

Are your operations audit ready? Lessons learned from Drinking Water Management System Audit Readiness Reviews

Philip de Souza, Global Lead: Water Safety Planning, Atom Consulting

Anderson Choo, Engineer, Atom Consulting

Natalie Crawford, Head: Water Safety Planning, Atom Consulting

ABSTRACT

Local water utilities in New South Wales are required to implement and maintain a water quality assurance program, commonly referred to as a Drinking Water Management System (DWMS). This comprehensive and proactive risk management approach aims to ensure the continuous supply of safe drinking-water. In recent years there has been a significant increase in hazards to providing safe drinking-water services, with several unexpected hazards materialising including extreme weather events and the COVID pandemic. Such shocks and stresses test the resilience of both water system infrastructure and operational staff in continuing to provide safe drinking-water. Auditing is a critical element in determining DWMS sustainability, as it provides a check that the DWMS is complete, understood, adequately implemented, working effectively, and that it supports continuous improvement. Effective DWMS operationalisation requires systems, processes and procedures to be embedded within the organisation, and for the organisation to foster an adaptation and continuous improvement mindset amongst staff. This paper shares findings from DWMS readiness review audits of selected water utilities in New South Wales, and highlights typical operational challenges in developing, implementing and sustaining DWMS practices. The paper focusses on trends and gaps identified through the auditing process, shares real-life experiences, innovations and lessons learned from engagements with operators, and highlights common focus areas or quick wins that may be of benefit to other water utilities.

1. INTRODUCTION

Local water utilities are required to develop and implement a drinking water management system (DWMS) under the Public Health Act 2010 (NSW) and the Public Health Regulation 2022 (NSW) (the Regulation). The DWMS must address the elements of the Framework as set out in the Australian Drinking Water Guidelines (ADWG) and the specific requirements of the Regulation.

NSW Health have released Guidelines for Review and Audit of Drinking Water Management Systems (NSW Health and Department of Planning Industry and Environment Water, 2022). The guidelines refer to two types of independent review (i.e. readiness review and external audit). In both cases, the independent review or audit allows the utility to have a ‘new set of eyes’ over their processes and identify any gaps or opportunities for improvement that can be addressed. The Central New South Wales Joint Organisation (CNSWJO) engaged Atom Consulting to conduct a DWMS audit readiness review at selected councils. This paper shares findings from these DWMS readiness review audits including gaps identified and lessons learned.

2. DISCUSSION

The scope for the DWMS readiness review was to test the adequacy and implementation of the DWMS of the selected Councils with consideration of all 12 elements (and 72 criterion) of the DWMS:

- Element 1 - Commitment to Drinking Water Quality (6 criterion)
- Element 2 - Assessment of the Drinking Water Supply System (13 criterion)
- Element 3 - Preventive Measures for Drinking Water Quality Management (5 criterion)
- Element 4 - Operational Procedures and Process Control (10 criterion)
- Element 5 - Verification of Drinking Water Quality (5 criterion)
- Element 6 - Incidents and Emergencies (8 criterion)
- Element 7 - Employee Awareness and Training (6 criterion)
- Element 8 - Community Involvement and Awareness (2 criterion)
- Element 9 - Research and Development (7 criterion)
- Element 10 - Documentation and Reporting (2 criterion)
- Element 11 - Evaluation and Audit (3 criterion)
- Element 12 - Review and Continual Improvement (5 criterion)

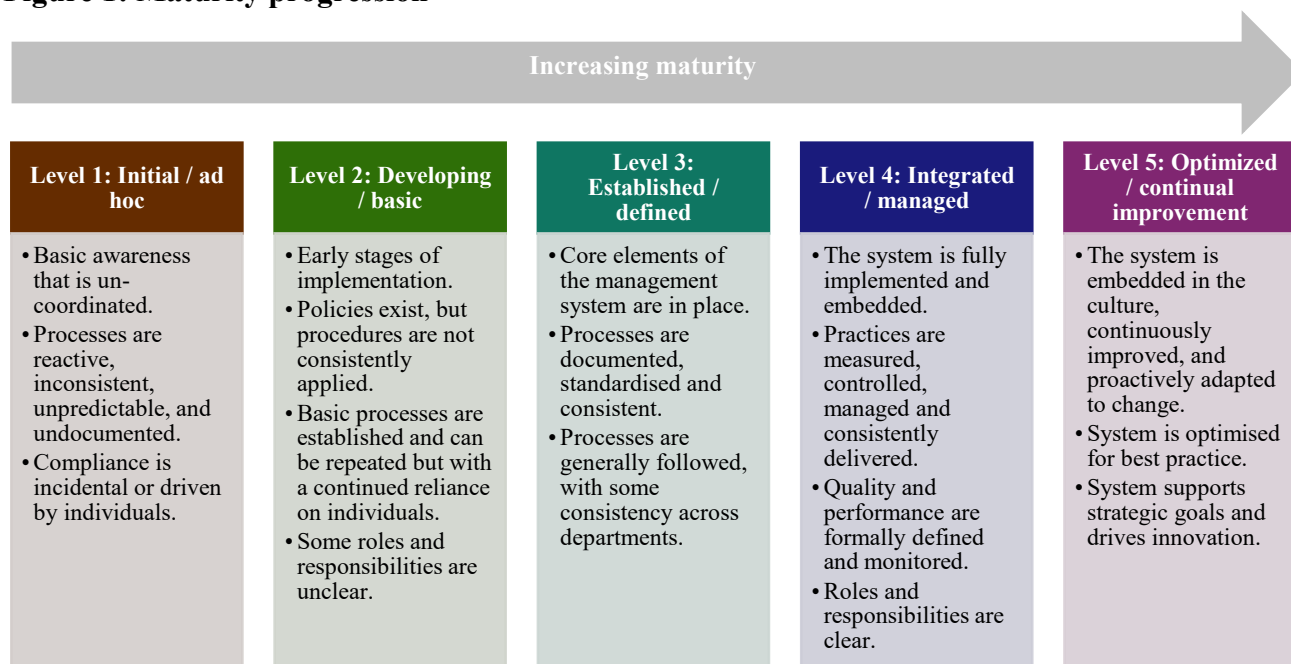
The audit readiness review process allows councils to identify points for improvement ahead of official audits to guide the improvement plan process, and aids councils in:

- achieving their strategic objectives,
- having better and more efficient levels of service delivery,
- having increased accountability and transparency,
- achieving better decision-making and having the confidence to make difficult decisions,
- having increased financial stability,
- achieving and maintaining compliance with all laws, regulations, internal policies and procedures, and,
- better safeguarding their public assets.

By conducting the process as a group of councils, combined strengths and points of weakness could also be drawn out. Additionally, individual council strengths could be identified and shared.

To assess the maturity of DWMS implementation by participating councils, we considered a model which has been adapted from Gartner's Maturity Model (Gartner, 2025) and the Capability Maturity Model Integration (CMMI Institute, 2025). A maturity progression scale was used to assess the extent of DWMS implementation across councils and identify areas for improvement (see Figure 1). Each increasing level represents a step towards a more mature and efficient DWMS implementation. By identifying the level of maturity, we can determine points of improvement to help councils develop strategies to advance to higher maturity levels. Importantly, maturity progression needs 3 stages to be in place, notably foundations (organisational culture, organisational governance), enablers (methodology and tools, information and data, capability and training) and integration (strategy and business planning, projects, programs and operational performance, reporting and communications). If any of these stages or attributes are not in place, the ability to progress and sustain DWMS implementation could be compromised.

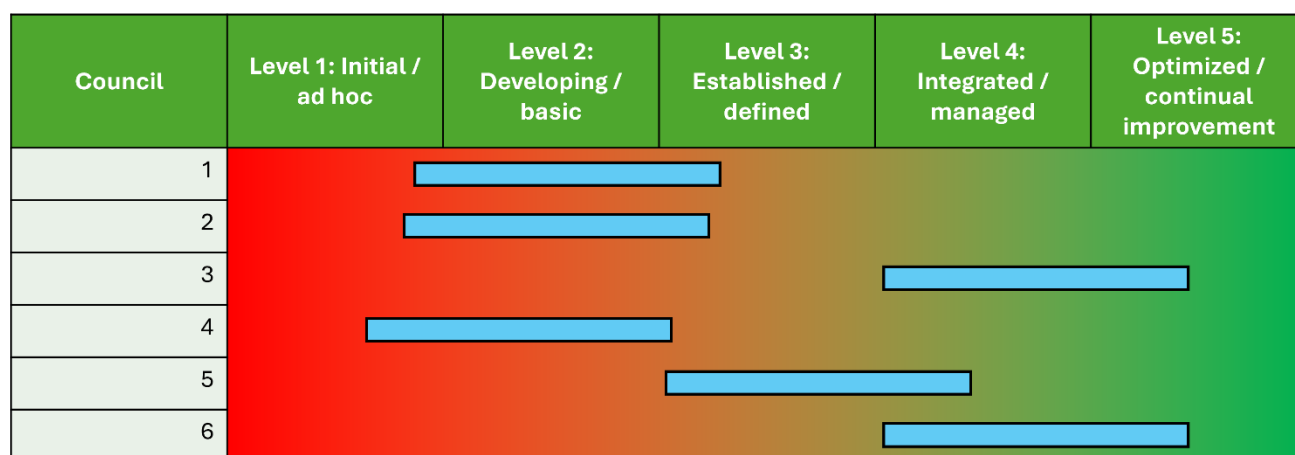
Figure 1: Maturity progression



Source: Adapted from Gartner's Maturity Model (Gartner, 2025) and the Capability Maturity Model Integration (CMMI Institute, 2025).

A high-level summary of DWMS implementation maturity across the councils is shown in Figure 2.

Figure 2: Maturity scale of DWMS implementation



With reference to the above, and the high-level summary of DWMS implementation maturity shown in Figure 1, varying levels of DWMS implementation maturity were noted across the CNSWJO, highlighting that not all processes are universal across the CNSWJO, and that different limitations are present at each council. Notably, two councils demonstrated an integrated and well managed DWMS with key aspects monitored and clear internal roles and responsibilities. Importantly, review of the NSW Health water quality verification monitoring results indicates excellent compliance to ADWG requirements for all six councils. This result indicates that despite challenges faced, participating councils are still managing to deliver good water quality to consumers. Several indicators of DWMS implementation maturity in place at several councils, included:

- Scheduled regular water quality meetings (enabling regular review and assurance of water quality data, providing assurance of compliance activities, review of plant operation, system upgrades and requirements, assessment of water related complaints).

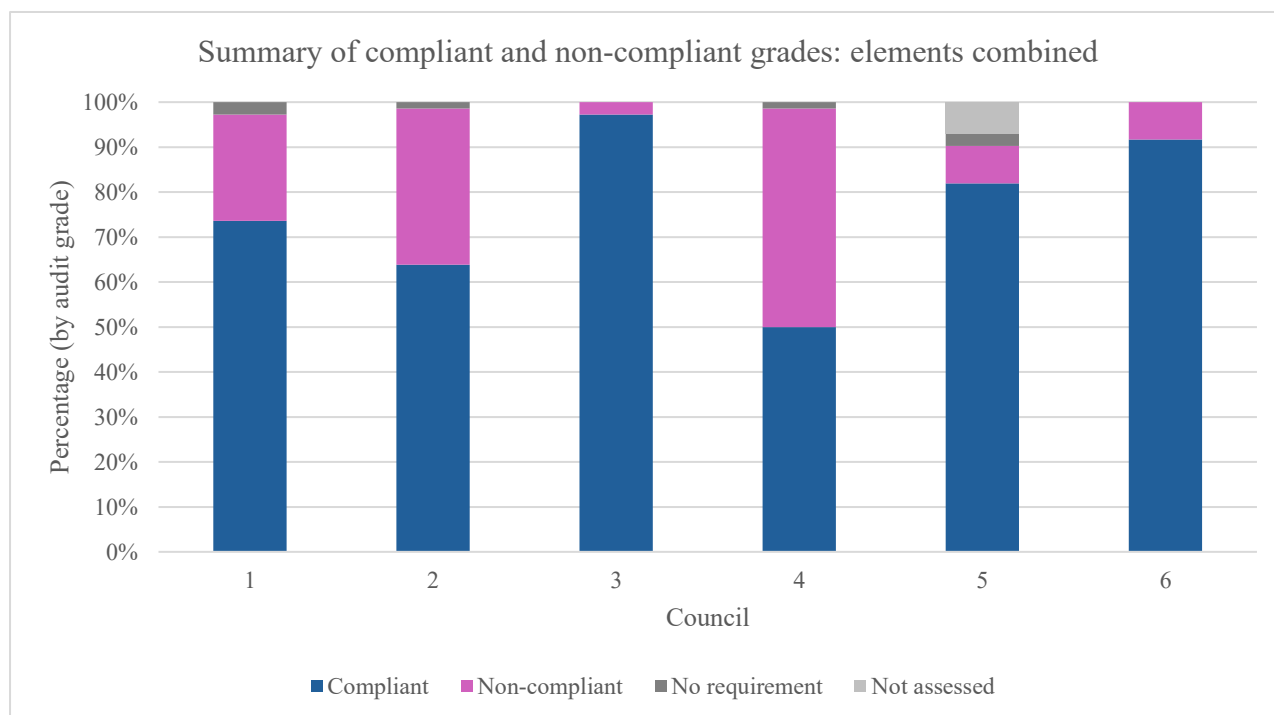
- Implementation of online critical limit monitoring of turbidity and chlorine critical control points (CCPs) at WTPs.
- Up to date risk assessment process and documentation.
- Annual reporting with reports submitted to NSW Health.
- Formalised operations, inspections and maintenance activities (scheduled inspections and maintenance activities, records of works activities, well-developed standard operating procedures that are followed).
- Formalised process for regular review of verification monitoring and data.
- Incident and emergency response planning activities (Incident & Emergency Response plan (IERP) has been developed and is current, incident scenarios have been undertaken, incident debriefs have been undertaken)
- Formal drinking water quality awareness training is undertaken with records.
- Improvement plan is current and actively in use.

Although not fully embedded, some emerging areas of good practice were also noted, including:

- Consideration of Health Based Targets (HBTs), with planning/designing (and sometimes even implementing) treatment improvements underway to alleviate estimated Log Reduction Value (LRV) treatment shortfall.
- Formal internal audits held or are being scheduled for internal review.

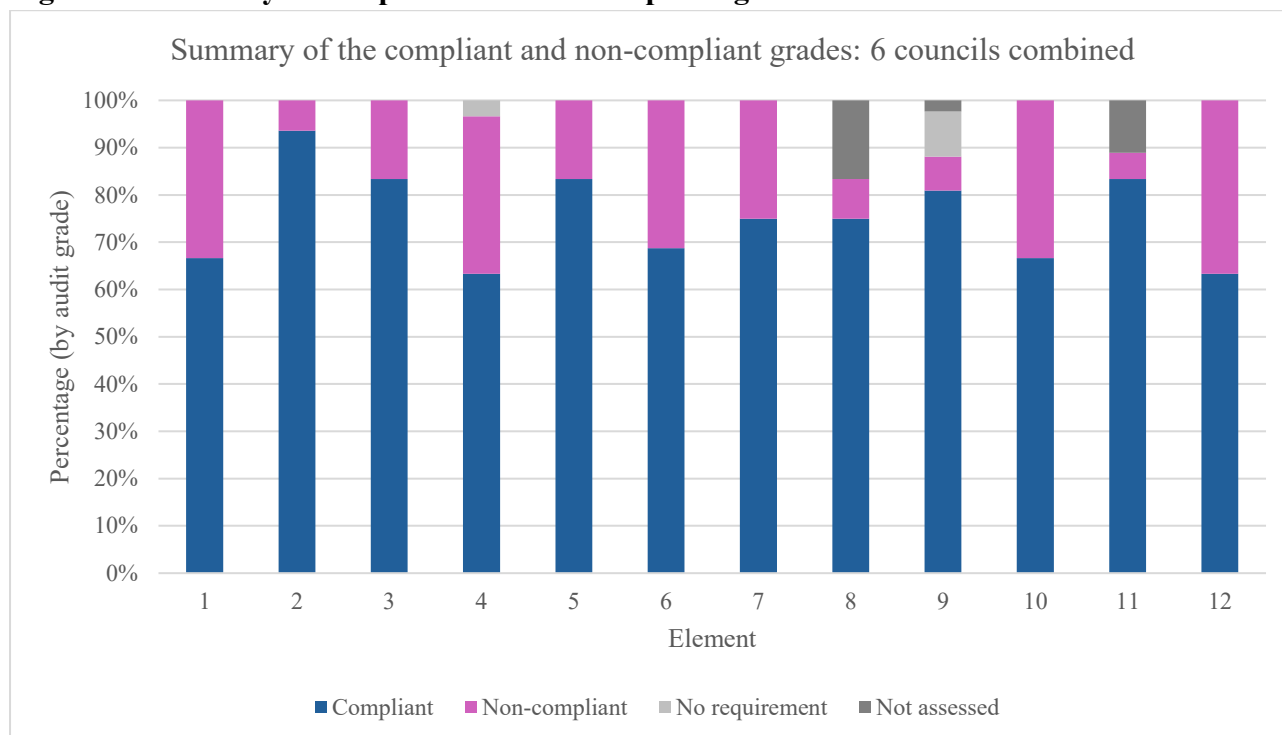
Figures 3 and 4 show the overall compliance grades across the councils and per element providing an overview of the DWMS implementation maturity of the councils. More mature councils could potentially share their good practices with developing councils to support overall regional progress.

Figure 3: Summary of DWMS compliance across the councils



Note: Non-compliant includes both material and non-material grades. Compliant includes both compliant and compliant (shortcomings) grades.

Figure 4: Summary of compliant and non-compliant grades across ADWG Elements



Key findings from the regional assessment are summarised in Table 1.

Table 1. Maturity scale of DWMS implementation

Assessment	Key findings	
Best performing element	<p>Element 2 (Assessment of Drinking Water Supply System) achieved the highest level of overall compliance indicating that councils are appropriately and effectively implementing the following:</p> <ul style="list-style-type: none"> assessment of water quality data, analysis of water supply systems, hazard identification and risk assessment procedures (e.g. appropriate methodology, full system assessment, effectiveness of preventative measures, appropriate documentation). 	
Framework Criterion	<p>Mature and well performing criterion (top 6)</p> <p>2-A: Appropriate team was employed during risk assessment process.</p> <p>2-F: Risks to public health is considered in the risk identification and assessment methodology and is documented in the DWMS.</p> <p>3-D: For each CCP, a critical limit has been set and a target criterion recorded.</p> <p>5-A: The DWMS verification monitoring plan meets the NSW Health Drinking Water Monitoring Program requirements and is followed.</p> <p>7-B: SOPs for managing CCPs are easily accessible to operational staff and displayed at the CCP location or control room.</p>	<p>Early stage and developing criterion (bottom 6)</p> <p>4-D: The processes and procedures for managing and reviewing any identified exceptions from normal operation or where a process or barrier is trending out of control is included in the DWMS are appropriate and have been followed.</p> <p>4-F: The inspection and maintenance program for the water supply system/scheme included in the DWMS is appropriate and followed.</p> <p>4-I: A water supply approved chemicals/materials register (or record) is maintained and includes key categories as set out in the ADWG.</p> <p>5-C: The process for communication of operational and verification monitoring result reviews to management (e.g. monthly reports) documented in the DWMS is appropriate and followed.</p>

Assessment	Key findings	
	9-A: The risk assessment outcomes have been used in developing actions to investigate water quality or improve knowledge of the system.	6-E: The contact details included in the DWMS for drinking water quality incidents and emergencies. 12-A: The process for updating the DWMS included in the DWMS is appropriate and followed.
Good practice at the WTPs and reservoirs inspected	<ul style="list-style-type: none"> • implementation of appropriate operational monitoring, • chemical deliveries and records supervision processes, • regular reservoir inspections by council staff, • secured sites with appropriate access control. 	
Areas of improvement	<ul style="list-style-type: none"> • regular, formalised and documented water team meetings to discuss DWMS status and appropriate actions to improve drinking water quality (e.g. monthly meetings with a set agenda that considers key elements of the DWMS), • frequent review and update of the improvement plan, • consideration of improvement plan actions with appropriate budgeting and within the strategic planning process. 	

For each of the 72 criterion, at least 1 of the 6 councils achieved compliance. This indicates an opportunity for peer engagement and knowledge sharing through the CNSWJO allowing for peer improvement among CNSWJO councils.

During interviews and discussions, councils commonly referred to three key challenges faced:

1. Lack of skilled staff (both the number of skilled staff available and the ability to attract and retain skilled staff).
2. Lack of funding and financial challenges arising from a small revenue base.
3. Ageing and stretched water supply system infrastructure, but with the need to adhere to more stringent requirements (e.g. water treatment related health-based targets).

Some councils also noted an opportunity to enhance water security in the region through ongoing dialogue, improved cooperation and associated agreements.

3. CONCLUSIONS

The DWMS readiness review highlighted typical operational challenges in developing, implementing and sustaining DWMS practices. The analysis showed that effective DWMS operationalisation requires systems, processes and procedures to be embedded within the organisation, and that staff require an adaptation and continuous improvement mindset. Feedback received regarding the value of the DWMS readiness review process was generally very positive with participants encouraging other councils to embrace audits/readiness reviews, and the learnings and improvements these processes can bring.

Considering the findings, and to ensure ongoing improvement in DWMS implementation maturity throughout NSW and beyond, the following recommendations are made:

- Mature councils (i.e. demonstrating DWMS implementation maturity and good practices related to specific elements/criterion) should share their experiences, processes, systems, lessons learned with councils that are struggling through appropriate forums/peer feedback sessions (e.g. joint organisation led sessions).

- In areas where all councils struggle (e.g. particular element/criterion), knowledge sharing and awareness training sessions should be conducted (utilising external assistance as appropriate) to convey requirements and reach consensus in understanding and way forward to address identified gaps. Mediums for this include combined training workshops, regular meetings, shared projects and resources, and/or online and communication platforms.
- Ongoing review of the status of implementation of DWMS readiness review recommendations (and opportunities for improvement) should be discussed via quarterly or biannual (6-monthly) working sessions where participating councils have an opportunity to present and discuss progress including sharing lessons learned and how any challenges were overcome. This will require an appropriate champion to drive and manage the process (e.g. logistics coordination, development of meeting schedule, selection of discussion topic/s, meeting invitations, meeting venues, consideration of site visit to view implementation status, meeting minutes and actions).

Implementation of the above will assist with driving progressive improvement with maintenance and implementation of the DWMS within councils, and help ensure readiness for any DWMS related future audits.

4. ACKNOWLEDGEMENTS

The authors would like to thank the Central NSW Joint Organisation and participating Councils for their support and permission to publish the information and lessons learned presented in this paper.

5. REFERENCES

Atom Consulting, 2025. Drinking Water Management System, Audit Readiness Review – individual Council reports. Atom Consulting.

CMMI Institute, 2025. Capability Maturity Model Integration, available from <https://cmmiinstitute.com>

Gartner, 2025. Gartner's Maturity Model, available from <https://www.gartner.com/>

NSW Government, 2023, Risk Management and Internal Audit for local government in NSW Guidelines. NSW Government