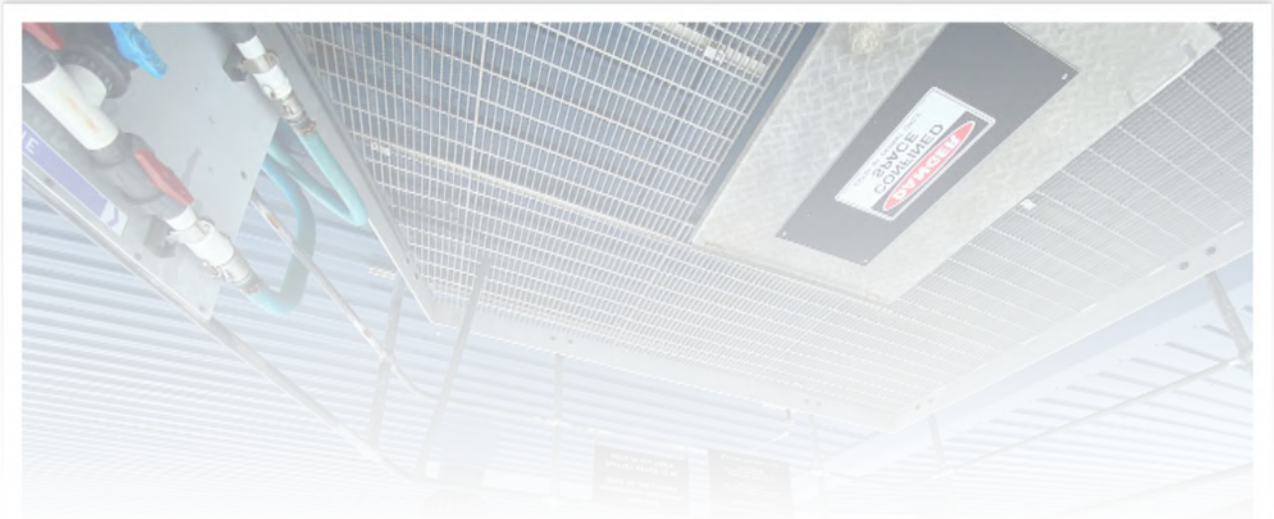
DNRME DWQMP Audit 2020



9 April 2020

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Contents

1. Acronyms and abbreviations

Acronym or abbreviation	Meaning
[the] Act	*Water Supply (Safety and Reliability) Act 2008* (Qld)
ADWG	Australian Drinking Water Guidelines
CCP	Critical Control Point
CWT	Clear water tank (the treated water storage reservoir at a treatment plant)
DNRME	Department of Natural Resources, Mines and Energy
DPD	diethyl-p-phenylene diamine
DWQMP	Drinking Water Quality Management Plan
HACCP	Hazard Analysis and Critical Control Points
IFE	Individual filter effluent
LIMS	Laboratory Information Management System
MIB	2-Methylisoborneol
MPVC	Modified Poly Vinyl Chloride
NATA	National Association of Testing Authorities, Australia
NHMRC	National Health and Medical Research Council
NTU	Nephelometric Turbidity Units
OFI	Opportunity for Improvement
PDF	Portable Document Format
SCADA	Supervisory control and data acquisition
Seqwater	Queensland Government Bulk Water Supply Authority "Seqwater" (Services Provider SP507)
WSAA	Water Services Association of Australia
WQMF	Water Quality Management Facility
WTP	Water Treatment Plant

2. Executive Summary

2.1. Purpose

To provide a 'standard regular' audit compliance by the Queensland Government Bulk Water Supply Authority "Seqwater" (Seqwater; the 'Services Provider' SP507) with its approved *Drinking Water Quality Management Plan* (DWQMP). The objectives were to:

- audit the monitoring and performance data provided to the regulator under the plan;
- assess the service provider's compliance with the plan; and
- assess the relevance of the plan in relation to the provider's drinking water service.

The audit was conducted on behalf of the Department of Natural Resources, Mines and Energy (DNRME) under the *Water Supply (Safety and Reliability) Act 2008* (Qld) (the Act). The findings of the audit are reported to DNRME.

2.2. Methodology

The principal documents that set the standard for the audit were as follows:

- Chapter 2 Infrastructure and service, Part 4 Service provider obligations, Division 2 Audit reports and reviews, Clauses 108 to 109 and Section 99(2)c of the Act.
- Condition 10.2 of the Information Notice for the Decision issued by DNRME dated 29 April 2019 (Information Notice).
- *Drinking Water Quality Management Plan Review and Audit Guideline* (DNRME 2019).
- *ISO 19011:2011 - Guidelines for auditing management systems* (the generic auditing Guideline).

The audit involved review of hard copy documentation, review of electronic records, interview with staff and inspection of assets and systems. The version of the DWQMP audited was the Seqwater *Drinking Water Quality Management Plan, PLN0004, Rev 10,* dated 8 August 2018. The audit covered a sample of Seqwater supply systems centring on the Water Treatment Plant (WTP) at each site as well as covering selected aspects of catchments, source waters and distribution systems.

Although there was some of days of notice given as to which sites were to be visited, there was only very general guidance given as to precisely what would be inspected in each area. All assets were considered potentially subject to audit and some were randomly inspected during the field audit. All records from within the audit period were considered to be within scope and portions of these records were randomly selected for inspection during the desktop and field audit.

2.3. Results

2.3.1. Compliance with the DWQMP and its conditions

Within the scope of the audit, Seqwater complied with its obligations under the Act, Regulations and Audit Guidelines. There was good compliance between the current version of the DWQMP in use by Seqwater and the observations made during the audit. No poor quality or inadequately maintained infrastructure was observed. Therefore, a compliant audit finding has been made by the auditor under the Act on behalf of DNRME.

Although there were no nonconformities with the Act and Regulation, a number of opportunities for improvement (OFIs) were identified during the audit. None were considered urgent or essential. The OFIs are flagged, below, as ideas for consideration to help improve efficiency or reliability or to reduce the risk of future non-conformities.

2.3.2. Accuracy of data provided to the regulator

Data from three principal sources were audited:

- Third-party laboratory verification monitoring.
- Seqwater laboratory verification and operational monitoring.
- Seqwater operational monitoring.

The data provided to the regulator was found to be accurate, with multiple independent monitoring processes taking place (e.g. online, benchtop laboratory and third-party laboratory) for the most critical parameters. Calibration processes for online and benchtop laboratory monitoring, and NATA accreditation processes for third-party laboratory monitoring, were found to be in good order. In summary, the auditor concluded that Seqwater had provided accurate data to the regulator.

2.3.3. Relevance of the DWQMP as it currently exists

The audit covered Seqwater's infrastructure, documents and records against the DWQMP as it currently stands. The DWQMP was found to be fully relevant, representing an accurate reflection of Seqwater's infrastructure and the way in which it is operated. In summary, the auditor concluded that Seqwater's DWQMP was accurate, current and relevant.

2.3.4. Highlights from the audit

The DWQMP had been regularly updated and has been kept sufficiently up to date. Seqwater has made multiple significant improvements in the reliability of its water quality management system. The numerous step wise improvements made in recent years has greatly enhanced the ability of Seqwater to reliably ensure good water quality and to keep up with the rising expectations of its stakeholders and more stringent industry standards. The results are paying dividends in that Seqwater is getting excellent treated water quality results despite challenging source water conditions in both dry and wet periods. The Seqwater telemetry and alert SCADA system were excellent and supported by hard wired back up arrangements and 24/7 monitoring. The process for managing and escalating incidents is clearly set out and logical and Seqwater has used that process during the audit period.

All staff interviewed portrayed a good attitude and knowledge in relation to water quality management. It was notable that operators were able to rapidly extract the relevant data and that there were no concerning gaps in data records or results outside of the compliant range.

The assets and systems inspected and audited were found to range from good to excellent in terms of their standard and the quality of their maintenance. All records inspected provided historical evidence of compliance with the DWQMP during the audit period. The records inspected included operational checks and on-line monitoring of critical limits. Seqwater maintains an effective telemetry system and was able to show evidence of consistent monitoring of critical limits with good to excellent performance. Among the records sampled, there was no evidence that at any time water was supplied to customers with CCPs operating outside of their agreed critical limits given in the DWQMP. There was good evidence of very regular and detailed manual checks being conducted to reality-check the on line monitoring.

A number of addition specific highlights from the audit, described in more detail in the body of the report, are noted as follows:

- Excellent summary schematics and HACCP Plan Wall Charts
- High standard of housekeeping and record-keeping by operators.
- Records being readily available and very amenable to auditing and verification.
- Bypasses being absent from WTPs.
- UV disinfection having been installed at the Capalaba WTP.
- Passive integrated samplers for organics.
- Dual validation of key online monitoring instruments.
- Flow and level data intelligently to help detect major bursts.
- Live CT chlorine dose display on SCADA.
- CAMSIZER XT system to help target media replacement.
- Remotely controlled visualisation systems to undertake inspections of storages.
- Upgrading treated water storage reservoirs.
- Making a long term commitment to ongoing sanitary surveys.
- Intelligently conducting health-based targets (HBT) treatment needs assessments.
- Contributing to the on-site sewage management system and sewerage code.
- Inhouse GCMS for rapid analysis of MIB and geosmin.

2.3.5. Opportunities for improvement and/or recommendations for the service provider

A number of OFIs are summarised as follows.

- Consider how to make it very clear on Wall Charts and other documents which numerical values are firm and which are just guiding or indicative and can be changed.
- Align the fluoride critical limits between the Wall Charts and SCADA for North Pine and Kooralbyn WTP sites.
- Some relatively faded and outdated labelling was noted on some of the chemical process lines at North Pine WTP that needed replacing/updating fairly before losing legibility.
- Consider the risk vs. benefit of moving to continuous monitoring of each of the separate streams for the Aspley WQMF rather than switching between the two every five min.
- Assess adequacy of the flow rate of the turbidity sample process line at Kooralbyn WTP.
- Look at ways to mitigate risks from start-stop operational mode for Capalaba WTP.
- Consider adopting a more risk-based, prioritised program for treated water storage inspection and maintenance.
- Given recent events re-evaluate sufficiency of organisational capacity to maintain reliable services during times of challenge, such as extreme events and incidents.

2.4. Acknowledgements

The auditor wishes to thank and acknowledge the full and proactive participation of all Seqwater staff involved in this audit and thank them for making the time and effort to participate and for their openness and preparedness for the interviews.

The auditor particularly wishes to single out the core water quality management function of Seqwater for special acknowledgement, represented by Andrea Clements, for providing open and complete assistance to the auditor at all stages during the process along with high level support from Duncan Middleton and detailed review of the report by Cameron Veal.

3. Audit overview

Item	Details
Title	Regular regulatory audit of Seqwater's Drinking Water Quality Management Plan (DWQMP).
Auditor	Daniel Deere.
Service provider	Queensland Government Bulk Water Supply Authority "Seqwater" (Services Provider SP507)
Water service	All of Seqwater's water supplies were in scope with interviews, observations and audit sampling occurring at the following locations (refer also to Figure 3-1): • Ipswich Icon Head Office. • Supply System Control Room. • Ewen Maddock Water Treatment Plant (WTP). • North Pine WTP. • Aspley Water Quality Management Facility (WQMF). • Kooralbyn WTP. • Capalaba WTP. • Esk WTP. • Mt Crosby Westbank WTP.
Audit completed	27 February 2020.
Audit period	1 March 2016 to 27 February 2020.
Field assessment dates	24 February to 27 February 2020.
DWQMP approval date	29 April 2019 (as per Seqwater's amended DWQMP that received final approval from the Regulator under the Information Notice Information Notice).
DWQMP audited	*Drinking Water Quality Management Plan, PLN0004, Rev 10, dated 8 August 2018.*
Objective	• To provide a 'standard regular' audit of the way in which the provider complies with its approved *Drinking Water Quality Management Plan* (DWQMP). The objective of that audit is to: o audit the monitoring and performance data provided to the regulator under the plan; o assess the service provider's compliance with the plan; and o assess the relevance of the plan in relation to the provider's drinking water service. • To conduct that audit on behalf of the Department of Natural Resources, Mines and Energy (DNRME) under the *Water Supply (Safety and Reliability) Act 2008* (Qld) (the Act) and to report the findings of the audit to DNRME.

Item	Details

Scope	• Audit type: 'Standard regular' audit of the DWQMP.
	• Criteria:
	  o Relevant clauses of the Act, associated DNRME regulations and guidelines and any relevant notices provided to Council by DNRME.
	  o Relevant components of the Australian Drinking Water Guidelines (ADWG).
	  o Follow up of recommendations from previous audits.
	• Sites: The audit sampled randomly selected sites as agreed with the service provider.
	• Records: The audit sampled randomly selected records as agreed with the service provider.
	• Services: Drinking water.

Audit standard	The principal documents that set the standard for this audit are as follows: • Chapter 2 Infrastructure and service, Part 4 Service provider obligations, Division 2 Audit reports and reviews, Clauses 108 to 109 and Section 99(2)c of the Act. • Condition 10.2 of the Information Notice for the Decision issued by DNRME dated 29 April 2019 (Information Notice). • *Drinking Water Quality Management Plan Review and Audit Guideline* (DNRME 2019) • *ISO 19011:2011 - Guidelines for auditing management systems* (the generic auditing Guideline).
Milestones	• January 2020: Selection of sites and records to review and finalisation of audit agenda. • February 2020: Supply of background data and information to the auditor. • February 2020: Site audit. • April 2020: Draft audit report to Seqwater for review. • April 2020: Final audit report to Seqwater and DNRME.

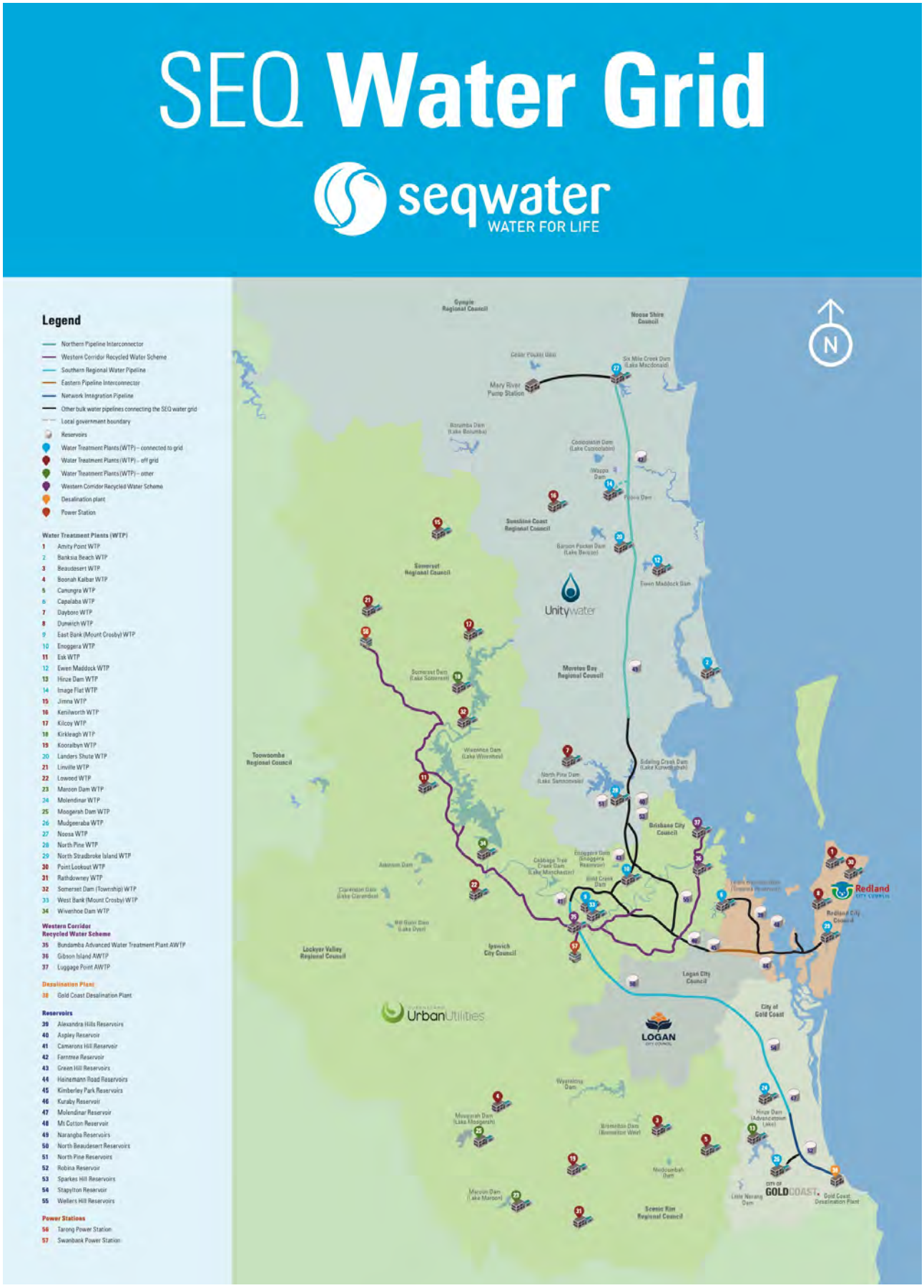

Figure 3-1. Map showing the range of Seqwater sites and those selected for audit.

4. Audit Methodology

4.1. First day, 24 February 2020, Icon Building Head Office.

Description	Audit actions and questions	Specific audit evidence samples	Time	Interviewees
Entry meeting	Introduction and welcome Safety conversation Presenting scope and objective by the auditor		9- 9.30 am	All
1. Service description	WQ • Have there been any changes in regulations, legislation or formal requirements? • Have there been organisational structure changes that may impact on risk management? • Are critical personnel appropriately qualified or require additional training? • Do the audit outcomes recommend changes to the DWQMP or related processes? • How are materials that may come into contact with water (e.g. pipes and jointing compounds) sourced, stored and quality assured? • How is non-potable to potable water cross-contamination mitigated? • How is suspected contamination of compromised mains identified and mitigated?	View and cite the most recent examples from since 1st March 2016: • Org Chart(s) • Key WQM roles • Qualifications and experience of persons in those roles View and cite current service descriptions (flow diagrams, other diagrams, asset data and GIS systems). Note the subsequent field checks will compare those to the selected sites that are visited (e.g. the selected WTPs).	9.30-10 am	C. Veal D. Middleton B. Hester N. Emblow K. McCulloch A. Clement T. Foote
2. Information gathering on water quality and catchment characteristics	Catchment, WQ and comms • Water quality data should be collated, analysed and trended, including for source water, treatment process steps and distribution. • Have there been changes to the source water quality or characteristics? • Have there been any changes to the output quality? • Does water quality data indicate that the level of risk has changed for certain hazards? • Has operational monitoring data identified any poorly functioning treatment processes? • Has there been any significant development or land use changes in the catchment? • Has the nature or frequency of any water quality complaints changed? • Has there been any occurrence of suspected illness following a customer complaint about water quality?	View and cite (from 1st of March 2016 to date of site audit) annual water quality monitoring reports. View and cite how risk assessments (viewed above) have been informed by data. View summary of water sources that have come on line since 1st March 2016. View and cite GIS or other summaries of catchment and landuse for catchments and understand its currency and how that currency is maintained. Note the subsequent field checks will compare those to the selected sites that are visited (e.g. the selected water sources).	10 am-12.30 pm	D. Middleton C. Veal N. Emblow K. McCulloch A. Clement T. Foote S. Rotherham R. Hague D. Guinea S. Walker G. Greene M. Handley

Description	Audit actions and questions	Specific audit evidence samples	Time	Interviewees
3. Hazard identification	Catchment and WQ • Have the personnel (position) responsible for hazard identification and risk assessment changed? • Have any new or emerging hazards or hazardous events been identified?	View and cite the most recent example risk assessments from 1st March 2016 to date of site audit and note what has changed.	10 am-12.30 pm	D. Middleton C. Veal N. Emblow K. McCulloch A. Clement T. Foote S. Rotherham R. Hague D. Guinea
4. Assessment of risks	Catchment and WQ • Is the risk assessment methodology still considered appropriate? • Have new risk management strategies been implemented? • Do any new risk management strategies require new assessment of residual risk? • Has an acceptable, residual risk level been clearly defined?	View and cite the risk assessment undertaken since 1st March 2016 how this has been captured in the risk assessments.	10 am-12.30 pm	D. Middleton C. Veal N. Emblow K. McCulloch A. Clement T. Foote S. Rotherham R. Hague D. Guinea
5. Risk management measures	Catchment and WQ • Have the existing risk management strategies achieved desired water quality outcomes? • Has the effectiveness of any new risk management strategies or infrastructure upgrades been evaluated?	View and cite (the most recent examples from 1st March 2016 to date of site audit) water quality data and how its' been used to assess mitigation of risks.	10 am-12.30 pm	D. Middleton C. Veal N. Emblow K. McCulloch A. Clement T. Foote S. Rotherham R. Hague D. Guinea
	Break		12.30 pm-1.00	
6. Risk management improvement program (RMIP)	PE and WQ • Review status of actions in the improvement program. • Were actions in the program completed in the timeframe outlined in the RMIP? • Did the program outlined in the DWQMP achieve the intended outcomes? • Does the program require updating to manage risks effectively, including measures for newly identified risks? • Are all unacceptable risks included in the RMIP and do all of these risks have a remedial action item and completion date?	View and cite RMIP action tracking based on seeing the most recent example from 1st March 2016.	1 pm to 1.30 pm	D. Middleton C. Veal N. Emblow K. McCulloch A. Clement T. Foote S. Rotherham R. Hague D. Guinea D. Kufeji C. Cilliers

Description	Audit actions and questions	Specific audit evidence samples	Time	Interviewees
7. Verification monitoring	• Have changes to the infrastructure resulted in a need to revise the monitoring program? • Are the range and frequency of parameters being tested appropriate? • Are the established corrective actions and regulator notifications actively applied as described in the DWQMP? • Are the corrective actions and notifications still appropriate? • Have monitoring records been maintained? • Have ADWG health guideline values changed for any parameters? • Have the arrangements for monitoring, transport arrangement for off-site analysis, or testing laboratory changed? • [How does Seqwater ensure compliance between the DWQMP and the verification monitoring program? • How does Seqwater ensure the reliability of monitoring results? Consider sampling site selection, sampling, transport of samples, analysis, quality assurance and control, reporting and communication. • Audit some records of a sample of results through from sample receipt to reporting. • How have such monitoring results been reported to DNRME?]	View and cite the current verification monitoring program and the notification and response limits currently in place. View and cite the current monitoring contracts with the service providers(s) in relation to the management of quality (e.g. NATA requirements). View and cite chain of custody and certificates of analysis from lab, and Seqwater in-house data records, for the month of September 2018 for: raw supply point to North Pine WTP; treated water final water monitoring point from Westbank WTP; and Unity Water treated water handover point; for *E. coli*, pH, free chlorine, Fe, Mn, turbidity and colour.	1.30 pm to 2.00 pm	D. Middleton C. Veal N. Fogarty K. Lee S. Tucker A. Clement S. Howard K. Gray
8. Operation and maintenance procedures	Control room: • Do the procedures and practices reflect current operations? • Is there a need to create new operation and maintenance procedures? • Have records related to associated procedures been kept? • Have training records been maintained? • Is training appropriate to the system, as it currently exists?	View and cite procedures or guidance making it clear what the process control limits relating to water quality are and what responses are required if deviations occur. View and cite access to those procedures.	2 pm to 2.30 pm	J. Browne D. Marinucci M. Whitehead F. Pascual J. Wright K. McCulloch

Description	Audit actions and questions	Specific audit evidence samples	Time	Interviewees
9. Operational monitoring	Control room/ Maintenance • Have changes to the infrastructure or process resulted in a need to revise the monitoring program? • Are the range and frequency of parameters being tested appropriate? • Are the established corrective actions and controls actively applied as in the DWQMP and still appropriate? • Have monitoring records been maintained? • Are monitoring equipment being calibrated? • How does Seqwater ensure compliance between the DWQMP and the SCADA systems? • How does Seqwater ensure the reliability of monitoring results? Consider analyser sample line site selection, verification and calibration, reporting and communication. • Audit some records of a sample of results from the SCADA systems through to reporting. • How have such monitoring results been reported to DNRME?] Annual report	View and cite current control room operations and assess reach/sight of systems from the control room and speed of access to data. Select raw water inputs to Ewen Maddock WTP, treated water and WTP data at Esk WTP, and Gold Coast City Council handover points as example sampling sites. View and cite control room oversight of critical limits View and cite instrument checking, verification, comparison and calibration processes	2 pm to 3 pm	J. Browne D. Marinucci M. Whitehead F. Pascual J. Wright K. McCulloch A. Clement T. Zeidler C. Veal D. Middleton
10. Management of incidents and emergencies	Incident team, WQ, Ops • Is the process for managing drinking water incidents and emergencies still appropriate for the drinking water service? • Do internal and external communication process and protocols work effectively? • Is the list of people to be contacted during emergencies up to date? • Is staff training for incidents and emergencies up to date? • Have incident and excursion records identified changes in risks and hazards? • [How does Seqwater maintain readiness to respond to water quality incidents? Consider detection and communication of incident triggers, duty arrangements, incident management facilities and documents. • Have there been any examples of incidents during the audit period? • How have incidents been reported to DNRME?]	View and cite the current incident and emergency response system and note its availability, currency and practicability. View at least one incident since 1st March 2016 and view notification, records, root cause analysis and closure.	3 pm to 3.30 pm	C. Di Marchi J. Browne D. Marinucci K. McCulloch C. Veal D. Middleton
Summary of day	• Summary of findings, follow ups, observations, opportunities for improvement and non-compliances		3.30 pm to 4 pm	C. Veal D. Middleton C. Di Marchi T. Zeidler J. Browne S. Rotherham K. McCulloch A. Clement

4.2. Second Day, 25 February 2020.

Description	Audit questions and action	Specific audit evidence samples	Date/ time	Auditees
Field audit Ewen Maddock WTP	• Have any of the service provider contact details changed? • Do the scheme details still apply? • Have the number of communities serviced changed? • Has the population size changed? • Have the number of connections changed? • Is the design capacity sufficient for population projections?	View and cite current system description and assess its currency.	9.30 am to 11.30 am	B. Mendham Duty operator N. Emblow M. Burns R. Banks Instrument tech
Field audit Ewen Maddock WTP	• How does the infrastructure in the field compare to the DWQMP description? Field inspect random samples (from the catchment, source, treatment and network) for the selected system and compare to the DWQMP description. • How are assets maintained in a secure, functional and readily operable state in order to protect water quality outcomes? • What are the operational monitoring instruments reading during the audit, how does that compare to the DWQMP, and how are the instruments and SCADA outputs routinely verified and calibrated? • What are the SCADA system process control set points during the audit, how do they compare to the DWQMP, and how are they modified and controlled? • How are chemicals, standards and reagents stored and maintained to ensure their quality and efficacy? Consider both treatment chemicals that are added to the water and laboratory chemicals used for monitoring purposes. • What materials are in use and how are they assured as being fit-for-purpose? • How are records retained and reported as they relate to water quality operational monitoring? • Who is responsible for operating the system and what are their credentials with respect to training, experience and qualifications?	View and cite at least one individual filter effluent turbidity analyser, controlling chlorine analyser and controlling fluoride analyser. View and cite current reading on instrument display and SCADA; historical SCADA record from April 2019; cross-check (vs. benchtop) records from April 2019; calibration records for period spanning April 2019.	9.30 am to 11.30 am	B. Mendham Duty operator N. Emblow M. Burns R. Banks Instrument tech
Service-wide support information management	• Are staff using current versions of documents? • Are the information management, record keeping and reporting processes being used appropriately?	View and cite current documents used by staff on site.	9.30 am to 11.30 am	B. Mendham Duty operator N. Emblow M. Burns R. Banks Instrument tech
	Travel to North Pine WTP (1 hour) and break (30 min)			

Description	Audit questions and action	Specific audit evidence samples	Date/ time	Auditees
Field audit North Pine	• Have any of the service provider contact details changed? • Do the scheme details still apply? • Have the number of communities serviced changed? • Has the population size changed? • Have the number of connections changed? • Is the design capacity sufficient for population projections?	View and cite current system description and assess its currency.	1 pm-2.30 pm	J. Smith M. Burns N. Emblow Instrument tech R. Banks
Field audit North Pine	• How does the infrastructure in the field compare to the DWQMP description? Field inspect random samples (from the catchment, source, treatment and network) for the selected system and compare to the DWQMP description. • How are assets maintained in a secure, functional and readily operable state in order to protect water quality outcomes? • What are the operational monitoring instruments reading during the audit, how does that compare to the DWQMP, and how are the instruments and SCADA outputs routinely verified and calibrated? • What are the SCADA system process control set points during the audit, how do they compare to the DWQMP, and how are they modified and controlled? • How are chemicals, standards and reagents stored and maintained to ensure their quality and efficacy? Consider both treatment chemicals that are added to the water and laboratory chemicals used for monitoring purposes. PRP • What materials are in use and how are they assured as being fit-for-purpose? • How are records retained and reported as they relate to water quality operational monitoring? • Who is responsible for operating the system and what are their credentials with respect to training, experience and qualifications?	View and cite at least one individual filter effluent turbidity analyser, controlling chlorine analyser and controlling fluoride analyser. View and cite reagents on site used for checking and calibration for turbidity, chlorine, pH and fluoride. View and cite current reading on instrument display and SCADA; historical SCADA record from November 2019; cross-check (vs. benchtop) records from November 2019; calibration records for period spanning November 2019.	1 pm-2.30 pm	J. Smith M. Burns N. Emblow Instrument tech R. Banks
Service-wide support information management	• Are staff using current versions of documents? • Are the information management, record keeping, and reporting processes being used appropriately?	View and cite current documents used by staff on site.	1 pm-2.30 pm	J. Smith M. Burns N. Emblow Instrument tech R. Banks
	Travel to Aspley WQMF (30 min)			
Aspley WQMF	Maintenance records (contractor). Calibration records onsite to be presented by a maintenance instrument tech.	View and cite maintenance records for July 2017 for selected instruments	3 pm-3.30 pm	Instrument tech
Summary of day	Summary of findings, follow ups, observations, opportunities for improvement and non-compliances		3.30-4 pm	A. Clement B. Mendham J. Smith N. Emblow

4.3. 26 February 2020

Description	Audit questions and action	Specific audit evidence samples	Date	Auditees
Field audit Kooralbyn WTP	• Have any of the service provider contact details changed? • Do the scheme details still apply? • Have the number of communities serviced changed? • Has the population size changed? • Have the number of connections changed? • Is the design capacity sufficient for population projections?	View and cite current system description and assess its currency.	9.30 am to 11.30 am	P. Rogers Duty Operator A. Clement T. Foote
Field audit Kooralbyn WTP	• How does the infrastructure in the field compare to the DWQMP description? Field inspect random samples (from the catchment, source, treatment and network) for the selected system and compare to the DWQMP description. • How are assets maintained in a secure, functional and readily operable state in order to protect water quality outcomes? • What are the operational monitoring instruments reading during the audit, how does that compare to the DWQMP, and how are the instruments and SCADA outputs routinely verified and calibrated? • What are the SCADA system process control set points during the audit, how do they compare to the DWQMP, and how are they modified and controlled? • How are chemicals, standards and reagents stored and maintained to ensure their quality and efficacy? Consider both treatment chemicals that are added to the water and laboratory chemicals used for monitoring purposes. • What materials are in use and how are they assured as being fit-for-purpose? • How are records retained and reported as they relate to water quality operational monitoring? • Who is responsible for operating the system and what are their credentials with respect to training, experience and qualifications?	View and cite at least one individual filter effluent turbidity analyser, controlling chlorine analyser and controlling fluoride analyser. View and cite reagents on site used for checking and calibration for turbidity, chlorine, pH and fluoride. View and cite current reading on instrument display and SCADA; historical SCADA record from December 2018; cross-check (vs. benchtop) records from December 2018; calibration records for period spanning December 2018.	9.30 am to 11.30 am	P. Rogers Duty Operator A. Clement T. Foote
Service-wide support information management	• Are staff using current versions of documents? • Are the information management, record keeping, and reporting processes being used appropriately?	View and cite current documents used by staff on site.	9.30 am to 11.30 am	P. Rogers Duty Operator A. Clement T. Foote
	Travel to Capalaba WTP (1 hour and 30 min) and break (30 min)			

Description	Audit questions and action	Specific audit evidence samples	Date	Auditees
Field audit Capalaba WTP	• Have any of the service provider contact details changed? • Do the scheme details still apply? • Have the number of communities serviced changed? • Has the population size changed? • Have the number of connections changed? • Is the design capacity sufficient for population projections?	View and cite current system description and assess its currency.	1 pm to 2.30pm	C.Bolin J. Cramer Duty operator T. Foote A. Clement
Field audit Capalaba WTP	• How does the infrastructure in the field compare to the DWQMP description? Field inspect random samples (from the catchment, source, treatment and network) for the selected system and compare to the DWQMP description. • How are assets maintained in a secure, functional and readily operable state in order to protect water quality outcomes? • What are the operational monitoring instruments reading during the audit, how does that compare to the DWQMP, and how are the instruments and SCADA outputs routinely verified and calibrated? • What are the SCADA system process control set points during the audit, how do they compare to the DWQMP, and how are they modified and controlled? • How are chemicals, standards and reagents stored and maintained to ensure their quality and efficacy? Consider both treatment chemicals that are added to the water and laboratory chemicals used for monitoring purposes. • What materials are in use and how are they assured as being fit-for-purpose? • How are records retained and reported as they relate to water quality operational monitoring? • Who is responsible for operating the system and what are their credentials with respect to training, experience and qualifications?	View and cite at least one individual filter effluent turbidity analyser, controlling chlorine analyser and controlling fluoride analyser. View and cite reagents on site used for checking and calibration for turbidity, chlorine, pH and fluoride. View and cite current reading on instrument display and SCADA; historical SCADA record from April 2017; cross-check (vs. benchtop) records from April 2017; calibration records for period spanning April 2017.	1 pm to 2.30pm	C. Bolin J. Cramer Duty operator T. Foote A. Clement
Service-wide support information management	• Are staff using current versions of documents? • Are the information management, record keeping, and reporting processes being used appropriately?	View and cite current documents used by staff on site.	1 pm to 2.30pm	C. Bolin J. Cramer Duty operator T. Foote A. Clement
Summary of day	Summary of findings, follow ups, observations, opportunities for improvement and non-compliances		2.30 to 3 pm	C. Bolin J. Cramer Duty operator T. Foote A. Clement

4.4. Fourth day, 27 February 2020.

Description	Audit questions and action	Specific audit evidence samples	Date	Auditees
Field audit Esk WTP Details of infrastructure used for providing the service	• Have any of the service provider contact details changed? • Do the scheme details still apply? • Have the number of communities serviced changed? • Has the population size changed? • Have the number of connections changed? • Is the design capacity sufficient for population projections?	View and cite current system description and assess its currency.	9.30 am to 11.30 am	D. Shillito J. Granzien A. Clement Y. Zhang B. Baxter B. Lane
	• Water quality • Do the schematics accurately reflect all the components, processes and linkages, from catchment to consumer? • Do any of the system description details require updating? • Have new chemicals been introduced into the treatment process or the dosing points re-located? • Have monitoring and telemetry systems been checked and/or changed? • Have low pressure areas in the distribution system changed? • Has a reservoir undergone refurbishment? • Have there been changes in the key stakeholders or engagement process? • Have there been any problems with infrastructure or equipment breakdown or deterioration	Review and cite major works undertaken since 1st March 2016 and how water quality management was considered in planning, designing, constructing, commissioning and handing over those works. Select up to three examples.	9.30 am to 11.30 am	D. Shillito J. Granzien A. Clement Y. Zhang B. Baxter B. Lane

Description	Audit questions and action	Specific audit evidence samples	Date	Auditees
	• How does the infrastructure in the field compare to the DWQMP description? Field inspect random samples (from the catchment, source, treatment and network) for the selected system and compare to the DWQMP description. • How are assets maintained in a secure, functional and readily operable state in order to protect water quality outcomes? • What are the operational monitoring instruments reading during the audit, how does that compare to the DWQMP, and how are the instruments and SCADA outputs routinely verified and calibrated? • What are the SCADA system process control set points during the audit, how do they compare to the DWQMP, and how are they modified and controlled? • How are chemicals, standards and reagents stored and maintained to ensure their quality and efficacy? Consider both treatment chemicals that are added to the water and laboratory chemicals used for monitoring purposes. • What materials are in use and how are they assured as being fit-for-purpose? • How are records retained and reported as they relate to water quality operational monitoring? • Who is responsible for operating the system and what are their credentials with respect to training, experience and qualifications?	View and cite at least one individual filter effluent turbidity analyser, controlling chlorine analyser and controlling fluoride analyser. View and cite reagents on site used for checking and calibration for turbidity, chlorine, pH and fluoride. View and cite current reading on instrument display and SCADA; historical SCADA record from October 2016; cross-check (vs. benchtop) records from October 2016; calibration records for period spanning October 2016.	9.30 am to 11.30 am	D. Shillito J. Granzien A. Clement Y. Zhang B. Baxter B. Lane
Service-wide support information management	• Are staff using current versions of documents? • Are the information management, record keeping, and reporting processes being used appropriately?	View and cite current documents used by staff on site.	9.30 am to 11.30 am	D. Shillito J. Granzien A. Clement Y. Zhang B. Baxter B. Lane
	Travel (1 hour) and break (30 min)			
Field audit Westbank WTP Details of infrastructure used for providing the service	• Have any of the service provider contact details changed? • Do the scheme details still apply? • Have the number of communities serviced changed? • Has the population size changed? • Have the number of connections changed? • Is the design capacity sufficient for population projections?		1 pm-3 pm	D. Shillito Duty operator K. McCulloch A. Clement Y. Zhang B. Baxter B. Lane

Description	Audit questions and action	Specific audit evidence samples	Date	Auditees
Field audit Westbank WTP Details of infrastructure used for providing the service	Water quality • Do the schematics accurately reflect all the components, processes and linkages, from catchment to consumer? • Do any of the system description details require updating? • Have new chemicals been introduced into the treatment process or the dosing points re-located? • Have monitoring and telemetry systems been checked and/or changed? • Have low pressure areas in the distribution system changed? • Has a reservoir undergone refurbishment? • Have there been changes in the key stakeholders or engagement process? • Have there been any problems with infrastructure or equipment breakdown or deterioration	Review and cite major works undertaken since 1st March 2016 and how water quality management was considered in planning, designing, constructing, commissioning and handing over those works. Select up to three examples.	1 pm-3 pm	D. Shillito Duty operator K. McCulloch A. Clement Y. Zhang B. Baxter B. Lane
Service-wide support information management	• Are staff using current versions of documents? • Are the information management, record keeping, and reporting processes being used appropriately?	View and cite current documents used by staff on site.	1 pm-3 pm	D. Shillito Duty operator K. McCulloch A. Clement Y. Zhang B. Baxter B. Lane
Exit meeting	Summary of findings, follow ups, observations, opportunities for improvement and non-compliances		3 pm to 3.30 pm	All

5. Audit Report

5.1. *Verify accuracy of monitoring and performance data*

5.1.1. Verification monitoring

The water quality verification monitoring program is summarised and publicly reported each financial year. The most recent report was entitled the "Seqwater (SP507) – Drinking Water Quality Management Plan Drinking Water Quality Annual Report 2018-19". Comments are not made in this audit report on the quality of the annual reports. This audit focused on auditing the veracity of the information presented in the annual reports. Seqwater was able to demonstrate that it had utilised NATA accredited laboratories in conducting its water quality monitoring. A variety of laboratories had been utilised during the audit period including both ALS and Symbio as well as specialist and sub-contracted labs.

The contracts were sighted and the schedules listed tests and stated that NATA accreditation was required for the key parameters of relevance to drinking water quality (such as *E. coli*, pesticides, metals and DBPs). The most recent version of one of the contracts was inspected. "Schedule 2 Analytical Services Requirements" of that contract was last updated 8 January 2020 and set out the required limit of detection (LoD) and limit of quantification (LoQ) and these were below the required ADWG guideline values. Both in-house and third-party samplers monitor chlorine, pH and EC in the field and all were shown to be suitably trained in such sampling and field analysis.

Examples were sought and PDF files sighted for certificates of analysis (CoA), Chain of Custody (CoC), Sample Receipt (SR) and Quality Control (QC) and found to be compliant. Unique ID numbers were utilised to follow samples through. Examples were audited and found to be in good order. For instance, a random sample of recent records was checked for the monthly for monthly standard analytical suite from Caloundra St which showed CoA code SEQ196040 dated to 4 February 2020 and showed the full dates of NATA accreditation, QC, LOR, measurement uncertainty, units and LoQ. The latter was reviewed for key parameters and were safely below guideline values (in mg/L):

- As (2.5);
- nitrate (0.003); and
- Fl (0.25).

There is an excellent linkage between the third-party laboratory LIMS and the in-house Seqwater laboratory database with data being transferred across every couple of hours updates. Based on the "Notification Protocol Testing Parameters 4 February 2019", if an exceedance or concerning result is detected, the third-party laboratory issues a phone call and follow-up email for some parameters, such as *E. coli*, for which simply sending an automated data upload is considered potentially insufficient warning. In addition, automated reports are used for less urgent exceedances. The audit examined records and found examples of such reporting:

- Automated LIMS-generated report from 21 February 2020 for a high conductivity reading of 880 µS/cm which was reported against a 600 µS/cm limit.
- Email from Symbio to Seqwater of enterococci of > 200 cultivable units/100 ml in a swimming area following rain.
- Email from Symbio to Seqwater of an *E. coli* detection from 15 November 2019 from the Caloundra St WQMF.

5.1.2. Operational monitoring

For the WTPs that it operates, and the network, Seqwater maintains a continuous SCADA monitoring system that can be seen by operators as well as being continually monitored by staff at the Seqwater Icon Building in the Control Room. The SCADA system was checked for its operation both on the day of the audit and during the audit period. Details of the auditing of the accuracy of monitoring and performance data are summarised in detail in section 5.2.5 and hence not repeated here.

5.2. Implementation of the DWQMP

5.2.1. The provisions and conditions in the approval notice

The approved version of the DWQMP audited was the Seqwater *Drinking Water Quality Management Plan, PLN0004, Rev 10,* dated 8 August 2018. An audit of the DWQMP took place before end March 2020 (reported in this document) as required in accordance with the 'Information notice for the decision' issued on 29 April 2019.

The Water Quality Policy and the ISO9001, 22000, 14001 and 4801 certifications were all current and copies of the Policy and of certificates attesting to the certifications were commonly displayed at sites.

The Prerequisite Programs, Preventive Barriers and Preventive Measures are summarised in the DWQMP.

The HACCP Plan Wall Chart documents provide the simple summaries for water quality controls at treatment plants and similar sites and these are subjected to quarterly reviews by supervisors to check their currency.

The implementation of the DWQMP, including the schematics and Wall Charts, were audited during the field as summarised in section 5.2.5 and these findings are not repeated here. Briefly, there weren't any non-compliances identified, whilst some highlights and OFIs were documented. In summary, it was concluded that Seqwater has complied with the provisions and conditions in the approval notices.

5.2.2. Implementation of all preventive measures for managing hazards and hazardous events as described in the plan

Details of observations relating to site- and location-specific preventive measures for managing hazards and hazardous events as described in the plan are summarised in detail in section 5.2.5 and hence are not repeated here. Audit findings relating to broader preventive measures and barriers and prerequisite programs are summarised in this section of the report.

Training

Training was continuing to follow good practices, including allocating plant competencies to specific staff for specific plants, and taking part in the National Technical Skills Training and in-house Water Quality Awareness Training. Most operators have at least Certificate II National Water Training Package (NWP) certification and most have or are obtaining Certificate III. Records of training are maintained in the 'Our Learning' system and were found to be up to date during the onsite audit. A specific Training Needs Analysis is undertaken for each role and records are kept of that training. Examples were provided of both experienced and trainee operators showing what training was required for those roles. In addition to the NWP training, examples of key in-house training modules of relevance to water quality management included:

- Drinking Water Quality Awareness - Maintenance & Projects Staff
- Drinking Water Quality Training - Operational Staff
- Fluoride Operations - Operate and control fluoride additions
- Process Laboratory Procedures Training [covering jar testing, particle sizing and a range of field and lab-based tests].

Stakeholder interaction

Seqwater showed evidence of positive interactions with Distribution Retail Entities. This included monthly Operations Meetings with the Distribution Retail Entities and the development and implementation of a Partnership Water Quality Plan. A Joint Operations Committee is in place to manage more routine matters. The interaction is supported by customer contracts and interaction with customers on their joint risk assessments. Seqwater staff usually attend the risk assessments undertaken by Distribution Retail Entities and is working on risk assessments for distribution systems and for the 'whole of system'.

5.2.3. Implementation of operational and maintenance procedures

Details of audits of the implementation of operational and maintenance procedures and related observations are summarised in detail in section 5.2.5 and hence are not repeated here. Selected sites were inspected, staff interviewed and records examined to look for evidence of implementation of operational and maintenance procedures. Briefly, no non-compliances were identified, whilst some highlights and OFIs were documented.

5.2.4. Implementation of the process for managing incidents and emergencies as described in the plan

Seqwater uses its Emergency Management Manual as the overarching document for incident and emergency management. There are centres at both Creek Street and the Icon Building that can be used for managing incidents and emergencies. Seqwater has helpfully defined the difference between these terms:

- "Incidents": can be managed by Seqwater largely operating alone; and
- "Emergencies": require multiple agencies in addition to Seqwater and hence broader coordination.

Seqwater has been using a 'Risk Wizard' tool to help guide its response and reporting of incidents and emergencies since 1 July 2019 (prior to that it used 'Form 27'). The tool is used to capture incidents and emergencies, document the root cause, and trend and use the information. All critical limit exceedances are notified and followed up. An example was provided of a July to December 2019 report that summarised failures that had occurred including critical limit exceedances (albeit these events didn't necessarily result in non-compliant water going into supply).

As detailed in section 5.1.1 of this report (hence not repeated here) Seqwater has a system for responding and escalating exceedances or concerning results being detected from party laboratory monitoring. A Flow Chart has been developed to support decision-making in this respect. Exceedances related to process failures that indicate unfit water may be supplied, such as operational monitoring indicating treatment process failures, or verification monitoring exceedances, are logged as an incident and notified internally to Water Quality and Operations as well as externally to the Regulator and the relevant Distribution Retail Entity.

5.2.5. Implementation of the operational and verification monitoring programs as described in the plan

Verification monitoring

Seqwater is proactively and continually improving its monitoring programs. The verification monitoring program includes a number of sophisticated innovations, one highlight being the pioneering use of passive integrated samplers for organics. The pioneering use of passive integrated samplers for organics is setting best practice nationally and internationally and providing invaluable evidence to assess inform risk assessment and catchment management. Verification monitoring was discussed in section 5.1.1 of this report and hence is it not discussed again in detail here other than where directly relevant to specific audited sites. For instance, this section of the audit report describes the checks made during the audit on verification sampling points and their labelling and condition.

Operational monitoring

This section of the report describes the results of detailed site auditing of Seqwater infrastructure and records that were inspected to look for evidence of implementation of operational monitoring.

Control Room

The Control Room at the Icon Building head office was inspected to look for evidence of implementation of operational monitoring. The SCADA systems was functional during the audit and was working fast and effectively. The Control Room has good sight of the whole of the Seqwater network.

Water Quality Main Page

Examples were seen of the Water Quality Main Page that provides an excellent interface to readily single out the most important water quality aspects. The audit found Operational Monitoring to be clearly represented. Examples of evidence sighted are summarised in Table 5-1. Alarm delays were appropriate: typically 15 min at 'dosed' sites and treatment plants and 30 min at 'non-dosed' monitoring sites. Alarms must be acknowledged otherwise they are escalated up the chain of authority and so are not readily ignored by staff.

Table 5-1. Evidence of operational monitoring sighted in the Control Room.

Site	Instruments viewed	ADWG	Critical limit	Low alert	High alert	Critical limit	ADWG	Delay	Comparison to HACCP Plan Wall Chart	Finding
Caloundra Street	Chlorine	0.5	2.5	2.8	4.1	4.5	4.9	15 min	Aligned	Compliant
Aspley Reservoir	Chlorine	0.5	1.5	2.0	4.1	4.5	4.9	30 min	Aligned	Compliant

Caloundra Street and Aspley Reservoir

At the dosed Caloundra St chlorination/chloramination and pH adjustment site, chlorine, pH, temperature and EC records were viewed and found to be captured in duplicate, with the difference/deviation between readings being shown. Turbidity was also monitored at that site. A highlight was the use of dual validation of key monitoring instruments which was a very good practice. Whilst limited to just a sub-set of sites, this is a very good practice. Triple validation is global best practice but even dual validation is rare in Australia at present and Seqwater is

ahead of most comparable utilities in this respect. Records from the non-dosed Aspley Reservoir were also viewed and found to be in good order.

Ferntree Balance Tank

At the Ferntree Balance Tank the pressure, water level and flow monitoring records were viewed. These are important for water quality protection to ensure system pressurisation and detect major leaks. Pressure and flow were monitored on both the inlet and outlet of the tank with alarms in place for pressure, flow and water level as well as deviation rates. A highlight was examples given by staff of major bursts being rapidly detectable from the control room. For instance, on 11 May 2019, a major burst occurring on the Karragarra Island, on a 400 mm ø main from Redland Bay, was detected by the Control Room at approximately 7 am on a Saturday and repaired by that night.

Broader operational monitoring

It was noted that further evidence to detect leaks was undertaken by Seqwater. This is important for water quality protection. This is achieved by daily reconciliation of billing and control water meters. At the Wellers Hill and Green Hill tanks entry point alarms and camera monitoring records were viewed to ensure tank security was covered. These are important for water quality protection. Examples were given of two boat hatches and access doors having been opened during works on 24 December 2019 at the Wellers Hill site.

WTP overview

Findings from auditing the WTPs are given below, for individual plants. A few Seqwater-wide programs are noted here. As a general highlight, the standard of housekeeping and record-keeping by Seqwater operators was consistently high and the records were readily available as requested and very amenable to auditing and verification.

Reagents, calibration and standards

The Laboratory Services Coordinator is responsible for overseeing benchtop instruments and their associated reagents, verification and calibration standards. The Standards and Reagents Log retained in the 'REX' record-keeping system is used to keep track of standards and reagents with each being given a unique ID. The process is used to manage currency of these standards and reagents.

Three Process Labs based at major facilities, such as Landers Shute, Molendinar and Mt Crosby, undertake monthly and quarterly technician checks on instruments which are backed up by third-party instruments checks. The three Process Labs act as sources of standards and reagents and technical support for the Operations Labs. The "Reference Standards Log", "Dilution and Working Standards Log Worksheet" and "Monthly Check Sheet", housed in REX, were provided as evidence of this process. The Process Labs supply and manage the reagents, standards and consumables used by the Operations Labs.

Towards the end of the audit period, for the 10 NTU formazan standards, instead of purchasing a new standard from Hach every 12 months, Seqwater uses a process of checking and re-certifying standards for a longer period. Some of the 10 NTU standards in the lab were still marked with their original expiry dates of May and November 2019. Seqwater is in the process of having those revised expiry dates added to a "Turbidity log" checklist to provide a record that the standard was checked each month, and, if required, re-verified. Seqwater provided evidence from its "Reference Standards Log" of these checked and extended standards.

Records and logbooks

Work undertaken by Operations Labs includes daily instrument cross-checking (and calibration if required). The results from routine operational checks carried out at the Process Labs are stored and are managed by the Process Labs with log books being retained at the Operations Labs. During the audit Operations Labs, standards and reagents were checked on site at WTPs. The DWQMP's description of these processes matched what was observed during the audit. As an example of a process to help with chemical delivery control, the "Receiving Bulk Chemical Deliveries" procedure FRM-01707 was sighted. This included items such as:

- Before unloading:
    a. Check the Statement of Compliance for the delivered chemical and for fluoride, check the Certificate of Analysis.
    b. Check the fill point used is correct.
    c. Check the truck label matches the delivery docket.
- After unloading:
    a. Confirm the correct storage was filled.

Ewen Maddock WTP

The Ewen Maddock WTP and associated infrastructure was audited on site. Online instruments and SCADA systems were functional during the onsite audit. Selected online instruments were compared to SCADA systems, and alarm setpoints were compared to the HACCP Plan Wall Chart from 5 June 2019 (Table 5-2).

The Hach 1720E IFE turbidity meters were found to be suitably placed close to each filter outlet and clearly labelled (Figure 6-1). SCADA records were viewed for the selected instruments for the month of April 2019 and results were found to be compliant throughout and showing good stability and performance. The WTP Schematic dated to 20 November 2018 was found to be an accurate reflection of the WTP as inspected.

For the benchtop instruments, log books on site were checked for January and February 2020 and found to be in good order – completed as required. The "Daily Operator Fluoridation Record Sheet" hard copy was checked against the "Ewen Maddock WTP Fluoride Sheet" workbook file; and the "Ewen Maddock WTP – Operator Daily Laboratory Results Form" and associated "TEM inputs" worksheet were compared for the IFE turbidity for filter #3 and the pre CWT chlorine analysers. The results were checked for the month of April 2019 and found to be consistent and in good order and completed as required. The operators recorded results clearly and noted offline days (e.g. 7 April 2019) in the log book.

Calibration standards and reagents were checked on site and example findings are summarised in Table 5-3. Results were complaint but there were some uncertainties: four solutions are used for fluoride instrument slope calibration (0.2 and 2 mg/L) and checking (0.8 and 1.0 mg/L) but not all had their expiry dates clear with the 2 mg/L solution having only its opening date marked (19 July 2018). The unmarked solutions were discarded by Seqwater following the audit and given that these were minor isolated findings no OFI was recorded.

Table 5-2. Critical limit online monitoring instrument and SCADA check for Ewen Maddock WTP.

Instrument	Display	Time read	SCADA	Time read	Alert limit	Alert alarm delay	Critical limit	Critical alarm delay	Comparison to HACCP Plan Wall Chart	Finding
IFE turbidity for filter #3 (NTU)	0.043	10:02	0.04	11:02	0.2	30 min	0.3	15 min	Aligned	Compliant
CWT inlet chlorine (mg/L)	2.6	10:10	2.65	11:02	1.3-2.3	30 min	1.0-3.3	10 min	Aligned	Compliant
CWT inlet fluoride (mg/L)	0.8	10:17	0.82	11:02	0.7-0.9	30 min	1.1	5 min	Aligned	Compliant

Table 5-3. Benchtop instrument, reagent and standard check for check for Ewen Maddock WTP.

Instrument	Standard or reagent	Lot	Expiry	Operator check	Last check	Technician check	Last check	Third party check	Last check	Finding
Hach TU5200	10 NTU formazan	8323	Nov 2019 (since extended based on in-house testing)	Daily instrument cross-checking and one-point calibration if required against a secondary 10 NTU formazan standard	25 February 2020	Quarterly instrument three-point check and calibration if required against a 10, 20 and 600 NTU StableCal primary standard	30 January 2020	Annual third party check and calibration if required (e.g. by Hach)	30 June 2019	Compliant
Hach PCII	DPD	Not audited	October 2024	Daily instrument cross-checking	25 February 2020	Monthly instrument check and calibration if required				Compliant

North Pine WTP

The North Pine WTP and associated infrastructure was audited on site. Online instruments and SCADA systems were functional during the onsite audit. Selected online instruments were compared to SCADA systems, and alarm setpoints were compared to the HACCP Plan Wall Chart from 31 December 2019 (Table 5-4).

SCADA records were viewed for the selected instruments for the month of November 2019 and results were found to be compliant throughout and showing good stability and performance. Turbidity was well below the target range of 0.1 NTU with chlorine being mostly within the target range. Two low readings were seen for chlorine on 5 November 2019 and were shown to be associated with a reading that tripped to 0 mg/L due to an instrument fault. The WTP Schematic dated to 19 November 2019 was found to be an accurate reflection of the WTP as inspected.

One minor difference was noted for the Wall Chart (dated to 31 December 2019) target range for chlorine which was 1.8-2.5 mg/L vs. the 2.2-2.7 mg/L on the SCADA system. The reason for this difference simply reflected operational responses to chlorine demand and flow patterns and wasn't of any concern from a direct risk perspective. However, it did present a small risk of causing confusion among operators: if it's acceptable to deviate from any of the values given in the Wall Charts there is the risk of operators deviating from critical limits. Whilst only a target range, as an OFI, it would be helpful to avoid confusing operators by making it very clear on Wall Charts and in other documents which numerical values are intended as firm values and which are just guiding or indicative and can be changed.

Table 5-4. Critical limit online monitoring instrument and SCADA check for North Pine WTP.

Instrument	Display	Time read	SCADA	Time read	Alert limit	Alert alarm delay	Critical limit	Critical alarm delay	Comparison to HACCP Plan Wall Chart	Finding
IFE turbidity for filter #1 (NTU)	0.044	14:33	0.05	12:10	0.2	30 min	0.3	15 min	Aligned	Compliant
CWT inlet chlorine (post filter) (mg/L)	1.92	14:48	3.23	12:05	1.4-3.0	30 min	1.0-3.2	30 min	Aligned	Compliant
CWT inlet fluoride (post dose) (mg/L)	0.748	14:48	0.72	12:05	0.7-0.9	1 hr	1.2	2 min	Aligned except Wall Chart critical limit was 1.1 mg/L	Small difference

Table 5-5. Benchtop instrument, reagent and standard check for check for North Pine WTP.

Instrument	Standard or reagent	Lot	Expiry	Operator check	Last check	Technician check	Last check	Third party check	Last check	Finding
Hach TU5200	10 NTU formazan	8242	Aug 2019 – extended to 30 July 2020 following in-house checks	Daily instrument cross-checking and one-point calibration if required against a secondary 10 NTU formazan standard	25 February 2020	Quarterly instrument three-point check and calibration if required against a 10, 20 and 600 NTU StableCal primary standard	19 November 2019	Annual third party check and calibration if required (e.g. by Hach)	29 May 2019	Compliant
Hach SC1000 ChemKey	ChemKey	Not audited	2 February 2020	Daily instrument cross-checking	25 February 2020	Not audited	Not audited	Annual third party check and calibration if required (e.g. by Hach)	29 May 2019	Compliant
Orion dual start pH/SE Meter	0.2	Not audited	15 July 2020	Daily instrument cross-checking	25 February 2020	Not audited	Not audited	Not audited	Not audited	Compliant
	0.8	Made in-house	30 April 2020	Daily instrument cross-checking	25 February 2020	Not audited	Not audited	Not audited	Not audited	Compliant
	1.0	Made in-house	30 September 2020	Daily instrument cross-checking	25 February 2020	Not audited	Not audited	Not audited	Not audited	Compliant
	2.0	Not audited	30 September 2020	Daily instrument cross-checking	25 February 2020	Not audited	Not audited	Not audited	Not audited	Compliant

The Wall Chart critical limit for fluoride was 1.1 mg/L for 2 min but 1.2 mg/L for 2 min on the SCADA which, as a minor difference with a 2 min alarm delay, was considered negligible and so wasn't raised as a non-compliance. The reason for this isolated discrepancy was understood to be a recent PLC reset that had yet to be noted as part of the internal audit process. As an OFI, the two should be aligned even though, technically, either value would be a safe limit.

For the benchtop instruments, log books on site were checked and found to be in good order – completed as required. The "North Pine WTP Daily Test Sheet" log, the "Fluoride Log" and the "Plant Data Log" worksheet were checked for the selected instruments for the month of November 2019 and found to be consistent and in good order and completed as required. Calibration standards and reagents were checked on site and example findings are summarised in Table 5-5. Results were complaint.

The chemical loading area was checked and clear signage was seen at the site along with a locked area, camlock fittings and valves. Chemicals on site included 10% sodium hypochlorite, alum, lime and caustic. Backwash supernatant wasn't returned to the head of the works. As an OFI some relatively faded and outdated labelling was noted on some of the chemical process lines on the site that needed replacing/updating fairly soon before they lose legibility.

Aspley WQMF

The Aspley Reservoir and Pump Station and associated chemical dosing systems were audited on site at the Aspley WQMF on the Northern Pipeline Interconnector (NPI) system. The principal chemicals dosed are sodium hypochlorite and ammonia. Good practice observations at the site included:

- sound roofing and mesh integrity;
- pumped circulation of water to the analysers to give timely sampling;
- interlocks on chemical dosing lines to stop them if the pumps stop running;
- critical limits being set for online monitoring of total chlorine and ammonia concentrations at locations pre and post dosing;
- online monitoring of levels, flow rates and usage rates of dosed chemicals;
- calculations based on the above to reality-check concentration measurements; and
- alarms on levels, flows, doses, concentrations and discrepancies.

One complication on the monitoring system is that to reduce instrument costs the analyses switch every five minutes between water flow sample streams rather than continually analysing one sample stream. From a risk and control perspective this is theoretically acceptable but does present some complications and risks of malfunction and challenges in analysing the data. As an OFI the risk vs. benefit of moving to continuous monitoring of each of the separate streams rather than switching between the two is worth reviewing.

Online instruments and SCADA systems were functional during the onsite audit. Selected online instruments were compared to SCADA systems, and alarm setpoints were compared to the HACCP Plan Wall Chart (Table 5-6). The Wallace and Tiernan DEPOLOX3 plus was functional and reading consistently between its display and the SCADA system.

The chemical loading area was checked and clear signage was seen at the site along with a locked area and camlock fittings that were locked. Chemicals on site included 10% sodium hypochlorite and ammonia. If the 10% sodium hypochlorite were considered to aged it was wasted to help manage chlorate formation.

Table 5-6. Critical limit online monitoring instrument and SCADA check for Aspley WQMF.

Instrument	Display	SCADA	Finding
Total chlorine (mg/L)	3.41	3.42	Compliant
pH (pH units)	7.81	7.81	Compliant

Kooralbyn WTP

The Kooralbyn WTP and associated infrastructure was audited on site and found to be in good condition and in particular the treated water reservoir was thoroughly protected from vermin and ingress. Online instruments and SCADA systems were functional during the onsite audit. Selected online instruments were compared to SCADA systems, and alarm setpoints were compared to the HACCP Plan Wall Chart from 18 December 2018 (Table 5-7). Examples of good practices observed on site included:

- the site had an S:CAN unit that was on trial; and
- the grab sample points on site were clearly labelled (raw water KOO-SP121 and treated water KOO-SP920).

It was noted that the flow rate (750 ml/min) to the turbidity meter was relatively low and as an OFI Seqwater could review speeding up the flow to the turbidity meter.

The Wall Chart critical limit for fluoride was 1.1 mg/L for 15 min but the delay was 2 min on SCADA. This was a minor difference and indeed the 2 min alarm delay in the field was more conservative, and hence lower risk, than that in the Wall Chart. Nonetheless, to avoid the potential for operators not taking critical limits literally, as an OFI, a solution, such as setting alarm delays as ≤ values, or aligning them, was considered warranted.

The WTP Schematic dated to 17 December 2018 was found to be an accurate reflection of the WTP as inspected.

The Molendinar Process Lab services the Operational Lab at this site. For the benchtop instruments, log books on site were checked and found to be in good order – completed as required. The Monthly Log Books for January and February 2020 were checked and showed good records of benchtop and online monitoring results. The logs showed information such as operator notes, readings, calibrations and other information.

The SCADA data was viewed for the selected instruments for January 2020. During the examined period the system was functional, results were compliant, and the change of water source was evident in the pattern of results. The source water noted to be subject to rapid water quality changes. The source could change between turbid river water with favourable alkalinity and low turbidity lagoon water with low alkalinity. The Dam Operations and WTP Operators provided evidence of monthly attendance and checks of the water source with monthly catchment samplers completing site observations.

Calibration standards and reagents were checked on site and example findings are summarised in Table 5-8. Results were complaint.

Table 5-7. Critical limit online monitoring instrument and SCADA check for Kooralbyn WTP.

Instrument	Display	Time read	SCADA	Time read	Alert limit	Alert alarm delay	Critical limit	Critical alarm delay	Comparison to HACCP Plan Wall Chart	Finding
Turbidity for filter #3&4 (NTU)	0.14	10:20	0.14	10:40	0.2	30 min	0.3	15 min	Aligned	Compliant
Pre chlorine (mg/L)	0.84	10:35	0.83	10:40	Not audited	Not audited	Not audited	Not audited	Not audited	Compliant
Post chlorine (mg/L)	3.85	10:20	4.09	10:41	1.5-4.0	30 min	1.0-4.5	15 min	Aligned	Compliant
Post pH (pH units)	7.27	10:20	7.15	10:41	Not audited	Not audited	Not audited	Not audited	Not audited	Compliant

Table 5-8. Benchtop instrument, reagent and standard check for Kooralbyn WTP.

Instrument	Standard or reagent	Lot	Expiry	Finding
Turbidity meter	10 NTU formazan	Not audited	May 2019 (since extended based on in-house testing)	Compliant
pH meter	pH 4.0	Not audited	May 2019 (manufacture date) (opening date not recorded so discarded post audit)	Missing opening date
	pH 6.8	Not audited	May 2019 (Manufacture)	Compliant
	pH 7.0	Not audited	August 2019 (Manufacture)	Compliant
	pH 10.0	Not audited	June 2019 (Manufacture)	Compliant
Fluoride Meter	0.2	Not audited	31 July 2020	Compliant
	0.8	Made in-house	5 August 2020	Compliant
	1.0	Made in-house	13 February 2020 (discarded post audit)	Just past its expiry date
	2.0	Not audited	24 February 2020	Compliant

Capalaba WTP

The Capalaba WTP and immediate source water dam were audited and found to be in good condition. Evidence was provided of filter inspections in the form of work orders for process engineering staff to attend and open and inspect filters. The two reservoirs on site were in need of roof upgrades with new roofs to be installed in the coming year and the box gutter removed as part of that upgrade (noting that one roof had blown off the previous year (Figure 6-6). No OFI or other notes were made on the state of the reservoir roof given that these actions are in train, although it is observed as a highlight that it was good to see Seqwater taking these proactive upgrade initiatives – noting reservoirs are a common source of pathogen ingress.

Online instruments and SCADA systems were functional during the onsite audit. Selected online instruments were compared to SCADA systems, and alarm setpoints were compared to the HACCP Plan Wall Chart from 27 April 2018 (Table 5-9). SCADA records were viewed for the selected instruments for the month of October 2018 and results were found to be compliant throughout and showing largely good stability and performance albeit with some pH variability. The WTP Schematic dated to 27 April 2018 was found to be an accurate reflection of the WTP as inspected.

The water source was found to be very challenging, being a small dam with a high daily turnover. The plant was found to be operating as a 'top up' plant for of the order 6 to 12 hr per day producing approximately 5 to 12 MLD of water. Operating in this stop-start mode presents a further challenge.

To help respond to the variable pH and other challenges, a "Cheat Sheet" quick look up reference guide and "Coag App" was shown on site that is used to help with optimising coagulation and help guide the dynamic range for conducting jar tests. This start-stop mode of operation might create other challenges. For instance, it was noted by staff that when the treated water pumps are offline, the alarms are 'masked'. A concern expressed by staff was that this masking might fail to come off, or noted that there might be problems if an old or backup PLC was used and had, or reset or tripped to, an old setting.

As an OFI Seqwater could look at ways to mitigate risks associated with start-stop operational mode and potential for PLC and alarm masking to not fail safe. As a highlight it was good to see that UV disinfection had been installed at the Capalaba WTP – the auditor considers that this decision was justified.

For the benchtop instruments, log books on site were checked and found to be in good order – completed as required. The "Operator Daily Laboratory Results Form" was viewed which showed the results collated by the operator. The tolerances for measured parameters were displayed in the lab.

Calibration standards and reagents were checked on site and example findings are summarised in Table 5-10. Results were complaint.

The chemical loading area was checked and found to be compliant, with clear signage and labelling seen. Deliveries are only permitted 7 am to 3 pm and the plant is staffed 6 am to 3:30 pm, hence all deliveries occur during staffed hours.

A highlight at the site was a filter optimisation and assessment process, most recently undertaken 16 October 2019, using a CAMSIZER XT. Media particles were assessed and displayed as a size bar chart which can be used to help target media replacement.

Table 5-9. Critical limit online monitoring instrument and SCADA check for Capalaba WTP.

Instrument	Display	Time read	SCADA	Time read	Alert limit	Alert alarm delay	Critical limit	Critical alarm delay	Comparison to HACCP Plan Wall Chart	Finding
Clarifier #3 pH (pH units)	6.59	13:30	7.06	14:05	Not audited	Not audited	Not audited	Not audited	Not audited	Compliant
Clarifier #3 turbidity (NTU)	4.65	13:30	4.97	14:05	Not audited	Not audited	Not audited	Not audited	Not audited	Compliant
Filter effluent turbidity (NTU)	0.045	13:41	0.046	14:05	0.2	30 min	0.3	15 min	Aligned	Compliant
UVT (%)	83.3	13:41	83.6	14:05	Not stated	Not stated	80% (70% in de-rate)	5 min	Aligned	Compliant
CWT inlet chlorine (post filter) (mg/L)	2.02	13:50	1.94	14:13	1.8-3.0	30 min	1.0-3.5	15 min	Aligned	Compliant
CWT inlet pH (pH units)	7.44	13:50	7.46	14:13	7.0-7.5	30 min	6.5-8.0	15 min	Aligned	Compliant

Table 5-10. Benchtop instrument, reagent and standard check for check for Capalaba WTP.

Instrument	Standard or reagent	Lot	Expiry	Third party check	Last check	Finding
Hach TU5200	10 NTU formazan	Not audited	May 2020	Not audited	Not audited	Compliant
Hach DR6000	DPD	Not audited	March 2024	Annual third party check and calibration if required (e.g. by Hach)	5 June 2019	Compliant
Radiometer pH meter	pH 4.0	Not audited	May 2019 (Manufacture) 9 February 2020 (Open)	Not audited	Not audited	Compliant
	pH 6.8	Not audited	March 2019 (Manufacture) 18 February 2020 (Open)	Not audited	Not audited	Compliant
	pH 7.0	Not audited	August 2019 (Manufacture) 23 February 2020 (Open)	Not audited	Not audited	Compliant
	pH 10.0	Not audited	June 2019 (Manufacture) 23 February 2020 (Open)	Not audited	Not audited	Compliant

Esk WTP

The Esk WTP was audited and found to be in good condition. The clarifier was found to be clear and free of debris and algae.

The CWT was in acceptable condition but was a potential source of ingress due to build-up of debris from vegetation and the presence of a gutter (Figure 6-7). As an OFI it might be worth prioritising certain treated water storages with more inherently vulnerable designs, older ages, lower disinfectant residuals, chloramine vs. chlorine, or subject to vegetation build up for more frequent inspection and maintenance by adopting a more risk-based, prioritised program.

The raw water (ESK-SP120) and treated water (ESK-SP910) sampling points were clearly labelled and of suitable design.

Online instruments and SCADA systems were functional during the onsite audit. Selected online instruments were compared to SCADA systems, and alarm setpoints were compared to the HACCP Plan Wall Chart (Table 5-9).

The WTP Schematic dated to 30 January 2019 was found to be an accurate reflection of the WTP as inspected.

For the benchtop instruments, log books on site were checked and found to be in good order – completed as required. The "Esk WTP Daily Calibration Record" was viewed for the month of October 2016 and showed the results collated by the operator. The operator was collecting and recording information on online and benchtop instrument water quality results.

Calibration standards and reagents were checked on site and example findings are summarised in Table 5-10. Results were complaint.

The chemical loading area was checked and found to be compliant, with clear signage and labelling seen. The site is attended during loadings. The alum and soda ash fill points are clearly labelled as were the chlorine and carbon dioxide gas tanks.

As an innovation highlight, the most recent detailed tank inspection for the treated water storage tank at the site occurred using Unmanned Aerial Vehicles (UAV) and submersible Remote Operated Vehicles (ROV) inspections above and within the tank. Evidence of the inspections was provided in the form of a "Tank Inspection – Asset and Sanitary Inspection" taking place on 3 September 2019 and reported on 20 February 2020. The report covered some 11 tanks.

Table 5-11. Critical limit online monitoring instrument and SCADA check for Esk WTP.

Instrument	Display	Time read	SCADA	Time read	Alert limit	Alert alarm delay	Critical limit	Critical alarm delay	Comparison to HACCP Plan Wall Chart	Finding
Hach 1720E Filter effluent turbidity (NTU)	0.082	10:00	0.08	10:16	0.2	20 min	0.3	5 min	Aligned	Compliant
Wallace and Tiernan final chlorine (post CWT) (mg/L)	2.3	10:00	2.31	10:16	1-3	30 min	0.5-3.5	15 min	Aligned	Compliant
Wallace and Tiernan final pH (pH units)	7.21	10:00	7.21	10:16	6.8-7.5	2 hr	6.5-8.0	15 min	Aligned	Compliant

Table 5-12. Benchtop instrument, reagent and standard check for check for Esk WTP.

Instrument	Standard or reagent	Lot	Expiry	Third party check	Last check	Finding
Hach TU5200	10 NTU formazan	Not audited	28 February 2021	Annual third party check and calibration if required (e.g. by Hach)	6 September 2019	Compliant
Hach DR6000	DPD	Not audited	September 2024	Annual third party check and calibration if required (e.g. by Hach)	17 October 2019	Compliant
Fluoride analyser	0.2 mg/L	Not audited	25 June 2020	Not audited	Not audited	Compliant
	0.8 mg/L	Not audited	15 January 2020 (opened)	Not audited	Not audited	Compliant
	1.0 mg/L	Not audited	15 January 2020 (opened)	Not audited	Not audited	Compliant
	2.0 mg/L	Not audited	25 June 2020	Not audited	Not audited	Compliant

Mt Crosby Westbank WTP

The Mt Crosby Westbank WTP was audited on site. The Process Lab was inspected in detail. A valuable investment and highlight was the observation of a GCMS that permitted rapid inhouse analysis of MIB and geosmin to help assess taste and odour rapidly and regularly.

The Mt Crosby WTP overall was found to be in good condition and readily inspectable (Figure 6-8). The raw water (MTC-SP122) sampling point was clearly labelled and of suitable design. An instrument at that point was displaying 3.66 NTU and had a critical limit of 1,500 NTU.

Online instruments and SCADA systems were functional during the onsite audit. Selected online instruments were compared to SCADA systems, and alarm setpoints were compared to the HACCP Plan Wall Chart from 9 May 2018 (Table 5-9). The SCADA history for February 2020 was viewed and found to be functional with compliant water being produced. The plant doesn't use interlocks as it is staffed 24/7 by at least two operators. The SCADA system was fast and functional and had innovations including one highlight being a live CT chlorine dose display.

The WTP Schematic dated to 30 January 2018 was found to be an accurate reflection of the WTP as inspected. For the benchtop instruments, log books on site were checked and found to be in good order – completed as required. The "Calibration Record Log" was viewed for the month of February 2020 and showed the results collated by the operator. The operator was collecting and recording information on online and benchtop instrument water quality results.

Calibration standards and reagents were checked on site and example findings are summarised in Table 5-10. Results were complaint.

The chemical loading area was checked and found to be compliant, with clear signage and labelling seen. The site is attended during loadings. The alum and soda ash fill points are clearly labelled as were the chlorine and carbon dioxide gas tanks. The filters are provided with an annual drain down, check and clean and each can be run individually for such purposes. Routine checks are conducted fortnightly on two filters each time on a rolling basis.

Table 5-13. Critical limit online monitoring instrument and SCADA check for Mt Crosby WTP.

Instrument	Display	Time read	SCADA	Time read	Alert limit	Alert alarm delay	Critical limit	Critical alarm delay	Comparison to HACCP Plan Wall Chart	Finding
Settled water turbidity basin#1 (NTU)	0.441	13:55	0.42	13:54	5	30 min	Not applicable	Not applicable	Aligned	Compliant
Hach TU5300 SC IFE#1 turbidity (NTU)	0.0277	13:55	0.03	13:54	0.2	30 min	0.3	15 min	Aligned	Compliant
Wallace and Tiernan Depolox 3 treated water chlorine (mg/L)	2.03	14:00	2.04	14:24	Not audited	Not audited	Not audited	Not audited	Aligned	Compliant
Wallace and Tiernan final pH (pH units)	7.21	10:00	7.21	10:16	6.8-7.5	2 hr	6.5-8.0	15 min	Aligned	Compliant

Table 5-14. Benchtop instrument, reagent and standard check for check for Mt Crosby WTP.

Instrument	Standard or reagent	Lot	Expiry	Operational lab check	Last check	Process lab check	Last check	Third party check	Last check	Finding
Hach TU5200	10 NTU formazan	Not audited	31 March 2020 (re-certified)	Monthly	3 February 2020	Quarterly	6 January 2020	Annual third party check and calibration if required (e.g. by Hach)	25 May 2019	Compliant
Hach DR6000	DPD	Not audited	Not audited	Monthly	3 February 2020	Quarterly	6 January 2020	Not audited	Not audited	Compliant
Fluoride analyser	0.2 mg/L	Not audited	25 June 2020					Not audited	Not audited	Compliant
	0.8 mg/L	Not audited	15 January 2020 (opened)					Not audited	Not audited	Compliant
	1.0 mg/L	Not audited	15 January 2020 (opened)					Not audited	Not audited	Compliant
	2.0 mg/L	Not audited	25 June 2020					Not audited	Not audited	Compliant

5.2.6. *Implementation of the risk management improvement program as described in the plan*

Seqwater was implementing its Drinking Water Quality Improvement Plan and recording those (most recently in the Register of changes to DWQMP, HACCP plans and procedures - 2018-2019, D14/7606). These improvements are linked to various corporate programs and are

largely as referred to elsewhere in this audit report. These includes water storage tank protection upgrades and improvements in operator training.

A number of problems continue to be experienced with disinfection by-products (DBPs). This includes chlorates from sodium hypochlorite breakdown and trihalomethane (THM) formation. Both are being proactively managed to within potential future (chlorate) and current (THM) guideline values. Seqwater assesses the THM formation potential of waters as part of its assessments and at the same time understands it chlorine decay rates. At present it's not uncommon for water to reach THM concentrations of 160 to 180 µg/L in the distribution system which is compliant with current. ADWG guideline values but not aligned with other OECD guidelines and hence potentially not sustainable long term. Through a Partnership Water Quality Plan Seqwater is actively engaging with the Distribution Retail Entities to better manage the risks associated with THMs in the supply system and retailer networks. As part of that, Seqwater have moved to enhanced coagulation in many locations. For the Mt Crosby WTPs a Bromide Management Plan was put in place, dated 20 January 2018, which illustrates how keeping raw water conductivity below 450 µS/cm can help mitigate bromide. Seqwater should continue with its ongoing efforts to get its DBPs down, albeit without compromising disinfection.

To respond to intensifying landuse, reduced dilution and increased concerns about some pathogens, Seqwater is undertaking several pieces work. A broader piece of work is being undertaken looking at the possible need for UV upgrades at WTPs with HBT LRV deficiencies. Seqwater is planning to upgrade treatment at some water extraction locations, for instance installing a new cartridge filter and UV at Linville. Seqwater is studying changing risk profiles on North Stradbroke Island at Dunwich and looking at groundwater age on North Stradbroke Island. These, and many similar studies, demonstrate Seqwater is continuing to review risks and respond to findings.

To help manage risks from on-site sewage management systems and urban development, a highlight was that Seqwater is acting at the state level to help improve drinking water catchment protection by contributing to the revisions to the on-site sewage management system and sewerage code. The work is developing the Landuse Risk Tool (LURT) for on-site sewage management systems. Seqwater is conducting source tracking programs with small-lot subdivisions with 1,000 m lots that have no sewer to help identify and mitigate sources. Seqwater has made recommendations for 2.5 Ha lot sizes in some areas to keep pollution densities down and has got changes and co-funding in some areas.

Major improvements are recorded and managed under an "issue and opportunity notice" (ION) which is provided to the Planning Team and captured within an Asset Portfolio Master Plan to help prioritise and track them. Improvements are assessed as part of Seqwater's broader priorities, e.g. considering the cost to the community. Improvements related to minor works are flagged directly to Regional Operations Managers. Other minor ION items and associated corrective actions are captured in a database of improvements via the process engineering team.

Overall Seqwater demonstrated a good culture of continuous improvement with a good future program to further enhance and improve its operations.

5.2.7. Maintaining records using the information management systems as described in the plan

Seqwater maintains its records from operational and verification monitoring and its DWQMP and supporting documents and within its SCADA system data historian, Q-Pulse, REX and CIS

document management systems. Seqwater was readily able to retrieve all data and documents sought during the audit. Version history information is recorded within the document management system.

5.2.8. Undertaking regular reviews at the frequency specified in the approval notice.

The SCADA system provides process schematics for the process trains that match the assets identified in the field. Attachments to the DWQMP provide excellent summaries of the processes in the form of process schematics and maps. The sighted assets were consistent with the SCADA diagrams and schematics. Therefore, it was concluded that Seqwater is keeping its SCADA diagrams and schematics up to date and accurate and as a highlight it was noted that Seqwater has excellent summary schematics and HACCP Plan Wall Charts.

Another highlight that was noted from viewing the schematics and the site inspections of the WTPs visited, that bypasses seem to be absent, which helps mitigate the risk of WTP bypasses.

5.3. Assessment of relevance of the plan as it currently exists

The DWQP was assessed with respect to whether the plan reflected current circumstances including catchment characteristics, water quality information and infrastructure.

5.3.1. Assessing whether the service description and details of infrastructure in the plan reflect the current circumstances for each scheme

The DWQMP was reflected in the assets and infrastructure that was sighted. Therefore, the DWQMP appears to be current with respect to the information used to describe and detail the infrastructure. In some cases some newer additional infrastructure has been and is being commissioned and these changes are intended to be reflected in periodic updates of the DWQMP. Examples of updates and changes made to reflect changing circumstances are noted as follows.

- Updated organisational structure coordinating water quality management:
    - Based on the new Org Chart dated to 24 February 2020: the Chief Operating Officer (no longer the General Manager of Operations) → Manager Technical Support and Improvement → Principal Water Quality; provide the main reporting line from October 2019 for coordinating water quality management. The Job description of the Principal Water Quality covers the ISO systems as well as the Act, DWQMP and other obligations. The incumbent has long experience in drinking water quality management and is well respected by the relevant key stakeholders (the Regulator, Qld Health and the Distribution Retail Entities). Other members of the team are similarly experienced and respected. As such, Seqwater has sufficient clarify, expertise and capacity to adequately coordinate and comply with its DWQMP.
    - The Chief Operating Officer is responsible for most aspects of water quality management. This includes operations, inspections and preventive maintenance, which helps avoid obligations falling between cracks.
    - The contingent of operational staff is relatively lean given the challenges faced in Seqwater's area of operations and there may be value in benchmarking this operational capacity against utilities with similarly challenging circumstances as an OFI to help ensure sufficient capacity to maintain reliable essential services compliance even during times of challenge.

- Updated infrastructure:
    - The Aspley WQMF is a new facility. This has been added to the SCADA system and DWQMP, albeit not yet added to the GIS system. The infrastructure was commissioned in stages, with initial testing being undertaken first with water before testing with chemicals so as to ensure no impact to the customer until the process performance could be assessed. Note that the WQMF was audited during this audit and found to be compliant.
    - A new WTP to provide for a capacity upgrade has been implemented at Canungra WTP (not a new scheme). The membrane plant was commissioned to stormwater and is now operating within its defects liability period.
- Updated needs of Distribution Retail Entities:
    - Seqwater has a good system to keep on top of water demand needs using forecasting linked to a Monthly Operating Strategy Schedule. Seqwater predicts water to be produced based on data from Distribution Retail Entities. An example was provided for February 2020 showing the forecast for whole system. The process combines the Distribution Retail Entity and Seqwater perspectives and shows figures as both a schematic and table. In addition, shorter-term interactions take place. Examples were shown of Unity Water providing demand forecasts approximately every couple of days (21 February 2020 by email).
    - Longer term planning is conducted by the Water Supply Planning team.
    - Supply disruption plans are in place for smaller interruptions. An example was given of Kooralbyn that has struggled with demand and has used tankers.
- Stakeholders:
    - Seqwater demonstrated that it regularly updated its stakeholder contact details.
    - Seqwater considered that it got good support from Distribution Retail Entities in terms of how they interact on matters such as wastewater flows.
    - Seqwater holds formal meetings with each Distribution Retail Entity every month and has a Partnership Water Quality Management Plan and operations protocols in place to bridge across to those entities and aid in stakeholder engagement.
    - Seqwater proactively engages with the Water Supply Regulator and the Queensland Department of Health Water Unit as co regulators and key stakeholders.
- Changing water sources:
    - Catchment characterisation work is ongoing and is summarised into broad catchment reports. Sanitary surveys provide an input to those with a target of conducting a sanitary survey every three years. The Sanitary Surveys are referenced in the Risk Assessment process which in turn records when the risk assessment was last undertaken. Example viewed included:
        - Logan River System Catchment Characterisation 2017
        - Logan River Catchment Survey 2016; and 2018-19 updated report (completed February 2020).

- To date these surveys have been outsourced but Seqwater now considers them to be "business as usual" and is looking to conduct rolling internal sanitary surveys. It was a highlight to see this long term commitment to sanitary surveys.
- Seqwater noted and has responded to bromide levels rising during the drought in the mid-Brisbane which has in turn impacted brominated DBPs.

5.3.2. Confirming the information in the plan used to identify hazards and hazardous events reflects the current circumstances for each scheme (including catchment characteristics, water quality information and infrastructure)

Seqwater maintains an Excel spreadsheet table for its risk assessments that covers maximum risk by hazard for approximately a couple of dozen hazards (specific hazards and hazard groups) and then keeps that updated over time. The major change in the structure since 2016 has been refining some of the chemical hazard groups. The Hazard and barrier assessment is then conducted to estimate the attenuated risk for a standard list of hazardous events, hazards and preventive measures. Bypasses are explicitly covered as an example potential hazardous event. A "Medium 6" is the acceptable risk cut off. Preventive measures are defined as a PRP, OPRP or CCP, as described in the DWQMP.

Seqwater has been keeping the risk assessments updated as 'living' documents. They are updated nominally every two years. For instance, there have been some updates to sources of water. The date of last change noted prior to the audit was for the North Pine system on 11 February 2020. The risk assessment process draws from water quality data, excursion reports and source description information. A "Water Quality Dashboard" developed by Seqwater is used to draw in verification and operational grab sample data on water quality to inform the risk assessments. An example of such a display was provided for the North Pine WTP for chlorate, including a trend from the routine verification data. Experienced water quality staff conduct the detailed review of the water quality data and pull up trends on a needs basis – if there is useful information to share. The risk assessment worksheet summary captures the information.

The Catchment Water Quality (CWQ) team create and revise the 'unmitigated risk' and then Seqwater staff review that as a workshop. The CWQ team that completes the risk assessment and the workshop participants are noted in the worksheet by date present and name. Usually a process engineer and water operators are involved along with catchment team members. Examples were shown of risk assessment updates and teams for North Pine from 11 February 2020 and Image Flat for 10 January 2020.

The risk assessments are conducted site by site since Seqwater inherited infrastructure from various different councils. As a result there is a lot of inter-site variability.

Improvements arising from the risk assessments are given a code number in the worksheet and are reviewed as each risk assessment is updated. If the risk treatment requires a formal improvement it will be escalated as described in section 5.2.6.

Overall, it was concluded that the DWQMP remains current with respect to the information used to identify hazards and hazardous events.

6. Photographic evidence summary

Figure 6-1. Photo of Ewen Maddock WTP turbidity analyser - well labelled and maintained.

Figure 6-2. Photo of Kooralbyn WTP clarifier – well maintained and clear.

Figure 6-3. Photo of Kooralbyn CWT – showing excellent condition.

Figure 6-4. Photo of Kooralbyn CWT – showing excellent screening.

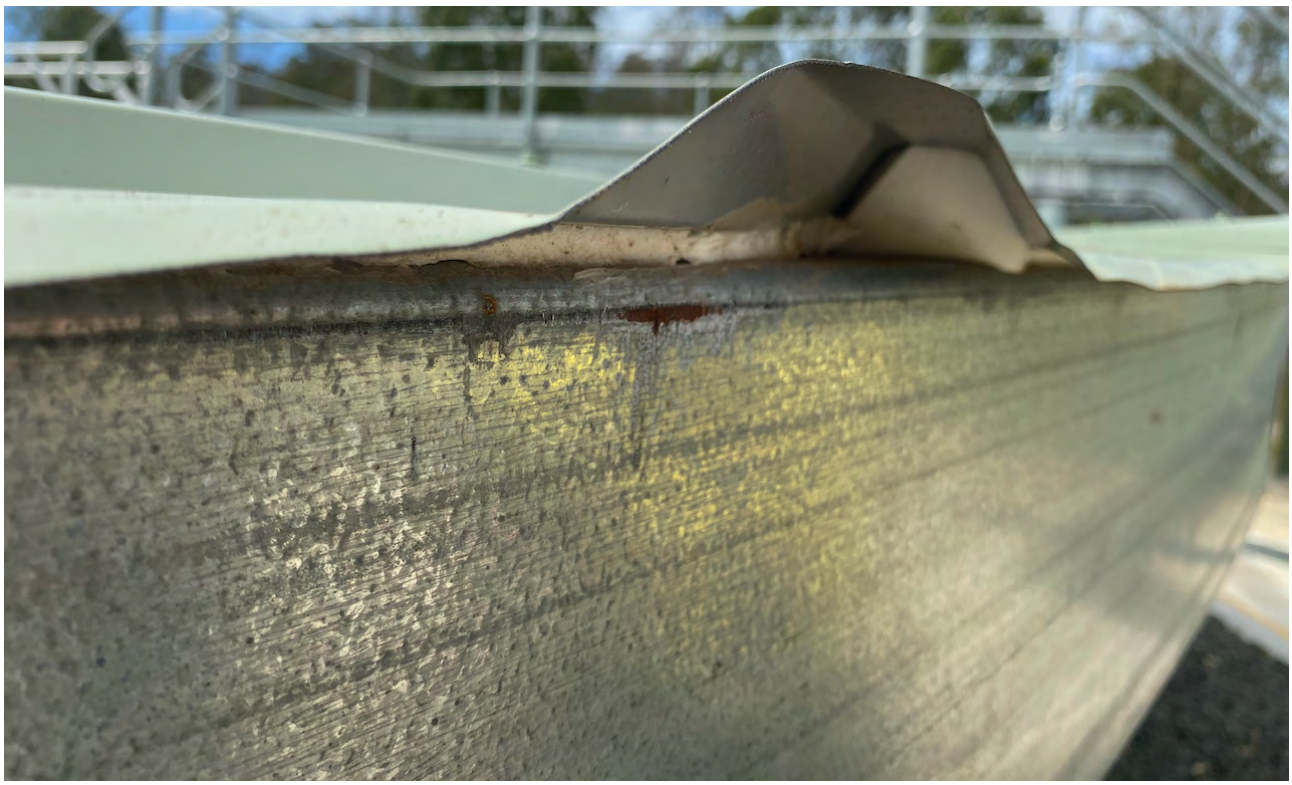

Figure 6-5. Photo of Kooralbyn CWT – showing excellent vermin-stoppers.

Figure 6-6. Photo of Capalaba CWT – scheduled for roof replacement.

Figure 6-7. Photo of Esk CWT – showing acceptable condition but some inherent challenges.

Figure 6-8. Photo of Mt Crosby Westbank WTP filters – showing excellent inspectability and conditions. The plant was offline during the inspection.