

Ballina Shire Council Drinking Water Management System Awareness Training



Purpose



Educate and raise staff awareness on drinking water management and the Ballina Shire Council Drinking Water Management System

Content

- Why have a management system and what can go wrong if not managed correctly?
- Requirement for a Drinking Water Management System (DWMS)
- Overview of the Ballina Shire Council DWMS



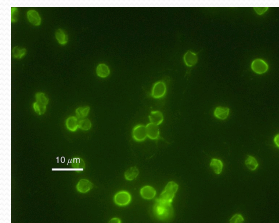
Why have a drinking water management system?

- A Drinking Water Management Systems is a risk management plan, that follows the 12 Elements of the Australian Drinking Water Guidelines (ADWG).
- The 12 Elements are a framework for managing risks in drinking water.
- Incidents are usually the result of systematic failures in a supply system where risks are not reliably identified and managed.
- Water quality incidents can result in widespread illness and disease, ongoing health issues and in extreme cases, death.



1993 – *Cryptosporidium* outbreak, Milwaukee, Wisconsin

- *Cryptosporidium* oocysts - largest documented outbreak in U.S history
 - 400,000 residents infected
 - source unknown (likely to be from faecal contamination from runoff into Lake Michigan)
 - chlorination not effective therefore filtration was the critical process
 - increased turbidity at WTP identified in the lead up to outbreak
- Outcomes include improved:
- watershed protection
 - public health surveillance
 - process monitoring
 - plant modernisation.



Immunofluorescence image of *C. parvum* oocysts.
Source Wikipedia



2002 – *Campylobacter* and *E. coli* outbreak, Walkerton, Ontario



- small rural community
- 7 deaths, 2,300 ill
- heavy rainfall caused cattle manure to be washed into a shallow water supply well
- inadequate chlorine dose
- failure to test chlorine residuals
- falsified log entries and reports
- operators had no formal training
- operators were found to be drinking alcohol on the job

Outcome:

- criminal charges for manager and operator

Recommendations:

- improve training
- increase funding to ensure adequate oversight of operations
- improve record keeping, log books and review processes
- improve environmental protection
- implement multiple barriers



<http://www.waterandhealth.org/drinkingwater/fiveyears.html>

1998, *Cryptosporidium* and *Giardia* events, Sydney

- heavy rains following long drought period resulted in low quality runoff
- drought and bushfires had reduced vegetation in the catchment – a natural buffer
- three contamination events recorded
- Sydney-wide boil water alert
- \$50,000 000 cost and loss of reputation

Recommendations:

- change Sydney Water and Hunter Water to statutory owned corporations

- establish Sydney Catchment Authority
- improve definition of powers and roles
- improve research, monitoring, incident reporting and strategies
- establish protocols with council, NSW Health and EPA



<http://www.sydneywater.com.au/>

2005 – Recycled water cross connection, Newington.

- Sydney Olympic Park provide recycled water to approximately 1,500 properties, Sydney water provide the drinking and wastewater services.
- Two cross connections between the drinking and recycled water systems were discovered following a customer complaint about the taste of their water.
- the cross connections were due to a plumbing fault in the service pipes and may have occurred anytime between 2001 and 2005
- recycled water was turned off
- 1500 house were audited
- new protocols for inspecting dwellings for cross connections were developed



www.sydneywater.com.au

www.sydneyolympicpark.com.au

2011 – *Salmonella* outbreak, Roma, Queensland

- *Salmonella typhimurium*
- 26 cases of illness, 3 hospitalised
- probable cause – backflow from underground storage tanks that were home to numerous frogs
- water supply system comprised of complex network of 14 bores, six reservoirs and 3 underground storage tanks, interconnected via the reticulation system
- only four out of 14 bores were chlorinated



Outcomes

- super chlorination and flushing of network
- boil water alerts
- decommissioning of 3 underground storages
- isolation of 3 bores
- increase in sampling



www.wqra.com.au

Drinking Water Management Systems

Public Health Act 2010



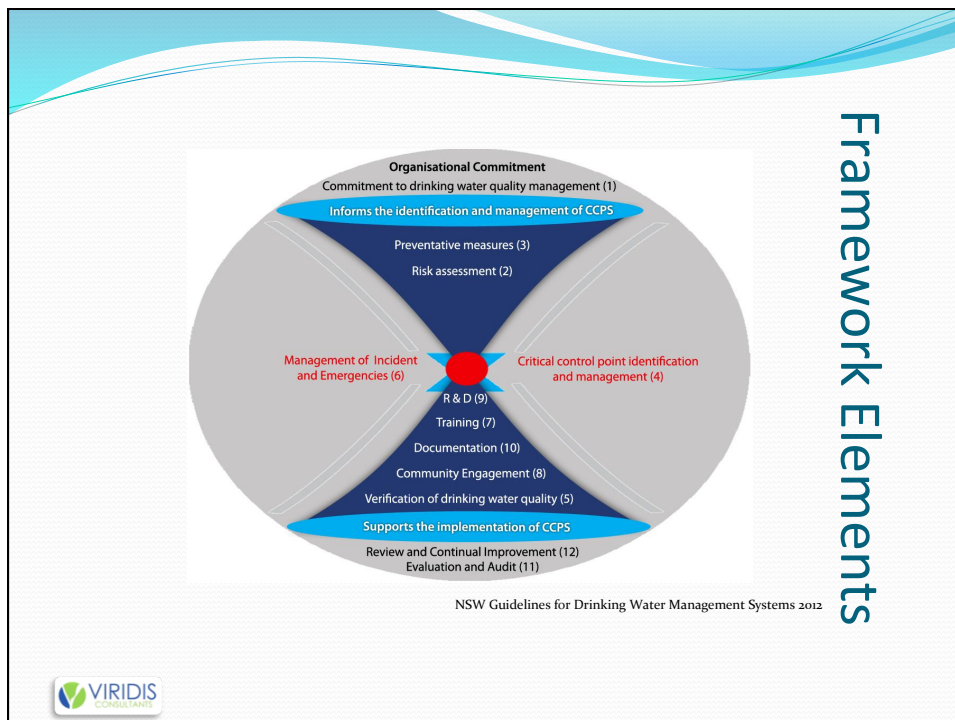
Statutory Requirement

- The *Public Health Act 2010* and the *Public Health Regulation 2012* have requirements for water utilities, private water suppliers, and water carters.
- From 1 September 2014, suppliers of drinking water are required to establish and adhere to a quality assurance program by preparing and implementing a Drinking Water Management System (DWMS).
- NSW Health has prepared a guidance document and four examples of DWMSs. This guidance is applicable to local water utilities and larger private suppliers.



Requirements for a DWMS

- The quality assurance program (DWMS) must address the elements of the Framework for the Management of Drinking Water Quality, set out in the Australian Drinking Water Guidelines (ADWG).
- A supplier of drinking water will be required to provide NSW Health with a copy of its most recent quality assurance program.
- A review of the supplier's quality assurance program can be arranged by NSW Health at any time.



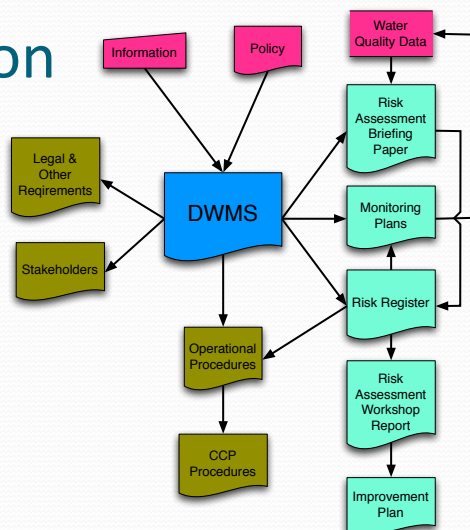
Ballina Shire Council DWMS



Documentation



Ballina has two main water supplies, the bulk supply from Rous Water and the Marom Creek Water Treatment Plant operated by Ballina Shire.



Responsibilities

- The Chief Executive Officer is responsible for implementing and maintaining this DWMS.
- Those employees within the Organisational Structure with responsibilities directly related to water quality management have those requirements relevant to their position reflected in their Position Description (PD).
- The Drinking Water Policy provides a commitment to ensuring that managers, employees and contactors are aware of their responsibility to implement the DWMS. The DWMS states where there are relevant responsibilities.
- The *Legal and Other Requirements Register* identifies the position with responsibilities under each of the requirements.



Ballina Shire Council Drinking Water Policy

Ballina Shire Council is committed to managing its water supply effectively to provide a safe, high-quality drinking water that consistently meets the NHMRC/NRMMC *Australian Drinking Water Guidelines*, consumer needs and expectations, and other regulatory requirements.

To achieve this, in partnerships with stakeholders and relevant agencies, Ballina Shire Council will:

- manage water quality at all points along the delivery chain from source water (through supply agreements where the source water is managed by Rous Water) to the consumer;
- use a risk-based approach in which potential threats to water quality are identified and balanced;
- integrate the needs and expectations of our consumers, stakeholders, regulators and employees into our planning;
- establish regular monitoring of the quality of drinking water and effective reporting mechanisms to provide relevant and timely information, and promote confidence in the water supply and its management;
- develop appropriate contingency planning and incident response capability;
- participate in appropriate research and development activities to ensure
- continued understanding of drinking water quality issues and performance;
- contribute to the debate on setting industry regulations and guidelines, and other standards relevant to public health and the water cycle;
- continually improve our practices by assessing performance against corporate commitments and stakeholder expectations.
- Ballina Shire Council will implement and maintain a drinking water quality management system consistent with the *Australian Drinking Water Guidelines* to effectively manage the risks to drinking water quality.
- All managers and employees involved in the supply of drinking water are responsible for understanding, implementing, maintaining and continuously improving the drinking water quality management system.



Legal and other Requirements Register

Appendix C of the DWMS

- Identifies statutory requirements
- Contains the following detail:



- Regulatory Instrument
- Authority
- Requirement – brief description
- How Ballina Shire Council addresses the requirements
- Responsibility



Stakeholder Engagement

Table 3 of the DWMS.

- Identifies the relevant stakeholders for Ballina Shire Council drinking water service and describes how Ballina Shire Council engage with their stakeholders.
- Stakeholders include
 - Rous Water
 - consumers
 - NSW Health and NSW Office of Water
 - other relevant organisations



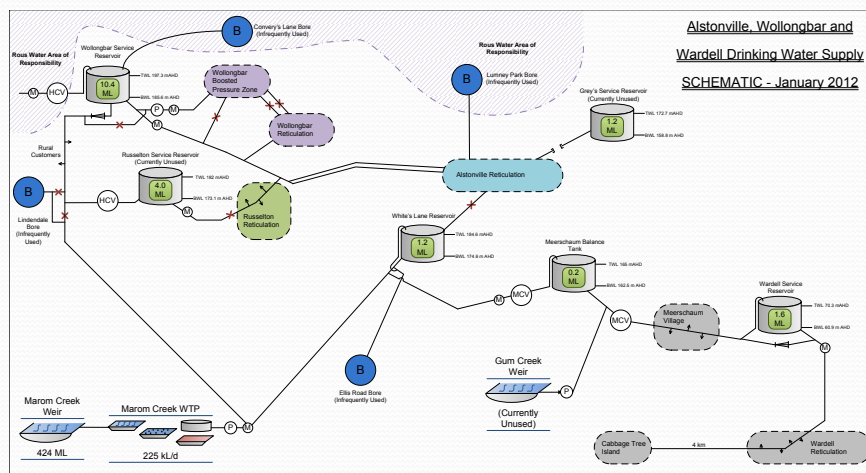
Water Supply System Analysis

Section 2 of the DWMS

- Understanding the infrastructure of the service is a critical first step for identifying the hazards and hazardous events that can compromise drinking water quality, and ensuring that risks are addressed.
- Infrastructure details include all the key components that form part of the service, from catchment to consumer, including:
 - Source
 - Treatment process
 - Disinfection process
 - Distribution and reticulation system including reservoirs and pump stations
 - Stakeholders (who are relevant to drinking water quality management).



Ballina Water Supply System



Risk Assessment Workshop Hazard Identification

Section 2 of the DWMS and the Risk Assessment Workshop Report
(including the Risk Assessment Workshop Briefing Paper)

Risk Assessment Workshop (September 2012)

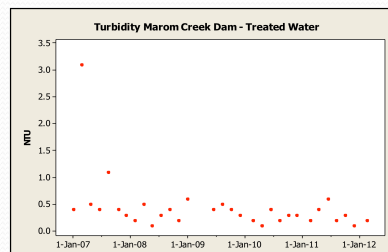
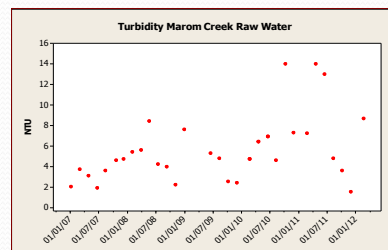
- Attended by managers, operators, catchment officers, EHOs, NSW Health, NSW Office of Water,
- Review of upstream risk (catchment assessment)
- Review of water quality data and system performance
- Review of water supply system and distribution system

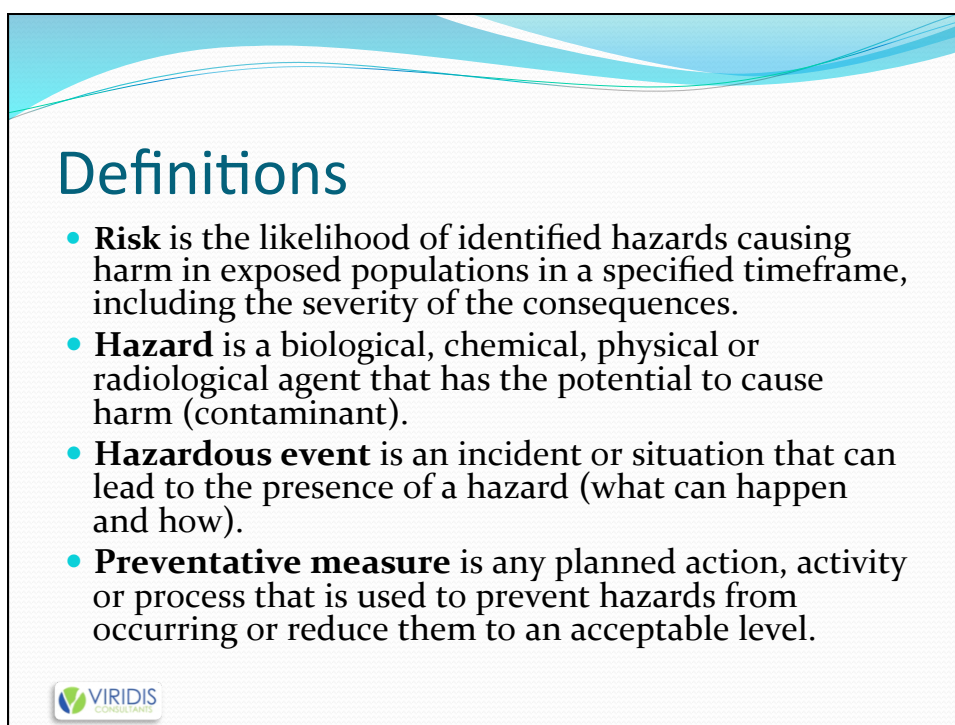
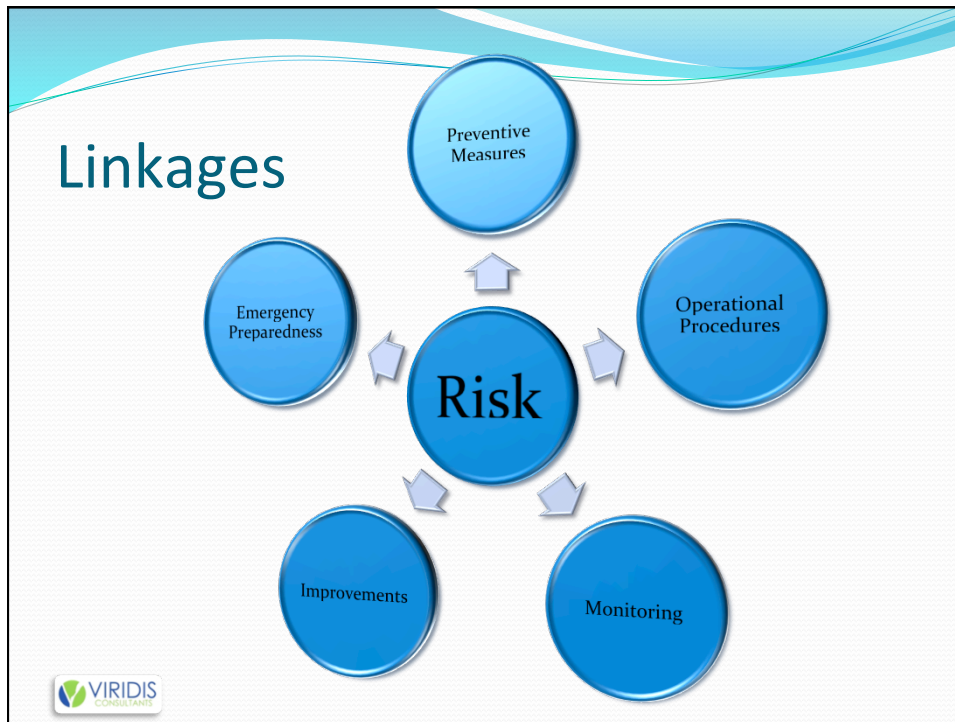


Water Quality Data Analysis

Data from:

- source – Marom Creek, Lindedale and Ellis Road bores
- processes – turbidity, chlorination
- treated water – reservoirs, trunk mains, consumer points





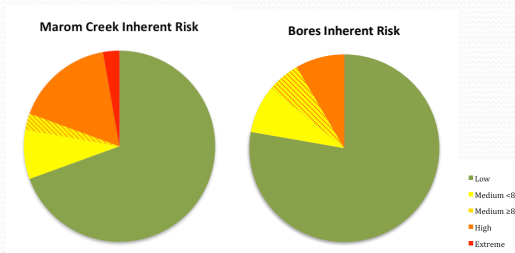
Definitions

- **Inherent risk** – this is the level of risk in Marom Creek Dam and the treated drinking water supplied by Rous Water.
- **Maximum risk** – risk without existing barriers/preventive measures in place. Therefore, maximum risk is the inherent risk plus any additional sources of hazards/hazardous events due to Ballina Shire Council’s treatment and /or distribution network.
- **Residual risk** – the risk after current barriers and preventive measures are taken into consideration.
- **Significant risk** – risk that is outside the acceptable range (greater than Medium 8).



Inherent Risk Wardell System

Inherent risk is the level risk in the raw water without treatment.



A number of significant inherent risks need to be managed



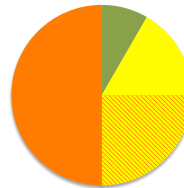
Hazard	Inherent Risk
Marom Creek	
Bacteria	Extreme (20)
Protozoa	High (15)
Viruses	High (12)
Aluminium	Medium (8)
Iron	High (15)
Colour	High (15)
pH	High (15)
Turbidity	High (12)
Lindendale Road and Ellis Road Bores	
Bacteria	Medium (8)
Viruses	Medium (8)
Hydrogen sulphide/ sulphide	High (15)
Iron	High (15)
Taste and odour	High (15)

Maximum and Residual Risk

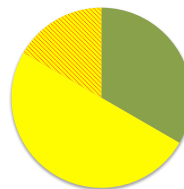
Maximum risk is without existing barriers in place.
Residual risk is the risk with existing barriers in place.

- Prior to the application of preventative measures, the maximum risk was outside the acceptable range for a high proportion of hazardous events.
- The residual risk pie chart demonstrates that the majority of risks are within the acceptable range.

Wardell System Maximum Risk



Wardell System Residual Risk



Distribution System

Distribution Maximum Risk



Distribution Residual Risk



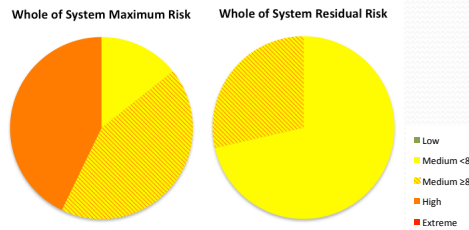
Low
 Medium <math>< 8</math>
 Medium ≥ 8
 High
 Extreme

Whilst the proportion of significant risks was reduced, there are still unacceptable residual risks in the distribution system that will require additional risk treatment.

New hazards can be introduced during the storage and distribution of treated water, for example through stagnation or backflow.



Whole of System



- Whole of system includes contracts, agreements, training, resources and management procedures.

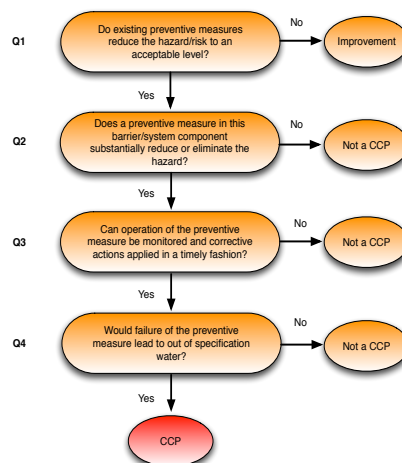
The residual risk pie chart demonstrates that two residual risks remain outside the acceptable risk range and additional risk treatments are required to reduce the risk to an acceptable level.



Preventive Measures

Section 3 of the DWMS and Risk Assessment Workshop Report

- Preventive measures identified in the risk assessment are assessed to determine if they are a Critical Control Point (CCPs).
- All preventative measures for significant risks are identified in the Risk Assessment Workshop Report.
- Preventative measure for significant risks must be implemented to ensure all risks are managed.



Operational Control

Section 3.2 of the DWMS and the CCP Procedures (Appendix D)

- Corrective actions are those taken immediately to prevent hazards from reaching end users for example, actions taken following noncompliance with water quality criteria.
- The effect of planned corrective actions is to ensure that the preventive measure is brought under control and non-conforming water is correctly handled.
- If a **target** criterion is not met then corrective action must be taken in good time
- If a **critical** limit is not met, the assumption that the water is safe no longer applies and a **pre-determined** corrective action must be taken urgently.



CCP Procedures

- CCP Procedures have been developed for the Ballina Shire Council system and are included in the DWMS in Appendix D.
- CCPs must be monitored and have a documented corrective action for exceedences of critical and alert limits.



CCP Monitoring

Preventive measure	What	How	Where	When	Who	Target value for optimal performance	Alert level	Critical limit	Corrective action procedure
Selective abstraction at Weir	Turbidity	Visual inspection Grab sampling	Raw water (Dam)	Daily	Operator	< 5 NTU	5 NTU	10 NTU	Appendix D Cease raw water pumping Adjust alum dose
Coagulation (Alum dosing and pH Correction)	pH	Grab sample	Flocculation pond Dose water	Daily (visual) Daily (grab)	Operator	6.6 - 6.8	<6.6 and >6.8	<6 - >7.5	Appendix D
Filtration	Turbidity	Current - grab Proposed - online	Current - clear water Proposed - filtered water	Current - daily Proposed - continuous	Operator	0.3 NTU	0.5 NTU	1 NTU	Appendix D Limit determined for effective chlorination
Chlorination	Chlorine residual	Grab sample	Clear water tank	Daily	Operator	1.2 - 1.4 mg/L	<1.2 - >1.4 mg/L	Low - <0.5 mg/L High > 5 mg/L	Appendix D AL - Check dosing CL - Shut down



Operational monitoring

Section 4.2

- Operational monitoring includes the planned sequence of measurements and observations to assess and confirm the performance of preventive measures.
- Measurements are of operational parameters that will indicate whether processes are functioning effectively.
- The CCP procedures for the Ballina Shire Council supply system is provided in Appendix D of the DWMS.



Verification Monitoring

Section 5 of the DWMS

- It is monitoring that is undertaken to determine that the products meets specification.
- It is usually at the transfer point.
- It is the water quality monitoring that is reported to a regulator.
- In many cases it differs from operational monitoring in that it is historic (e.g. metal results are received 1 week after water is supplied to the customer).
- The *Operational and Verification Monitoring Plan* is provided in Appendix E.



Incidents and Emergencies

Section 6 of the DWMS

Incident and emergency response protocols are regarded as a priority and are managed in accordance NSW Health Protocols, with formal internal procedures to be developed as identified in the *Improvement Plan* (Appendix F).

Water quality incidents must be managed in accordance with the following protocols:

- NSW Health Response Protocol – Management of Microbiological Quality
- NSW Health Response Protocol - Treatment Failure, Cryptosporidium and Giardia
- NSW Health Response Protocol - Management of Physical and Chemical Quality
- NSW Water Directorate - Blue Green Algae Management Protocols
- NSW Code of Practice for Fluoridation of Public Water Supplies



Improvement Plan

Section 12.2 of the DWMS

- Supporting Document - Improvement Plan (Appendix F, DWMS)
- Developed to address high residual risks – water quality improvements detailing
 - Ref number
 - Source of the improvement
 - Scheme
 - Project title
 - Project description
 - Residual risk
 - Responsibility
 - Priority
 - Timeframe
 - Status
 - Outcome



Improvement Plan

The priority of each action was determined using level of risk, as follows:

- Level 1 priority was assigned to hazardous events with a residual risk of High or Extreme and must be actioned within 12 months of acceptance of this DWMS.
- Level 2 priority was assigned to hazardous events with a residual risk of Medium (9) or Medium (8) and must be actioned within 24 months of acceptance of this DWMS.
- Level 3 priority was assigned to hazardous events with a residual risk of Medium (6) or lower where improvements were identified. These improvements are intended to optimize system performance or assist gain greater knowledge of supply. They are to be actioned within 48 months.

Level 1 Improvement Items

Ref	Scheme Component	Improvement Action
WQ16	Distribution	Review of Service Level Agreement between Rous Water and Ballina Shire



Ongoing DWMS Implementation

- From 1 September 2014 all drinking water providers must have implemented and be compliant with their DWMS.
- Regular internal and external auditing of the DWMS is required.
- Long term evaluation of results, including performance of CCPs, water quality data, levels of service.
- The DWMS must be submitted to the NSW Health Public Health Unit for review.
- Components of the DWMS will be audited by NSW Health and NSW Office of Water.

