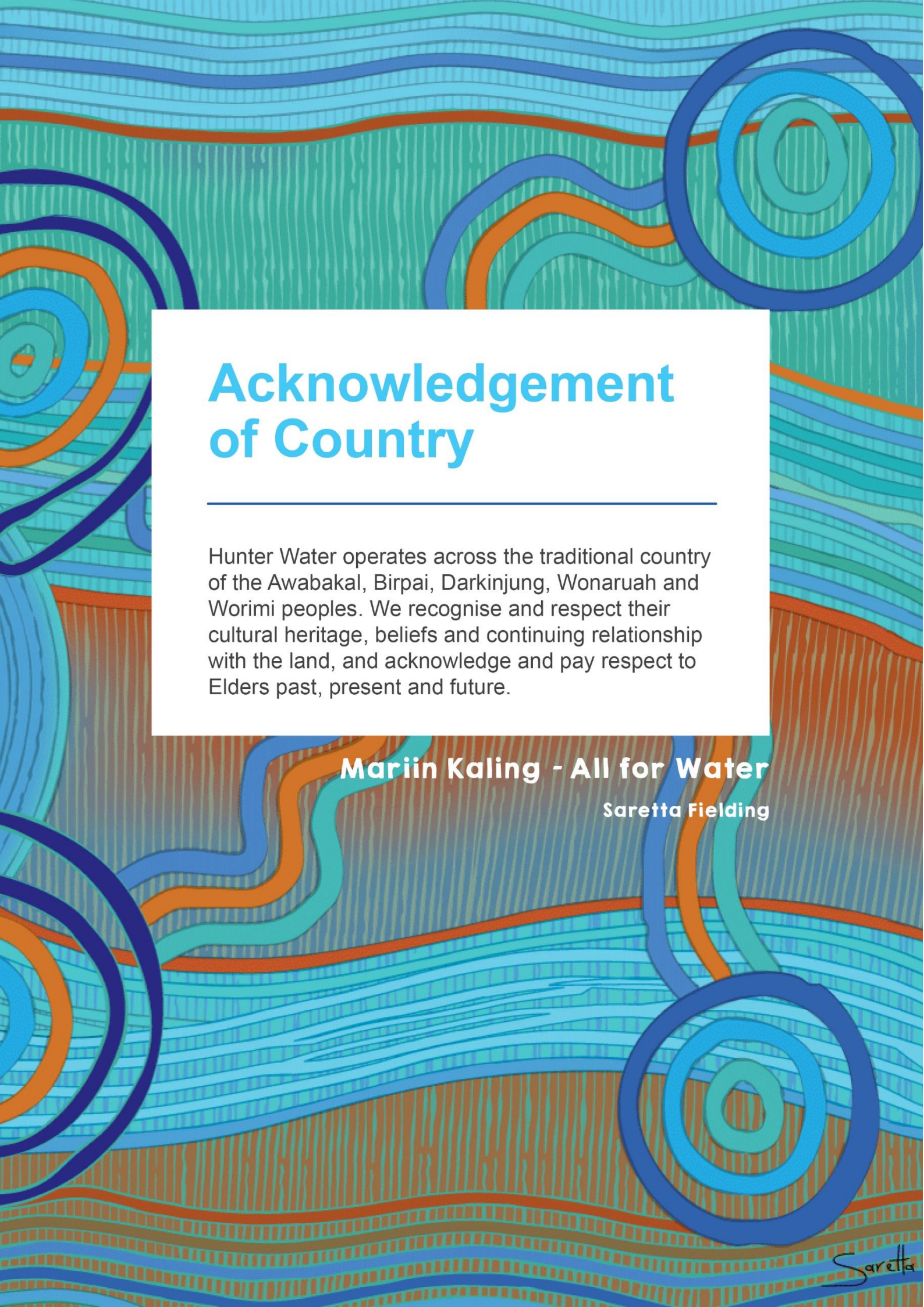
COMPLIANCE AND PERFORMANCE REPORT

SEPTEMBER 2022

HUNTER WATER

Acknowledgement of Country

Hunter Water operates across the traditional country of the Awabakal, Birpai, Darkinjung, Wonaruah and Worimi peoples. We recognise and respect their cultural heritage, beliefs and continuing relationship with the land, and acknowledge and pay respect to Elders past, present and future.



EXECUTIVE SUMMARY

Hunter Water is dedicated to providing safe, reliable and efficient water and wastewater services to the households and businesses of the Lower Hunter. Our Operating Licence sets out the terms and quality expectations that govern the delivery of those services to the community. [1] This report details our compliance with and performance against the requirements of our Operating Licence and Operating Licence Reporting Manual for 2021-22. [2]

Quality, safety and reliability are of critical importance to us. As a State-Owned Corporation, we strive to deliver these outcomes efficiently and with due regard to community and environmental values.

Hunter Water performed at a consistent, high standard throughout 2021-22. We are undertaking programs in 2022-23 to ensure that we continue to deliver high quality services to the Lower Hunter. Key performance and operational outcomes during 2021-22 include:

Supply services and performance standards

- Full conformance with the Drinking Water Quality Management System (DWQMS) with the exception of not publishing the Monthly Water Quality Monitoring Report on time for the month of July 2021.
- Full conformance with the Recycled Water Quality Management System (RWQMS).
- Full compliance with regulatory requirements for verification monitoring as specified in the Australian Drinking Water Guidelines (ADWG).
- Reviewed water quality risks associated with our potable water distribution network.
- Continued to consult with NSW Health about implementation of our DWQMS and RWQMS.
- Met system performance standards for water pressure, water continuity and wastewater overflows.

Water conservation & system yield

- Continued to make significant progress in the area of water conservation. This performance is outlined in a separate water conservation report.
- Continued to monitor and review the level of service standards and system yield associated with our water storages. The Lower Hunter Water Security Plan was released in April 2022.

Organisational systems management

- No major non-conformances with the Asset Management System (AMS) were identified during third party audits or internal audits and certification maintained to ISO 55001:2014 (AS/NZS ISO 55001:2014)
- No major non-conformances with the Environmental Management System (EMS) were identified during third party audits or internal audits and certification maintained to ISO 14001:2015 (AS/NZS ISO 14001:2016).
- No major non-conformances with the Quality Management System (QMS) were identified during third party audits or internal audits and certification maintained to ISO 9001:2015 (AS/NZS ISO 9001:2016)
- Continued to adopt an integrated approach to managing the management systems in the form of an Integrated Management System (IMS). The IMS provides processes, principles and guidelines across the common functions of the AMS, EMS, QMS, Health and Safety Management System

[1] NSW Government 2017, Hunter Water Operating Licence 2017-2022.
[2] NSW Government 2017, Hunter Water Operating Licence Reporting Manual 2017-2022.

(HSMS) and Information Security Management System (ISMS). No major non-conformances with the IMS were identified during third party audits.

- Approval of a new Environmental Management Plan (EMP), developed in parallel with our Sustainability Strategy.

Customer and stakeholder relations

- Regular consultation with our customers through the Customer and Community Advisory Group (CCAG). Consultation was held in accordance with the CCAG Charter and thus matters were raised either for information or to receive feedback from members.
- Actions implemented to improve the effectiveness and timeliness of customer complaint responses.
- Supporting our most vulnerable customers through maintaining a significant presence at community events and recommencing field visits.
- Ongoing membership of the External Dispute Resolution Scheme, through the Energy and Water Ombudsman of NSW (EWON).
- Compliance with the Customer Complaint Management Standard and Guideline, AS/NZS 10002:2014.

TABLE OF CONTENTS

1 INTRODUCTION

Hunter Water is a state-owned corporation that provides safe, reliable, and efficient water and wastewater services to over half a million people in the Lower Hunter region. We also manage trunk stormwater channels in the Newcastle, Lake Macquarie, and Cessnock local government areas. We are governed by the *State Owned Corporations Act 1989* and *Hunter Water Act 1991*. The NSW government regulates Hunter Water's operations through a variety of regulatory bodies and instruments.

Our Operating Licence is the key regulatory instrument that enables and requires us to provide services. The Operating Licence contains terms and conditions that specify how services are to be provided, and quality and performance standards that must be achieved. Through it, we are accountable to the NSW government for our performance. Our adherence to and performance against the Licence is monitored and reviewed by the Independent Pricing and Regulatory Tribunal (IPART).

This Compliance and Performance Report provides detailed information on our performance during 2021-22 with respect to prescribed clauses of the Operating Licence and in accordance with the associated Reporting Manual.[3,4]

The contents of this report are as follows:

- **Chapter 2** - The water quality performance of our drinking water and recycled water systems. We also report our performance against the minimum standards in our Operating Licence for water pressure, water continuity and wastewater overflows system performance.
- **Chapter 3** - Our methodology for calculating system yield. We now report on water conservation and efficiency in a separate report – Hunter Water's annual Water Conservation Report
- **Chapter 4** - Performance of our asset, environmental and quality management systems
- **Chapter 5** - Performance against the customer and stakeholder clauses in our Operating Licence
- **Chapter 6** – A glossary of technical terms

[3] NSW Government 2017, Hunter Water Operating Licence 2017-2022.
[4] NSW Government 2017, Hunter Water Operating Licence Reporting Manual 2017-2022.

2 SUPPLY SERVICES AND PERFORMANCE STANDARDS

2.1 Drinking water

2.1.1 Overview of drinking water supply systems

Hunter Water supplies high quality drinking water to more than half a million people in the Lower Hunter region of New South Wales: in the local government areas of Newcastle, Lake Macquarie, Maitland, Cessnock, Port Stephens, Dungog and small parts of Singleton.

As required by the Operating Licence our drinking water systems are managed in accordance with the Drinking Water Quality Management System (DWQMS), complemented by our ISO 9001 Quality Management System. Our DWQMS is consistent with the Australian Drinking Water Guidelines 2011 (ADWG) framework for management of drinking water quality.[5] The framework is based on the application of multiple barriers – preventive measures at all steps in the drinking water system – to ensure that consistently safe drinking water is supplied.

Drinking water systems consist of:

- **Catchments**

  Water is collected in the natural landscape by creeks, rivers, and groundwater systems. Water quality in our catchments is protected by regulation that controls the activities that are allowed within them.[6] We also work closely with the community and stakeholders on land management and development to ensure it is undertaken in a manner appropriate for a drinking water catchment. **Figure 1 - Hunter Water's catchments, storages, and water treatment plants** shows the locations of our drinking water catchments.

- **Storages**

  Water is stored in dams and groundwater sandbeds (aquifers) before we treat it to drinking standards. The drinking water storages that we own are: Chichester Dam, Grahamstown Dam, Tomago Sandbeds and Anna Bay Sandbeds. We also source some water from the Paterson River (via Lostock Dam, which is owned by WaterNSW) and the Allyn River. The locations of our storages are shown in **Figure 1 - Hunter Water's catchments, storages, and water treatment plants** and capacities are provided in **Table 1 - Capacity of Hunter Water's water storages**.

- **Water treatment plants**

  We operate six water treatment plants (WTPs) that treat water to a quality suitable to drink safely. These water treatment plants are Dungog WTP, Grahamstown WTP, Lemon Tree Passage WTP, Anna Bay WTP, Nelson Bay WTP, and Gresford WTP. **Figure 1** shows the locations of our WTPs.

- **Water supply systems**

  A closed distribution network transports and stores the water we supply. All clear water tanks and storage reservoirs within the distribution system are covered and regular inspections are undertaken to ensure we maintain the integrity of the system. Security measures are in place to prevent unauthorised access to water storage facilities. We undertake maintenance and construction activities in accordance with procedures designed to ensure protection of drinking water quality. We have backflow prevention measures in place to minimise the likelihood of backflow of potentially contaminated water from customers' properties into the water supply system. **Figure 2** shows the water supply systems. We describe these further in this chapter.

We also supply and receive some drinking water from outside of our area of operations. We supply a small volume of treated water to MidCoast Council in Karuah (4.0 ML in 2021-22) and can also supply and receive bulk treated water from the Central Coast Council area.

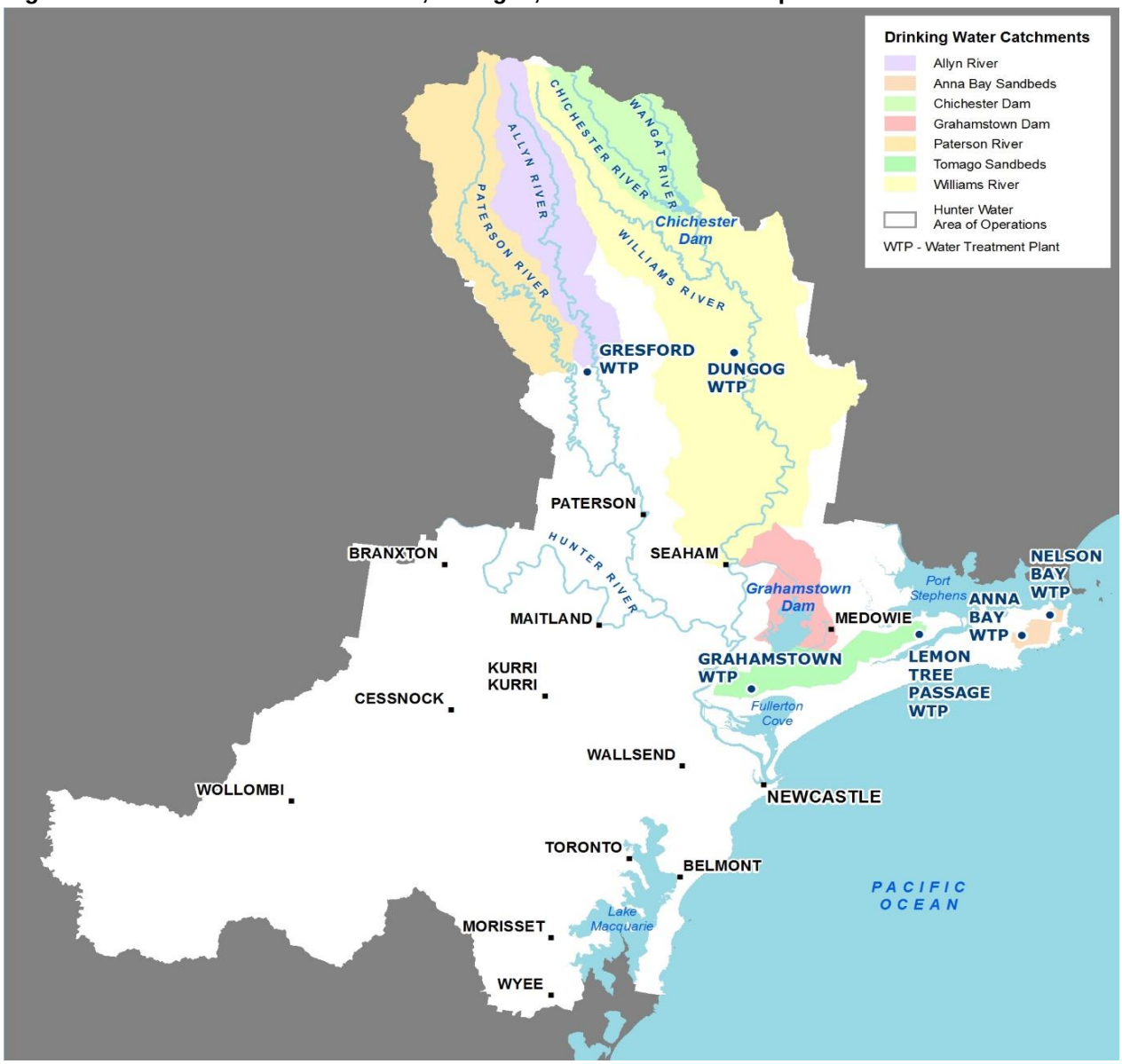
During 2021-22, we supplied 1,707.2 ML of water to the Central Coast and received 798 ML from Central Coast Council's water supply system. Central Coast Council maintain a quality assurance program for their

[5] National Health and Medical Research Council, 2016, Australian Drinking Water Guidelines 2011 – updated Jan 2022

[6] *Hunter Water Regulation 2015*, Part 2 – Special Areas.

water supply systems under the *NSW Public Health Regulation 2012*. We also provided small volumes of water to private network operators within the Hunter Water area of operations.

Figure 1 - Hunter Water's catchments, storages, and water treatment plants

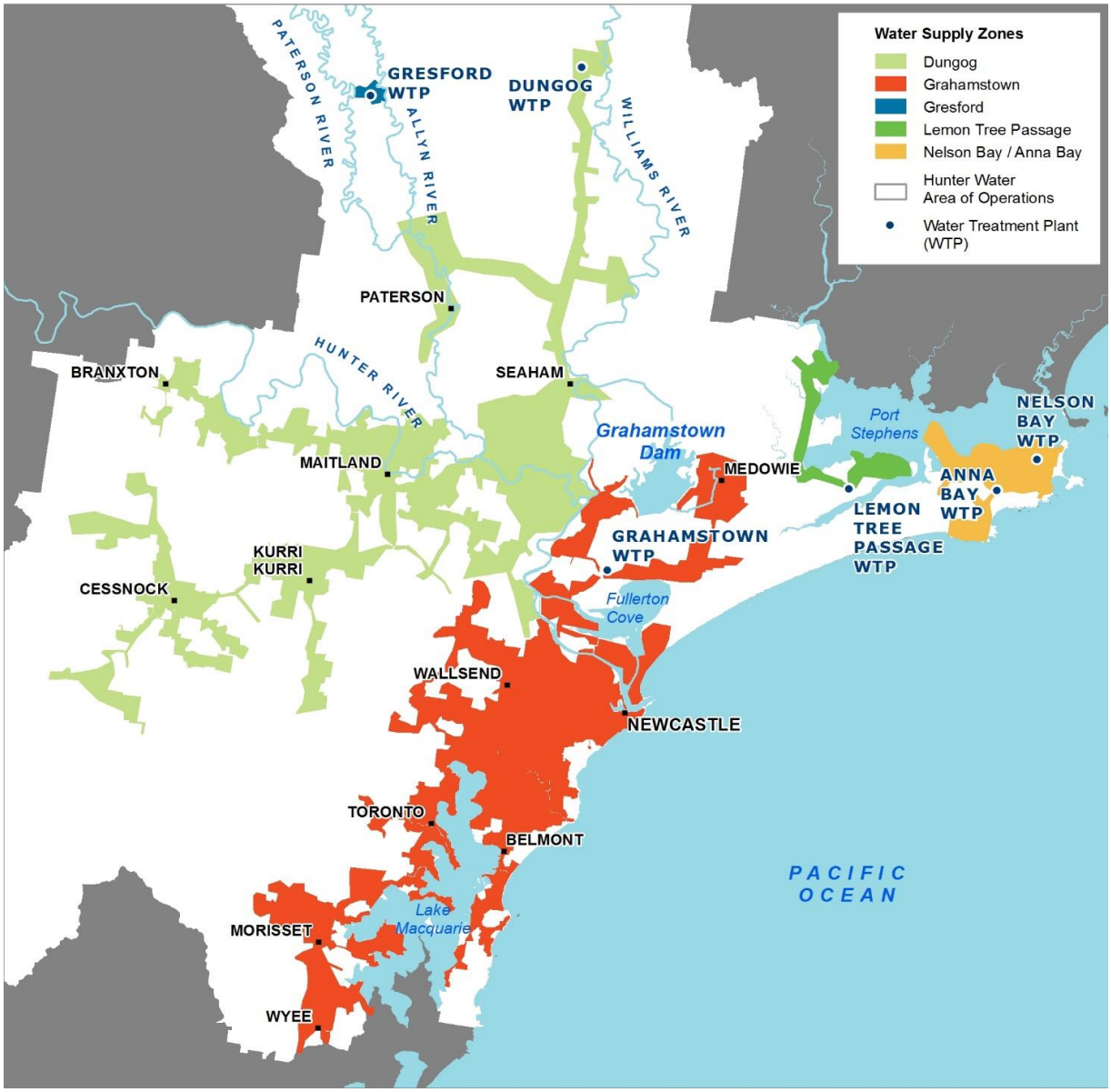


Source: Hunter Water

Table 1 - Capacity of Hunter Water's water storages

Water Source	Maximum Capacity (ML)
Chichester Dam	18,356
Grahamstown Dam	182,305
Tomago Sandbeds	54,000
Anna Bay Sandbeds	14,537
Total storage	**269,198**

Figure 2 - Hunter Water's drinking water supply systems



Source: Hunter Water

2.1.2 Performance at critical control points

Where practical, we continuously monitor water quality parameters at Critical Control Points (CCPs) monitored using a supervisory control and data acquisition (SCADA) system. Operational limits for CCPs are set at levels that are more stringent than the critical limit. Using SCADA, alarm limits are set so that we can take corrective action before the critical limit is reached.

Exceedance of the critical limit indicates a risk of unacceptable water quality being supplied to customers. If a critical limit is exceeded, an investigation is undertaken and any necessary corrective action(s) are implemented. To minimise the likelihood of exceeding critical limits, we have implemented automatic shutdowns for key water quality parameters at all WTPs.

The performance review is applicable to Hunter Water's CCPs in place during the reporting period.

An outline of each of our water supply zones and performance at CCPs during 2021-22 is set out below. An exceedance of a CCP critical limit does not necessarily indicate that unsafe water quality was supplied to customers, rather it means that the risk threshold was exceeded and a corrective response was required. A brief explanation of each of the water treatment processes referenced in this section is included in the Glossary.

Dungog water supply system

We treat water from Chichester Dam at Dungog WTP. Dungog WTP is a direct filtration plant with a maximum capacity of 90 ML/day and the following treatment processes are in place:

- raw water chlorination (event-based)
- powdered activated carbon (PAC) dosing (event-based)
- coagulation / flocculation
- filtration
- pH correction
- disinfection
- fluoridation

The majority of water from the Dungog WTP is fed by gravity trunk main to the Cessnock, Maitland and Newcastle areas. We re-chlorinate water supplied to Maitland and Cessnock at the outlet of Four Mile Creek Reservoir. Water from the Chichester Trunk Gravity Main (CTGM) also gravitates to the Newcastle and Lake Macquarie areas (Grahamstown water supply zone), where it blends with water supplied from Grahamstown WTP. The Dungog water supply system supplies an estimated permanent population of 163,000 people.

Table 2 shows the performance at CCPs within the Dungog system.

Table 2 - Dungog water supply system: CCPs performance 2021-22

Critical control point	Critical limit	Compliant
Dungog WTP coagulation and filtration	Individual filters. Filtered water turbidity must not exceed 0.5 NTU for > 15 consecutive minutes at individual filter outlets	✓
Dungog WTP post-filtration disinfection	Disinfection prior to first customer (Chlorine Contact Time (CT) must not be less than 15 min.mg/L) [a]	✓
	pH at clear water tank outlet must not be greater than 9 for > 15 consecutive minutes	✓
	Free chlorine residual at clear water tank outlet must not exceed 4.5 mg/L for > 15 minutes	✓
Dungog WTP fluoridation	Fluoride concentration at clear water tank outlet must not exceed 1.5 mg/L	✓
Four Mile Creek reservoir chlorinator	Free chlorine residual at water main re-chlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓

Notes:

a) Chlorine Contact time (CT) is calculated using chlorine, flow and Clear Water Tank level data. A surrogate limit of 0.3 mg/L free chlorine at the Clear Water Tank outlet applies.

Grahamstown water supply system

We treat water from Grahamstown Dam and the Tomago Sandbeds at Grahamstown WTP. Grahamstown WTP has a maximum capacity of 266 ML/day and the following treatment processes are in place:

- PAC dosing (event-based)
- aeration (Tomago Sandbeds water only)
- coagulation / flocculation
- sedimentation
- filtration
- pH correction
- disinfection
- fluoridation

We pump treated water from Grahamstown WTP to Newcastle and Lake Macquarie, as well as Medowie, Stockton and Kooragang Island. We re-chlorinate the water at four locations within the Newcastle and Lake Macquarie distribution system to improve the chlorine residual to minimise water quality risk within the distribution system. We pump water from this supply zone to the Tomaree Peninsula to form part of the supply to Port Stephens. The Grahamstown water supply system supplies an estimated permanent population of 409,000 people. **Table 3** summarises performance at CCPs within the water supply system.

Table 3 - Grahamstown water supply system: CCPs performance 2021-22

Critical Control Point	Critical Limit	Compliant
Grahamstown WTP coagulation and filtration	Filtered water turbidity must not exceed 0.5 NTU for > 15 consecutive minutes at individual filter outlets	✓
Grahamstown WTP and mains disinfection	Disinfection prior to first customer (Chlorine Contact Time (CT) must not be less than 15 min.mg/L) [a]	✓
	pH at clear water tank outlet must not be greater than 9 for > 15 consecutive minutes	✓
	Free chlorine residual post re-chlorination must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
Grahamstown WTP fluoridation	Fluoride concentration at clear water tank outlet must not exceed 1.5 mg/L	✓
Cardiff South Chlorinator	Free chlorine residual at water mains re-chlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
Elermore Vale Chlorinator	Free chlorine residual at water mains re-chlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
North Lambton Chlorinator	Free chlorine residual at water mains re-chlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
Toronto Chlorinator	Free chlorine residual at water mains re-chlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓

Notes:

a) Chlorine Contact Time (CT) is calculated using chlorine, flow and Clear Water Tank level data. A surrogate limit of 0.7 mg/L free chlorine at the Clear Water Tank outlet applies.

Lemon Tree Passage water supply system

We treat water from the Tomago Sandbeds at Lemon Tree Passage WTP. Lemon Tree Passage WTP has a maximum capacity of 5 ML/day and the following processes are in place:

- aeration
- coagulation / flocculation
- two stage filtration
- pH correction
- disinfection
- fluoridation

We pump treated water from Lemon Tree Passage WTP to Tanilba Bay, Mallabula, Lemon Tree Passage, Swan Bay, and Karuah. This system supplies an estimated permanent population of 9,300 people.

Performance at CCPs within the water supply system is summarised in **Table 4**.

Table 4 - Lemon Tree Passage water supply system: CCPs performance 2021-22

Critical Control Point	Critical Limit	Compliant
Lemon Tree Passage WTP coagulation and filtration	Filtered water turbidity must not exceed 1 NTU for > 15 consecutive minutes at secondary filter outlets	✓
Lemon Tree Passage WTP disinfection	Disinfection prior to first customer (Chlorine Contact Time (CT) must not be less than 15 min.mg/L) [a]	✓
	pH at clear water tank outlet must not be greater than 9 for > 15 consecutive minutes	✓
	Free chlorine residual at the clear water tank outlet must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
Lemon Tree Passage WTP fluoridation	Fluoride concentration at clear water tank outlet must not exceed 1.5 mg/L	✓

Notes:

a) Chlorine Contact Time (CT) is calculated using chlorine, flow and Clear Water Tank level data. A surrogate limit of 0.4 mg/L free chlorine at the Clear Water Tank outlet applies.

Anna Bay and Nelson Bay water supply system

The Anna Bay Sandbeds are located within the protected catchment of the Tomaree National Park and groundwater is naturally filtered within the sandbeds. We extract the water using a network of production bores and treat the water at Anna Bay and Nelson Bay WTPs.

Anna Bay WTP and Nelson Bay WTP can each supply a maximum flow of approximately 12 ML/day and the following treatment processes are in place:

- aeration
- pH correction
- disinfection
- fluoridation

Water from the WTPs supplies the Tomaree Peninsula including Anna Bay, Boat Harbour, Salamander Bay, Nelson Bay, Fingal Bay, Shoal Bay, Corlette and Soldiers Point. The system supplies an estimated permanent population of 34,000 people. Water from Grahamstown WTP can also supplement this water supply system. **Table 5** summarises the performance at CCPs within the water supply system.

Table 5 - Anna Bay/ Nelson Bay water supply system: CCPs performance 2021-22

Critical Control Point	Critical limits	Compliant
Anna Bay WTP disinfection	Disinfection prior to first customer (Chlorine Contact Time (CT) must not be less than 15 min.mg/L) [a]	✓
	Free chlorine concentration at clear water tank outlet must not exceed 4.5 mg/L for > 15 minutes	✓
	pH at clear water tank outlet must not be greater than 9 for > 15 consecutive minutes	✓
	Turbidity at clear water tank outlet must not exceed 5 NTU for > 5 consecutive minutes	✓
Nelson Bay WTP disinfection	Disinfection prior to first customer (Chlorine Contact Time must be less than 15 min.mg/L) [a]	✓
	pH at the clear water tank inlet must not be greater than 9 for > 15 consecutive minutes	✓
	Free chlorine residual at clear water tank outlet must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
	Turbidity at clear water tank outlet must not exceed 5 NTU for > 5 consecutive minutes	✓
Anna Bay/Nelson Bay WTP fluoridation	Fluoride concentration at clear water tank outlet must not exceed 1.5 mg/L	✓

Notes:

a) Chlorine Contact Time (CT) is calculated using chlorine, flow and Clear Water Tank level data. A surrogate limit of 0.8 mg/L and 0.3 mg/L free chlorine applies at the Clear Water Tank outlets, at Anna Bay WTP and Nelson Bay WTP, respectively.

Gresford water supply system

We extract water from the Allyn and Paterson Rivers at Gresford, and treat it at Gresford WTP. Gresford WTP has a maximum capacity of 0.5 ML/day and the following treatment processes are in place:

- membrane microfiltration
- disinfection

Performance at CCPs within the water supply system is summarised in **Table 6**.

Table 6 - Gresford water supply system: CCPs performance 2021-22

Critical Control Point	Critical Limit	Compliant
Gresford WTP microfiltration	Filtered water turbidity must not exceed 0.5 NTU for > 15 consecutive minutes at clear water tank inlet	✓
	Calculated pressure decay rate across membranes must not exceed 10 kPA/min	✓
Gresford WTP disinfection	Disinfection prior to first customer (Chlorine Contact Time (CT) must not be less than 15 min.mg/L) [a]	✓
	pH at the clear water tank inlet must not be greater than 9 for > 15 consecutive minutes	✓
	Free chlorine concentration at the clear water tank outlet must not exceed 4.5 mg/L for > 15 minutes	✓

Notes:

a) Chlorine Contact Time (CT) is calculated using chlorine, flow and Clear Water Tank level data. A surrogate limit of 0.2 mg/L free chlorine at the Clear Water Tank outlet applies.

2.1.3 Verification monitoring

The ADWG Drinking Water Quality Framework emphasises a preventive approach, including operational monitoring and process control, combined with verification monitoring to confirm that preventive measures have been effective: [7]

> *Verification of drinking water quality provides an important link back to the operation of the water supply system and additional assurance that the preventive measures and treatment barriers in the water supply system have worked, and are working, to supply safe drinking water.*

Verification monitoring is based on results of water quality samples that are representative of water supplied to customers' taps. Water quality standards specified in the ADWG are considered safe for people to drink over an entire lifetime. Therefore, licence performance is a statistical analysis of results, based on percentage compliance rather than absolute figures.

In 2021-22, we achieved full compliance with the key microbiological and physical / chemical parameters shown in **Table 7, Table 8 and Table 9**. Descriptions of the parameters are provided in glossary to this report.

[7] National Health and Medical Research Council, 2016, Australian Drinking Water Guidelines 2011 – updated Jan 2022, Element five, Section 9.5, p. 142.

Table 7 - Microbiological water quality 2021-22

Parameter	Health / Aesthetic	Measure of Compliance	Performance Standard	Whole of Hunter Water 12 Months Samples	Compliant
E.coli	Health	% of samples containing < 1 Most Probable Number (MPN) per 100 mL	>98% of samples shall contain <1 MPN per 100 mL	100% of samples contained < 1 MPN per 100 mL	✓

Table 8 - Key health physical / chemical analytes 2021-22

Analyte	Units of Measure	ADWG health guideline value	Performance standard (assessment over 12 months)	95th Percentile over the last 12 months	Compliant
Fluoride	mg/L	1.5	95th percentile of test results less than respective ADWG health guideline value	1.00	✓
Chlorine	mg/L	5		1.65	✓
Copper	mg/L	2		0.012	✓
Lead	mg/L	0.01		0.001	✓
Manganese	mg/L	0.5		0.007	✓
Trihalomethanes	mg/L	0.25		0.178	✓

Table 9 - Key aesthetic physical / chemical analytes 2021-22

Analyte	Units of Measure	ADWG aesthetic guideline value	Performance standard (assessment over 12 months)	12 month average result	Compliant
Iron	mg/L	0.3	Average of test results less than respective ADWG aesthetic guideline value	0.021	✓
Aluminium	mg/L	0.2		0.039	✓
Copper	mg/L	1		0.005	✓
Zinc	mg/L	3		0.003	✓
Turbidity	NTU	5		0.2	✓
True colour	HU	15		5	✓
pH	pH units	6.5-9.2	Average of results between 6.5 and 9.2	7.59	✓

2.1.4 Drinking water quality management activities and programs in 2021-22

Improvements to drinking water quality management undertaken or underway during 2021-22 are shown in **Table 10**. Water quality objectives are aligned to the actions of the ADWG Framework and the strategic objective to maintain the safety of drinking water.

Table 10 - Drinking water quality management activities and programs 2021-22

ADWG framework sub-element		Water quality objective	Activity / Program	Results / Outcomes
2.3	Hazard Identification and Risk Assessment	Identify and document hazards, sources and hazardous events.	Lemon Tree Passage and Gresford WTP risk assessment.	The risk assessment update was finalised and improvement actions prioritised.
2.3	Hazard Identification and Risk Assessment	Identify and document hazards, sources and hazardous events.	Distribution network risk assessment.	The risk workshop was completed in June 2022.
2.3	Hazard Identification and Risk Assessment	Identify and document hazards, sources and hazardous events.	Update catchment to tap risk assessment guideline.	Guideline updated to include information to consider such as water quality data investigations, plans, and strategies. Information on dual reticulation schemes also included.
2.3	Hazard Identification and Risk Assessment	Identify and manage existing, new and emerging risks.	Naegleria Fowleri Strategy.	The strategy was further developed in consultation with NSW Health.
3.1	Preventive Measures and Multiple Barriers	Water quality in Tomago catchment.	Tomago PFAS Operating Strategy.	The Tomago Borefields were operated in accordance with the PFAS Operating Strategy, including reporting of results to NSW Health.
3.1	Preventive Measures and Multiple Barriers	Maintain effective secondary disinfection barrier.	Maintain effective chlorine residual throughout the network.	The chlorine residual >0.2mg/L was greater than 90% of customers (rolling 12 month to 30 June 2022).
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	UV upgrade at Grahamstown WTP.	Project progressing. Delivery program being reviewed in response to cost escalation.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	Gresford water quality upgrade.	Project progressing. Cost escalation requires a review of business case that will impact the delivery program. Contingency plan implemented and operational.
3.1	Preventive Measures and Multiple Barriers	Improved chlorine residuals across the network.	Disinfection Optimisation Strategy (DOS) Stage 1B.	Project progressing according to program.
6.2	Incident and Emergency Response Protocols	Investigation and recording of water quality incidents.	Improve water quality incident management documentation.	Improved documentation has been developed including for health complaints, notifying third parties and conducting incident investigations.
7.2	Employee Training	Ensure that employees, including contractors, maintain the appropriate experience and qualifications	Operator training.	Operators are trained to complete site checklists.

ADWG framework sub-element		Water quality objective	Activity / Program	Results / Outcomes
10.1	Management of Documentation and Records	Document information pertinent to all aspects of drinking water quality management.	DWQMS manual update.	Manual updated with information around existing practices across various elements.
10.2	Reporting	Establish procedures for effective internal and external reporting	Water quality monitoring program.	Improved quality assurance protocols for checking completion of scheduled network verification sampling.
11.2	Internal auditing	Maintain reservoir integrity.	Distribution network reservoir inspections for online reservoirs.	More than 95% of inspections were completed by scheduled due date. Additional inspections completed for high risk locations following severe storm events.
11.2	Internal auditing	Ensure that the system is being implemented correctly and is effective.	Watermain repair hygiene compliance monitoring.	Compliance monitoring requirements developed and implementation program commenced for developer constructed assets.

2.1.5 Proposed drinking water quality management activities and programs

Table 11 outlines proposed activities to improve drinking water quality management in the future. Water quality objectives are aligned to the actions of the ADWG Framework and the strategic objective to maintain the safety of drinking water.

Table 11 - Proposed drinking water quality management activities and programs

ADWG framework sub-element		Water quality objective	Activity / Program	Scope / Expected Outcomes / Timeframe
2.3	Hazard Identification and Risk Assessment	Identify and document hazards, sources and hazardous events.	Distribution network risk assessment.	Finalisation of risk assessment update and risk management priorities developed. Timetable – 2022-23.
2.3	Hazard Identification and Risk Assessment	Identify and document hazards, sources and hazardous events.	Dungog WTP risk assessment.	Review risk assessment according to schedule. Timetable – 2022-23.
2.3	Hazard Identification and Risk Assessment	Identify and manage existing, new and emerging risks.	Naegleria Fowleri Strategy.	Continue to implement strategy. Timetable – ongoing.
3.1	Preventive Measures and Multiple Barriers	Water quality in Tomago catchment.	Tomago PFAS Operating Strategy.	Continue to implement strategy. Timetable – ongoing.
3.1	Preventive Measures and Multiple Barriers	Evaluate additional preventive measures where improvement is required.	Dungog WTP valve and pipework configuration.	Business Case being prepared to reduce risk of ingress of raw water into treated water streams for Dungog WTP. Timetable – 2022-23.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	Catchment fencing project.	Project progressed according to program.

ADWG framework sub-element		Water quality objective	Activity / Program	Scope / Expected Outcomes / Timeframe
				Timetable – as per delivery program.
3.1	Preventive Measures and Multiple Barriers	Maintain effective secondary disinfection barrier.	Maintain effective chlorine residual throughout the network.	Free chlorine residual >0.2mg/L to at least 90% of customers (rolling 12 month). Timetable – ongoing.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	UV upgrade at Grahamstown WTP.	Project progressing according to revised program. Timetable – as per revised delivery program.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	Gresford water quality upgrade.	Project progressing according to revised program. Timetable – as per revised delivery program.
3.1	Preventive Measures and Multiple Barriers	Improved chlorine residuals across the network.	Disinfection Optimisation Strategy (DOS) Stage 1B.	Project delivery progressing. Timetable – as per delivery program.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	Grahamstown WTP Stage 2 filter refurbishment.	Project progressing according to program. Timetable – as per delivery program.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to chemical contamination.	Water Treatment plants chemical systems backflow prevention.	Project progressing according to program. Timetable – as per delivery program.
4.2	Operational Monitoring	Develop monitoring protocols.	Improved treated water quality standards.	Reporting to daily treated water targets for filtered water turbidity and chlorine residual. Timetable – ongoing.
4.2	Operational Monitoring	Minimise treated water manganese concentrations.	Planned operation of the Tomago Borefields.	Information communicated to key stakeholders. Treated water manganese concentrations minimised. Timetable – 2022-23.
9.2	Validation of Processes	Revalidate processes periodically.	Document and review basis of CCP critical limits.	Basis of CCP critical limits reviewed. Timetable – 2022-23.
10.1	Management of Documentation and Records	Document information pertinent to all aspects of drinking water quality management.	DWQMS manual update.	Manual updated with reference to the basis of Critical Control Point critical limits. Timetable – 2022-23.
11.2	Internal auditing	Maintain reservoir integrity.	Distribution network reservoir inspections for online reservoirs.	At least 95% of inspections completed by scheduled due date. Timetable – ongoing.

2.1.6 Continual improvement of the DWQMS in 2021-22

Senior executives at Hunter Water provide support and oversight focused on management and continuous improvement of our drinking water systems. We document, prioritise, and track drinking water quality improvement initiatives in the drinking water quality improvement plan (DWQIP).

Example improvements undertaken in 2021-22 include:

- Delivery of treatment actions to address risk of non-compliance with agreed drinking water standards
- Implementation of Naegleria Fowleri Management Strategy
- Improved response protocols for health related water quality complaints
- Review of the water quality risks associated with the potable water distribution network

The water quality committee is responsible for ensuring the effective management and implementation of Hunter Water's Drinking Water Quality Management System (DWQMS) in compliance with Hunter Water's Operating Licence. The water quality committee meetings consider factors such as: quality and supply issues, audit outcomes, training, and monitoring and reporting. Findings and actions from the water quality meetings are communicated to, and reviewed by, senior management on an as-required basis.

The Executive Management Team (EMT) reviews, endorses and approves the drinking water quality policy, and regularly reviews water quality performance. The EMT reviews findings, results, and reports from IPART's operational audit. We develop action plans to address recommendations and findings, including the allocation of additional resources as required. Key EMT members are involved in quarterly liaison meetings with NSW Health to review the effectiveness of the DWQMS and discuss operational issues.

We ensure resources are dedicated to the development, review, and implementation of the DWQMS through our water quality committee and a dedicated DWQMS coordinator. All Hunter Water management, employees, and contractors involved in the supply of drinking water are responsible for understanding, implementing, maintaining and continuously improving the DWQMS.

2.1.7 Significant changes to the drinking water quality management system

There was one proposed significant change to the Drinking Water Quality Management System in 2021-22:

- Hunter Water previously had a "low" risk appetite in regard to water quality events that are likely to result in public health impacts. In line with an update to our enterprise risk framework, Hunter Water has reduced the risk appetite to "as low as reasonably practicable" (ALARP).

This significant change was communicated to both IPART and NSW Health, in line with our Operating Licence Reporting Manual obligations.

2.1.8 Non-conformances with the Drinking Water Quality Management System

There were no major non-conformances with the Drinking Water Quality Management System in 2021-22.

The following minor non-conformances were identified and have been subsequently addressed and/or planned for resolution:

Operating Licence audit recommendations:

- 2021-1: By 31 March 2023, undertake a review and revision of both the MidCoast Council and the Central Coast Council water supply agreements, with particular attention to quality, quantity, maintenance, operations and ownership aspects.
- 2021-2: At the next Corporate Incident and Emergency Management Plan review, review incident level categories and make clear which ones require a root cause analysis / incident investigation. This has been completed.

- 2021-3: By 30 June 2022, Hunter Water must communicate finalisation of its health complaints guideline to NSW Health. This has been completed.
- 2021-4: By 1 November 2022, Hunter Water must improve documentation of the evidence base for CCP limits (e.g. through annotations in the CCP limits table).
- 2021-5: By 30 June 2022, Hunter Water must include MidCoast Council and Central Coast Council in the Key Emergency Services and Stakeholder Contact List of the Corporate Emergency Plan. This has been completed.
- 2021-6: At the next risk review, Hunter Water must ensure that the risk assessments capture a corresponding risk treatment for medium controlled risks and above, within the risk register itself.
- 2021-7: By 1 November 2022, Hunter Water must review CCP Limit Tables and ensure that the limits and the logic are accurate and match SCADA.
- 2021-8: By 1 November 2022, Hunter Water must update the network chlorinators CCP information to include the currency information, according to the stated process. This has been completed.
- 2021-9: By 30 June 2022, Hunter Water must ensure that operators are trained to complete all components of the site checklists. This has been completed.
- 2021-10: By 30 September 2022, Hunter Water must strengthen existing reporting lines to the water quality committee to include comparison of the network verification sampling completed and scheduled. This has been completed.
- Hunter Water reported to IPART in 2021 that Hunter Water did not publish its monthly water quality summary on time in August 2021. IPART determined this to be a non-material deficiency. Hunter Water had finalised the report in time but had failed to upload it onto its website due to an administrative error. It was uploaded on 25 August 2021. IPART reported that the deficiency had been resolved and did not make any further recommendations.

2.2 Recycled water

Hunter Water manages its recycled water schemes in a way that protects human health, the environment and complies with customer agreements as well as other relevant regulatory requirements. Our 2017-2022 Operating Licence requires us to maintain and implement a system for managing recycled water quality that is consistent with the *Australian Guidelines for Water Recycling 2006* (AGWR). A key component of complying with the AGWR is the implementation of a risk-based management framework, including critical control points (CCPs).

The AGWR requires that we develop Recycled Water Quality Management Plans (RWQMPs) for all recycled water schemes. A RWQMP is a documented system for managing the production and supply of recycled water and consolidates all essential information about the operation and management of the recycled water system.

We have developed RWQMPs for all our recycled water schemes, addressing the 12 elements described in the AGWR. We undertake a rolling review process for our RWQMPs.

In this section of the report, we describe:

- Hunter Water's recycled water schemes
- Performance at CCPs during 2021-22
- The recycled water quality management activities completed during 2021-22
- Proposed future recycled water quality management activities
- Recycled water management continual improvement activities undertaken during 2021-22
- Significant changes to the Recycled Water Quality Management System (RWQMS) in 2021-22
- Any non-conformances with the RWQMS

2.2.1 Overview of recycled water schemes

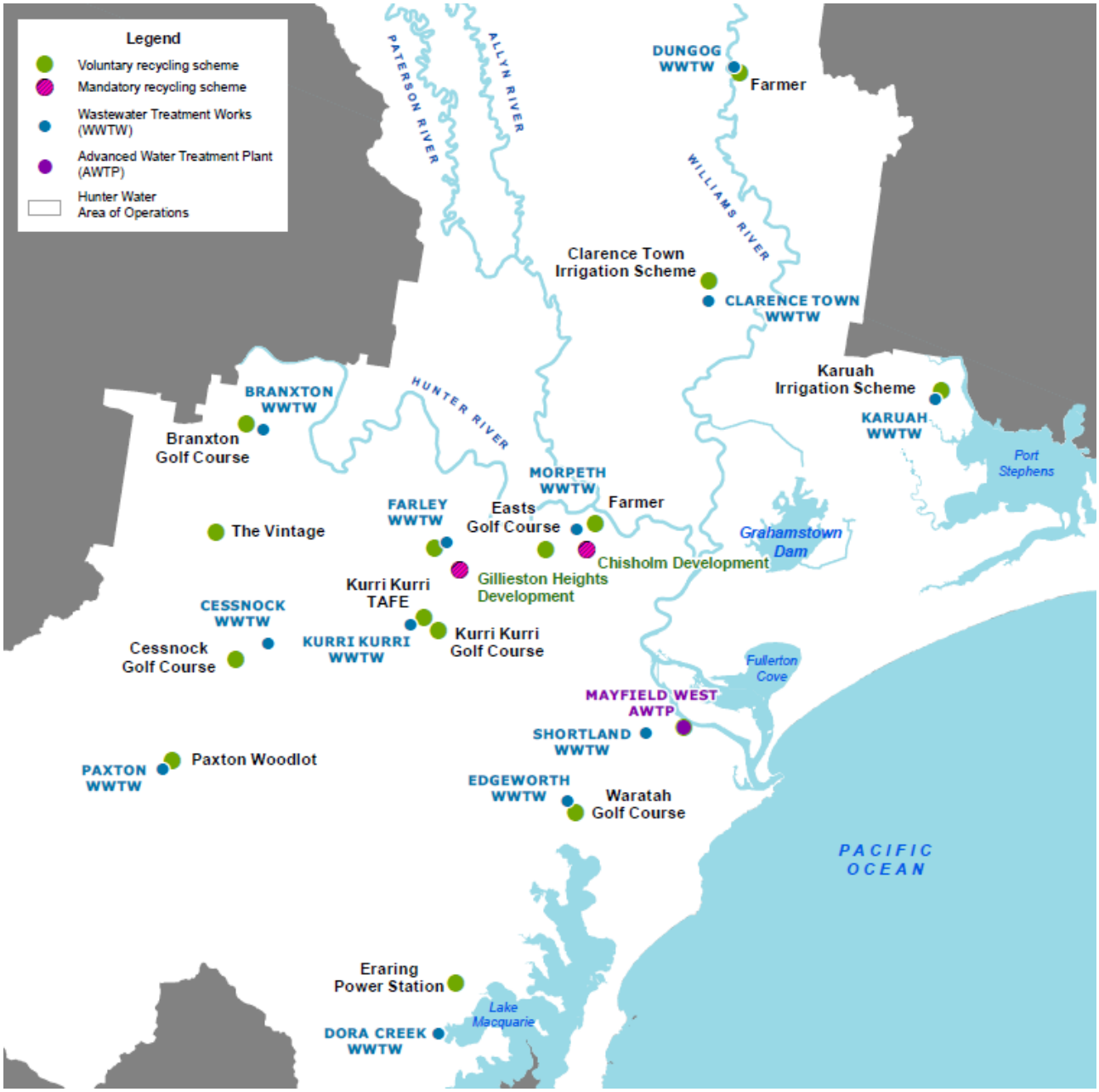
During 2021-22, Hunter Water's recycled water schemes provided recycled water to external customers from the Branxton, Cessnock, Clarence Town, Dora Creek, Dungog, Edgeworth, Karuah, Kurri Kurri, Morpeth, and Shortland Wastewater Treatment Works (WWTW) and dual reticulation recycled water from the Morpeth and Farley Recycled Water Treatment Plants (RWTP). **Table 12** provides the volume of recycled water provided from each source and **Figure 3** shows the location of the recycled water schemes.

Table 12 - Hunter Water's recycled water schemes

Recycled water source	Recycled water use	2021-22 reuse volumes (ML)
Branxton WWTW	Branxton Golf Course and The Vintage Golf Course	108.76
Cessnock WWTW	Cessnock Golf Course	31.46
Clarence Town WWTW	Clarence Town Irrigation Scheme	41.75
Dora Creek WWTW	Eraring Power Station	845.42
Dungog WWTW	Local farmer	351.40
Edgeworth WWTW	Waratah Golf Course	64.57
Farley RWTP	Gillieston Heights dual reticulation	62.81
Karuah WWTW	Karuah Irrigation Scheme	85.19
Kurri Kurri WWTW	Kurri Kurri Golf Course and Kurri Kurri TAFE	15.06
Shortland WWTW	Kooragang Water (Mayfield West AWTP)	3643.73
Morpeth WWTW	Easts Golf Course and local farmer	33.37
Morpeth RWTP	Chisholm dual reticulation	23.57
Total		**5,307.09**[a]

a) Total excludes use by Hunter Water onsite at WWTW and indirect agricultural reuse.

Figure 3 - Hunter Water's recycled water schemes



2.2.2 Performance of critical control points

The following sections describe performance at CCPs. A brief explanation of each of the wastewater treatment terms referenced is included in the glossary.

Branxton wastewater treatment works

Branxton WWTW receives wastewater from Branxton East, Branxton, and Greta. Influent entering the system is primarily residential (domestic) with only a small volume of trade waste flows from retail outlets, hotels, and small automotive repair garages.

Branxton WWTW includes the following processes:

- screening and grit removal
- bioreactor
- membrane filtration
- chlorination

We supply recycled water from Branxton WWTW to Branxton Golf Course and The Vintage Golf Course. **Table 13** shows performance at CCPs within the Branxton WWTW.

Table 13 - Branxton WWTW: recycled water scheme CCPs performance 2021-22

Critical control point	Critical limit	Compliant
Membranes filtration	Turbidity of permeate at each individual membrane train must not exceed 0.5 NTU for > 120 seconds	✓
Chlorination system	Chlorine contact time must be at least 8.3 min.mg/L	✓
	pH upstream of chlorine contact tank must not exceed 9	✓

Cessnock wastewater treatment works

Cessnock WWTW receives wastewater from the Cessnock local government area. Influent entering the system is primarily residential (domestic). There are also a number of commercial trade waste customers discharging to the system.

Cessnock WWTW includes the following processes:

- screening
- clarification
- trickling filters
- maturation ponds
- dissolved air floatation
- UV disinfection

We supply recycled water from the Cessnock WWTW to the Cessnock Golf Course. **Table 14** shows performance at CCPs within the Cessnock WWTW.

Table 14 - Cessnock WWTW: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Lagoon ponding	Flow rate	<280 L/s for more than 60 minutes when supplying recycled water to the customer	✓
UV System	UV operation	UV unit must be on when supplying recycled water to the customer	✓
		Bypass valve must be closed when supplying recycled water to the customer	✓
	UV calculated dose	>32mJ/cm^2 with UV transmissivity at >40% at ADWF of 12ML/d when supplying recycled water to the customer	✓
	UV lamps	Minimum of 30 lamps operating when supplying recycled water to the customer	✓
	UV flow rate	<140L/s when pumping recycled water to the customer	✓

Clarence Town wastewater treatment works

Clarence Town WWTW receives wastewater from the township. Influent entering the system is primarily residential (domestic).

Clarence Town WWTW includes the following processes:

- oxidation ponds
- maturation ponds
- effluent storage ponds.

We supply recycled water from the Clarence Town WWTW to an irrigation scheme. **Table 15** shows performance at CCPs within the Clarence Town WWTW.

Table 15 - Clarence Town WWTW: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Lagoon ponding	Flow rate	<252 kL/d when irrigating at the reuse area	✓
	Valve position	V1102 must be closed	✓
		V1100 must be open when irrigating on the reuse area	✓

Dora Creek wastewater treatment works

Dora Creek WWTW receives wastewater from Bonnells Bay, Silverwater, Morisset Park, Yarrawonga Park, and Sunshine Brightwaters. Influent entering the system is primarily residential (domestic) with a number of trade waste customers also discharging to the treatment plant.

Dora Creek WWTW includes the following processes:

- screening
- grit removal
- bioreactor
- clarification
- effluent storage dam

We supply recycled water from Dora Creek WWTW to the Eraring Power Station. **Table 16** shows performance at CCPs within the Dora Creek WWTW.

Table 16 - Dora Creek WWTW: recycled water scheme CCPs performance 2021-22

Critical control point	Critical limit	Compliant
Secondary treatment process	Flow rate < 367 L/s for more than 60 minutes	✓
Effluent balance dam ponding	Flow rate < 734 L/s for more than 60 minutes	✓

Dungog wastewater treatment works

Dungog WWTW receives primarily residential (domestic) influent into the system.

The Dungog WWTW includes the following processes:

- screening
- secondary treatment modified Ludzack-Ettinger
- membrane bioreactor
- UV disinfection
- Irrigation pond storage

We supply recycled water from Dungog WWTW to a local farmer. **Table 17** shows performance at the CCP within the Dungog WWTW. We have developed a new CCP for the MBR process and in consultation with NSW Health; this CCP is awaiting finalisation.

Table 17 - Dungog WWTW: recycled water scheme CCP performance 2021-22

Critical control point	Critical limit	Compliant
Membrane filtration	Membrane permeate turbidly >0.5 NTU for >15 consecutive minutes	✓ [a]

Notes:

a) CCP's are operational and awaiting finalisation

Edgeworth wastewater treatment works

Edgeworth WWTW receives wastewater from the Charlestown, Cardiff and Speers Point wastewater catchment area. Influent entering the system consists primarily of residential (domestic) wastewater. There are also a number of commercial and industrial trade waste customers discharging to the system.

Edgeworth WWTW includes the following processes:

- screening
- bioreactor
- clarification
- UV disinfection

We supply recycled water from the Edgeworth WWTW to the Waratah Golf Course. **Table 18** shows performance at CCPs within the Edgeworth WWTW.

Table 18 - Edgeworth WWTW: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Secondary Treatment	Flow rate	<873L/s for more than 60 minutes when pumping to customer	✓
	Aeration monitoring	0 m^3/h in either tank for more than 8 hours while customer is taking recycled water	✓
UV System	UV operation	Must be on when reuse customer is being supplied recycled water	✓
	UV lamps	Minimum of 18 lamps per bank operating when supplying recycled water to the customer	✓
	UV calculated dose	Minimum dose 40 mJ/cm^2 with UV transmissivity of 40% when reuse customer is being supplied with recycled water	✓
	UV flow rate	<80L/s per unit for 60 minutes when pumping recycled water to the customer	✓
		<160L/s for both units for 60 minutes when pumping recycled water to the customer	✓

Farley recycled water treatment plant

Farley RWTP receives secondary treated effluent from the Farley WWTW.

Farley RWTP includes the following processes:

- membrane filtration
- UV disinfection
- chlorination

We use the treated recycled water from Farley RWTP to supply the dual reticulation scheme at Gillieston Heights. **Table 19** shows performance at CCPs within the Farley RWTP.

Table 19 - Farley RWTP: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Membrane Filtration	Turbidity	Membrane permeate turbidity > 0.15 NTU for > 15 consecutive minutes.	✓
	Rate of decay in pressure differential	The membrane integrity test (MIT) result correlated with 4.0 log10 removal of 3 micron particles is > 3.9 kPa per 5 min at a test pressure of 130 kPa.	✓
UV System	Online UV intensity meter and UV Transmissivity (UVT) analyser	UV adenovirus RED < 65.3 mJ/cm2 for > 15 consecutive minutes. UVT is < 40.1% for > 15 consecutive minutes.	✓ ✓
Chlorination	Free chlorine concentration (to meet the CT requirements)	Ct < 22 min•mg/L for > 15 consecutive minutes.	✓
	pH range	pH > 8.5 for > 15 consecutive minutes.	✓

Karuah wastewater treatment works

Karuah WWTW receives wastewater from the Karuah township. Influent entering the system is primarily residential (domestic).

Karuah WWTW includes the following processes:

- screening
- bioreactor
- UV disinfection
- effluent storage dam

We supply recycled water from Karuah WWTW to an irrigation scheme. **Table 20** shows performance at CCPs within the Karuah WWTW.

Table 20 - Karuah WWTW: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Biological treatment	Inlet flow meter	<48.3 L/s for more than 60 minutes when irrigation is occurring	✓
	Aeration control	No aerators available/running during six consecutive IDEA cycles	✓
UV System	UV operation	UV bank must be on when irrigation is occurring	✓
	UV calculated dose	>35mJ/cm2 with a transmissivity of greater than 55% at 44L/s when irrigation is occurring	✓
	UV flow rate	<44L/s when irrigation is occurring	✓

Kurri Kurri wastewater treatment works

Kurri Kurri WWTW receives wastewater from the Kurri Kurri catchment area. Influent entering the system is primarily residential (domestic).

Kurri Kurri WWTW includes the following processes:

- screening
- bioreactor
- clarification
- tertiary filtration (dual media)
- UV disinfection

We supply recycled water from the Kurri Kurri WWTW to the Kurri Kurri TAFE and Kurri Kurri golf course. **Table 21** shows performance at CCPs within the Kurri Kurri WWTW.

Table 21 - Kurri Kurri WWTW: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Biological treatment	Inlet flow meter	<172 L/s for more than 60 minutes when the golf course is pumping recycled water	✓
	Aeration process	Air flow rate 0 m3/h for no more than 8hrs when pumping to the Golf course or effluent storage ponds	✓
Media filtration	Filter lift flow	<172 L/s for more than 60 minutes when pumping to the golf course or effluent storage ponds	✓
UV System	UV operation	Must not be off for more than 60 minutes when pumping to the golf course or Kurri TAFE storage pond	✓
	UV lamps	At least 18 lamps per bank must be on when pumping to the Golf course or Kurri TAFE storage ponds	✓
	UV calculated dose	>35mJ/cm2 for 60 minutes when pumping to the golf course or Kurri TAFE storage ponds	✓
	UV flow rate	<400L/s when pumping to the golf course or Kurri TAFE storage ponds	✓

Morpeth wastewater treatment works

Morpeth WWTW receives wastewater from Morpeth, Metford, Thornton, Tenambit, Ashtonfield, Beresfield, East Maitland and parts of Maitland. Influent entering the system is primarily residential (domestic).

Morpeth WWTW includes the following processes:

- screening
- bioreactor
- clarification
- UV disinfection
- maturation ponds

We supply recycled water from Morpeth WWTW to a local farmer and golf course. **Table 22** shows performance at CCPs within the Morpeth WWTW.

Table 22 - Morpeth WWTW: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Secondary treatment processes	Biological treatment flow rate	< 500 L/s when valve to maturation pond is open	✓
UV System	UV operation	Must be on when valve to the maturation pond is open	✓
	Flow rate through UV	< 500 L/s when valve to maturation pond is opened	✓
	UV calculated dose	>32 mJ/cm^2 with UV transmissivity at 40%	✓
	UV operation	Must be at least 48 out of 60 lamps when maturation pond valve is open and reuse customer is pumping	✓
Lagoon ponding	Inlet flow rate	<500 L/s when maturation pond valve is opened	✓

Morpeth recycled water treatment plant

Morpeth RWTP receives secondary treated effluent from the Morpeth WWTW. We use the treated recycled water to supply the dual reticulation scheme at Chisholm.

Morpeth RWTP includes the following processes:

- membrane filtration
- UV disinfection
- chlorination

Table 23 shows performance at CCPs within the Morpeth RWTP.

Table 23 - Morpeth RWTP: recycled water scheme CCPs performance 2021-22

Critical control point		Critical limit	Compliant
Membrane Filtration	Turbidity	Membrane permeate turbidity > 0.15 NTU for > 15 consecutive minutes.	✓
	Rate of decay in pressure differential	The membrane integrity test (MIT) result correlated with 4.0 log10 removal of 3 micron particles is > 3.9 kPa per 5 min at a test pressure of 130 kPa.	✓
UV System	Online UV intensity meter and UV Transmissivity (UVT) analyser	UV adenovirus RED < 65.3 mJ/cm2 for > 15 consecutive minutes.	✓
		UVT is < 40.1% for > 15 consecutive minutes.	✓
Chlorination	Free chlorine concentration (to meet the Ct requirements)	Ct < 22 min•mg/L for > 15 consecutive minutes.	✓
	pH range	pH > 8.5 for > 15 consecutive minutes.	✓

Shortland wastewater treatment works

The Shortland WWTW serves the communities of Sandgate, Shortland, Birmingham Gardens and Maryland as well as drawing in effluent from the Burwood catchment via a wastewater pumping stations (WWPS) in Newcastle. Influent entering the system is partly residential (domestic).

Shortland WWTW includes the following processes:

- screening
- activated sludge secondary treatment via two intermittently decanted aerated lagoons (IDAL)
- chlorination
- de-chlorination (prior to environmental discharge)

We supply effluent from Shortland WWTW to the Mayfield West Advanced Water Treatment Plant owned by Kooragang Water. The Shortland WWTW does not have CCP requirements as the additional recycled water treatment is undertaken at the advanced water treatment plant.

2.2.3 Recycled water quality management activities and programs 2021-22

Table 24 describes improvements to recycled water quality management undertaken during 2021-22. Recycled water objectives are aligned to the actions of the AGWR Framework and the strategic objective to maintain the safety of recycled water.

Table 24 - Recycled water activities and programs 2021-22

AGWR Framework sub-element		Recycled water objective	Activity / Program	Results / Outcomes
2.4	Hazard identification and risk assessment	Undertake a risk assessment.	Identify and document hazards and hazardous events, estimate the level of risk and determine preventive measures.	An updated risk assessment was undertaken on the Branxton and Clarence Town recycled water schemes.
6.2	Incident and emergency response protocols	Document procedures.	Develop an incident response procedure roadmap.	An incident procedure road map has been developed to identify the documentation that has been created to manage incidents and exceedances. The roadmap clarifies roles and responsibilities to be used by relevant sections within Hunter Water.
9.1	Validation of Processes	Validate processes to ensure they control hazards effectively.	Document the validation of the Dungog WWTW recycled water scheme.	The Dungog WWTW validation documentation has been updated to better reflect the basis for log reduction values.
10.1	Recycled water quality management plans	Documentation of all aspects of recycled water quality management.	Review and update the Corporate Recycled Water Quality Management Plan (RWQMP).	The Corporate RWQMP has been updated to include aspects of the dual reticulation recycled water schemes and to address IPART audit outcomes.
10.1	Recycled water quality management plans	Documentation of all aspects of recycled water quality management.	Update the Dungog WWTW RWQMP.	The Dungog WWTW RWQMP has been updated to address internal and external review comments and IPART audit outcomes.
10.1	Recycled water quality management plans	Documentation of all aspects of recycled water quality management.	Update the Dual Reticulation RWQMP.	The Dual Reticulation RWQMP has been updated to address internal and external review comments.
11.2	Audit of Recycled water quality management	Establish process for external audits.	Audit of recycled water schemes.	Audits were undertaken on the Branxton and Clarence Town WWTW's recycled water schemes. The audits were undertaken by an external contractor in-line with the risk assessment process.
12.2	Recycled water quality improvement plans	Ensure the plan is communicated and implemented and that the improvements are monitored for effectiveness.	Complete the recycled water quality improvement plan actions.	The improvement plan is continually communicated and actions progressed as required.

2.2.4 Proposed recycled water quality management activities and programs

Table 25 outlines proposed measures to improve recycled water quality management in the future. Recycled water objectives are aligned to the actions of the AGWR Framework and the strategic objective to maintain the safety of recycled water.

Table 25 - Proposed recycled water activities and programs

AGWR Framework sub-element		Recycled water objective	Activity / program	Scope / expected outcomes / timetable
2.4	Hazard identification and risk assessment	Undertake a risk assessment.	Identify and document hazards and hazardous events, estimate the level of risk and determine preventive measures.	Review and update risk assessments. Timetable – ongoing
6.2	Incident and emergency response protocols	Document procedures.	Review current incident management procedures.	Update current Recycled Water Incident procedures. Timetable – 2022-23
7.2	Operator, contractor and end user awareness	Develop communication procedures.	Review and update Hunter Water recycled water training.	Update training to reflect standard and advanced training needs. Timetable – 2022-23
9.1	Validation of Processes	Validate processes to ensure they control hazards effectively.	Review and update Validation Testing Programs.	Review and update the Validation Testing Program for all Water Recycling Schemes. Timetable – 2022-23
10.1	Recycled water quality management plans	Documentation of all aspects of recycled water quality management.	Update management plans following risk assessments.	Bring together all aspects of recycled water management. Timetable – 2022-23
12.2	Recycled water quality improvement plans	Ensure the plan is communicated and implemented and that the improvements are monitored for effectiveness.	Complete recycled water quality improvement plan actions.	Successful completion of improvement actions. Timetable – 2022-23

2.2.5 Continual improvement in 2021-22

Recycled water quality improvement initiatives are documented in the Recycled Water Quality Improvement Plan (RWQIP) and prioritised and reported as a standing agenda item through monthly recycled water quality meetings involving key internal stakeholders. Example improvements over this period include:

- Review and update of Corporate RWQMP
- Review and update of risk assessments
- Review recycled water customer agreements and communication

The monthly recycled water quality meetings consider factors such as:

- quality and supply issues
- audit outcomes
- training
- monitoring and reporting.

Findings and actions from the recycled water quality meetings are communicated to and reviewed by senior management on an as required basis.

The EMT reviews findings, results, and reports from IPART's operational audit. We develop action plans to address recommendations and findings, including the allocation of additional resources as required. Key EMT members are involved in quarterly liaison meetings with NSW Health to review the effectiveness of the RWQMS and discuss operational issues.

We ensure resources are dedicated to the development, review, and implementation of the RWQMS through our recycled water quality meetings and a dedicated RWQMS Technical Lead. All Hunter Water management, employees and contractors involved in the supply of recycled water are responsible for understanding, implementing, maintaining and continuously improving the RWQMS.

2.2.6 Significant changes to the recycled water quality management system

No significant changes have been proposed.

2.2.7 Non-conformances with the Recycled Water Quality Management System

There were no major non-conformances with the Recycled Water Quality Management System during 2021-22.

The following minor non-conformances were identified during 2021-22:

- Operating licence audit recommendation **REC-2021/3.2.1-1**: By March 2022, update Table 2.1 of the Corporate RWQMP to include residential use as an intended use for recycled water from the Morpeth and Farley WWTWs
    - Update: The Corporate RWQMP has been updated to reflect this requirement.
- Operating licence audit recommendation **REC-2021/3.2.1-2**: By June 2022, document the process for providing annual reports on recycled water to end users and clearly communicate this process with each end user
    - Update: The Corporate RWQMP has been updated to reflect this process and customers notified.
- Operating licence audit recommendation **REC-2021/3.2.1-3**: By 31 March 2022, update the Corporate RWQMP to reflect changes to the process for scheduling internal audits of RWQMPs including how the scope of the audits is determined and how the audit recommendations are actioned and tracked.
    - Update: The Corporate RWQMP has been updated to reflect this requirement.

- Operating licence audit recommendation **REC-2021/3.2.2-1**: By March 2022, ensure that all recycled water customer agreements are not past their expiry date and develop procedures to ensure the agreements are extended or renewed before the expiry date.
    - Update – Hunter Water is currently reviewing the terms and conditions on which we supply recycled water to our commercial customers. Due to this review, customers whose agreement dates have lapsed have been advised that they will continue to be supplied as per 1.5(b) of the agreement on a monthly basis. The new contract is under revision for completion by November 2022 after which these customer's agreements will be amended in line with the new terms and conditions.
- Operating licence audit recommendation **REC-2021/3.2.2-2**: By March 2022, update the process flow diagram for Kurri Kurri WWTW to reflect the current number of clarifiers and chemical dosing.
    - Update – The Kurri Kurri WWTW process flow diagram has been updated.
- Operating licence audit recommendation **REC-2021/3.2.2-3**: By March 2022, review, with Veolia, the need for testing of every delivery of aluminium sulphate at wastewater treatment works and update the work instruction for delivery and testing to reflect the outcome of this review.
    - Update – The requirement for testing of chemicals has been reviewed and process updated.
- Operating licence audit recommendation **REC-2021/3.2.2-4**: By June 2022, include the basis for the 4-log reduction in helminths in the membrane bioreactor at Dungog WWTW and update the Validation Testing Program for Water Recycling Schemes to include the log reductions for the upgraded Dungog WWTW. Hunter Water must also develop a process to ensure changes to log reduction values are reviewed and incorporated into the Validation Testing Program for Water Recycling Schemes.
    - Update – The validation documentation for Dungog WWTW has been reviewed and updated to provide clarity on the basis of log reduction. A contractor has been engaged to review and updated the Validation Testing Program for Water Recycling Schemes.
- Operating licence audit recommendation **REC-2021/3.2.2-5**: By March 2022, update the Disinfected Effluent UVT limit to reflect the CCP limit in the spreadsheet used to present long term trends of Kurri Kurri recycled water quality and check all other recycled water trend spreadsheets for discrepancies in the limits.
    - Update – Documentation has been updated to reflect this requirement.

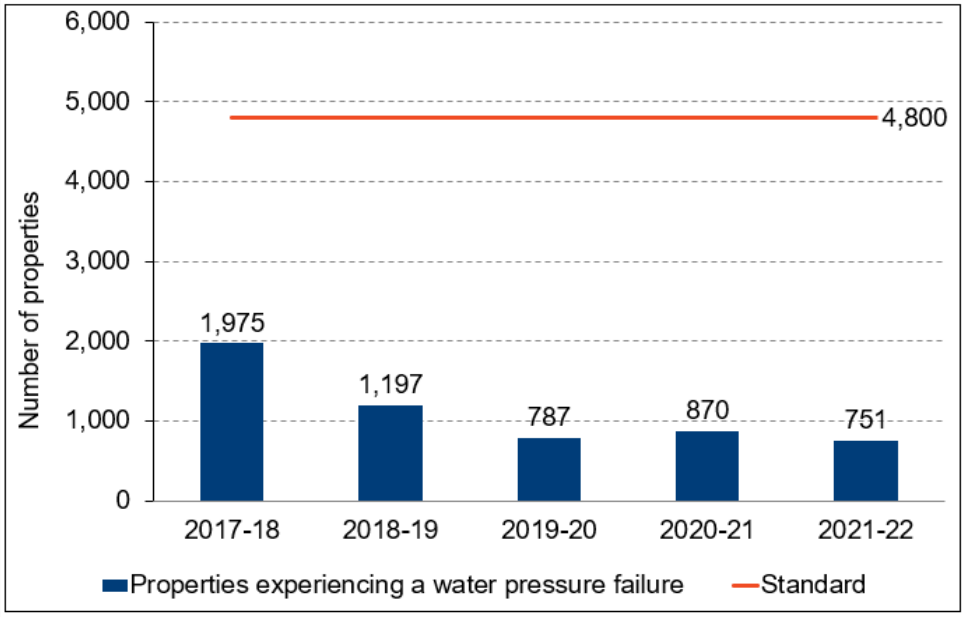
2.3 System performance standards

The Operating Licence sets the service levels that customers can expect from Hunter Water in three core areas: water pressure, water continuity, and wastewater overflows. We describe performance against licence limits below. We present six-year results for these metrics in **Figure 4** – Water pressure failures through **Figure 8** - Multiple wastewater overflows

2.3.1 Water pressure standard

Hunter Water must ensure that no more than 4,800 properties experience a water pressure failure in a financial year.[8]

Figure 4 – Water pressure failures



Note: Data for 2017-18 has been revised (from 2,487) due to an error in reporting, and therefore does not align with data reported in Hunter Water's 2017-18 Compliance and Performance Report.

We met the performance requirement of this standard for 2021-22, with 751 properties experiencing low pressure, which is significantly below the limit of 4,800.

The number of properties affected in 2021-22 was lower than recent years. This was a result of weather conditions with a relatively wet summer which resulted in lower customer demand and hence lower consumption which assists in maintaining a higher pressure across our network.

Water pressure failures occur for a range of reasons including:

- Customer water usage during periods of high water demand, which can be seasonal (i.e. higher demands in summer compared to winter), diurnal (peak demand periods in morning and evening) and weather-related (e.g. during periods of extreme hot and dry weather).
- Location of customer properties, including properties that are located close to water network reservoirs and therefore do not have sufficient elevation difference between the property and the reservoir.

[8] NSW Government, 2017, Hunter Water Corporation Operating Licence 2017-2022, Clause 3.3.1

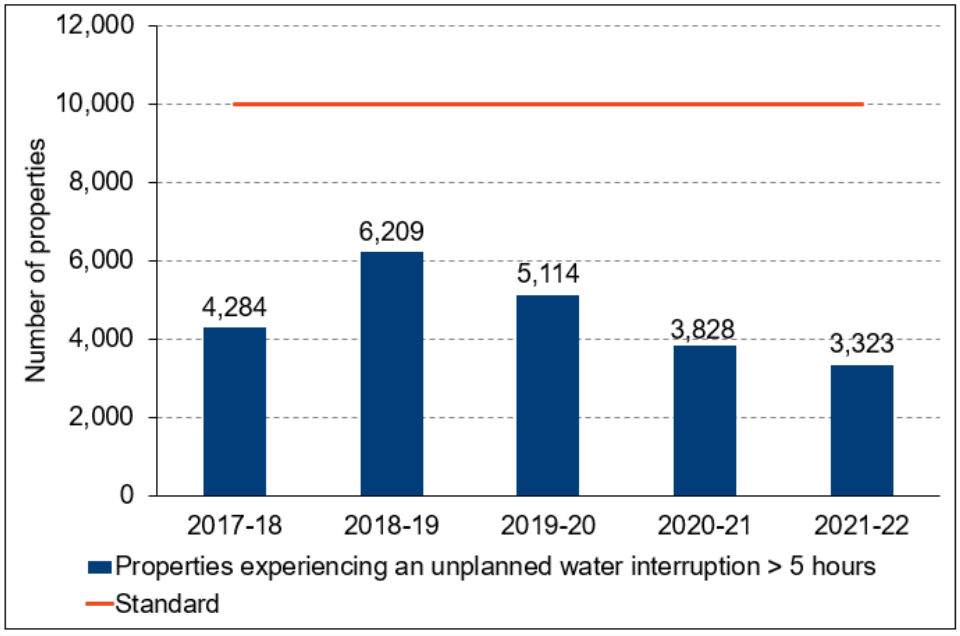
- Water network design and configuration, such as older parts of the network that were not designed to current standards or areas where water demand has increased over time with increased development ahead of system upgrades.

2.3.2 Water continuity standards

Hunter Water must ensure that in a financial year:[9]

1. *No more than 10,000 properties experience an unplanned water interruption that lasts more than 5 continuous hours; and*
2. *No more than 5,000 properties experience 3 or more unplanned water interruptions that each lasts more than 1 hour.*

Figure 5 – Unplanned interruptions > 5 hours



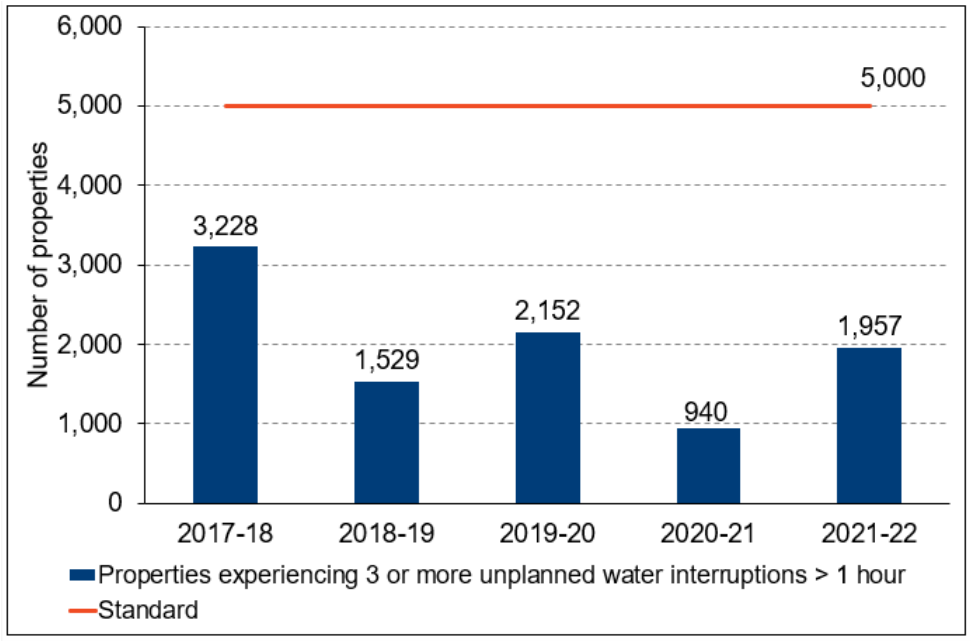
We met the performance requirement of the water continuity standard for 2021-22, with 3,323 properties experiencing an unplanned water interruption exceeding five hours compared with the limit of 10,000. Our performance in 2021-22 was the lowest result over the last 6 years. Performance can be quite variable from year to year, with the metric being primarily influenced by large water main breaks that are difficult to access or implement a shutdown.

Water main breaks can occur because of asset condition and performance as well as weather conditions. The moderate weather conditions with periodic rain over summer resulted in a more stable soil moisture content, which contributes to reduced frequency of breaks. The number of properties impacted by an unplanned water interruption is also influenced by network configuration. The duration of the unplanned water interruption is affected by the location and complexity of the required repair, resource availability, job prioritisation, and the condition of and access to valves.

[9] NSW Government, 2017, Hunter Water Corporation Operating Licence 2017-2022, Clause 3.3.2

The improved result for 2021-22 is attributed to a reduced number of breaks and was also likely impacted by Hunter Water maintaining availability of first responders and on-call crews to respond to breaks and minimise the duration of outages.

Figure 6 – Multiple unplanned interruptions



We recorded 1,957 properties that experienced 3 or more unplanned outages during 2021-22. The result was well below the limit of 5,000 however it shows an increase compared to the previous year.

The increase in 2021-22 was primarily due to repeated breaks in the East Lakes and West Lakes area of operations, particularly towards the end of the financial year as low demand resulted in increased pressure and increased frequency of breaks across our network.

Hunter Water manage performance in this area through targeted water mains replacements. We determine the water mains to replace through analysis of water main failure history and modelling, mitigating the likelihood of repeat events.

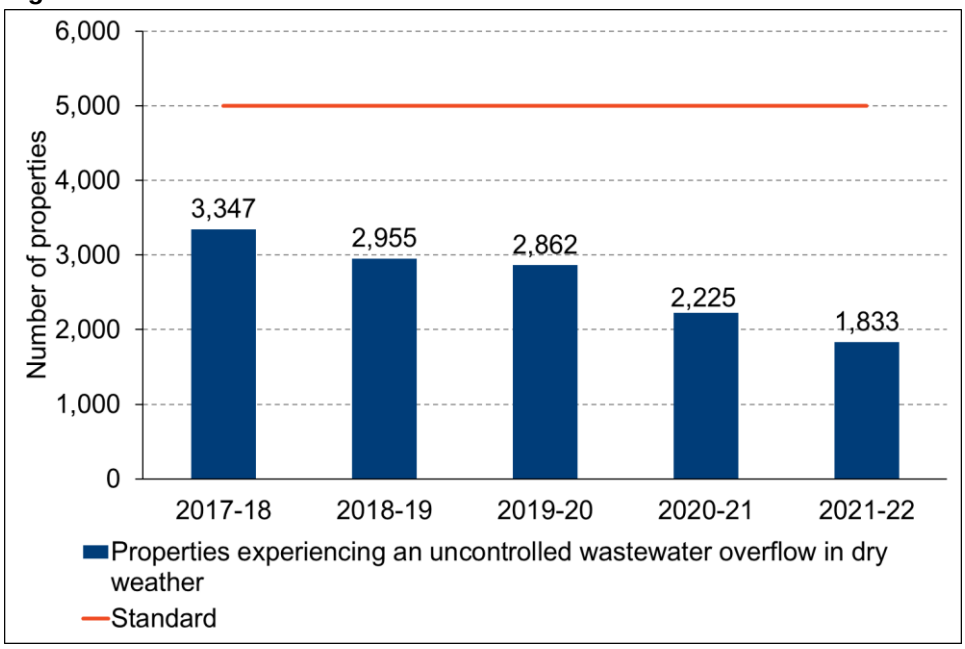
2.3.3 Wastewater overflow standard

Hunter Water must ensure that in a financial year:[10]

1. *No more than 5,000 properties (other than public properties) experience an uncontrolled wastewater overflow in dry weather.*

2. *No more than 45 properties (other than public properties) experience three or more uncontrolled wastewater overflows in dry weather.*

Figure 7 - Wastewater overflows



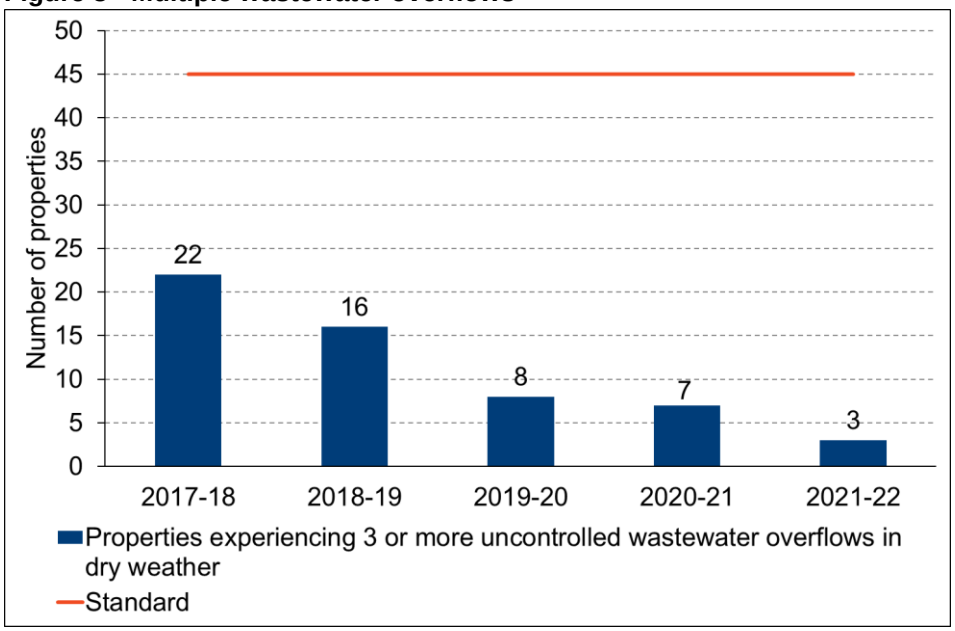
Note: Minor revisions have been made to data for 2015-16 and 2017-18 due to a reporting error, and therefore do not align with data reported in Hunter Water's 2017-18 Compliance and Performance Report.

Dry weather overflows affecting private properties were reported to be the lowest in six years. The number of incidents is lower than last year and is significantly lower than the standard.

Factors influencing dry weather overflows include asset condition, as well as periods of extended dry weather where tree roots enter sewerage mains and cause blockages. Regular wet weather events during the year are likely to have reduced the number of blockages due to tree roots. An increased preventative jetting program and a media campaign to educate the community on items that should not be flushed down the toilet may also have contributed to this good result.

[10] NSW Government, 2017, Hunter Water Corporation Operating Licence 2017-2022, Clause 3.3.3

Figure 8 - Multiple wastewater overflows



This indicator measures repeat impact to private properties.

Multiple overflows affecting private properties were the lowest in six years. The number of incidents remains significantly lower than the standard.

Factors influencing repeat overflows include preventative jetting programs, the quality of jetting work, and processes to identify pipes for rehabilitation or repair. An increased preventative jetting program and community education on the wastewater system has contributed to this good result.

2.4 Changes to Hunter Water's area of operations

There were no changes to Hunter Water's area of operations in 2021-22.

3 WATER CONSERVATION

This chapter reports on Hunter Water's compliance with clause 2 of the Operating Licence Reporting Manual. [11]

3.1 Water conservation

Our Operating Licence Reporting Manual (2017-2022) outlines that until Hunter Water has its new Economic Level of Water Conservation (ELWC) method approved by IPART, it must convey its compliance and performance with the Water Conservation target in this report. The ELWC method has now been approved, and as per section 2.1.1 of the Reporting Manual, Hunter Water publishes a separate annual Water Conservation Report.

This separate report meets the Reporting Manual requirements by detailing:

- Hunter Water's performance against its water conservation work program in 2021-22
- Water conservation strategies, targets, options and activities for the next five financial years
- Any changes to the water conservation activities identified in previous reports
- How Hunter Water's water conservation activities relate to the Lower Hunter Water Security Plan
- Information on water leakage, volume of recycled water sourced and the quantity of Drinking Water drawn by Hunter Water from all sources (GL/year)

3.2 Reliable quantity of water available from existing storages (yield)

The Lower Hunter Water Security Plan (LHWSP) is the Lower Hunter's long term water plan. It enables economic prosperity and underpins the growth, liveability and quality of life in the Lower Hunter region. It includes a range of water supply and demand measures to ensure there is enough water to supply homes, businesses and industry in the region for the future and during drought.

The LHWSP has been developed with significant engagement with the Lower Hunter community and reflects community values and priorities. It is both robust and adaptable in the long term, ensuring a resilient and sustainable water future for the region.

Upon release of the LHWSP in April 2022, the method used to determine the reliable quantity of water available from Hunter Water's system (yield) was changed. This change occurred within the 12-month reporting period.

Prior to April 2022, the estimated yield of the existing system was 76 billion litres of water each year. Following release of the LHWSP, this estimate reduced to 55 billion litres of water each year.

The main reason that estimated yield has fallen is the need to be able to manage severe drought without the community facing the risk of completely running out of water. With estimated yield now falling short of demand, it is recognised that new infrastructure and improved water use efficiency will be required to bring the system into balance. The 2022 LHWSP outlines the actions that are required.

In the interim, the revised estimate of yield should not be seen as an indication that the area will run out of water, but that the risk of such an event occurring is considered to be outside the risk appetite of the community. This risk will continue until actions from the LHWSP have been delivered.

The modelling that underpins the LHWSP decision-making process considers all of the relevant factors that are listed in the Operating Licence, being:

[11] NSW Government 2017, Hunter Water Operating Licence Reporting Manual 2017-2022, clause 2.1.2.

- The capacity of the water storages, and the rates of depletion and recovery of water in the water storages at current rates of consumption;
- Climatic data, trends and projections;
- Supply to and/or from areas outside the Area of Operations; and
- Constraints on extraction of water to the water storages, including those imposed by licences and approvals under the Water Act 1912 (NSW), the Water Management Act 2000 (NSW) and conditions in the relevant water sharing plans.

The level of service standards used in the 2022 LHWSP include:

- Frequency of restrictions not to be more than once in 10 years on average
- Duration of restrictions to be not more than 5 per cent of the time on average
- The annual risk of reaching the storage level that under drought conditions would deplete to 15% in 36 months, should not exceed 2%.

The third level of service standard is designed to do two things:

- To reflect the length of time required to construct an emergency desalination plant (estimated to be 36 months provided that environmental approvals are in place, that a concept design exists, and that a site has been selected).
- To reflect the acceptable frequency of triggering the construction of an emergency desalination plant (which has been set at an annual exceedance probability of 2%, or once per 50 years on average). The acceptable frequency effectively draws a line between the amount of effort that should be expended in creating a reliable water supply up front, versus the amount of effort that may be triggered during a drought event to ensure a reliable water supply.

4 ORGANISATIONAL SYSTEMS MANAGEMENT

This chapter provides an overview of the performance of three of our management systems in 2021-22: Asset Management System (AMS), Environmental Management System (EMS) and the Quality Management System (QMS). For each management system, we report on the programs and activities completed during the year and the outcomes of these activities. We also report on proposed future programs and activities, any significant changes made to the systems, and any major non-conformances during 2021-22.

4.1 Asset Management System (AMS)

4.1.1 Overview of Hunter Water's Asset Management System

Our physical assets comprise water, wastewater, recycled water, and stormwater systems that are important in ensuring delivery of effective, efficient, and high-quality services. Given the asset-intensive nature of the organisation, asset management is critical in determining the level of service provided to customers, compliance with regulations that aim to protect the environment and human health, the cost of services and our efficiency and financial performance.

The objective of the asset management system is to ensure that we have in place the framework, processes, procedures, and resources needed to effectively manage physical assets to support the achievement of business objectives.

Our 2017-2022 Operating Licence requires that we maintain and implement an AMS to ensure that our assets continue to fulfil their intended functions. The Operating Licence required us to develop an AMS by 31 December 2017 that is consistent with the Australian Standard AS ISO 55001:2014. We were required to fully implement the AMS by 1 July 2018. We accomplished this, as required, during the 2017-18 year, with external verification of this achievement demonstrated by certification.

Hunter Water was the first urban Australian water authority to be certified to the ISO 55001:2014 (AS/NZS ISO 55001:2014) standard. The AMS provides the framework to optimally manage asset lifecycles to achieve the agreed outcomes for customers, the environment, and the community.

ISO 55001:2014 describes an asset as:

> *"an item, thing or entity that has potential or actual value to an organisation" and that: "asset management is the coordinated activity of an organisation to realise the value from its assets".*

Effective asset management is essential to providing services in the most cost-effective manner and demonstrating this to customers, regulators and other stakeholders. The organisational benefits of asset management include:

- improved governance and accountability
- enhanced service management and customer satisfaction
- improved risk management
- improved financial efficiency and affordability for customers
- sustainable creation and operation of assets

The asset management system is one of five certified management systems within Hunter Water's overall integrated management system, along with safety, environmental, quality and information security. The key elements of ISO 55001 are:

- organisational context and leadership
- planning
- operation
- performance evaluation

- improvement

Both our Asset Management Policy and Strategic Asset Management Plan guide our asset management system. These strategic plans provide guidance on our asset management principles to:

- enable the sustainable growth of the region
- provide safe, high quality and affordable services to the community
- provide a resilient water supply that withstands drought and enables growth
- take a responsible and sustainable approach to protecting the environment and public health
- seek innovative solutions and challenge traditional methodologies across the asset life cycle
- understand customer, consumer and community needs and expectations
- comply with all legislative and regulatory requirements
- minimise customer prices and ensure financial sustainability
- maximise investment grade credit rating
- ensure we have a workforce that embraces learning, innovation and change

The scope of our AMS incorporates both the physical assets and asset lifecycle processes required to provide water, wastewater, recycled water and stormwater drainage services. The following assets are covered by the AMS: raw water, treatment, water network, wastewater network, recycled water, stormwater, electrical, and telemetry and SCADA.

4.1.2 Asset management activities and programs, 2021-22

During 2021-22, we successfully completed an ISO 55001:2014 surveillance audit of our certified AMS. In addition, routine internal auditing for developer delivered infrastructure and treatment operations maintenance activities is ongoing.

Prior to Hunter Water achieving certification, we have historically implemented asset management activities and have been involved in both water industry assessments (Aquamark and WSAA) and broader asset management industry learnings (Australian Asset Management Council). However, the ISO 55001 transition required movement beyond technical lifecycle activities to a management system approach that involves strategic alignment, document control, competency, communication and awareness.

Therefore, the AMS initiatives undertaken in 2021-22 include a combination of improved management system, governance and system processes, and procedures. **Table 26** describes the key activities and the results/outcomes of these activities.

Table 26: AMS - Activities and programs completed in 2021-22

AMS Initiative	Activity / Program	Results / Outcomes
Asset management system	AMS surveillance audit	During 2021-22, we successfully completed an ISO 55001:2014 surveillance audit of our AMS.
	IPART Operating licence audit	During 2021-22, we successfully completed the annual IPART Operating Licence audit of our AMS.
	Asset management leadership	AMS review is ongoing by Executive Managers, in which the strategic elements of the AMS are evaluated and improvement initiatives assessed and implemented. In addition, the asset management steering committee (comprised of Group Managers) has been maintained and continues to review key areas for improvement at a technical level.
	Strategic directions	Investment priorities clearly link to strategic cases, which are in turn aligned to the drivers set out in our IPART price submission.
	Critical assets program	Hunter Water continued to implement improvements in managing critical assets including updating our Standard, continued categorisation of equipment criticality, development of asset class plans for fatal assets (Fatal Asset Strategy) and development of a Dams Safety Management System which was externally audited to the satisfaction of Dams Safety NSW.
	Capital portfolio	Further refinement of the Capital Portfolio Dashboard.
	Asset management dashboards	Hunter Water has developed various dashboards to improve the monitoring of asset performance against Operating Licence requirements and to assist improvements to planning of maintenance activities.
	Technical change	Technical change management is ongoing to effectively manage risks.
	Enterprise risk management	The AMS has ongoing review and incorporates updated risk appetite statements for the nominated risk profiles and objectives within its approach to asset risk management.
	Stakeholder & community engagement	We are continuing to innovate in our approach to stakeholder, customer and community engagement, with a suite of initiatives. This includes the Love Water program. These initiatives are integrated into the AMS through asset planning/creation and managing operational community and customer impacts.
	Awareness and training	We continue to deliver asset management awareness training, which is undertaken through the employee induction process, as well as through staff and contractor training.
	Design Assurance Training	We continue to deliver design assurance training for our accredited designers.
	Asset Management Competency Framework	Development of asset management competency framework and training requirements for assurance that staff possess the various essential skills and competencies in each workplace environment, ensuring high levels of customer service and work health safety.
	AMS benchmarking	We continued a review of outcomes from the 5-yearly Water Services Association of Australia (WSAA) asset management benchmarking initiative.
	Dams safety planning	The Chichester Dam Safety Emergency plan was practised in a desktop exercise in December 2021; subsequent exercises for all dams are scheduled. Under the Regulation, declared dams are required to have classroom exercises at least every 3 years and practical exercises involving external stakeholders at least every 5 years.
	Civil maintenance system application upgrade	Hunter Water's Civil Maintenance IT platform is in the process of an upgrade to ensure ongoing reliability and successful linkage to a wider hardware/software information technology services initiative ('Field Service Model (FSM) program').
	Asset Standards	Continuous improvement of standard technical specifications for: SCADA and automation equipment, potable water reservoirs, general requirements for electrical, general requirements for mechanical.

	Roles and accountabilities	Review and update of the AMS Steering Committee Terms of Reference was completed.
Asset planning	Water resilience program	We are improving our planning for water security by expanding the planning philosophy to incorporate adaptive planning, scenario planning, systems thinking and opportunity thinking principles related to water conservation, integrated water cycle management and water source augmentations.
	Sustainable wastewater	We are expanding our traditional wastewater planning to consider medium and long-term opportunities for potential waste to energy solutions, improved biosolids management, recycled water systems and carbon neutrality.
	Climate change vulnerability planning	Further development of Climate Change Adaptation risk management and vulnerability mapping was completed.
	Climate adjusted demand forecast	We are implementing the updated climate-adjusted demand forecasting to our demand modelling and projections.
	Growth plan	Our growth plan is updated biennially to reflect the connection growth information and development forecasts ensuring that developers, planners and the broader community can reference up-to-date information.
	Condition Assessment Program	Treatment Plant site condition assessments completed.
	AMS internal audit	The asset management planning program is updated to include a periodic implementation review, where Hunter Water checks the alignment between the Asset Management Plans and the maintenance schedules, and other implementation actions of the plan.
	Asset class plans	Developed or reviewed asset management plans for Borefields, Critical Water Mains, Critical Sewer Mains, Chichester Trunk Gravitational Main (CTGM), Wastewater Treatment Plants, Potable Reservoirs, Water Pumping Stations, Stormwater.
	Asset class planning	Hunter Water will continue to articulate alignment of its asset management objectives with specific objectives and the appropriate risk and opportunity mitigation actions within asset class plans.
Investment management	Strategic planning	Continued implementation of the strategic cases and program business cases.
	Investment management	Further development of our program business cases as part of the 2020-24 Price Path.
Asset Information	GIS Strategy 2020-24	Our Geospatial Information System (GIS) Strategy was updated to align with business drivers.
	Information standards & process	A review of our asset information standards and collection processes included updates to our Piping and Instrumentation Diagrams (PID) STS 913 standard, as well improvements to asset data collection for Developer Delivered infrastructure.
Asset creation	Resource strategy	The project and contract management forward program is supported by a resource strategy which involves engagement of a program and project management support contract.
	Asset Solutions	Hunter Water's Asset Solutions Group continues to provide support capacity to deliver the capital investment portfolio and improve capability across the business.
	Capital portfolio	Reviewed and prioritised our capital portfolio to meet our combined Towards 2024 Strategy and asset management objectives.

4.1.3 Proposed asset management activities and programs

We will continue to review and improve our asset management system to meet defined asset management objectives. The AMS initiatives planned to be undertaken through 2022-23 include a combination of improved management system governance, processes, and procedures. The key initiatives are described in **Table 27**.

Table 27: AMS - Proposed activities and programs

AMS Initiative	Activity / Program	Results / Outcomes	Timetable
Asset management system	Asset class plans	Continue development, rolling review, update and consolidation of our asset class plans including conversion to digital platforms based on asset criticality.	Ongoing
	Asset Management Competency Framework	Further develop asset management competency definitions and training requirements to provide assurance that staff possess the various essential skills and competencies in each workplace environment, ensuring high levels of customer service and work health safety.	June 2023
	Design Assurance Training	Continue delivering design assurance training for accredited designers.	Ongoing
	Develop an AMS communication strategy	Review and develop communication of the asset management systems message, and asset management value proposition to the organization and all stakeholders.	June 2023
	Shutdown management	Review and further develop Hunter Water's shutdown management procedures.	June 2023
	Roles and accountabilities	Review and update the AMS RACI Matrix (Responsibility, Accountable, Consulted, Informed).	June 2023
	Leadership	Continue to implement and embed management review through planning & coordination of both the executive management review and asset management steering committee.	Ongoing
	Document management system	AMS documentation will be reviewed, updated and captured through our document control system.	Ongoing
	Stakeholder & community engagement	We are continuing to innovate in our approach to stakeholder, customer and community engagement, with a suite of initiatives. This includes the Love Water program. These initiatives are integrated into the AMS through asset planning/creation and managing operational community and customer impacts.	Ongoing
	Asset standards	Continuous improvement of standard technical specifications and design guidelines/codes.	Ongoing
Asset Planning	Critical assets	Review and update the critical asset program incorporating the enterprise risk management framework and development of asset class plans for operational critical assets.	Ongoing
	Condition Assessment Program	Network and Critical Mains Condition Assessments.	June 2023
	Dams Safety Reviews & Risk Assessments	Grahamstown and Chichester Dams will undertake Dams Safety Reviews & Risk Assessments.	June 2023
	Growth Plan	Continuous improvement of Hunter Water's Growth Plan with addition of dashboard tools.	June 2023
	Climate change vulnerability planning	Further development of Climate Change Adaptation risk management and vulnerability mapping.	Ongoing
	Water resilience program	We are improving our planning for water security by expanding the planning philosophy to incorporate adaptive planning,	Ongoing

		scenario planning, systems thinking and opportunity thinking principles related to water conservation, integrated water cycle management and water source augmentations.	
	Sustainable wastewater	We are expanding our traditional wastewater planning to consider medium- and long-term opportunities for potential waste to energy solutions, improved biosolids management, recycled water systems, and carbon neutrality.	Ongoing
Asset Information	Information standards & process	A review of our asset information standards and collection processes is ongoing and part of continuous improvement.	Ongoing
	Asset management dashboards	Hunter Water will continue developing various dashboards to improve the monitoring of asset performance against operating licence requirements and to assist improvements to planning of maintenance activities.	Ongoing
	Engineering Drawing Management System (EDMS) upgrade	An upgrade and replacement of Hunter Water's digital engineering drawing file management system.	Oct 2022
	GIS system update	Hunter Water's GIS system software update.	Nov 2022
	GIS and CMMS (Ellipse) data synchronisation	Synchronisation of the GIS and computerised maintenance management systems (CMMS) for creation of linear assets within Ellipse from the GIS.	April 2023
	SCADA Strategy	SCADA Strategy implementation.	Ongoing
	SCADA System update	Hunter Water's SCADA system software update.	Dec 2022

4.1.4 Significant changes to the Asset Management System in 2021-22

There have been no significant changes to Hunter Water's AMS in 2021-22.

4.1.5 Non-conformances in the Asset Management System

There were no new non-conformances from the 2022 ISO 55001 surveillance audit.

The following minor non-conformance identified in the previous year was carried over pending further confirmation and was closed in the 2022 ISO 55001 surveillance audit:

- Review the alignment of its asset management objectives with the appropriate risk and opportunity mitigation actions within asset management plans.

4.2 Environmental Management System (EMS)

Clause 4.2 of our Operating Licence stipulates that Hunter Water must maintain and implement an environmental management system that is consistent with the A*ustralian Standard AS/NZS ISO 14001:2016 Environmental Management Systems – requirements with guidance for use*.

Our Environmental Management System (EMS) provides a framework for developing, implementing, monitoring, and reviewing our objectives, actions, and targets in relation to our commitment to the community and environment. We have been externally audited and certified against the ISO Standard, demonstrating our compliance with Clause 4.2 of our Operating Licence.

4.2.1 Environmental Management Plan

The development and implementation of an Environmental Management Plan (EMP) is a key component of our EMS. The EMP outlines our environmental objectives, program of actions and targets to manage risk as well as drive environmental improvements for the organisation.

A new EMP was developed and approved in 2021-22. The EMP was developed in parallel with the Sustainability Strategy and the focus areas and objectives are aligned. The new EMP is available on our website (see Environmental Management Plan 2021-2024).

It contains 14 objectives that span across the following sustainability focus areas:

- Social
- Environmental
- Economic
- Governance

The objectives that sit beneath the sustainability focus areas guide organisational improvement and address our key responsibilities to the environment and our community. Programs, projects and actions are aligned against each of the sustainability objectives within the EMP and together provide a summary of what Hunter Water is doing to ensure we meet our environmental obligations and drive environmental improvements.

4.2.2 Environmental management activities and programs

This chapter of the Compliance and Performance Report provides a summary of progress against all the objectives within the EMP. Activities and programs completed in 2021-22 and proposed next steps are outlined below in **Table 28**: EMS – Social focus area activities and programs through **Table 31**: EMS – Governance focus area activities and programs. Activities and programs are categorised into the four sustainability focus areas listed above.

Social Focus Area – Progress Update

Table 28: EMS – Social focus area activities and programs

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
EMP Objective: Improve community liveability			
Increase length of Hunter Water stormwater channels with amenity improvements – 1km of improvements to be delivered	Cottage creek works complete, planning underway for further sites.	Continue to engage with local councils and the community on project concept design.	2023-24
Increase area of public open space irrigated with non-potable water supply – 4.8ha to be delivered	Focus this year has been developing the project plan and objectives with key stakeholders for recycled water scheme for sporting fields at Edgeworth and Cameron Park.	Continue to engage with local councils and the community on potential projects.	2023-24

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
Reduce number of dry weather wastewater overflows impacting private property	Works are on track with modelling undertaken to optimise jetting activities, predicate blockages and implement derived flow and mass balance code across 120 stations.	Ongoing works to prevent overflows before they occur and allow for a quicker response time.	Ongoing
Deliver a new odour control facility at Newcastle WWPS1	Concept design and environmental assessment has been completed.	Final design and approvals will be sought in 2022-23.	Dec 2023
Implement and review the effectiveness of the out of hours noise policy	Guideline developed and implemented.	Continue to review to ensure potential noise impacts are addressed in relation to work occurring outside of normal business hours.	Dec 2022
EMP Objective: Improve customer and community understanding			
Develop and implement Sustainability Communications and Engagement Plan for our employees, customers and communities	Works commenced to develop an engagement plan, as part of the newly developed Sustainability Strategy.	Finalise engagement plan and start to implement plan, including staff sustainability survey in 2022-23.	Dec 2022
Review community and customer engagement results and insights to direct and prioritise environmental engagement actions	Environment and sustainability insights utilised to help shape EMP and key programs of work including recycled water strategy, carbon strategy and stormwater improvements program.	Customer and community insights to be sought, including environment and sustainability insights, as part of planning for Hunter Water's next price proposal.	Ongoing

Environmental Focus Area – Progress Update

Table 29: EMS – Environmental focus area activities and programs

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
EMP Objective: Reduce demand for potable water			
Reduce customer potable water consumption	Successful collaboration with NSW Land and Housing Corporation to install water efficient equipment. *Refer to Water Conservation report for further details.*	Ongoing program of works to reduce potable water consumption, including continued support to LAHC, water conservation messaging, continued rollout of data loggers on large sites, WEMPs and recycled water strategy - as per Towards 2024 strategy.	Ongoing
Reduce leakage from Hunter Water assets	Hunter Water has dedicated considerable resources into reducing leakage in recent years. Approximately 60% of all leaks are resolved and fixed within two days. Our Customer Services teams have been working with major customers to reduce leakage. This work has included identification of major leaks at	Ongoing program of works, including potable water replacement at WWTW sites and increased network coverage by district metered areas (DMAs).	Ongoing

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
	local hospitals with assistance provided to repair leaks.		
EMP Objective: Reduce impacts on waterways			
Dry weather overflows program of works.	Preliminary modelling undertaken to develop a more advanced model to optimise jetting activities. Project awarded for monitoring of emergency relief structures (ERS). Relining programs and sewer renewals continued which helps to ensure our network systems are performing well and meeting Operating Licence requirements. Proactive inspection program slightly behind planned schedule but have achieved good results with a substantial reduction in reportable dry weather overflows in 2021-22 compared to previous years.	Modelling to be validated and workflows reviewed to optimise scheduling of jobs considering the workload of maintenance planners and teams. ERS monitoring Phase 2 to be completed. Proactive program of works to continue including CCTV, jetting and manhole inspection in sensitive, difficult to access locations.	Ongoing
Water discharged to environment programs of work.	Lake Macquarie effects-based assessment finalised with Dept of Planning and Environment. Data provided for Beachwatch reporting.	Ongoing participation in Beachwatch program including data gathering WTWW upgrade program Finalisation of Hunter River Estuary Wastewater masterplan.	Ongoing
Deliver catchment improvement initiatives including development of a new Catchment Management Plan.	Projects within the improvement plan such as land management improvements on Hunter Water land and working with farmers in our catchment is underway and progressed as planned. Catchment model built and tested to assess pollutant hot spots and efficacy catchment management measures in improving water quality. Consultation on the development of the new Catchment Management Plan (CMP), including best practice review for drinking water catchment protection.	Ongoing implementation of the current Catchment Management Improvement Plan. Handover of catchment model to Hunter Water. Finalise Medowie and Seaham Weir pool models. Economic evaluation of catchment management. Assessment of benefits of catchment management for addressing emerging contaminants and pathogen risks. Finalisation of strategy and preparation of business case for investment.	2023-24
Grahamstown Dam Vegetation Management Plan.	Vegetation Management Plan reviewed and updated with consulting ecologist. Monitoring at sites and weed control works completed.	Further updates to the plan to be undertaken. Controlled burns scheduled and more weed controls works to be completed.	Ongoing
Research and development program for wastewater and water resources	R&D program updated and priorities set for 2022-2025. Participation as part of SewAus project. Prioritisation of contaminants of emerging concerns for drinking water	Ongoing R&D program of works. Continue to be part of SewAus project. Campvale Canal contaminants of concern assessment. Support ARC linkage grant	Ongoing

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
	catchments based on land uses within catchments. Belmont Ocean Outfall Benthic Monitoring Investigation competed. Next investigation due 2024/2025. Honours project set up with University of Newcastle to develop a scope to assess wastewater overflow impacts on oyster harvesting in the Port Stephens area.	application on the fate of PFAS in biosolids. Continue honours project with UON to develop a decision-making framework for wastewater overflow impacts on oyster harvesting in Port Stephens.	
Annual native vegetation gained – no net loss	6.4ha of native vegetation cleared in 2021-22. Only 1 ha of native vegetation was revegetated – KPI behind for 2021-22.	Large restoration projects underway in 2022-23 at Shortland, Stockton and within the Grahamstown Dam catchment land.	Ongoing
Improve fish passage at Seaham Weir	Detailed design and modelling completed. Temporary works in river commenced.	Complete temporary works, construct fishway and flow control gates before commissioning.	2022-23
EMP Objective: Reduce impact on land			
Review and update the contaminated land management strategy	Strategy updated in 2021 – focus on groundwater monitoring at Burwood Beach and Farley treatment plants. Focus also on managing contamination risks as part of capital projects.	Groundwater monitoring to be implemented at Burwood Beach and Farley. Restoration works to occur at Stockton, including management of hot spot and spoil stockpile on site. Management of contaminated sites as part of upcoming capital works program.	Complete – implementation of strategy to occur
Complete the roll out of the Chemical Dosing Unit upgrade program	Works completed in 2021-22 – 15 WWPS supplied with new Chemical Dosing Units (CDUs), 50 sites with various redundant CDU infrastructure removed.	No further action.	Complete
Develop a rehabilitation feasibility plan for the former Stockton WWTW site	Landfill removal from site completed. Contamination assessment completed with remediation action plans developed. Works started for revegetation works to begin in early 2022-23.	Revegetation works planned for 2022-23, along with fencing of the entire site. Site contamination remediation action plans to be reviewed and addressed for hot spot contamination and stockpile spoil in line with the Stockton Coastal Management Plan and site plans.	2023-24
Develop a Biodiversity Strategy (including biodiversity offsets, offset policy, ecology data updates and guidance for developers)	Draft Biodiversity Offsets Standard and Offsetting Strategy. Workshop with Port Stephens Council to identify tasks needed to develop a local biodiversity offsetting scheme at the organisational level.	Consult internal stakeholders on drafts. Identify how land management actions at the offset sites will be delivered. Identify potential sites.	2023-24

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
EMP Objective: Increase climate resilience			
Incorporate climate change risk assessment into the Enterprise Risk Management framework and develop climate change risk appetite statements	Risk Appetite Statement (RAS) and risk profile created and reported on within 2021 Annual Risk Review.	Risk profile to be reviewed and reported ongoing as part of annual risk review process.	Complete
Conduct climate change vulnerability assessments	Pilot project completed – Climate Risk Vulnerability Mapping. Outcome was such that the tool not be progressed any further due to limitations of the tool.	No further action. Recommendation that a business case is developed to assess other options/tools.	Complete
Undertake climate change adaptation maturity health assessment	Climate Risk maturity Health Check Tool completed.	No further action.	Complete
Develop position statement on climate change adaptation to help guide future planning	Draft positions statement developed.	Finalise draft statement for endorsement by December 2022.	2022-23
EMP Objective: Reduce waste			
Reduce solid waste to landfill to from head office and depots	Ongoing tracking of solid waste. Annual target achieved. Tender process completed for total waste and recycling services contract – to be awarded and implemented in early 2022-23.	Develop a solid waste management strategy/action plan as part of the new waste and recycling service contract in collaboration with service provider. Review and update waste reporting and data in line with new contract and service provider.	Ongoing
Increase spoil recycling and reuse	Ongoing spoil handling practices within civil operations to separate and segregate contaminated materials. Testing of spoil against Hunter Water specific Order and Exemption. Decommissioned reservoir in Cardiff assessed to be established as a spoil reuse location.	Request extension of Hunter Water specific spoil Order and Exemption. Establish Cardiff Reservoir for reuse of spoil. Review spoil handling practices and waste handling and disposal requirements with Assets Solutions group.	Ongoing
EMP Objective: Increase circular economy			
Reduce annual net greenhouse gas emissions – scope 1 & 2	Net Zero Target established – Net Zero by 2035 subject to confirmation of customer willingness to pay. 80% reduction on 2005 levels targeted by 2030.	Development of a net zero roadmap.	Ongoing
100% of biosolids reused for beneficial purposes	Biosolids stabilisation business case finalised. Handed over to Asset Solutions for project delivery.	Delivery of centralised biosolids treatment facility	Ongoing
Recycled water program	Public Open Space recycled water program design concept and EIA procured.	Complete concept design, EIA and confirm total project cost estimate.	Ongoing
Renewable energy program of works	Ongoing delivery of the on-site solar program across wastewater treatment sites and depot site.	Ongoing delivery of on-site solar program.	2023-24

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
	Seven sites now up and running. Chichester hydro energy generations increased from December 2021. 1.737 MW of renewable energy capacity in place as of end of June 2022.	Tracking of monthly renewable energy generation for use and exports to the grid.	

Economic Focus Area – Progress Update

Table 30: EMS – Economic focus area activities and programs

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
EMP Objective: Maintain cultural heritage			
Heritage program of works	Engaged our heritage consultant to review the S170 heritage register and started revision of the Heritage Assets Management Strategy.	Finalise S170 register review Improve GIS mapping of our listed items. Finalise the Heritage Assets Management Strategy. Develop a procedure for conservation of built heritage. Develop new heritage training content for delivery to key internal roles in 2022-23. Develop an inventory list of moveable heritage items.	Ongoing
Assess the feasibility of incorporating indigenous cultural burning practices in to catchment bushfire management plans	Collaboration with Hunter Local Land Services to consider using cultural burning and associated education programs in Grahamstown catchment areas.	Apply for grant funding for restoration works, with the project to include cultural burns as part of restoration activities.	Ongoing
Identify opportunities for involvement of local indigenous communities in environmental, natural resource and restoration projects	Ad-hoc involvement during projects to date – including engagement of Worimi Green Team to support Stockton revegetation works in 2022-23, and Welcome to Country/Acknowledgement of Country engagement of local Indigenous peoples explored as part of community planting days.	Support the roll out of the Reconciliation Action Plan – including consideration of employment of local Indigenous organisation through the setup of a panel of contractors for natural resource and restoration works. Establish a panel of Aboriginal stakeholders for input in to Aboriginal heritage investigations.	Ongoing
EMP Objective: Increase alignment with regional priorities			
Support and assist local community programs that promote water source protection, catchment health and environmental improvements	Successful Love Water grants program implemented – more than $100,000 of funding supporting irrigation systems, water tank installs and community gardens.	Ongoing community and education programs to promote water conservation, catchment health and sustainability.	Ongoing

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
Collaborate with regional and industry partners to explore environmental and sustainable improvement and innovation opportunities	Various sustainable products explored and trialled during the Cessnock WWTW upgrade project in collaboration with University of Newcastle and local suppliers – including concrete, green steel.	Further trials as part of the Cessnock upgrade project with the contractor asked to implement sustainable opportunities where feasible. Investigate options as part of the Belmont Desalination project.	Ongoing
Implement the Developer Works REF reforms	New guidelines, application forms and templated created to improve quality of applications and improve administration efficiency. Targeted industry consultation completed.	Address industry feedback on the newly created processes and further clarify proposed processes. Once finalised, new processes will be piloted before being implemented.	2022-23
Collaborate and liaise with City of Newcastle (CN) on the Stockton coastal management program	Work was undertaken to ascertain the least cost options to protect the former Corroba landfill from ongoing coastal erosion. Site restoration planning and project kick off was also undertaken to improve site security and land restoration on Hunter Water land at Stockton.	Ongoing collaboration and communication with CN for the Stockton Coastal Management Program.	2023-24
EMP Objective: Improve sustainability in our capital works program			
Planning guidance and tools for assessment of climate change considerations for inclusion in to the Asset Creation Framework	Climate Risk Screening Guideline and Project Risk Screening Tool incorporated in to planning framework for capital works projects as part of the Initiation Phase to assess risk from climate change.	Undertake climate risk screening and assessments for infrastructure projects.	Complete
Develop improved estimate tools which ensure electricity consumption considers carbon pricing into ongoing OPEX costs for new capital projects	Preliminary discussions had with economics team to discuss improved estimate tools.	Further engagement and investigation to consider potentially updating the estimate guidelines.	2023-24
Deliver sustainability baseline assessments for two key asset types – water, waste and energy assessments	Water, waste and energy assessments underway as part of the Cessnock WWTW upgrade project.	Funding to be sought to undertake additional assessments on select projects.	2023-24
Design & Construction Sustainability Guidelines embedded Hunter Water's Asset Creation Framework (ACF)	Long lead, strategic project captured as a key initiative within the organisation's sustainability strategy.	Engage the Design and Engineering Panel partners to leverage their expertise and maturity to gauge where and when we should be intervening on projects on sustainability requirements.	2023-24
EMP Objective: Improve sustainability governance in our supply chains			
Develop and launch the Supplier Partnership Principles (SPP) – including supplier environmental expectations	SPP produced and implemented. Publicly supplied on Hunter Water website. The principles will be used to communicate to current and potential suppliers. Assessment schedules updated to include sustainability aspects for	Continued engagement with suppliers through contractor forums on sustainability topics. Collaborate with suppliers	Complete

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
	assessment during tender process. Continued engagement with suppliers through contractor forums.	on sustainability initiatives and sharing of knowledge. Review of tender assessment schedules to simplify the process and capture assessment data for suppliers across Hunter Water.	
Implement the Sustainable Procurement Improvement Plan	Actions focused on better understanding modern slavery risks and opportunities to incorporate sustainability consideration in tender assessments.	Ongoing review and implementation of the improvement plan including initiatives within the Reconciliation Action Plan which will create employment opportunities for First Nations members of our community.	Ongoing
Establish a methodology for estimating our organisational scope 3 GHG emissions	Scope 3 carbon assessment completed providing an estimated carbon footprint for 2020-21. Started engagement with contract owners of suppliers with high scope 3 emissions and connected with key suppliers to talk about opportunities to reduce carbon emissions.	Further supplier scope 3 emissions reduction conversations, and more specific works with DESP and Veolia. Questionnaires to be sent to largest suppliers.	2022-23

Governance Focus Area – Progress Update

Table 31: EMS – Governance focus area activities and programs

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
EMP Objective: Embed sustainability in decision making systems and processes			
Establish Sustainability Steering Group and develop the Hunter Water Sustainability Strategy	Sustainability Working Group (SWG) and charter formed in 2021. Sustainability Strategy finalised in early 2022.	Review sustainability reporting moving forward, and support implementation of Sustainability Strategy.	2022-23
Review EMS Policy documents - enhance systems to include relevant sustainability programs and plans	EMS documents reviewed as required.	Sustainable procurement and climate resilience procedures to be linked to the relevant EMS policies and procedures.	Ongoing
Review and update environment performance measures for internal reporting	Monthly and quarterly reporting of environmental measures reviewed and updated.	Reporting against current Environmental KPIs ongoing.	Complete
EMP Objective: Maintain the Hunter water Environmental Management System (EMS)			
Reduce environmental risk for all high rated risks to medium or below Develop and oversee implementation of the Environmental Risk Actions Plans	Risk arising from chemical spills reduced due to the completion of the implementation of chemical handling and storage projects within the wastewater network and treatment plants.	Focus on dry weather wastewater overflows. Works planned across the business to address this risk and seek to reduce the risk of dry weather overflows on the	2023-24

Activity / Program	Results / Outcomes 2021-22	Next Steps 2022-2023	Timetable
	Upgrades have occurred over several years.	environment and our communities.	
Pollution Reduction Programs (PRPs)	All PRPs completed and submitted to the NSW EPA on time.	Continue PRPs as required.	As required
Annual field inspection program	Field inspection completed as per schedule. Developed inspection program for 2022-23.	Implement inspection program for 2022-23, with reports and actions documented. Develop inspection program for 2023-24.	Ongoing
Environmental training program	Environment induction package updated for new starters and now being implemented. Video produced for inclusion as part of induction. Delays in delivery of some refresher training for field staff due to resourcing – rescheduled for early 2022-23.	Refresher training for field crews to be delivered in early 2022-23. Online training packages to be developed for key training elements including heritage, utilising further video content produced in 2021-22.	Ongoing
Certification of the EMS with ISO14001 & audit program	Audit of Bushfire management Plan completed. Routine surveillance audits of the management system. Annual IPART Operating Licence audit completed.	Audit environmental performance of Developer Services works and waste management processes. Recertification audit for EMS against ISO140001.	Ongoing
Environment reporting	Reporting completed as per current requirements. Environmental KPIs reviewed and updated in 2021-22.	Review use of digital reporting tool for reporting progress against the EMP in quarterly Environment report to Executive Team. Complete monthly, quarterly and annual reporting for environmental KPIs, projects and EMP.	Ongoing

4.2.3 Significant changes to the Environmental Management System in 2021-22

During 2020-21 (July 2020), our EMS was recertified to ISO 14001:2015 (AS/NZS ISO 14001:2016). Subject to annual surveillance audits, the certification will run until 9 July 2023. A surveillance audit was completed in May 2022.

The main change to the EMS during 2021-22 has been the development and implementation of the new 2021-24 Environmental Management Plan which has been reported upon in this report.

4.2.4 Non-conformances with the Environmental Management System in 2021-22

No major non-conformances with the EMS were identified during third party certification audits or internal audits during 2021-22. Several minor non-conformances related to capital works were identified during the surveillance audit in May 2022 which will be addressed and closed out during 2022.

4.3 Quality Management System (QMS)

This section describes Hunter Water's quality management performance. We report on compliance with clause 4.3 of our Operating Licence and in doing so, detail the quality management programs and activities completed during 2021-22, and the proposed programs and activities for 2022-23. We also report on any non-conformances with, and significant changes made to, our quality management system.

4.3.1 Overview of Hunter Water's Quality Management System

Hunter Water's Quality Policy Statement outlines that Hunter Water is committed to maintaining high levels of customer and community satisfaction through consistently providing safe, reliable, and efficient services with a focus on the needs of the community, throughout its area of operations.

Hunter Water has implemented and maintains a Quality Management System (QMS) to put this statement into practice. The system consists of systematic processes to manage the core functions of the organisation. We implement the system to ensure the organisation consistently meets all of its product and service requirements, addresses its risks and opportunities, and provides high levels of customer satisfaction while meeting regulatory requirements.

We have adopted an integrated approach to operating our management systems in the form of an Integrated Management System (IMS). The IMS (shown in **Figure 9**) provides processes, principles, and guidelines across common functions of the different management systems. Individual management systems provide the subject matter expertise and inputs to the integrated processes. Elements of the ISO 9001 quality requirements are managed via the integrated processes, systems and data in Hunter Water's IMS and others are managed directly via the QMS.

We achieved initial certification to ISO 9001 in August 2015. We have continuously maintained our certification and passed our most recent, external, annual surveillance audit in May 2022. Recertification dates are aligned across all ISO Management Systems to improve the efficiency of the audit process.

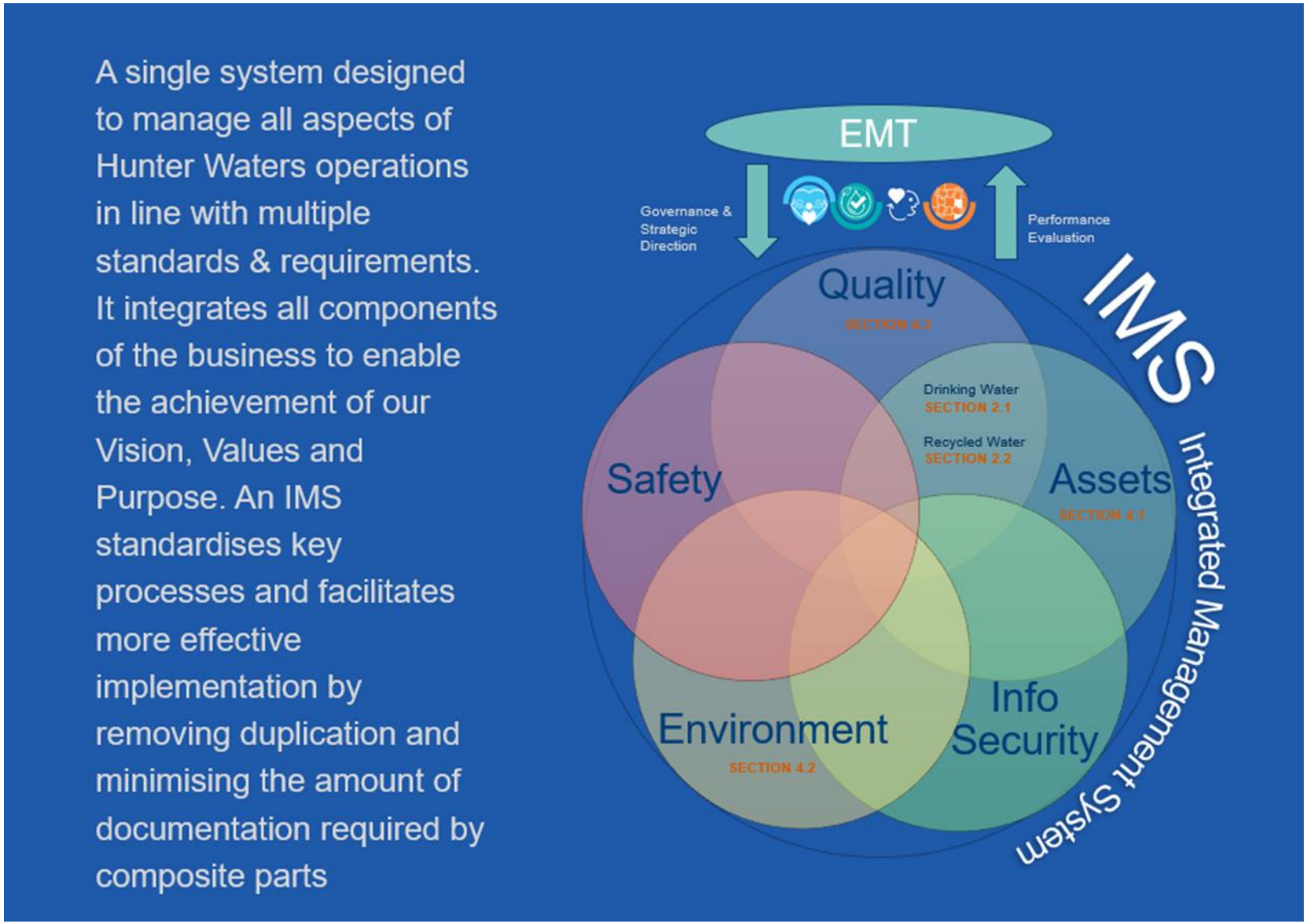
These standards include ISO 9001 Quality, ISO 14001 Environment, 27001 IT Security, 45001 Health and Safety and ISO 55001 Asset Management – all of which were audited in May 2022. No major non-conformances were recorded against any of the certification standards.

Because of the integrated approach, only quality-specific requirements are managed directly by the QMS. In addition, the requirements of the Australian Drinking Water Guidelines (ADWG) and Australian Guidelines for Water Recycling (AGWR) form two of the many requirements that we must comply with in providing our products and services. So, whilst they can be described in isolation, in practice they form part of the overall QMS for Hunter Water. In section 2 of this report, we describe our DWQMS and RWQMS.

The objectives of our IMS and QMS are:

- reliable, high-quality water and wastewater service delivery
- customer satisfaction
- compliance
- continuous improvement
- meet stakeholder needs

Figure 9: Overview of our Integrated Management System and the applicable sections of the compliance and performance report



4.3.2 QMS - activities and programs completed during 2021-22

Table 32 describes the activities and programs completed in 2021-22 to meet the IMS/QMS objectives.

Table 32 – QMS/IMS activities and programs completed during 2021-22

IMS/QMS Objective	Activity / Program	Results / Outcomes
IMS		
Continuous improvement	A tender process and contract award for an integrated incident and risk management application, to capture and manage governance, risk, compliance and incident information.	A contract has been awarded (Protecht ERM) and project implementation is underway.
	Combined Assurance Project: A systematic approach to assurance activities applying the Lines of Defence model to optimise the benefits from a whole of business perspective	Mapping of procedural controls and assurance activities that we currently have in place continued into this period. The aim is to ensure that where we are conducting assurance and audits, these are adding the maximum value by: • mapping our existing assurance activities in one place • determining the level of desired assurance relative to our business risks • assessing gaps and overlaps • providing clear vision to the Executive Management Team and Board Audit and Risk Committee to base decisions around changes to levels of activity. The initial phase of this project is nearing completion, with further work pending subject to the implementation of the Protecht ERM software (formally known as Watershed). This software will facilitate the scheduling and tracking of audit assurance activity.
	Second Line of Defence (2LOD) audit program	A revised audit process (adopting the three lines approach) has been implemented and audits scheduled accordingly. The three lines approach provides flexibility regarding changing risk profiles and is expected to be further enhanced with the implementation of the Protecht ERM software.
	Interim Document Control Solution	Hunter Water's previous Document Control system was no longer fit for purpose. An interim solution has been implemented to address this issue and subsequent data cleansing is progressing well in the lead-up to phase two of the Document Control improvement project. The second phase of the project is expected to deliver an easy-to-use digital solution in the long term.
QMS		
Continuous improvement	Ongoing Improvement Initiative	The QMS will complement the DWQMS/RWQMS through ongoing organisational improvements that include document control and compliance management.
Meet stakeholder needs	Mystery Shopper and customer experience monitoring	Hunter Water has continued participating in a nationally recognised Mystery Shopping program for Customer Experience. At the end of 2020-21, Hunter Water was again ranked 1st position in the Water Utility category. Hunter Water also positioned 1st overall amid a pool of over 200 organisations, converging from differing industries and sectors. We have also continued to regularly monitor customer experience across many touchpoints (including phone, face-to-face, complaints, field services, and developer

IMS/QMS Objective	Activity / Program	Results / Outcomes
		services) to ensure customers are highly satisfied. This also provides us with an opportunity to engage in service recovery (when things go bad), celebrate success (when things go well), and identify pain points and opportunities (to ensure we get better). Across the last 12 months, we have used this information to improve online services and streamline processes to provide better outcomes for customers
	Voice of Customer (VoC) Program	Uplifting capability across the organisation to improve customer centricity has been prioritised over the last 12 months. This has been led by internal subject matter experts, delivering training modules to improve employee knowledge and confidence around: • managing customer conversations, • recognising vulnerability indicators, • complaint and case management, and; • self-care for front-line staff. Further to this, customer data and insights have continued to be made more visible and central, to aid customer-centric decision making across the organisation.
	Service and experience program	Hunter Water implemented electronic billing and My Account in late 2021, providing customers with an online bill management and delivery option. This digital project was foundational to meeting customer expectations by providing customers with a digital channel choice to manage their account 24/7. Further enhancements were also implemented to the online Developer Self Service portal, ensuring all development applications can be submitted online, and streamlining back-of-office processes. We have also upgraded the “Your Voice” community engagement platform – making it easier for customers and the community to engage with us via our website.

4.3.3 Proposed IMS and QMS activities and programs

Hunter Water works on a process of continual improvement to progressively develop and enhance the QMS/IMS. Future proposed activities and programs to meet the objectives of the QMS/IMS are described in **Table 33** IMS/QMS - Proposed quality management activities and programs

Table 33 IMS/QMS - Proposed quality management activities and programs

QMS / IMS Objective	Activity / Program	Results / Outcomes	Timetable
Continuous improvement	Service and experience program	Work will continue on enhancing the online developer portal for our plumbing and hydraulic customers, and introducing a secure payment gateway for all our online applications. This will also include a workflow hub for processing plumbing applications, and automating our Section 47 process – due for implementation by the end of 2022. Further enhancements to our online My Account customer portal will be prioritised in 2023, using customer insights and learnings to improve their experience and provide greater service options such as payments and current account balances.	Ongoing
	Incident & non-conformance and corrective action process improvement.	Integration analysis and improvement project across all areas of the business to standardise processes and maximise continuous improvement outcomes on a whole of business basis. This process will be carried out in conjunction with the Protecht project and will continue beyond the initial software implementation	Ongoing
	Document Control Improvement Project – Phase 2	Data analysis and cleansing of IMS controlled document data to facilitate the IMS Improvement Project and progress to a long-term Document Control solution.	Ongoing
	IMS Improvement Project	Strategy development leading to simplified and improved system structure, processes, awareness, user adoption, and overall compliance	Ongoing
	QMS/DWQMS/RWQMS Alignment	Enhance alignment between the ISO9001 based QMS and the Drinking Water and Recycled Water Quality Management Systems	June 2023
Meeting stakeholder needs	Customer Strategy Project	The Customer Strategy project will use all the great artefacts, data, and learnings we have collected across the last 2+ years, to develop a clear and simple strategy that creates alignment, direction, and focus across the business. Part of this project will be the development of a roadmap of change activities to improve the customer experience, that prioritises our efforts and ensures we are focused on what matters most to customers.	July – Dec 2022

4.3.4 Significant changes to the IMS/QMS in 2021-22

There have been no other significant changes to Hunter Water's QMS in 2021-22.

4.3.5 Major non-conformances in the QMS and actions taken to resolve them

There have been no major non-conformances with the QMS during 2021-22. Our external management system provider, Bureau Veritas, completed a surveillance audit across all of our management systems. We continue to ensure continuous improvement and that our systems progressively mature.

5 CUSTOMER AND STAKEHOLDER RELATIONS

In this chapter, we describe the activities and achievements of our Customer and Community Advisory Group during 2021-22 and demonstrate our compliance with the Group's charter. We also identify underlying complaint drivers and describe the actions taken to resolve root causes for complaints.

We also outline any changes that were made to the following key documents or procedures:

- customer contract
- procedures for payment difficulties and actions of non-payment
- charter for customer and community advisory group
- internal complaints handling procedures
- external dispute resolution scheme

5.1 Customer and Community Advisory Group (CCAG)

Our Operating Licence requires that we maintain and regularly consult with our customers through a customer advisory group. We fulfil this requirement through our Customer and Community Advisory Group (CCAG).

5.1.1 Compliance with the Customer and Community Advisory Group Charter

We demonstrate our compliance with the CCAG Charter in **Table 34**.

Table 34 - Compliance with the requirements of our Customer and Community Advisory Group's charter in 2021-22

Mandatory content	Charter reference	Charter requirement	Compliance
Role	Section 2 – Role of the Customer and Community Advisory Group	Section 2.1, 2.2 and 2.3 - To provide advice on the interests of customers and consumers of Hunter Water, the Customer Contract and other key issues related to Hunter Water's planning an operations.	Compliance with the requirements of this section is demonstrated by the range of topics discussed at CCAG during 2021-22. Minutes for all meetings (including actions taken by Hunter Water) are available at: www.hunterwater.com.au/ccag
How members and the Chair of the customer advisory group will be appointed	Section 3 – How members and the Chair of the Customer and Community Advisory Group will be appointed	A person representing each of the groups nominated in section 3.1 are included on the forum where practicable. The requirements of members are outlined in Section 3.2. The selection process is outlined in Section 3.3 and 3.4. Section 3.5 addresses membership vacancies.	The CCAG includes representation from each of the required groups.
Membership term	Section 4 – the term for which members are appointed	Section 4 provides for four year terms, with allowance for one renewal.	All members have term limits.

Mandatory content	Charter reference	Charter requirement	Compliance
Operations	Section 5 – Operations	Section 5.1 - meetings will be held at least four times per year.	Four meetings were held in 2021-22. The CCAG met on: • 10 August 2021 • 30 March 2022 • 17 May 2022 • 14 June 2022 There was some disruption to meetings during the start of the financial year, due to local government elections originally scheduled for September 2021, and then postponed to December 2021.
		Section 5.2 – Chairperson – Hunter Water will appoint an Independent Chair	The CCAG had an independent Chair for the full year. Cr Paul Le Mottee, representative for Port Stephens Council, served as Chair until December 2021. Cr Le Mottee was not re-elected to Port Stephens Council in December 2021, and ceased being a CCAG member. Following his re-appointment as a CCAG representative for Lake Macquarie City Council, Cr Brian Adamthwaite was appointed Chair in March 2022.
		Section 5.3 – Attendance at meetings	The invite list to CCAG meetings is restricted to CCAG members, Hunter Water staff and invited guests.
		Section 5.4 – Quorum	All meetings held in 2021-22 satisfied the quorum requirement.
		Section 5.5 – Meeting papers	CCAG members are provided with meeting notice in advance of meetings, which includes the opportunity to help shape the meeting agenda. Meeting papers were then distributed in advance of each meeting.
		Section 5.6 - Authority	The CCAG acted as an advisory committee for the full year.
		Section 5.7 – Conflict of Interests	A standing item on each CCAG agenda is an opportunity to declare conflicts of interest. Any declarations made are recorded in the minutes.
		Section 5.8 – Sub-committees/working parties	Nil working parties/sub committees were formed or held in 2021-22.

Mandatory content	Charter reference	Charter requirement	Compliance
Procedures for monitoring issues raised at meetings	Section 6 – Monitoring and reporting on issues raised at the Customer and Community Advisory Group	Section 6.1 – Minutes – requires Hunter Water to maintain minutes of each meeting.	Minutes of each meeting are recorded, and tabled for adoption at the next meeting of the CCAG. Adopted minutes are published on the CCAG website. Minutes for CCAG meetings held during 2021-22 are available on the CCAG website.
Types of matters raised and mechanisms	Section 7 – Matters to be considered by the Customer and Community Advisory Group	Hunter Water will liaise with members to assemble the agenda and distribute in advance of meetings. Matters include: Performance objectives, consultation strategies, programs and activities, current and emerging issues.	Members are invited to submit items for the agenda, both in the form of substantive topics for inclusion and Questions on Notice. CCAG Members are also able to raise any topics (without notice) during General Business. Questions are documented in the Minutes, and actions recorded. Key matters raised in 2021-22 are described below.
Communicating meeting outcomes	Section 8 – Communicating the outcomes of the Customer and Community Advisory Group to the Public	Section 8.1 outlines Hunter Water's reporting responsibilities including publication of adopted meeting minutes will be published on Hunter Water's website. A summary of the Forum's work will be included in Hunter Water's Annual Report. Forum activities are to be included in newsletters to Hunter Water employees.	Meeting minutes are available on Hunter Water's website. (see https://www.hunterwater.com.au/haveyoursay/customer-and-community-advisory-group) A summary of meetings will also be included in Hunter Water's 2021-22 Annual Report.
Procedures for amending the charter	Section 10 – Charter Section 11 - Approvals	Section 10.1 – The CCAG's charter will be updated at least once every four years. The Charter is to be approved by Hunter Water's Board of Directors.	The Charter is scheduled to be reviewed by September 2022. It is noted that a new Operating Licence commenced on 1 July 2022. The new Charter will be updated to be consistent with the requirements of the new Operating Licence.
Funding and resourcing	Section 9 – Funding and resourcing of Customer and Community Advisory Group	Hunter Water will provide a venue and secretarial support for the CCAG. Members of the CCAG are paid a sitting fee consistent with the Premier's Memorandum (M2012-18 Classification and Remuneration Framework for NSW Government Boards and Committees). Hunter Water will reimburse members reasonable out of pocket expenses.	Hunter Water ensured appropriate venue and secretarial support was provided for each meeting. All CCAG members were provided with an option to collect the sitting fee for each meeting they attended in 2021-22. These fees were paid into the bank accounts nominated by members, or where nominated, paid to their organisation or a charity of their choice. Nil costs were reimbursed during 2021-22, however, this option remains available to members if required.

Source: Hunter Water's 2017-2022 Operating Licence, CCAG Charter. Hunter Water analysis

5.1.2 Customer and Community Advisory Group activities and achievements

In 2021-22, the CCAG considered a range of issues, including those recommended by Hunter Water, and self-generated topics that are of interest to members of the group. In accordance with the Charter, matters were raised either for information or to receive feedback from members. It should be noted that the matters outlined in the following sections were relevant to the time they were raised, however further progress and/or changes may have resulted since that time.

Key matters and achievements in 2021-22

Hunter Water's Strategic Direction (including corporate performance)

At each meeting, as part of the Managing Director's report, Hunter Water provided an update on corporate performance, including against the Towards 2024 Strategy, and Corporate Scorecard results.

Detailed presentations were provided on benchmarking Hunter Water's performance against the National Performance Report.

Lower Hunter Water Security Plan (LHWSP)

At each meeting, the Group received a presentation on the Lower Hunter Water Security Plan, including customer and community engagement processes and results, and phased investigations. This included discussions about community engagement, across the development of the plan.

A special briefing with the CCAG was held in August 2021 ahead of the public release of the draft Lower Hunter Water Security Plan. The plan was subsequently released to the public in April 2022.

Recycled Water, Water Conservation and Leakage

Members nominated the topic of recycled water and water conservation for discussion.

Hunter Water led an update on water conservation and leakage, and recycled water opportunities, including via the Lower Hunter Water Security Plan.

Regulatory matters

CCAG members have been engaged in regulatory matters relevant to Hunter Water. Hunter Water provided updates on Hunter Water's Operating Licence Review, levels of service work, the Customer Contract, IPART's new regulatory framework, and preparations for Hunter Water's next pricing proposal.

COVID and customer support

A regular focus of discussion at each CCAG meeting was Hunter Water's response to the COVID pandemic, including customer support initiatives.

Site tour: Belmont Wastewater Treatment Works and Desalination Site

A site tour was held of the Belmont Wastewater Treatment Works and the site of the proposed Belmont Desalination Plant. The tour included an overview of the wastewater treatment process, and investments to improve environmental sustainability and efficiency.

5.2 Actions taken to resolve root causes of complaints

The ongoing analysis of complaints is a key component of our corporate Voice of Customer Program, which is focused on understanding and utilising information around expectations, preferences and pain points of our customers and acting to improve overall customer experience and community outcomes. We undertake regular working group sessions using customer complaint information to prioritise improvements, including customer journey map development, as a means to remove customer pain points.

Our recently adopted 'Tone of Voice framework' has refined and improved our customer communication. This framework focuses on consistency and simplicity, to ensure our communication is relevant and easy to understand. To embed customer centricity across the organisation, we have provided targeted training in

Complaint Handling to uplift capability for our people and ensure customer centred decision making. These activities feed into our ongoing commitment to improving and delivering great experiences for our customers.

In 2021-22, total water and sewerage complaints decreased 12.8% compared to 2020-21.

Billing and account complaints decreased by 38.26% in 2021-22, driven by fewer meter reading complaints. We have seen billing accuracy improve across the last 12 months, with continued improvements in our meter reading system and processes that use photos to confirm higher or lower than normal meter readings. The introduction of our new billing system in November 2020 has also enabled increased focus on proactive bill validation, leading to improved bill accuracy.

Water quality complaints increased by 33.83% in 2021-22. The increase is mainly due to taste and odour complaints received from the operation of our Tomago water source, particularly in July and August 2021. Water provided from the Tomago water source has different characteristics (including taste and odour) and higher natural levels of iron and manganese, compared to other water storage sources. Complaints then decreased and stabilised throughout the remainder of the year. Other water service complaints decreased by 71.43% in 2021-22 due to increased rainfall and colder temperatures, resulting in lower water demand by customers which results in a more consistent and higher supply of pressure. In addition, we have improved our services for customers in relation to the visibility of both planned and unplanned water outage notifications. This has been achieved through improving SMS capability and implementation of a live interactive outage page on our website, resulting in fewer water service complaints.

Overall, sewer service complaints decreased by 15.58% in 2021-22. Sewer odour complaints were 12.25% lower, mainly due to higher rainfalls throughout the year. More rainfall results in wastewater spending less time within our wastewater network and higher flows flushing out biofilms from within the network.

We have continued to focus on improving customer complaint responsiveness and closing aged complaints more efficiently. This has been driven by system efficiencies and using data and insights to guide decision making. Our live complaint dashboard and targeted complaint training have provided greater visibility, capability and confidence for complaint management. Across 2021-22, 98% of complaints were resolved within 10 working days.

To ensure ongoing focus, collaboration and progress, we track complaints that are unable to be resolved in the short term through our commitment tracker. We regularly report progress to our Customer Case and Service Level Committee, with issues escalated to the Executive Management Team as required.

A project dedicated to reducing repeat customer impacts has continued to progress. Across the last 12 months, an information dashboard and impact framework has been developed to better inform our understanding and support short and long-term decision making and investment in improving our water or wastewater services for these customers.

5.3 Changes to customer and stakeholder documentation and procedures

Hunter Water's Operating Licence Reporting Manual requires it to report any changes to the following documents and procedures.

5.3.1 Customer Contract

Our Operating Licence includes a Customer Contract that clarifies the relationship between Hunter Water and our customers and consumers. The Customer Contract:

- provides clarity on the rights and obligations of each party
- describes the services we provide to our customers
- describes payment terms and assistance options for customers experiencing financial hardship
- provides information on enquiries, complaints and disputes.

There were no changes to the 2017-2022 Customer Contract in the financial year 2021-22 however during this time Hunter Water has worked with IPART to review and renew the Operating Licence and associated Customer Contract effective 1 July 2022.

5.3.2 Procedure for payment difficulties and actions for non-payment

We have sustained our focus on supporting customers financially impacted by the COVID-19 pandemic and increased cost of living pressures in 2021-22. The numbers of customers supported as part of our Customer Assistance Program doubled through peak COVID periods, reaching up to 1,645. We continue to see an increase in customers accessing this program. Hunter Water continues to review and refine our support options, practices and business rules in recognition of the pressures our customers are facing.

In the past 12 months, the ability of customers' to pay bills in full decreased, with a 20% increase in payment plans/extension during 2021-22. In response to this change we have designed and launched our 'Easy Pay' bill smoothing payment option online form. This enables customers to elect to pay smaller, more regular payments to better manage their household budget and water bills. To further support our customers in avoiding debt accrual, information and training have been rolled out to frontline staff regarding our 'Easy Pay' option. This allows our staff to appropriately offer this option at first point of contact.

We have refined the application of our hardship policy to include non-residential customers to access our Payment Assistance Support (PAS). This improvement was guided by insights from frontline staff, customer segmentation data and our Voice of Customer Program. We undertake regular workshop sessions to identify key trends, barriers to access support and to tighten our processes for engagement and negotiation with customers that may require extra assistance. For example, we are currently undertaking a customer engagement and research project that is dedicated to understanding vulnerability indicators in our local community. This vulnerability research explores topics including:

- how vulnerability can present in customers
- what barriers may exist for customers seeking support
- how we can improve our service offerings, now and in the future, to support vulnerable customers

We have refreshed our Customer Outreach Engagement Program, by reconnecting with all of our Community Service Partners to better understand frontline trends, increase awareness of how we can support customers and community, and identify strategic focus areas. Our Outreach Engagement Program maintains our strong partnerships with key stakeholders within the community as well as EWON (Energy and Water Ombudsman NSW) and other government service providers. As part of this program, we have also commenced bimonthly Outreach Visits, allocating one of our team members in a Community Service partner's office to have face to face engagement with customers that may be experiencing vulnerability. This proactive approach encourages further education about our support programs with both the service provider's staff and our customers, whilst assisting customers immediately with payment support, bills

smoothing, bill enquiries or more complex matters. This approach offers a more personalised and localised service experience for the customer.

Hunter Water have also attended the Hunter Disability Expo and Multicultural Services Expo in order to reach those that may be more vulnerable within our community and we endeavour to recommence our 'Bring Your Bill Days' in our region for 'one stop shop' support, in collaboration with other service providers. We will continue using a range of engagement channels to communicate with our diverse customer base, ensuring that we identify early indicators of vulnerability and understand how we can provide flexible support options for customers who may be experiencing short and/or long-term payment difficulty.

Collection actions recommenced in May 2022, with the support of our external collection agent. We adapted our collection approach, ensuring that capacity to pay assessments were undertaken in an empathic, understanding and collaborative way before moving forward with collection action for each customer. We also recommenced our home (field) visits, initiating contact with customers that may not have engaged or made a payment within the last 12 months, in order to provide a more personalised approach and resolution.

5.3.3 Customer Advisory Group Charter

A copy of the Customer and Community Advisory Group's Charter is available on the Group's website: www.hunterwater.com.au/ccag

No changes were made to the Charter during 2021-22.

The Charter is scheduled to be reviewed by September 2022.

It is noted that a new Operating Licence commenced on 1 July 2022, with some changes to the CCAG. The new Charter will be updated to be consistent with the requirements of the new Operating Licence.

5.3.4 Internal complaints handling procedure

We have an approved Standard for Complaint Handling (the Internal Complaint Handling Guideline) in place that is compliant with the Australian Standard AS/NZS 10002:2014. The Standard ensures that associated strategies and initiatives are supported and implemented, that we are compliant with regulatory requirements in line with the guiding principles of the Australian/New Zealand Standard AS/NZS 10002:2014 Guidelines for Complaint Management in Organisations, and that aligns with our Privacy Management Framework. Our Standard for Complaint Handling has been updated to align with the current Australian Standard AS/NZS 10002:2022.

The Standard for Complaint Handling is Hunter Water's commitment to the effective management and resolution of customer complaints and is reviewed every three years.

5.3.5 External dispute resolution scheme (EWON)

Hunter Water is a member of the Energy and Water Ombudsman of NSW (EWON), with 100% of cases referred by (EWON) being responded to efficiently within two business days. Escalated complaints referred to the Ombudsman decreased by 25% in 2021-2022, compared to 2020-21. Hunter Water and EWON have continued to regularly engage, via monthly round table sessions, as a way to build knowledge, understand insights and collaborate more effectively to achieve better customer outcomes. This decrease has also been driven by the increased education and awareness of our people in identifying potential escalations sooner and adopting earlier intervention opportunities to resolve complaints internally.

We make it easy and clear for customers to understand our complaint handling process and how they can contact EWON should they need to.

https://www.hunterwater.com.au/contact-us/compliments-complaints.

Complaint Handling Brochure

https://www.hunterwater.com.au/documents/assets/src/uploads/documents/Complaints-Handling-Brochure-July-2022.pdf

There were no changes to our external dispute resolution scheme in 2021-22.

6 GLOSSARY

6.1 Acronyms

Process	Description
ACF	Asset Creation Framework
ALARP	As low as reasonably practicable
ADWG	Australian Drinking Water Guidelines
AGWR	Australian Guidelines for Water Recycling
AMS	Asset Management System
AWTP	Advanced Water Treatment Plant
CCAG	Customer and Community Advisory Group
CCP	Critical control point
CT	Contact time
CTGM	Chichester Trunk Gravity Main
DOS	Disinfection Optimisation Strategy
DWQIP	Drinking Water Quality Improvement Plan
DWQMS	Drinking Water Quality Management System
ELWC	Economic Level of Water Conservation
EMP	Environmental Management Plan
EMS	Environmental Management System
EMT	Executive Management Team
EPA	NSW Environment Protection Authority
ERM	Enterprise Risk Management
EWON	Energy and Water Ombudsman of NSW
FSM	Field Service Model
GHG	Greenhouse gas
GIS	Geospatial Information System
HSMS	Health and Safety Management Plan
HU	Hazen unit
ILI	Infrastructure Leakage Index
IMS	Integrated Management System
IPART	Independent Pricing and Regulatory Tribunal
ISMS	Information Security Management Systems
ISO	International Organization for Standardization
LHWSP	Lower Hunter Water Security Plan
ML/day	Megalitres per day – one megalitre is a measure of volume equal to one million litres
MPN	Most probable number
NCR	Non-compliance report
NPR	National Performance Report
NTU	Nephelometric Turbidity Units
NWI	National Water Initiative
OEH	NSW Office of Environment and Heritage
PFAS	Per- and poly-fluoroalkyl substances

Process	Description
QMS	Quality Management System
RWQIP / RWQMP	Recycled Water Quality Improvement Plan / Recycled Water Quality Management Plan
RWQMS	Recycled Water Quality Management System
RWTP	Recycled Water Treatment Plant
SCADA	Supervisory control and data acquisition
VoC	Voice of Customer Program
WELS	Water Efficiency Labelling and Standards Scheme
WEMP	Water Efficiency Management Plan
WHS	Work Health and Safety
WSAA	Water Services Association of Australia – peak industry body for the Australian water industry
WTP	Water Treatment Plant
WWPS	Wastewater Pumping Station
WWTW / WWTP	Wastewater Treatment Works / Wastewater Treatment Plant

6.2 Water treatment terminology

Process	Description
Aeration	Aeration is typically used as a first step in the treatment of groundwater. The main function is to remove carbon dioxide and hydrogen sulphide from water, and to add oxygen, which assists in iron removal. Water extracted from Anna Bay Sandbeds and treated at Anna Bay and Nelson Bay Water Treatment Plants is naturally very low in iron and hydrogen sulphide. Aeration at these plants is essentially to remove carbon dioxide and add oxygen.
Coagulation / Flocculation	During coagulation, liquid aluminium sulphate (alum) and/or polymer is added to untreated water (raw water). When mixed with water, this causes tiny particles that are naturally present in source water, when extracted, to stick together or coagulate. The heavier/larger coagulated material ('floc') is easier to remove by settling or filtration.
Disinfection	Water is disinfected before it enters the distribution system to ensure that any disease-causing bacteria, viruses, and parasites are destroyed. Chlorine is used because it is a very effective disinfectant, and residual concentrations can be maintained to guard against possible biological contamination in the water distribution system. CT values are used to calculate disinfectant dosage for the chlorination of drinking water. The CT value is the product of the concentration of chlorine and the contact time with the water being disinfected. It is expressed in units of min.mg/L.
Filtration	Water flows through a filter designed to remove particles in the water. The filters are made of layers of sand and gravel, and in some cases, crushed anthracite. Filtration collects the suspended impurities in water and enhances the effectiveness of disinfection. The filters are routinely cleaned by backwashing. Microfiltration is a filtration process which removes particles from water by passage through a microporous membrane.
Fluoridation	Water fluoridation is the treatment of community water supplies for the purpose of adjusting the concentration of the free fluoride ion to the optimum level sufficient to reduce dental decay. Hunter Water is required to fluoridate in accordance with the NSW *Fluoridation of Public Water Supplies Act 1957*.
Membrane microfiltration	Membrane microfiltration is a type of physical filtration process where water is passed through a special pore-sized membrane to separate microorganisms and suspended particles from the raw water.
Powdered activated carbon (PAC) dosing (event based)	Powdered Activated Carbon (PAC) dosing is used to remove organic compounds from the water supply such as Geosmin and Methyl-Isoborneol (MIB) that periodically occur in surface waters. Geosmin and Methyl-Isoborneol (MIB) are naturally occurring compounds that have a musty, earthy taste and odour.
pH Correction	Lime is added to the filtered water to adjust the pH and stabilise the naturally soft water in order to minimise corrosion in the distribution system, and within customers' plumbing.
Sedimentation	As the water and the floc particles progress through the treatment process, they move into sedimentation basins where the water moves slowly, causing the heavy floc particles to settle to the bottom. Floc which collects on the bottom of the basin is called sludge, and is piped to drying lagoons.
Two-stage filtration (Lemon Tree Passage Water Treatment Plant)	Flocculation occurs within roughing filters (also referred to as adsorption clarifiers) before separation is achieved. In the roughing filter the coagulated water is fed upwards through a bed of granular plastic media where the flocs are trapped within the filter media and the filter overflow exits for further treatment. Final polishing of water from the roughing filters occurs within the dual media (ie coal/sand) rapid gravity filters.

6.3 Wastewater treatment terminology

Process	Description
Bioreactor	A bioreactor is a device that supports an aerobic or anaerobic biological environment.
Chloramine dosing	The application of chlorine and ammonia to water to form chloramines for the purpose of disinfection.
Chlorination	The application of chlorine to wastewater, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results - aiding coagulation or controlling odours or sludge bulking in wastewater.
Clarification	Any process or combination of processes the main purpose of which is to reduce the concentration of suspended matter in a liquid.
Dissolved air floatation	Dissolved air flotation is a water treatment process where wastewater is clarified by the removal of suspended matter such as oil or solids. Air is dissolved under pressure in wastewater and then released at atmospheric pressure in a tank. The released air forms tiny bubbles which stick to the suspended matter causing it to float to the surface, where it is removed by a skimming device.
Grit removal	Grit removal is accomplished by providing an enlarged channel or chamber that causes the flow velocity to be reduced and allows the heavier grit to settle to the bottom of the channel where it can be removed.
Maturation pond	A shallow pond that ensures sunlight penetrates the full depth for photosynthesis to occur. Oxygen is provided by algae during photosynthesis and wind-aided surface aeration. These ponds are often mixed by recirculation to maintain dissolved oxygen throughout their entire depth.
Membrane filtration	Membranes are thin and porous sheets of material able to separate contaminants from water when a driving force is applied. They are used to remove bacteria and other microorganisms, particulate material, micropollutants, and natural organic material.
Microfiltration	A pressure-driven membrane filtration process that separates particles down to approximately 0.1 µm diameter from influent water using a sieving process.
Oxidation ponds	A man-made body of water in which waste is consumed by bacteria.
Reverse osmosis	The Reversed Osmosis (RO) process uses a semi-permeable membrane to separate and remove dissolved solids, organics, pyrogens, submicron colloidal matter, viruses, and bacteria from water. The process is called ‘reverse’ osmosis since it requires pressure to force pure water across a membrane, leaving the impurities behind.
Screening	Screening removes gross pollutants from the wastewater stream to protect downstream operations and equipment from damage. The screen has openings that are generally uniform in size. It retains or removes objects larger than the openings. A screen may consist of bars, rods, wires, gratings, wire mesh, or perforated plates.
Secondary treatment	Typically, a biological treatment process that is designed to remove approximately 85% of the biological oxygen demand and influent suspended solids. Some nutrients may incidentally be removed, and ammonia may be converted to nitrate.
Sedimentation	The process of settling and depositing of suspended matter carried by water or wastewater. Sedimentation usually occurs by gravity when the velocity of the liquid is reduced below the point at which it can transport the suspended material.
Sludge digesters	Tank in which complex organic substances like sewage sludges are biologically dredged. During these reactions, energy is released and much of the sewage is converted to methane, carbon dioxide, and water. These changes take place as microorganisms feed on sludge in anaerobic or aerobic digesters.
Tertiary filtration (dual media)	Filtration is used to separate nonsettleable solids from water and wastewater by passing it through a porous medium. Dual media filters use two media, commonly crushed anthracite coal

Process	Description
	and sand. Tertiary treatment is the final cleaning process that improves wastewater quality before it is reused, recycled or discharged to the environment.
Total Nitrogen	Excessive amounts of Total Nitrogen may lead to low levels of dissolved oxygen, therefore load limits are set to protect downstream water quality from algal blooms.
Trickling filters	Trickling filters are processes that use a static medium such as rocks for growing a film or biomass and then trickling the wastewater over this medium.
UV disinfection	Ultraviolet irradiation achieves disinfection by inducing photobiochemical changes within microorganisms. When ultraviolet radiation is absorbed by the cells of microorganisms, it damages the genetic material in such a way that the organisms are no longer able to grow or reproduce, thus ultimately killing them.

6.4 Key physical, chemical and microbiological drinking water quality parameters

Water Quality Parameter	Description
Aluminium	Aluminium occurs naturally in untreated water in the form of silts and clays. Aluminium sulphate (alum) is also used as a flocculent to remove unwanted colour and turbidity from water supplies. Research has shown that aluminium in drinking water does not make up a substantial proportion of aluminium ingested, and that aluminium in drinking water is no more bio-available than any other source.
Chlorine	Chlorine is used as a disinfectant in water treatment. It controls potentially harmful micro-organisms to ensure the safety of drinking water.
Colour	Colour is measured in Hazen Units (HU). Colour can originate from organic matter in the soil through, or over, which the water has passed.
Copper	Copper is naturally present in both treated water and throughout the distribution system. However, soft water in contact with copper plumbing systems can on occasion give higher concentrations of copper at the customer tap. The incidence of high copper concentrations within Hunter Water's area of operation is very low, and customer complaints are infrequent.
E. coli	*Escherichia coli* is an indicator bacteria, that is, bacteria which are not normally harmful in themselves, but may indicate the presence of other pathogenic (disease-causing) micro-organisms. *E. coli* is a type of thermo-tolerant coliform bacteria, and is nearly always present in the faeces of humans and other warm-blooded animals. *E. coli* is generally regarded as the most specific indicator of faecal contamination, and therefore an important indicator for public health.
Fluoride	In accordance with the *Fluoridation of Public Water Supplies Act 1957*, fluoride is added to the water to help prevent tooth decay and generally improve dental health.
Iron and Manganese	Iron and manganese may occur naturally at low levels in the water and may be responsible for taste and staining problems with the water.
Lead	Lead levels in Hunter Water's distribution system are typically less than the 0.001 mg/L limit of detection and well below the health guideline of 0.01 mg/L. Lead levels in customer plumbing can occasionally be elevated where water has lengthy residence time in contact with brass plumbing fittings. These contain small quantities of lead, and leaching into the water can occasionally occur. However this is very unlikely to cause continually elevated lead levels. Note that within the area serviced by Hunter Water, there is little or no lead pipework left in the plumbing systems.
pH	pH is a measure of the hydrogen ion concentration of water. A pH of 7 is neutral, greater than 7 is alkaline, and less than 7 is acidic. pH is important because it can affect the disinfection process.
Trihalomethanes	THMs are formed during the disinfection process by reaction between chlorine and mainly naturally-occurring organic substances. Treatment processes are controlled to minimise their production.
Turbidity	Turbidity refers to the cloudiness or dirtiness of water, and is measured by a light scattering technique. Turbidity is measured in Nephelometric Turbidity Units (NTU).
Zinc	As with other heavy metals, treated and reticulated water supplied by Hunter Water contains only very low levels of naturally occurring zinc. Some elevated levels in customer plumbing can be caused by old galvanised pipes and some leaching ("dezincification") from older style brass fittings. Newer plumbing systems do not use galvanised steel, and brass fittings are normally "dezincification resistant", so levels of zinc at the tap are rarely elevated.

Hunter Water
ABN 46 228513 446
Customer enquiries 1300 657 657
enquiries@hunterwater.com.au
hunterwater.com.au

Version: 1.0

Date: September 2022