any signs of leaks (staining, damp patches, puddles)
- b. Check for damage to the walls from rocks or other items
- c. Check mesh/netting (if installed) for any holes
- d. Check for any signs of animal entry

4. Inspection of roof – try and see top of roof if possible without climbing

- a. Check hatch is closed
- b. Check for any damage to the roof from rocks or other items
- c. Check for any signs of animals, particularly birds nesting

WTP Water Sampling and Testing

What:	Regular water sampling and quality testing at the WTP
Who:	Plant Operator
How often:	Daily

Insert picture of lab bench testing equipment

1. Sampling water from taps in laboratory

- a. Grey tap is raw water, blue tap is clear water
- b. Fill 1L glass beaker, marked 'Raw Water' or 'Clear Water'
- c. Use sample to fill cuvettes for required tests (from colour, pH, turbidity, fluoride, chlorine)

Standard Operating Procedures – S006

2. Grab sampling from plant

- a. Ensure personal safety while sampling, use PPE if required
- b. Use a clean beaker
- c. Rinse beaker in sample water and empty
- d. Fill beaker with representative sample, ensure not to contaminate with hands
- e. Sampling locations

<p>Coagulation pH After weir 1 in tank</p>	<p>Individual filtered water pH, turbidity From inspection pits next to filter</p>
<p><i>Insert picture of sampling point</i></p>	<p><i>Insert picture of sampling point</i></p>

3. Testing

- a. Calibrate instrument daily (or as required)
- b. Check instrument against standard (standards must be within use by date)
- c. Perform tests as per procedures
- d. Record all results on laboratory sheet, then in diary, then copy into spreadsheet
- e. Clean and pack away equipment as required

4. Tips for recording and storing data

- Use a spreadsheet to record collected data
- Dates down the left, parameters across the top is standard
- Try to keep as much raw data as possible in a single spreadsheet. Consider keeping raw data in a separate spreadsheet to maximise the amount of data stored, while keeping the file size small.
- Use a new spreadsheet for weekly/monthly reporting and data manipulation, referencing the raw data.
- When producing weekly/monthly/yearly reports, think about how meaningful the statistics are. A report on 'Amount of times parameter exceeded operational limit' can be useful in determine effectiveness of operational procedures.
- Produce long time scale plots of relevant parameters to observe patterns over weeks, months, seasons, years etc.
- Use conditional formatting in spreadsheets to quickly highlight unexpected data
- Investigate any strange results to determine if they are a measurement/data entry error, or a valid but anomalous result.

APPENDIX C –CONTINUOUS IMPROVEMENT PLAN

Actions will be developed into a full plan based on the following template:

ACTION PLAN No.	ACTIONS	RESPONSIBILITY	PRIORITY (TIMEFRAME)	PROGRESS	COMMENTS
1.1.1	Expand the strategic objective 'to provide safe drinking water' into a full drinking water quality policy.	Water and Wastewater Engineer	Within 3 months	Commenced	Discussions held with Executive Management Team about this action. A policy is currently being drafted.

Actions arising from the Gap Analysis and the Risk Assessment (note that the first two numbers of each action refer to the Element and Component numbers for ease of cross-referencing actions back to the Framework).

ACTION No.	DESCRIPTION
1.1.1	Expand the strategic objective 'to provide safe drinking water' into a full drinking water quality policy.
1.1.2	Communicate the drinking water quality policy throughout the organisation once developed (examples include through awareness programs, posting policy on the intranet in the 'Water' and 'Policy' sections, including policy in induction materials and stating requirement to understand policy content in position descriptions).
1.2.1	Develop and maintain the currency of a Drinking Water Legal and Formal Compliance Register. The register should include at least the jurisdiction of the instrument, the type, the relevance to drinking water, who is responsible for keeping the document current and the next review date.
1.2.2	Ensure that the drinking water compliance requirements are communicated to employees and contractors (examples include articulating responsibilities in position descriptions, within the Drinking Water Quality Policy, via the website).
1.3.1	Develop a drinking water specific Stakeholder Register and show how RWC's current activities relate to stakeholder communication. The document should include at least the stakeholder, the jurisdiction, the relevance to the drinking water system, mode of communication (MoU, seminar etc), current responsible position from RWC and currency of the register.
1.3.2	Review how interagency communication is currently undertaken (to be partly covered by procedure developed by NSW Public Works in relation to incident response plan: see risk register FC10).
1.3.3	Improve RWC departmental communication (to be partly covered by procedure developed by NSW Public Works in relation to clarifier bypass procedure, see risk register FC10).
1.3.4	Formalise agreement with Centennial re water quality and communication protocols if treatment fails at Centennial (see risk register CCS1).
1.3.5	Review asset ownership between RWC and Bulk Water Corp (see risk register DR3).
1.3.6	Make sure asset agreements are in place between RWC and Bulk Water Corp (see risk register DR3).
1.3.7	Review how the potable water system is dealt with in terms of communication and education (see guidance from NSW Health) (see risk register NPW1).
2.1.1	Develop a clear team details table to show current positions and responsibilities for drinking water quality to help improve compliance with this component. The table should include at least the position, drinking water responsibilities and Drinking Water Management System responsibilities in particular.
2.1.2	Responsibility for the currency of the conceptual system flow diagram needs to be assigned. It is suggested that the Water and Wastewater Manager be assigned this responsibility.
2.2.1	Ensure that a comprehensive operational water quality database is set up to facilitate trend analysis of data in the future.

ACTION No.	DESCRIPTION
2.2.2	Ensure that when set up, data from Critical Control Points are logged (probably through SCADA) and analysed on a frequent basis (say monthly, initially) to allow for any emerging trends at these critical points to be picked up quickly.
2.3.1	Ensure that responsibility for maintenance of currency of the Risk Register is assigned to someone within the water quality team.
2.3.2	Ensure that a review frequency is set for the Risk Register and record when the Risk Register is reviewed and any changes made.
2.3.3	Review water quality results that Centennial has to report on as part of its Environment Protection Licence (see risk register CCS1).
2.3.4	Review pipeline location for input of Percy Colliery Source in new configuration (see risk register CCS1).
2.3.5	Check hydrocarbons in the Percy Colliery Source water to better assess risk (see risk register CCS1).
4.2.1	Review the formalisation and development of operational procedures, covering all aspects of the water supply system from catchment to tap. Training in the formalised procedures will also be required.
4.2.2	Review procedures for bushfires in Emergency Response Plan including how Hokey Pokey WTP is managed (arose out of risk assessment 1 September 2011 and refers to risks FC2 and WOS1).
4.2.3	Review how the septic system is managed at the Motorcycle club (arose out of risk assessment 1 September 2011 and refers to risks FC7).
4.2.4	CCP response procedures required (to be developed by NSW Public Works).
4.2.5	Develop a list of SOPs for WTP and Retic operations. A list and some SOPs to be developed by Public Works.
4.2.6	Develop calibration records (see risk register WOS6). Template to be prepared by NSW Public Works.
4.2.7	Consider moving to online telemetered monitoring for treated water pH, chlorine residual as well as online raw water monitoring (turbidity, EC, pH; see risk register pH1, pH2, Coag6, Dis2).
4.2.8	Develop a formalised procedure for this bypass of the clarifier during maintenance (see risk register Clar2).
4.2.9	Review the need for individual filter turbidity meters (see risk register F1).
4.2.10	Consider undertaking individual filter monitoring once the media has been changed (see risk register F1, F4).
4.2.11	Develop a procedure for Filter inspection and backwash including review of need for filter to waste (see risk register F2, F4).
4.2.12	Review chlorination procedures (plant shut down on chlorine failure etc) (see risk register Dis2; NSW Public Works).
4.2.13	Formalise current procedures for managing chlorination and testing (see risk register Dis2; NSW Public Works).
4.2.14	Develop SOP for managing the raw water bypass including the O&M of the bypass infrastructure (see risk register RWB1).
4.2.15	Consider having reservoir inspection procedures and checklists (see risk register DR1, DR5; NSW Public Works template).
4.2.16	Formalise mains repair procedures including review of ADWG guidance (see risk register D3, D4).
4.2.17	Formalise procedures relating to switching between water supplies (FARMERS RIVER WATER SUPPLY/RWC).
4.2.18	Ensure that a register is in place for all backflow devices installed and checking frequencies (see risk register D7)
4.2.19	Procedure required for mains flushing (see risk register D8).
4.2.20	Review areas of dead ends to see if they can be reticulated (see risk register D8).
4.5.1	Consider having a system in place where operators check chemicals delivered against a range of set criteria for each chemical e.g. observation of chemical state (colour, smell (where safe to do so), liquid, solid etc) and record of findings for each delivery.
4.5.2	The hypochlorite used in the booster chlorinators will have to be added to a purchasing policy and included in a stock rotation roster.
4.5.3	The purchasing policy was not included in the policy list on the RWC website and will need to be posted there for completeness. Other specific purchasing information (such as tender documentation) may be commercial in confidence and would not be expected to be made available on RWC's website (see also risk register WOS2).
4.5.4	Ensure that the procurement policy specifically includes water quality assessment when purchasing chemicals and materials in contact with drinking water. Standards which could be

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	specified for compliance with include <i>AS/NZS 4020:2005 Testing of products for use in contact with drinking water.</i>
4.5.5	Ensure that a procedure is in place for appropriate storage and rotation of all chemicals used (see risk register CB3).
5.1.1	Review the sampling program against the requirements of the NSW Health Drinking Water Monitoring Program and ADWG Part III guidance and check that the samples are representative of the system (also arose in risk assessment 1 September 2011 and refers to risks FC9; will be partly addressed by NSW Public Works) (see also risk register Dis4).
5.1.2	Review raw water monitoring program (see risk register FCD6).
5.2.2	Review how call centre employees are trained in taking and dealing with water quality complaints.
5.2.3	Review how water quality complaint records are designed and filled out to enable all required water quality issues to be comprehensively documented.
5.2.4	Review how Dataworks and Proclaim can be better integrated to provide for a more comprehensive customer water quality complaint analysis.
5.3.1	Ensure that customer requests relating to water quality are analysed for trends.
5.3.2 and 5.4.1	Ensure that short-term evaluation of results and reporting of findings is formalised.
6.1.1	Review Business Continuity Plan and ensure that drinking water provisions are adequately covered. Also review for sewerage provisions (see risk register FCD2).
6.1.2	Review how RWC deals with the media in the event of a drinking water quality incident – examples include having a draft media statement prepared ready to tailor for the situation encountered.
6.1.3	Ensure that a formally documented protocol is in place on responsibilities for providing information to the media on drinking water quality issues (this action may be satisfied by reviewing the information in the ERP).
6.1.4	Ensure that RWC has a formal system in place for recording water quality incidents and how they are dealt with (cross reference with Element 10 actions below).
6.2.1	Review how incidents are managed at RWC including undertaking scenario training (with appropriate records) of incidents noting that draft boil water alert statements are available on the NSW Health website.
6.2.2	After scenario training has been conducted, review how the protocols were implemented in practice and ensure that any gaps are identified and incorporated into improvements to the protocols.
6.2.3	Consider having an agreement in place with emergency services in the event that something happens in the water supply catchment (arose out of risk assessment 1 September 2011 and refers to risks FC4 and FC5).
6.2.4	Review procedures for bushfires in Emergency Response Plan (see risk register FCD4). Incident response plan template to be developed by NSW Public Works).
7.1.1	Ensure that water quality issues are added to the agenda of the daily operator meetings.
7.1.2	Ensure that service providers to RWC are aware of water quality protection requirements when undertaking their jobs by including specific water quality awareness and protection clauses in contracts and ensuring that water quality awareness training is kept up to date.
7.2.1	Ensure that all staff in RWC undertakes water quality awareness training and competency assessment (the level being dependent on the role within RWC).
7.2.2	Review how contractors and outgoing staff are currently managed. May need to develop an employee exit procedure (see risk register WOS5).
8.2.1	Consider placing the DWMS (or a summary of it if information is considered too sensitive) on the website when finalised.
8.2.2	Ensure that residents on non-potable water are informed on a consistent basis that their water is not intended for drinking.
8.2.3	Consider signage in the catchment (sect 632 LGA) to indicate that the catchment is used as a water supply catchment and to report any contamination to RWC (arose out of risk assessment 1 September 2011 and refers to risks FC6, FC8 and FC9).
9.1.2	Consider using distribution system modelling techniques to track water distribution and age for chlorine residual maintenance purposes.
9.2.1	Ensure that RWC liaises with Farmers River Water Supply over the management of water quality at the RWC/ Farmers River Water Supply handover points. Agreement between RWC and Bulk Water Corp needs to be reviewed and tightened in terms at least water quality to meet ADWG levels, communication protocols in case of non-conformance, chlorine residual adequacy in the water supplied to Rydal and Wallerawang and Fe and Mn management (see risk register FRS1).
9.2.2	Ensure that the location of the Percy Colliery pipeline is reviewed in terms of at least position of

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	entry into the dam and likely impact on potential short-circuiting.
9.2.3	Review raw water quality data and inflows to reservoir (mm rain) to see if a relationship can be established (see risk register FCD3).
9.2.4	Review the need for water quality monitoring program for catchment for sources of hazards such as <i>Cryptosporidium</i> (see risk register F4).
9.2.5	Consider improving the chlorine dosing system (see risk register Dis1).
9.2.6	Confirm chlorine CT for the plant (see risk register Dis1).
9.2.7	Review how pH is monitored and where (see risk register Dis3).
9.2.8	Consider whether stabilisation of water is needed (see risk register Dis3).
9.2.9	Review reasons for pH increases including plant and reticulation issues (see risk register PD1).
9.2.10	Consider shock dosing of reservoirs (see risk register DR1: NSW Public Works procedure).
9.2.11	Consider undertaking a security vulnerability assessment on all assets (see risk register DR4).
9.2.12	Adequacy of asset replacement program, asset management and condition assessment to be considered. Need to include cast iron mains in asset management program when developed. (see risk register D1, D9).
9.2.13	Review system for examination and management of reticulation water age issue (see risk register D6).
9.2.14	Review how contractors check their equipment (see risk register D10).
9.2.15	Consider undertaking a more in depth system modelling to better understand water balance (see risk register D12).
9.3.1	Ensure that the fluoridation equipment and operation is validated appropriately (commissioned).
10.1.1	Ensure that the records management policy is reviewed as it is currently two years past its review date.
10.1.2	Ensure that a SOP is written to cover standardisation of file naming for later ease of searching.
10.1.2	Consider reviewing how water quality data/incidents and records are stored at RWC to improve access to data and records.
10.1.3	Make sure that all asset inspections are logged, not just those that fall out of hours.
11.1.1	Consider improving use of the NSW Health Drinking Water Database to help with long-term trending and review of water quality data.
11.2.1	Formalise and record inspections undertaken by the operators (use templates, checklists etc to facilitate direction of inspections).
11.2.2	Ensure that a formalised audit schedule is developed for the system then implement it.