COMPLIANCE AND PERFORMANCE REPORT

SEPTEMBER 2018

HUNTER WATER

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Hunter Water is a state-owned corporation that strives to be a valued partner in delivering the aspirations of our region. We provide safe, reliable and efficient water and wastewater services to over half a million people in the Lower Hunter region. Our Operating Licence is the key regulatory instrument that enables and requires us to provide our services. This 2017-18 Compliance and Performance Report provides detailed information on our performance in accordance with our Reporting Manual.

Since the introduction of our 2017+3 Strategy, we have pursued strategic programs aimed at enabling the sustainable growth of the region and the life our communities desire with high quality, affordable services. This has required us to shift to an 'always on' community engagement approach that aligns with our intent to become a learning organisation where customers, instead of being passive consumers, become participants in the decisions of our organisation as we learn together.

Our multiple barrier approach to our drinking water quality management system ensured that consistently safe drinking water was supplied to customers throughout the year. We reviewed and revised our critical control points (CCPs) in 2017-18 in consultation with NSW Health. Our verification monitoring results showed full compliance with required water quality parameters. We completed a variety of drinking water quality activities throughout the year to continue to improve the quality and consistency of the drinking water that we supply to our customers.

During 2017-18 we supplied safe recycled water to a range of non-residential users including golf courses and industrial customers. Our recycled water quality management system performed well, including our performance at CCPs. We continued to undertake activities and programs aimed at improving our recycled water quality management system.

Aligned with our aspirational goal to add ten years to the timing of our future water source augmentation, we pursued a range of water conservation projects during 2017-18, highlighted by our successful drive to continue to reduce our non-revenue water and water leakage across our system; leakage fell for the second successive year. We also launched our 'Love Water' campaign which aims to engage more deeply with the community in order to encourage behavioural change. Our average annual residential water consumption increased from the previous year due to the hot and dry conditions that prevailed for the majority of the year.

During 2017-18 we maintained our strong track record of compliance, demonstrated by the performance of our certified management systems; no major non-conformances were identified. We achieved certification of our asset management system with the new International Organisation for Standardisation (ISO) standard, becoming the first Australian urban water authority to be certified against this standard.

We developed and implemented a new environmental management plan (EMP), which is a key component of our environmental management system. Our EMP outlines our environmental objectives, program of actions and targets to manage risk and to drive environmental improvements for the organisation. We continued to implement our quality management system and successfully transitioned this system to be certified against the latest version of the ISO standard.

We achieved compliance against our five system performance standards which relate to the number of our customers that are affected by water pressure failures, water continuities and wastewater overflows throughout the year. We also updated our Enterprise Risk Management framework including introducing risk appetite statements and revising our risk rating tools.

We have performed soundly during the first year of our new Operating Licence (2017-2022) and continue to be committed to full compliance with all our regulatory obligations.

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 the 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 number of regulatory bodies and instruments.

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

This 2017-18 Compliance and Performance Report provides detailed information on our performance against prescribed clauses of the Operating Licence[1] and in accordance with the associated reporting manual[2]. Each chapter addresses a specific topic in the licence.

Our water quality performance is reported in chapter two. This chapter provides an overview of our drinking water supply systems, recycled water supply systems and how these are managed. It reports on performance at critical control points (CCPs) where we apply controls to ensure water quality. Activities and programs to manage water quality are described for 2017-18 and beyond. Any non-conformances with the drinking water quality and recycled water quality management systems are described. Chapter two also describes our performance against our system performance standards for water pressure, water continuity and wastewater overflows.

Our water quantity performance is reported in chapter three. It indicates our compliance with the water conservation target for residential water use defined in our Operating Licence, contributing projects undertaken in 2016-17 and those planned for the future. The chapter also outlines the estimate of our system yield as developed under the Lower Hunter Water Plan (LHWP).

Chapter four describes the performance of our asset, environmental and quality management systems that are each certified against the relevant standards. For each management system, the activities undertaken to meet the system's objectives and the associated outcomes of these activities are described. Proposed future activities and programs are outlined, as well as any non-conformances with each management system.

Our customer and stakeholder performance is reported in chapter five. The activities and achievements of the Customer and Community Advisory Group in 2017-18 are described, as is compliance against the group charter. Systemic problems arising from our analysis of customer complaints are identified and the actions taken to resolve these problems are reported. The chapter also describes any changes made to our customer contract, procedure for payment difficulties and actions of non-payment, customer and community advisory group charter, internal complaints handling procedure and its external dispute resolution scheme.

We report our performance against the National Water Initiative indicators and IPART's performance indicators in chapters six and seven respectively.

[1] NSW Government 2017, Hunter Water Operating Licence 2017-2022
[2] 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. Our drinking water systems are managed in accordance with the Australian Drinking Water Guidelines 2011 (ADWG) framework for management of drinking water quality (referred to as 'the framework').[3] 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 by the natural landscape by creeks, rivers and groundwater systems. Water quality in our catchments is protected by regulation that controls activities that are allowed within them.[4] We also work closely with the community and stakeholders on land management and development to ensure that it is undertaken in a manner appropriate for a drinking water catchment. The locations of our drinking water catchments are shown in Figure 2-1.

- **Storages**

  Water is stored in dams and groundwater sandbeds (aquifers) before it is treated to drinking standards. Drinking water storages that we own are: Chichester Dam, Grahamstown Dam, Tomago Sandbeds and Anna Bay Sandbeds. Some water is also sourced 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 2-1 and capacities are provided in Table 2-1.

- **Water treatment plants**

  We operate six water treatment plants (WTPs) that treat water to a quality suitable to safely drink. These water treatment plants are Dungog WTP, Grahamstown WTP, Lemon Tree Passage WTP, Anna Bay WTP, Nelson Bay WTP and Gresford WTP. The locations of our WTPs are shown in Figure 2-1.

- **Water supply systems**

  The water that we supply is transported and stored within a closed distribution network. All clear water tanks and storage reservoirs within the distribution system are fully covered and regular inspections are undertaken to ensure that the integrity of the system is maintained. Security measures are in place to prevent unauthorised access to water storages. Maintenance and construction activities are undertaken in accordance with procedures that are designed to ensure that drinking water quality is protected. 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. Water supply systems are shown in Figure 2-2 and further described in section 2.1.2.

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 Water in Karuah (5.2 ML in 2017-18) and can also supply and receive bulk treated water from the Central Coast. During 2017-18, we supplied 148 ML of water to the Central Coast and received 675 ML from Central Coast Council's water supply system. Central Coast Council maintain a

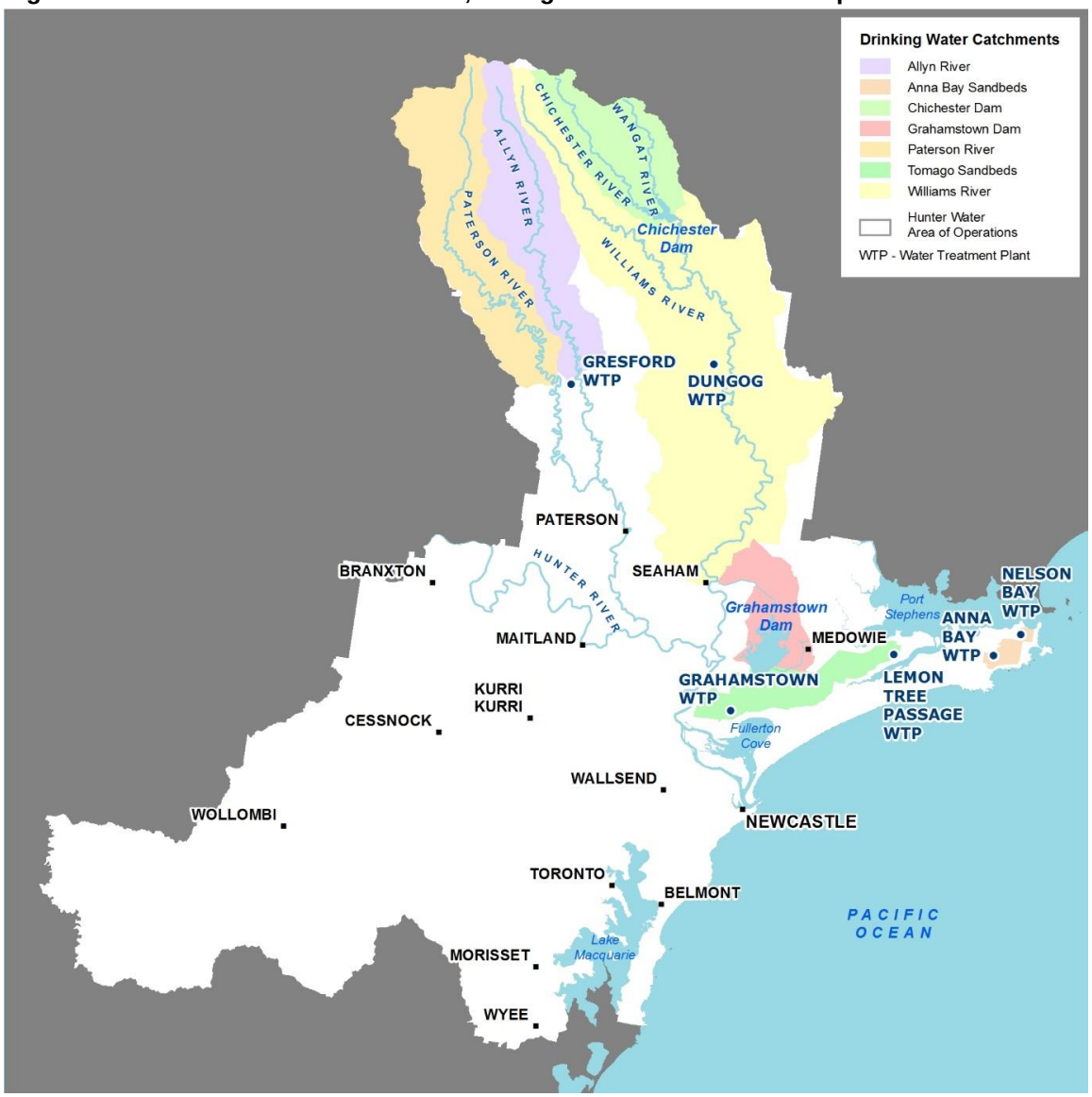
[3] National Health and Medical Research Council, 2016, Australian Drinking Water Guidelines 2011,– updated Oct 2017
[4] *Hunter Water Regulation 2015*, Part 2 – Special Areas.

quality assurance program for their 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, including 2.5 ML to Cooranbong Water and 58.2 ML to Huntlee Water.

Table 2-1 Capacity of Hunter Water's water storages

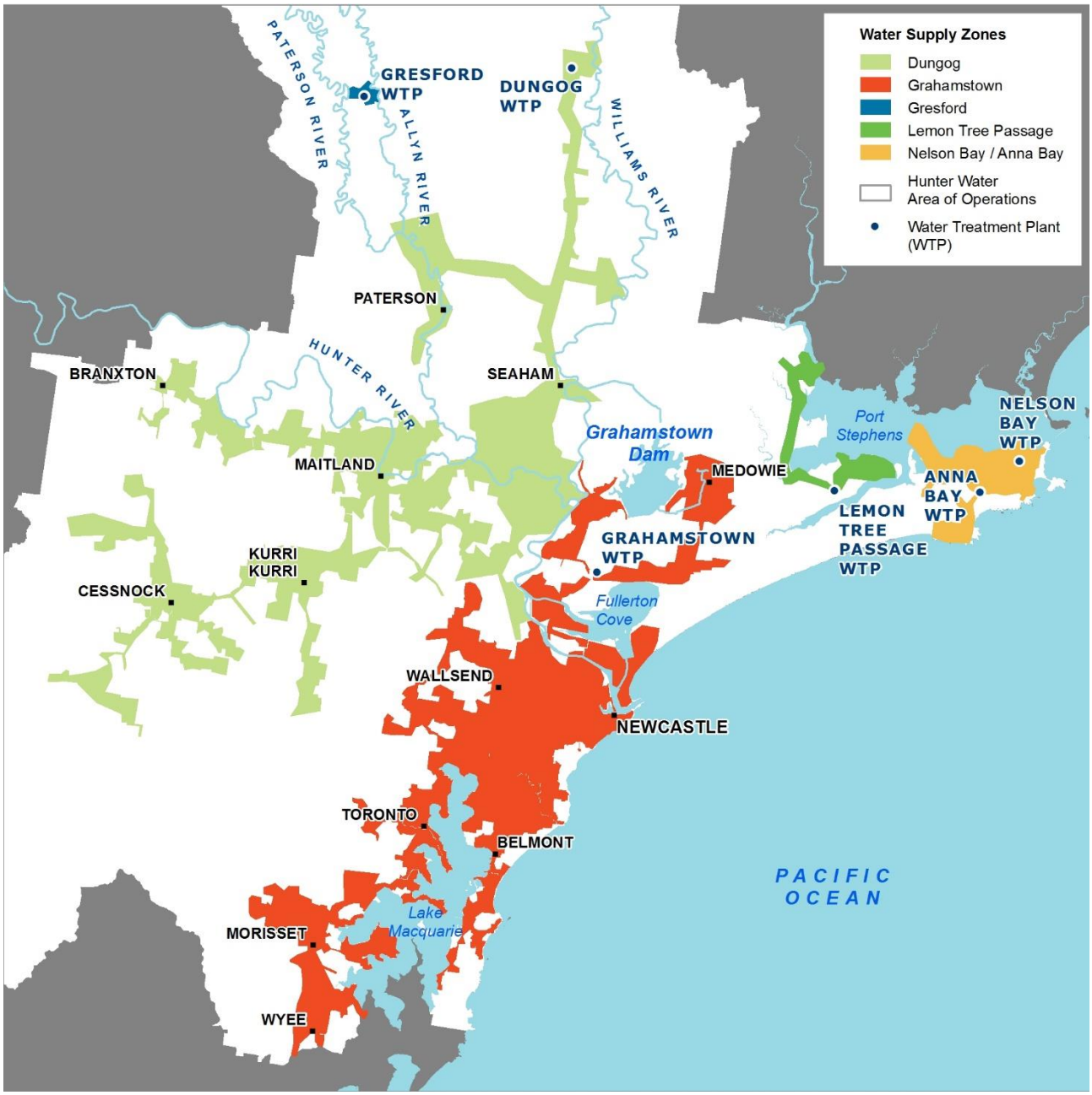
Water Source	Maximum Capacity (ML)
Chichester Dam	18,356
Grahamstown Dam	182,305
Tomago Sandbeds	60,000
Anna Bay Sandbeds	16,024
Total Storage	276,685

Figure 2-1 Hunter Water's catchments, storages and water treatment plants



Source: Hunter Water

Figure 2-2 Hunter Water's drinking water supply systems



Source: Hunter Water

2.1.2 Performance at critical control points

Where practical, water quality parameters at Critical Control Points (CCPs) are continuously 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 corrective action can be taken before the critical limit is reached. Notification limits have also been set in consultation with NSW Health.

In situations where the CCP is located immediately prior to potential supply to customers, the notification limit is the same as the critical limit. Exceedance of the critical limit indicates a risk of unacceptable water quality being supplied to customers. At some other CCPs, exceedance of a critical limit triggers both a corrective action and further sampling (or calculations) to determine whether water quality is acceptable for supply to customers. Hunter Water has implemented automatic shutdown for key water quality parameters at all WTPs to ensure critical limits are not exceeded.

We reviewed and revised our CCPs in 2017-18 in consultation with NSW Health.

An outline of each of our water supply zones and performance at CCPs during 2017-18 is set out below. An exceedance of a CCP does not necessarily indicate that unsafe water quality was supplied to customers, rather it means that the acceptable 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 (see section 7.2).

Dungog water supply system

Water from Chichester Dam is treated at Dungog WTP. Dungog WTP is a direct filtration plant with a maximum capacity of 90 ML/day. Treatment processes at the plant are:

- raw water chlorination
- 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. Water supplied to Maitland and Cessnock is re-chlorinated at the outlet of Buttai 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 estimated permanent population within the Dungog water supply system is 144,000 people. Performance at CCPs within the system is provided in Table 2-2.

Table 2-2 Dungog water supply system: CCPs performance 2017-18

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 4 min.mg/L) [a]	✓
	pH at clear water tank outlet must not be less than 6 or 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 rechlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✗ [b]

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

b) Free chlorine residual recorded at Four Mile Creek Chlorinator exceeded 4.5 mg/L between 10:38 pm and 10:55 pm (17 minutes) on 20th October 2017, reaching a maximum reading of 4.7 mg/L. At this maximum concentration there was no risk to human health. The water mixes and is diluted within the trunk mains downstream of Four Mile Creek Chlorinator, and it is expected that the chlorine within the distribution system would have been lower than the peak recorded at the chlorinator. No customer complaints were received in relation to this brief exceedance. Modifications to the chlorinator including installation of an additional sample line and chlorine analyser, new pipework and valving and a new programmable logic controller were completed to mitigate risks associated with chlorine dosing monitoring and control at Four Mile Creek Chlorinator.

Grahamstown water supply system

Water from Grahamstown Dam and the Tomago Sandbeds is treated at Grahamstown WTP. The plant has a maximum capacity of 266 ML/day and includes the following treatment processes:

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

Treated water from Grahamstown WTP is pumped to Newcastle and Lake Macquarie, as well as Medowie, Stockton and Kooragang Island. The water is re-chlorinated at four locations within the Newcastle and Lake Macquarie distribution system to improve the chlorine residual in order to minimise water quality risk within the distribution system. Water from this supply zone is also pumped to the Tomaree Peninsula to form part of the supply to Port Stephens. The estimated permanent population within the Grahamstown water supply system is 391,000 people. Performance at CCPs within the water supply system is summarised in Table 2-3.

Table 2-3 Grahamstown water supply system: CCPs performance 2017-18

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 4 min.mg/L) [a]	✓
	pH at clear water tank outlet must not be less than 6 or greater than 9 for > 15 consecutive minutes	✓
	Free chlorine residual post rechlorination 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 rechlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
Elermore Vale Chlorinator	Free chlorine residual at water mains rechlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
North Lambton Chlorinator	Free chlorine residual at water mains rechlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓
Toronto Chlorinator	Free chlorine residual at water mains rechlorination facilities must not exceed 4.5 mg/L for > 15 consecutive minutes	✓

a) Chlorine*Contact Time (CT) is calculated using chlorine, flow and Clear Water Tank level data. A surrogate limit of 0.25mg/L free chlorine at the Clear Water Tank inlet and mains chlorination applies.

Lemon Tree Passage water supply system

Water from the Tomago Sandbeds is treated at Lemon Tree Passage WTP. The plant has a maximum capacity of 5 ML/day and includes the following processes:

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

Treated water is pumped from Lemon Tree Passage WTP to Tanilba Bay, Mallabula, Lemon Tree Passage, Swan Bay and Karuah. The estimated permanent population supplied by this system is 8,800 people.

Performance at CCPs within the water supply system is summarised in Table 2-4.

Table 2-4 Lemon Tree Passage water supply system: CCPs performance 2017-18

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 combined secondary filter outlets	✓
Lemon Tree Passage WTP disinfection	Disinfection prior to first customer (Chlorine*Contact Time (CT) must not be less than 4 min.mg/L) [a]	✓
	pH at clear water tank outlet must not be less than 6 or greater than 9 for > 15 consecutive minutes	✓
	Free chlorine residual at the clear water tank inlet must not exceed 4.5 mg/L for > 15 consecutive minutes. If this limit is breached, free chlorine residual is calculated at the clear water tank outlet to determine the quality of water supplied to customers.	✓
Lemon Tree Passage WTP fluoridation	Fluoride concentration at clear water tank inlet must not exceed 1.5 mg/L for > 5 consecutive minutes	✓[b]

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

b) If this limit is exceeded, fluoride concentration is derived at the outlet to determine the quality of water supplied to customers, i.e. to ensure that water quality supplied to customers does not exceed the ADWG guideline of 1.5 mg/L.

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. Water is extracted using a network of production bores and treated at Anna Bay and Nelson Bay WTPs.

Each WTP can supply a maximum flow of about 12 ML/day using the following processes:

- 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 estimated permanent population within the water supply system is 34,200 people. Water from Grahamstown WTP can also supplement this water supply system. Performance at CCPs within the water supply system is summarised in Table 2-5.

Table 2-5 Anna Bay/ Nelson Bay water supply system: CCPs performance 2017-18

Critical Control Point	Critical limits	Compliant
Anna Bay WTP disinfection	Disinfection prior to first customer (Chlorine*Contact Time (CT) must not be less than 4 min.mg/L) [a]	✓
	Free chlorine concentration at clear water tank inlet must not exceed 4.5 mg/L for > 15 minutes. If this limit is breached, free chlorine residual is calculated at the clear water tank outlet to determine the quality of water supplied to customers.	✓
	pH at clear water tank outlet must not be less than 6 or 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 4 min.mg/L) [a]	✓
	pH at the clear water tank inlet must not be less than 6 or greater than 9 for > 15 consecutive minutes	✓
	Free chlorine residual at clear water tank inlet must not exceed 4.5 mg/L for > 15 consecutive minutes. If this limit is breached, free chlorine residual is calculated at the clear water tank outlet to determine the quality of water supplied to customers.	✓
	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 inlet must not exceed 1.5 mg/L for > 5 consecutive minutes. If this limit is exceeded, fluoride concentration is derived at the outlet to determine the quality of water supplied to customers.	✗ [b]

a) Chlorine*Contact Time (CT) is calculated using chlorine, flow and Clear Water Tank level data. A surrogate limit of 0.3 mg/L and 0.2 mg/L free chlorine applies at the Clear Water Tank inlets, at Anna Bay WTP and Nelson Bay WTP, respectively.

b) Fluoride concentration at the clear water tank inlet at Nelson Bay WTP exceeded 1.5 mg/L for > 5 minutes on a number of occasions but on all occasions the concentration at the clear water tank outlet complied with the ADWG health-related guideline (i.e. ≤ 1.5 mg/L) and was safe to drink. This information was presented to NSW Health and we have also subsequently improved the process control of Nelson Bay WTP to address this issue. In addition, we are pursuing a project to install fluoride analysers on the clear water tank outlet to improve monitoring of this CCP.

Gresford water supply system

Water is extracted from the Allyn and Paterson Rivers at Gresford, and is treated at the Gresford WTP. The plant has a maximum capacity of 5 ML/day and includes the following processes:

- membrane microfiltration
- disinfection

Performance at CCPs within the water supply system is summarised in Table 2-6.

Table 2-6 Gresford water supply system: CCPs performance 2017-18

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 4 min.mg/L) [a]	✓
	pH at the clear water tank inlet must not be less than 6 or 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.	✓

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 inlet 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: [5]

> *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 2017-18, full compliance with regulatory requirements were achieved for verification monitoring. The performance and mean results of analysis for key microbiological and physical / chemical parameters are shown in Table 2-7, Table 2-8 and Table 2-9. Descriptions of the parameters are provided in section 7.4.

[5] National Health and Medical Research Council, 2016, Australian Drinking Water Guidelines 2011– updated Oct 2017, Element five, Section 9.5, p. 140.

Table 2-7 Microbiological water quality 2017-18

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	99.83% of samples contained < 1 MPN per 100 mL	✓

Table 2-8 Key health physical/ chemical analytes 2017-18

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	1.02	✓
Chlorine	mg/L	5		1.19	✓
Copper	mg/L	2		0.025	✓
Lead	mg/L	0.01		0.001	✓
Manganese	mg/L	0.5		0.013	✓
Trihalomethanes	mg/L	0.25		0.150	✓

Table 2-9 Key aesthetic physical/ chemical analytes 2017-18

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	0.023	✓
Aluminium	mg/L	0.2		0.047	✓
Copper	mg/L	1		0.008	✓
Zinc	mg/L	3		0.005	✓
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 2017-18

Improvements to drinking water quality management undertaken or underway during 2017-18 are shown in Table 2-10.

Table 2-10 Drinking water quality management activities and programs 2017-18

ADWG Framework sub-element		Water quality objective	Activity / Program	Results / Outcomes
3.1	Preventive Measures and Multiple Barriers	Mitigate risks associated with dosing control at network re-chlorination facilities	Modifications to Four Mile Creek Chlorinator	Modifications to the chlorinator including installation of an additional sample line and chlorine analyser, new pipework, valving and a new programmable logic controller.
2.1	Assessment of the Drinking Water Supply System	Assess water quality risks in the distribution system across Hunter Water	Distribution system risk review	A workshop based risk assessment was held in June 2018 with key stakeholders including NSW Health. The workshop was facilitated by an independent water quality specialist.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	Dungog WTP upgrades / modifications.	Upgrades / modifications including raw water inlet failsafe valve, clear water tank to inlet valve automation, and filter gullet remediation were completed in 2018.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination.	Assessment of the Dungog WTP against the Water Research Australia Good Practice Guide for the management of microbial risk.	Assessment includes site inspections completed in 2018. Finalisation of documentation expected in July 2018.
3.1	Preventive Measures and Multiple Barriers	To improve chlorine residuals across the network.	Distribution system Disinfection Optimisation Strategy (DOS) Stage 1B program of chlorinator upgrades.	Options assessment for chlorinator upgrades is underway. Upgrades currently expected to be completed by June 2020.
3.1	Preventive Measures and Multiple Barriers	Minimise impact of existing septic systems on drinking water catchments.	Inspection/rectification of on-site sewer systems (SIRP).	Supplementary resourcing provided to Port Stephens and Dungog Shire Councils to assist with environmental compliance and inspection of septic systems.
3.1	Preventive Measures and Multiple Barriers	Reduce impact of agricultural land uses on drinking water catchments.	Monitoring and validation of the dairy farm upgrades undertaken, and investigation of additional catchment improvement opportunities.	The program in the Williams River is complete. The project has transitioned into the Sustainable Agricultural Project, which is being implemented in the Paterson and Allyn River valleys and the Upper Chichester River.

ADWG Framework sub-element		Water quality objective	Activity / Program	Results / Outcomes
3.1	Preventive Measures and Multiple Barriers	Minimise impact of dairy industry on drinking water catchments.	Tillegra Riparian Improvement Project (TRIP).	Delivery of primary riparian buffer zone establishment works was completed in 2018 with ongoing weed management works. Impacts from dairy industry in the Paterson, Allyn and Upper Chichester Rivers will be addressed by the Sustainable Agriculture Project.
3.1	Preventive Measures and Multiple Barriers	Education of the general public about water quality and catchment management issues.	Schools engagement project.	Project is ongoing, and is intended to continue through the 2021/22 price path, with delivery by Hunter Local Land Services.
3.1	Preventive Measures and Multiple Barriers	Reduce turbidity and associated water quality risks associated with erosion in the Williams River.	Seaham Weir Pool erosion management project	Liaison with Roads and Maritime Services (RMS) and Transport for NSW (TfNSW) ongoing. Works are subject to funding agreement with RMS, but are expected to continue through the 2020-24 price path.
3.1	Preventive Measures and Multiple Barriers	Provide safe drinking water to customers.	In consultation with customers, Hunter Water has now committed to provide potable drinking water to all non-standard customers connected to the CTGM.	Consultation and site inspections have been undertaken with each affected property owner to determine which solution (on property rainwater tanks or point of entry water treatment) was most appropriate for them. Installation of rain water tanks has commenced. We are targeting to complete the project by the end of 2018.
3.1	Preventive Measures and Multiple Barriers	Protect and improve water quality in Hunter Water's catchments and storages.	Update the Catchment Management Plan for implementation.	The revision of the Catchment Management Plan has been completed, and includes works up until 2022.

2.1.5 Proposed drinking water quality management activities and programs

Proposed measures to improve drinking water quality management in the future are outlined in Table 2-11.

Table 2-11 Proposed drinking water quality management activities and programs

ADWG Framework sub-element		Water quality objective	Activity / Program	Scope / Expected Outcomes / Timeframe
3.1	Preventive Measures and Multiple Barriers	Mitigate pathogen risks supplied from Gresford WTP in accordance with new Health Based Targets.	Prepare Business Case for additional treatment barrier to Gresford WTP.	A business case to address treatment requirements at Gresford WTP will be prepared in 2019.
10.1	Management of Documentation and Records	Document information pertinent to all aspects of drinking water quality management.	DWQMS manual peer review and update.	The DWQMS manual will be peer reviewed by a specialist water quality consultant and updated to ensure it reflects best practice.
3.2	Critical Control Points	Improved monitoring of fluoride critical control points.	Install fluoride analysers at clear water tank outlets.	Analysers to be installed and commissioned by 2019.
3.2	Critical Control Points	Improved monitoring of disinfection critical control points.	Review / development of disinfection critical control points.	Disinfection critical control points to be reviewed / developed by late 2019.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination at Dungog WTP.	Implementation of recommendations from assessments undertaken against the Water Research Australia Good Practice Guide for management of microbial risk.	Recommendations will be prioritised in 2018 and where appropriate added to the drinking water quality improvement plan.
3.1	Preventive Measures and Multiple Barriers	Improved barriers to pathogen contamination in the distribution network.	Review and improve distribution network reservoir inspection process.	The reservoir inspection process will be reviewed in 2018.
3.1	Preventive Measures and Multiple Barriers	Minimise impact of existing septic systems on drinking water catchments.	Inspection/rectification of on-site sewer systems (SIRP).	Continuation of resourcing of Port Stephens Council (PSC) and Dungog Shire Council (DSC) to assist with environmental compliance and inspection of septic systems.
3.1	Preventive Measures and Multiple Barriers	Reduce impact of agricultural land uses on drinking water catchments.	Monitoring and validation of the dairy farm upgrades undertaken under the DEFMP and investigation of additional catchment improvement opportunities.	This project is continuing and is being implemented in the Paterson and Allyn River valleys and the Upper Chichester River until 2020
3.1	Preventive Measures and Multiple Barriers	Minimise impact of dairy industry on drinking water catchments.	Sustainable Agriculture Project	Impacts from dairy industry in the Paterson, Allyn and Upper Chichester Rivers will be addressed by the Sustainable Agriculture Project. Project will also

ADWG Framework sub-element		Water quality objective	Activity / Program	Scope / Expected Outcomes / Timeframe
				include follow-up assessment of the Dairy Effluent and Farm Management Project undertaken in the Williams River.
3.1	Preventive Measures and Multiple Barriers	Education of the general public about water quality and catchment management issues.	Schools engagement project.	Project is ongoing and is intended to continue through the 2020-24 price path, with delivery by Hunter Local Land Services.
3.1	Preventive Measures and Multiple Barriers	Reduce turbidity and associated water quality risks associated with erosion.	Seaham weir pool and other erosion management works	Liaison with RMS and TfNSW ongoing. Hunter Water has committed to funding erosion management works in the Seaham weir pool which is subject to a funding agreement with RMS. Revegetation works on the HWC land adjacent to Campvale Canal and mitigation works to reduce sediment runoff from unsealed roads near Chichester Dam are planned to be undertaken during the next two price paths.

2.1.6 Continual improvement of the DWQMS in 2017-18

Drinking water quality improvement initiatives are documented in the drinking water quality improvement plan (DWQIP) and prioritised and reported through a standing agenda item at the monthly meeting of the cross-divisional Water Quality Committee. Over the last 12 months, Hunter Water completed 95% of actions prioritised in the DWQIP. Example improvements that were conducted over this period include:

- Review of the distribution system risk assessment;
- Establishment of primary riparian buffer zones as part of the Tillegra Riparian Improvement Project (TRIP);
- Commencement of potable drinking water solutions to non-standard customers connected to the Chichester Trunk Gravity Main (CTGM); and
- Improved labelling of CCPs to increase visibility and awareness for operators.

The purpose of the monthly Water Quality Committee is to oversee provision of safe drinking water to customers and the community. The committee considers factors including, but not limited to:

- significant changes to the DWQMS;
- operational performance including CCPs;
- water quality sampling results and trends;
- corrective action taken in response to water quality variations and exceptions; and
- outcomes of internal and external audits of the DWQMS

Findings and actions from meetings of the Water Quality Committee are communicated to and reviewed by our Executive Management Team (EMT) on an as required basis.

We conduct an annual Integrated Management System (IMS) review meeting. The meeting involves the EMT and includes a review of the individual systems of the IMS (i.e. safety, environment, quality, drinking water, recycled water, assets and information security). The requirements of the DWQMS and ADWG are incorporated in the meeting agenda and presentation for these meetings. Progress of improvement initiatives from the DWQIP are communicated to the EMT through this review meeting.

The performance and effectiveness of the DWQMS is also reported to, monitored and reviewed by the EMT as part of the formal quarterly strategic risk driver analysis update. This update includes action items from the DWQIP that address existing risks, and also identifies needs for change including where additional capital and operating expenditure may be required.

Findings, results and reports from IPART's operational audit are reviewed by the EMT and action plans developed for addressing recommendations and findings including allocating additional resources as required. Key metrics for drinking water quality related to system effectiveness including water quality verification testing and water quality complaints are reported monthly to the EMT and our Board of Directors. Key EMT members are involved in quarterly liaison meetings with NSW Health to review the effectiveness of the DWQMS and discuss operational issues.

Hunter Water ensures resources are dedicated to the development, review and implementation of the DWQMS through the Water Quality Committee and a dedicated DWQMS coordinator. All our management, employees and contractors involved in the supply of drinking water are responsible for understanding, implementing, maintaining and continuously improving the DWQMS. All members of the EMT sit on the Management Investment Committee which provides strategic oversight and makes recommendations on major investments and service provision strategies and planning. Prioritisation of all capital projects includes assessment of risk in accordance with our Enterprise Risk Management framework that includes a category for public health risk (covering drinking water quality).

2.1.7 Significant changes to the drinking water quality management system

We proposed to make three significant changes to the Drinking Water Quality Management System during 2017-18. We notified NSW Health of these proposed changes on 19 March 2018. The proposed changes included:

- To adopt the updated Enterprise Risk Management framework in relation to the Drinking Water Quality Management System. This includes the introduction of risk appetite statements and applying the revised risk rating tools for all new risk assessments undertaken.
- Revision of the future schedule of risk assessments for the 2017-2022 Operating Licence Period.
- A revision to the Criteria for Notification to NSW Health for Drinking Water Quality proposed in consultation with NSW Health. This proposed revision was tabled at a meeting between Hunter Water and NSW Health on 1 March 2018.

Following consultation with NSW Health, the updated criteria for notification to NSW Health for DWQ and future schedule of risk assessments were implemented from 6 April 2018. We are continuing to consult with NSW Health on the revised risk rating tools for all new risk assessments. This consultation is ongoing.

2.1.8 Non-conformances with the Drinking Water Quality Management System

There were no non-conformances with the Drinking Water Quality Management System during 2017-18.

2.2 Recycled water

2.2.1 Introduction

Hunter Water manages its recycled water schemes in a way that protects human health and the environment and complies with customer agreements and 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 CCPs.

The AGWR requires Recycled Water Quality Management Plans (RWQMPs) to be developed 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 surrounding the operation and management of the recycled water system.

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

This section of the report describes:

- Hunter Water's recycled water schemes
- Performance at CCPs during 2017-18
- Recycled water quality management activities completed during 2017-18 (Table 2-23)
- Proposed future activities (Table 2-24).
- Continual improvement activities undertaken during 2017-18
- Significant changes made to the Recycled Water Quality Management System (RWQMS) in 2017-18
- Any non-conformances of the RWQMS

2.2.2 Overview of recycled water schemes

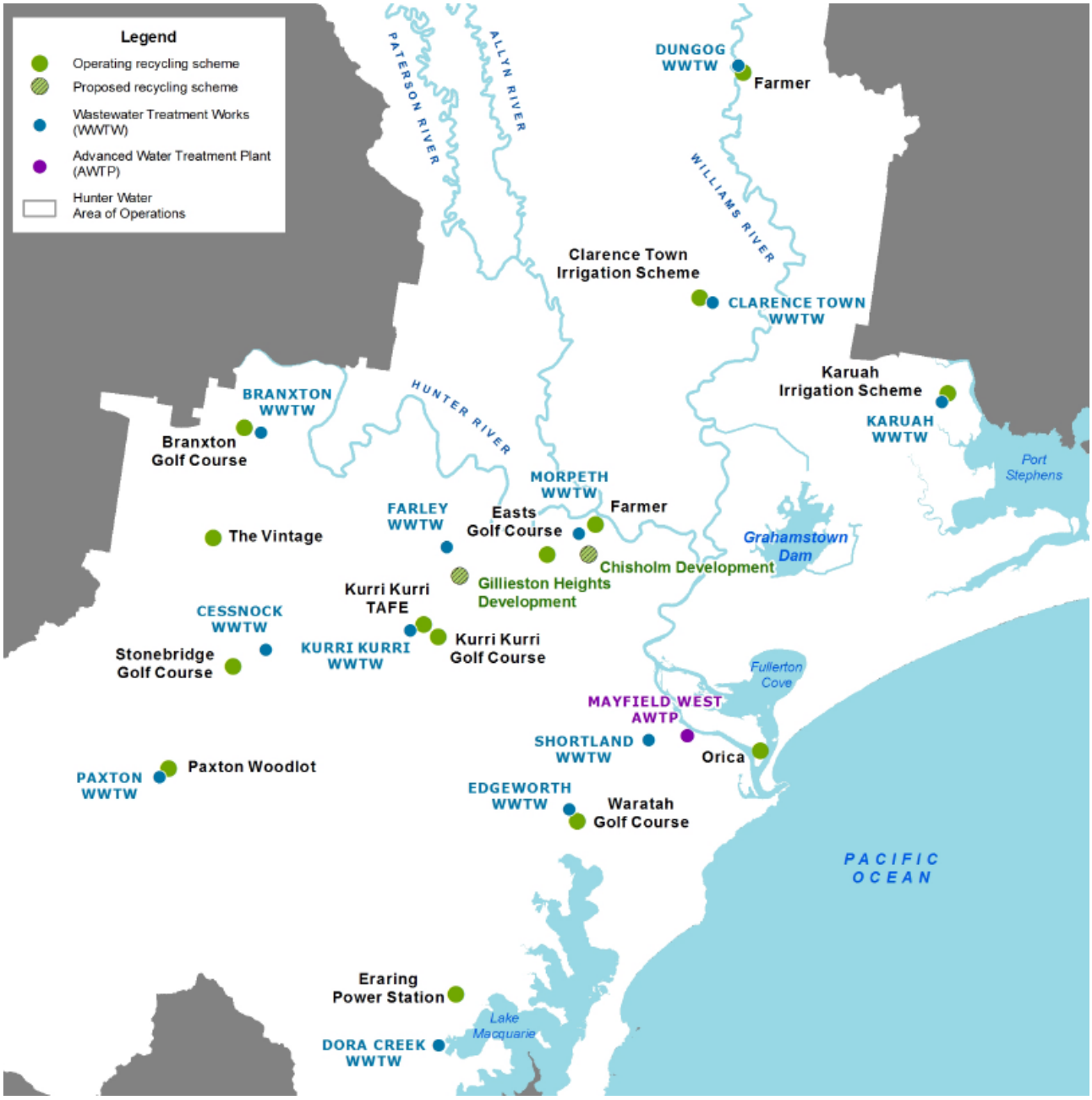
Hunter Water's current recycled water schemes provide recycled water from the Branxton, Cessnock, Clarence Town, Dora Creek, Dungog, Edgeworth, Karuah, Kurri Kurri and Morpeth Wastewater Treatment Works (WWTW) and the Shortland WWTW (part of the Kooragang Industrial Water Scheme) - see Table 2-12. The location of our current and proposed recycled water schemes are shown in Figure 2-3.

Table 2-12 Hunter Water's recycled water schemes

Recycled water source	Recycled water use	2017-18 reuse volumes (ML)
Branxton WWTW	Branxton Golf Course and The Vintage Golf Course	270
Cessnock WWTW	Cessnock Golf Course	130
Clarence Town WWTW	Clarence Town Irrigation Scheme	49
Dora Creek WWTW	Eraring Power Station	872
Dungog WWTW	Local farmer	269
Edgeworth WWTW	Waratah Golf Course	87
Karuah WWTW	Karuah Irrigation Scheme	148
Kurri Kurri WWTW	Kurri Kurri Golf Course and Kurri Kurri TAFE	66
Mayfield West Advanced WTP	Orica Australia Pty Ltd	964 [b]
Shortland WWTW	Water Utilities Australia	1530 [b]
Morpeth WWTW	Easts Golf Course and local farmer	163
Paxton WWTW	Paxton woodlot	19
Total		**4,567** [a]

a) Excludes use by Hunter Water onsite at WWTW and indirect agricultural reuse.
b) On 27 November 2017 the Mayfield West AWTP was sold to Water Utilities Australia. Following this date the AWTP is maintained and operated by Water Utilities Australia. Hunter Water now supplies recycled water from Shortland WWTW to Water Utilities Australia at the Mayfield West AWTP.

Figure 2-3 Hunter Water's recycled water schemes



2.2.3 Performance of critical control points

The following sections describe performance at CCPs. A brief explanation of each of the wastewater treatment terms referenced in the section is included in the Glossary (see section 7.3).

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

Recycled water from Branxton WWTW is supplied to Branxton Golf Course and The Vintage Golf Course. Performance at CCPs within the Branxton WWTW during 2017-18 is shown in Table 2-13.

Table 2-13 Branxton WWTW: recycled water scheme CCPs performance 2017-18

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	✓

Mayfield West advanced water treatment plant (Kooragang Industrial Water Scheme)

Mayfield West AWTP receives treated wastewater from Shortland WWTW. Influent entering the system is primarily residential (domestic), however the WWTW does accept trade waste flows from a number of trade waste customers.

The AWTP includes the following processes:

- chloramine dosing
- screening
- microfiltration
- reverse osmosis
- chlorination

Recycled water from Mayfield West AWTP is supplied to Orica Australia Pty Ltd. On the 27 November 2017 the AWTP was sold to Water Utilities Australia. Following this date the AWTP is maintained and operated by Water Utilities Australia. Performance at CCPs during 2017-18 (prior to 27 November 2017) is shown in Table 2-14.

Table 2-14 Kooragang Industrial Water Scheme: recycled water CCPs performance 2017-18 (pre 27 November 2017)

Works/Plant	Critical control point	Critical limit	Compliant
Shortland WWTW	Aeration cycle	Outside target range (less than -0.2 mg/L of DO set-point) for 10 consecutive aeration cycles OR no aeration blowers available	✓
	Alum dose rate	No alum dosing for 14 days	✓
Mayfield West AWTP	Microfiltration	Combined permeate turbidity > 0.15 NTU for > 40 mins	✓
		Pressure decay time > 7 kPa for 3 consecutive tests of > 10 kPa for an individual test	✓
	Reverse osmosis (RO)	Combined permeate electrical conductivity (EC) > 70 µS/cm for > 60 mins	✓
		Electrical conductivity removal across the RO achieves <90% reduction in EC for 60 mins	✓
	Chlorination system	Chlorine contact time at outlet < 11 min.mg/L (pH < 7.5) for > 20 mins, Chlorine contact time at outlet < 27 min.mg/L (7.5 < pH < 9) for > 20 mins	✓
		pH at outlet > 9 for > 10 mins	✓
		Temperature at outlet > 10 for > 10 mins	✓

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

Recycled water from Dora Creek WWTW is supplied to the Eraring Power Station. Performance at CCPs within the Dora Creek WWTW is shown in Table 2-15.

Table 2-15 Dora Creek WWTW: recycled water scheme CCPs performance 2017-18

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

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

Recycled water from Karuah WWTW is supplied to an irrigation scheme. Performance at CCPs within the Karuah WWTW is shown in Table 2-16.

Table 2-16 Karuah WWTW: recycled water scheme CCPs performance 2017-18

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/cm^2 with a transmissivity of greater than 55% at 44L/s when irrigation is occurring	✓
	UV Flow rate	<44L/s when irrigation is occurring	✓

Dungog wastewater treatment works

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

The Dungog WWTW includes the following processes:

- screening
- sedimentation
- trickling filters
- sludge digesters
- maturation ponds

Recycled water from Dungog WWTW is supplied to a local farmer. Performance at the CCP within the Dungog WWTW is shown in Table 2-17.

Table 2-17 Dungog WWTW: recycled water scheme CCP performance 2017-18

Critical control point	Critical limit	Compliant
Effluent reuse pond	Flow rate < 520kL/d for more than 4 days and reuse customer irrigating	✓

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

Recycled water from Morpeth WWTW is supplied to a local farmer and golf course. Performance at CCPs within the Morpeth WWTW is shown in Table 2-18.

Table 2-18 Morpeth WWTW: recycled water scheme CCPs performance 2017-18

Critical control point		Critical limit	Compliant
Secondary treatment processes	Biological treatment flow rate	< 500L/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	< 500L/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	✓

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

Recycled water from the Clarence Town WWTW is supplied to an irrigation scheme. Performance at CCPs within the Clarence Town WWTW is shown in Table 2-19.

Table 2-19 Clarence Town WWTW: recycled water scheme CCPs performance 2017-18

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	✓

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

Recycled water from the Kurri Kurri WWTW is supplied to the Kurri Kurri TAFE and Kurri Kurri golf course. Performance at CCPs within the Kurri Kurri WWTW is shown in Table 2-20.

Table 2-20 Kurri Kurri WWTW: recycled water scheme CCPs performance 2017-18

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	× [a]
UV System	UV operation	Must not be off for more than 60 minutes when pumping to the golf course or Kurri TAFE storage pond	× [b]
	UV Lamps	At least 18 lamps per bank must be on when pumping to the Golf course or Kurri TAFE storage ponds	× [b]
	UV calculated dose	>35mJ/cm2 for 60 minutes when pumping to the golf course or Kurri TAFE storage ponds	× [b]
	UV Flow rate	<400L/s when pumping to the golf course or Kurri TAFE storage ponds	× [b]

a) A technical issue resulted in a bypass of the tertiary filters, resulting in approximately 1.5kL of recycled water being pumped to the Kurri Golf Club that did not receive filtration. The Kurri golf club was notified and a sample from their on-site dam collected. The failure was rectified and the incident was reported to NSW Health as per the requirements of our Recycled Water Quality Management System.

b) The UV system at Kurri Kurri WWTW failed on 3 occasions during 2017-18. The interruptions were a result of instrument failures; the level sensor and a module switch. On each occasion the Kurri Kurri golf club was notified to cease pumping until further investigation occurred. Where required, samples of the receiving dam were undertaken to monitor microbial levels. The process failures were rectified and the recycled water delivery recommenced when appropriate. The incidents were reported to NSW Health as per the requirements of our Recycled Water Quality Management System.

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

Recycled water from the Cessnock WWTW is supplied to the Cessnock Golf Course. Performance at CCPs within the Cessnock WWTW is shown in Table 2-21.

Table 2-21 Cessnock WWTW: recycled water scheme CCPs performance 2017-18

Critical control point		Critical limit	Compliant
Lagoon ponding	Flow rate	<280L/s for more than 60minutes 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	✓

Edgeworth wastewater treatment works

Edgeworth WWTW receives wastewater from the Charlestown, Cardiff and Speers Point sewer 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

Recycled water from the Edgeworth WWTW is supplied to the Waratah Golf Course. Performance at CCPs within the Edgeworth WWTW is shown in Table 2-22.

Table 2-22 Edgeworth WWTW: recycled water scheme CCPs performance 2017-18

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	✓

2.2.4 Recycled water quality management activities and programs 2017-18

Improvements to recycled water quality management undertaken during 2017-18 are described in Table 2-23.

Table 2-23 Recycled water activities and programs 2017-18

AGWR Framework sub-element		Recycled water objective	Activity / Program	Results / Outcomes
1.3	Partnership and engagement of stakeholders	Identify roles and responsibilities.	Create a matrix that identifies roles and responsibilities for recycled water management.	A matrix was developed identifying stakeholders involved in keys areas of recycled water management.
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.	Risk assessments were updated for the Dora Creek and Edgeworth WWTWs.
3.2	Critical control points	Establish mechanisms for operational control.	Complete site acceptance testing of recycled water quality critical control points and alarms.	Site acceptance testing was undertaken. The testing verified the controls associated with the critical control points. Any improvement actions have been prioritised for completion.
5.1	Recycled water quality monitoring	Determine the characteristics to be monitored.	Develop a blue green algae management plan.	A blue green algae management plan has been developed. The plan sets out a procedure to be followed for sites that may be impacted with blue green algae.
8.1	Assess requirements for effective involvement of users of recycled water	Customer consultation and satisfaction.	Assess recycled water customer satisfaction.	As part of annual site visits the customer was asked regarding their satisfaction. Any improvement ideas were noted and implemented as appropriate.
12.2	Recycled water improvement plan	Continuous improvement	Review the risk of helminths from recycled sewerage effluent at Karuah WWTW.	An intensive wastewater quality monitoring program focusing on helminth identification was undertaken. The study yielded positive results in determining Hunter Water's compliance with AGWR requirements for helminth control.
12.2	Recycled water improvement plan	Continuous improvement	Complete a gap analysis of the current recycled water quality management plans against the AGWR.	A comprehensive review of the actions required in the AGWR was completed and a list of improvement actions developed.

2.2.5 Proposed recycled water quality management activities and programs

Proposed measures to improve recycled water quality management in the future are outlined in Table 2-24.

Table 2-24 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.	Update risk assessments during 2018-19 including Cessnock WWTW scheme.
3.2	Critical control points	Document the critical control points (CCP), critical limits and target criteria.	Creation of a CCP response plan.	Improve documentation of CCP's and response protocols.
7.2	Operator, contractor and end user training	Identify training needs.	Update training for CCP response procedures in 2018-19	Provide WWTW operators with updated training in CCP operations.
9.1	Validation of processes	Validate processes and procedures to ensure they control hazards effectively.	Update validation report to include finalisation of helminth study and provide further detail on critical limit basis. Report to be submitted to NSW Health and Department of Primary Industries in 2018.	Provide an increased understanding of recycled water scheme validation and justification of critical limits.
10.1	Recycled water quality management plans	Documentation of all aspects of recycled water quality management	Update the corporate and scheme specific management plans during 2018-19 to ensure completeness.	Provide a more consistent and thorough approach to the reporting of recycled water management.
11.1	Long-term evaluation of results	Collect and evaluate long-term data to assess performance and identify problems.	Create a schedule for the analysis and long term review of recycled water performance during 2018-19.	Provide an increased understanding of recycled water quality performance and assist in identifying trends.
11.2	Audit of recycled water quality management	Establish processes for internal and external audits.	Use the completed gap analysis to review recycled water management using the AGWR framework assessment tool Requality.	Provide an increased understanding and assist in the identification of improvement areas.

2.2.6 Continual improvement in 2017-18

Recycled water quality improvement initiatives are documented in the Recycled Water Quality Improvement Plan (RWQIP) and prioritised and reported through the monthly cross-divisional recycled water quality meeting as a standing agenda item. Example improvements that were conducted over this period include:

- Review of the Edgeworth and Dora Creek Wastewater Treatment Works risk assessments
- Gap analysis review of the Recycled Water Quality Management Plans
- Review of helminth risk as part of the Karuah recycled water scheme
- Site acceptance testing of recycled water CCPs

The monthly recycled water quality meetings also 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 EMT members on an as required basis.

Hunter Water conducts an annual Integrated Management System (IMS) review meeting. The meeting involves the Executive Management Team (EMT) and includes a review of the individual systems of the IMS (i.e. safety, environment, quality, drinking water, recycled water, assets and information security). The requirements of the RWQMS and AGWR are incorporated in the meeting agenda and presentation for these meetings. Progress of improvement initiatives from the RWQIP are communicated to the EMT through this review meeting.

The performance and effectiveness of the RWQMS is also reported to, monitored and reviewed by the EMT as part of the formal quarterly strategic risk driver analysis update. The update monitors key risk profiles and also identifies needs for change, including where additional capital and operating expenditure may be required.

Findings, results and reports from IPART's operational audit are reviewed by the EMT and action plans developed for addressing recommendations and findings, including allocating 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 coordinator. 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.

2.2.7 Significant changes to the recycled water quality management system

We proposed to make one significant change to the Recycled Water Quality Management System during 2017-18. We notified NSW Health of this proposed change on 19 March 2018.

The proposed change was to adopt the updated Enterprise Risk Management framework in relation to the Recycled Water Quality Management System. This includes the introduction of risk appetite statements and applying the revised risk rating tools for all new risk assessments undertaken.

We are continuing to consult with NSW Health on the revised risk rating tools for all new risk assessments. This consultation is ongoing.

2.2.8 Non-conformances with the Recycled Water Quality Management System

There were no non-conformances with the Recycled Water Quality Management System during 2017-18.

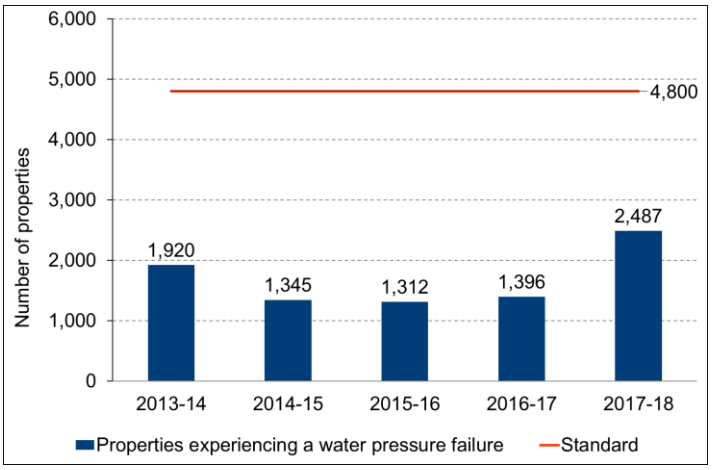
2.3 System performance standards

The Operating Licence sets the service levels that customers can expect from Hunter Water in three core areas: water pressure, water continuity and sewer overflows. Performance against licence limits is described in the following sections.

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.[6]

Water pressure failures



We met the performance requirement of this standard for 2017-18, with a total of 2,487 properties experiencing low pressure, which is significantly below the limit of 4,800.

The number of properties affected in 2017-18 was higher than the previous four years, primarily due to an exceptionally warm month of January, which was the third-warmest on record for New South Wales in terms of mean maximum temperature.

Our area of operations experienced above average temperatures together with well below average rainfall in January. This combined to produce a period of high customer water demand which peaked at 331 ML/d on 8 January 2018. This was the highest daily demand since 2001.

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.
- 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.

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

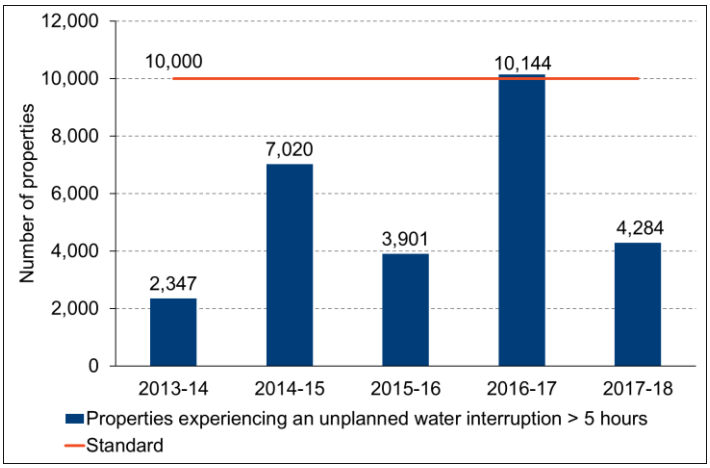
2.3.2 Water continuity standards

Hunter Water must ensure that in a financial year:[7]

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.*

Unplanned interruptions > 5 hours



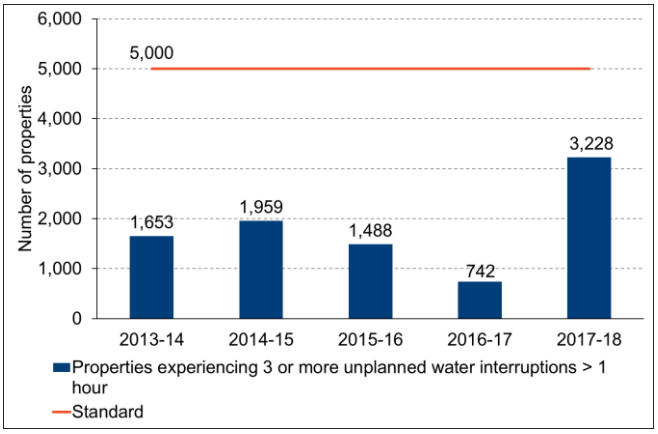
We met the performance requirement of the water continuity standard for 2017-18, with a total of 4,284 properties experiencing unplanned water interruptions exceeding five hours compared with the limit of 10,000.

Our performance in 2017-18 was below the rolling five year average. Performance in 2017-18 was significantly improved compared to 2016-17 where we exceeded the limit of 10,000 primarily due to a large trunk water main break in a remote area of western Lake Macquarie over a weekend in February 2017. We did not experience a break of this magnitude in 2017-18.

Watermain breaks are the main contributor to unplanned supply interruptions and can occur as a result of asset condition and performance as well as weather conditions. The number of properties impacted by an unplanned water interruption is 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.

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

Multiple unplanned interruptions



Commentary

We recorded 3,228 properties that experienced 3 or more unplanned outages during 2017-18. The result was 28 per cent above our 5-year average for this measure, but still below the limit of 5,000.

This result is not consistent with the decreasing trend from the previous three years. This is primarily due to several repeat interruptions which each affected a large number of customers in 2017-18. Examples include repeat events in Sandgate and Adamstown Heights which affected greater than 600 properties each time.

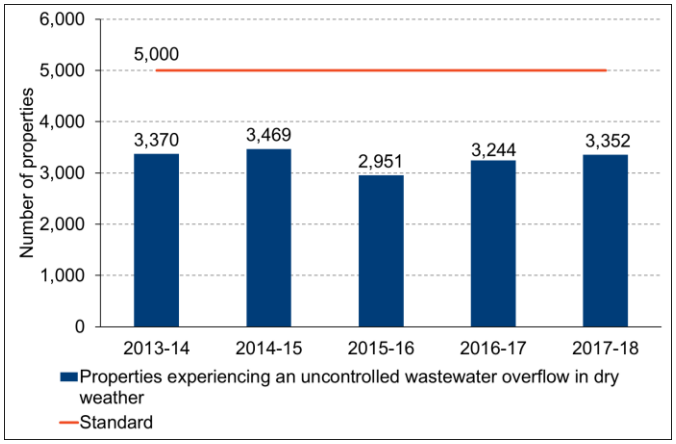
We manage our performance through water mains replacements. The water mains to be replaced are determined through analysis of water main failure history and modelling, so that the likelihood of repeat events such as those that occurred in 2017-18 is mitigated in the future.

2.3.3 Wastewater overflow standard

Hunter Water must ensure that in a financial year:[8]

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 3 or more uncontrolled wastewater overflows in dry weather.*

Wastewater overflows



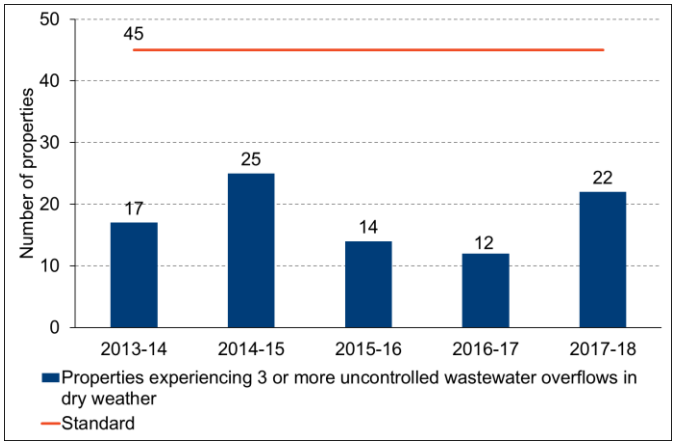
Commentary

Dry weather overflows affecting private properties were slightly higher than the rolling five year average. The number of incidents is comparable with the past four years and is significantly lower than the standard.

Factors influencing dry weather overflows include asset condition, as well as periods of extended periods of dry weather where tree roots enter sewerage mains and cause blockages.

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

Multiple wastewater overflows



Commentary

This indicator measures repetitive impact to private properties.

Multiple overflows affecting private properties were slightly higher than the rolling five year average and have increased compared to 2016-17. The number of incidents remains significantly lower than the standard.

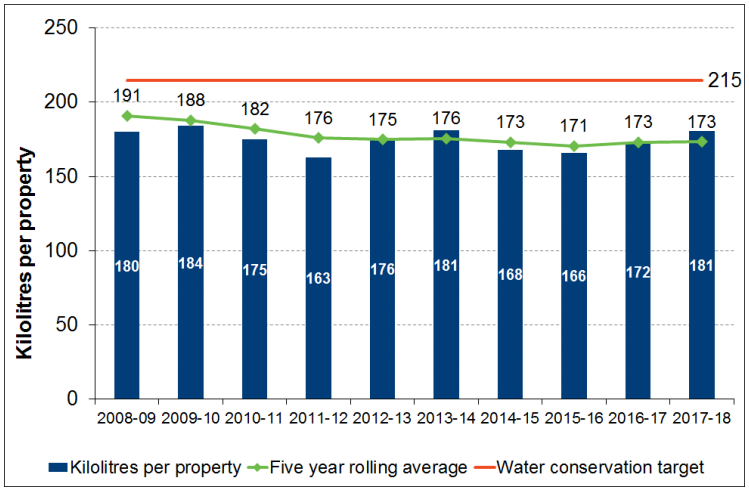
3 WATER CONSERVATION

This chapter reports on compliance with our water conservation target for residential water use in the Lower Hunter and provides information on the water conservation projects undertaken in 2017-18 and planned for the future.

It also includes an estimate of the maximum reliable quantity of water that Hunter Water can supply from one year to the next from our existing water storages based on the yield definition and methodology developed as part of the 2014 Lower Hunter Water Plan (LHWP).

3.1 Performance against the water conservation target

Figure 3-1 Ten year trend in residential water use



Hunter Water has a water conservation target in our Operating Licence requiring that the five year rolling average for annual residential water consumption is equal to or less than 215 kilolitres per year for each residential property. We achieved the water conservation target in 2017-18.

Residential water usage is shown in Table 3-1 and Figure 3-1. Historical water consumption per capita and per property varies each year due to the weather. The five year rolling average water consumption smooths out the effects of weather.

The increase in household water consumption in 2017-18 can be linked to the weather being hotter and drier than the two previous years, with nine months of below average rainfall combined with above average temperatures.

The five year rolling average water consumption remained relatively static after generally trending downward between 2006 and 2016. Further research is required to understand this flattening off in water conservation gains, but it may be due to the market for water efficient appliances becoming saturated as old inefficient models and fittings have been replaced over time.

Table 3-1 Annual residential water use

	2013-14	2014-15	2015-16	2016-17	2017-18
Kilolitres per property	181	168	166	172	181
Five year rolling average of above	176	173	171	173	173
Kilolitres per person	70	65	65	68	74

3.2 Projects undertaken to achieve water conservation target in 2017-18

The water conservation target is based on residential water use. We have also implemented water conservation programs that target consumption by non-residential customers and also leakage. An integrated approach has been taken during 2017-18 combining water saving initiatives with partnerships and community engagement while building foundational knowledge and seeking innovative solutions.

3.2.1 Water loss management

We can greatly influence water losses from our distribution network through operational practices, planning and better use of technology. In 2017-18, Hunter Water continued and increased our active leak detection program, surveying 3000km of mains (around 60%) across our water network. Other works related to loss management included:

- Black Hill Reservoir – completed the rehabilitation of the concrete floor to provide a better seal across leaking joints.
- Watermain replacement program – ongoing replacement of reticulation mains with history of multiple breaks or leaks recorded.
- Water service replacement program – ongoing replacement of service mains (pipe located between the reticulation main and customer meters) that have previously failed.
- Pressure management (seasonal) – system pressures are being reduced across two water supply zones during low demand periods (cooler months) which helps reduce leaks and main breaks in these zones.
- Pressure management (permanent) – implementation of permanent pressure reduction in two zones from very high to average levels.

These programs contributed to the Infrastructure Leakage Index (ILI) decreasing from 1.4 to 1.2 and real losses from 4.3 to 3.9 kilolitres per day per kilometre of watermain.

Hunter Water also commenced a trial of an intelligent water network monitoring system that uses existing operational data and applies advanced algorithms to detect, accurately identify and report network events such as leaks, bursts and other anomalies. These kinds of monitoring systems can support a more proactive and targeted approach to network leak management.

Temporary data loggers were installed on meters across 52 customer and Hunter Water sites. The information from these loggers helped identify 19 large internal leaks at schools, businesses and local council sites and at Dora Creek Wastewater Treatment Works. Of these, 16 leaks have already been repaired, leading to 208 ML of water saved.

3.2.2 Water efficiency

Three large industrial/commercial customers participated in a detailed water audit of their businesses. These audits identified 237 ML of potential water savings.

Water efficiency management plans were also completed for 28 major water customers during 2017-18 and data loggers were installed on all major customer billable meters. These plans and data loggers provide key foundational information to start discussions about current water usage practices and assist with future identification of potential water savings through additional detailed water audits and consumption monitoring.

We completed detailed water efficiency audits at Grahamstown Water Treatment Plant and the Dora Creek and Burwood Beach Wastewater Treatment Works. We also completed a project at Karuah Wastewater Treatment Works replacing potable water with recycled effluent for some treatment operations with expected savings of more than 3 ML per annum.

3.2.3 Community engagement and partnerships

We have been engaging with the community and building partnerships to increase awareness and promote water conservation behaviours. Table 3-2 includes details of the types of programs and projects completed by Hunter Water during 2017-18.

Table 3-2 Water conservation community engagement programs and partnerships in 2017-18

Description	Actions in 2017-18
Love Water campaign	Love Water is a water conservation campaign primarily focused on residential consumers. The campaign encourages water wise behaviour, but rather than communicating the Water Wise Rules, we aim to engage more deeply with the community to encourage behaviour change. The campaign was first launched in late December 2017 on social media platforms and rolled out to other channels using interactive content, sparking curiosity and getting people talking about water and its value.
School and Community Group Incursions and Excursions	There were 38 school incursions and tours of the Hunter Water Centre for Education during the year. Our education programs have been designed to meet Science-based elements of the school curriculum for Stage 2 (Years 3 and 4) and Stage 4 (Years 7 and 8) students. Programs have also been developed for community groups. These programs aim to inform students and the community of the ways our operations benefit customers and the environment as well as teaching students about their role in caring for and sustaining water resources.
Bubbles and Supa Squirt	Bubbles and Supa Squirt is a school water education show that incorporates tips on using less water. More than 80 performances were held at local primary schools, preschools and in the community in 2017-18.
Hunter Water Website	Our website includes a dedicated 'Save Water' section that provides information on how to be water efficient in the home and garden with new information added to compliment the Love Water objectives (http://www.hunterwater.com.au/Save-Water/Save-Water.aspx). In 2017-18, our Water Usage Calculator received 241,814 visits.
Community Events	We had an active presence at 18 community events attended by more than 185,000 people including V8 Supercars, Surfest, Port to Port, Living Smart Festival and Light Up Newcastle.
Media – Awareness Raising	We regularly emphasised the need for residents to be water efficient in media messaging over the year. This was specifically linked to dam level stories during the warmer months. When supplies replenished, the message remained that by continuing to be water conscious through winter, water storages are in better shape for summer. This ties into a wider campaign to build awareness of the vulnerability of Hunter Water's storages and therefore the need to work together to ensure water security into the future.
Learning with Schools	The Learning with Schools Program partners with local primary and secondary schools to empower students to plan and take action to improve water resilience in and beyond the Hunter community. It involves students designing and leading their own learning journeys to help shape the environmental health and wellbeing of their community. We partner to share knowledge, resources and expertise.
Community Funding Program	In 2017-18, we supported 20 key community impact programs to help raise awareness of water conservation. Partnerships included working collaboratively with local conservation organisations such as Port Stephens Koalas to educate the community on the importance of the environment and the impact that community behaviour has.
Support of WELS	We continued to support the Water Efficiency Labelling Scheme (WELS) for household appliances by including information on WELS under the 'Save Water' section of the Hunter Water website. In addition, Hunter Water attended several community events to promote and encourage householder uptake of water efficient products.
Smart Water Advice	We have signed an agreement to participate in the Smart Water Advice program. This is a national, not for profit water efficiency membership program for water utilities and councils. It allows for economies of scale to be leveraged for the development and distribution of online water saving information for the home, garden and business sectors, educational interactive resources, a video library, posters and factsheets. All materials are regionalised and branded for its members.

These activities rely on consumers acting on better awareness of water efficient products and behaviours. Therefore, it is difficult to robustly estimate the resulting amount of water that is saved.

3.3 Proposed water conservation projects

Hunter Water intends to continue to take an integrated approach to water conservation, working with customers and the broader community to reduce leakage and use water more efficiently.

3.3.1 Water loss management

The following leakage reduction projects and programs are planned for implementation in 2018-19:

- Ongoing leak detection survey of the water distribution network covering east and west Lake Macquarie
- Lining and repair of Toronto, Four Mile Creek and Bellbird Heights 2 Reservoirs and further work on Black Hill Reservoir
- Ongoing use of temporary data loggers to assist customers with the identification of large internal leaks with a particular focus on schools
- Expansion of the intelligent water network monitoring trial to cover approximately 25% of our distribution system

3.3.2 Water efficiency

Water efficiency management plans will be prepared in consultation with 23 large water customers during 2018-19. Eleven detailed water audits will also be completed with large commercial/industrial customers to identify opportunities to reduce potable water use in their operations.

A project to substitute various points of potable water usage at Burwood Beach, Belmont and Boulder Bay Wastewater Treatment Works with recycled effluent will be carried out with potential potable water savings of approximately 140 ML per annum once commissioned. The effectiveness of the Karuah Wastewater Treatment Plant project is also being monitored to identify if there are other opportunities for potable water use replacement at this site.

3.3.3 Community engagement and partnerships

We plan to continue with and build on all of our existing community engagement and partnership programs during 2018-19.

In addition, the existing Plumbing Assist Program has been redesigned and will be expanded for 2018-19. This program works with vulnerable customers to identify and repair leaks on their property and assist with the replacement of inefficient fittings and appliances. Historically, this assistance has been targeted at customers who are already facing difficulties paying their bill, however in the future we will be contacting customers with particularly high levels of consumption (more than three times the average) to proactively identify potential issues and, if required, offer assistance with finding leaks and reducing water use. Initial estimates are that this more proactive and expanded program could save up to 30 ML per annum.

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

The NSW Department of Industry (then Metropolitan Water Directorate) led a whole-of-government approach to developing the Lower Hunter Water Plan (LHWP) which was released in April 2014. A key driver for the LHWP was to ensure water security during drought and reliable water supplies to meet the needs of a growing population and business activity.

An important part of the LHWP planning process was to define the level of service standards, such as the maximum acceptable frequency and duration of water restrictions and the risk of reaching critically low storage levels. The maximum amount of water that can be supplied each year without exceeding the level of service standards is referred to as the ‘yield’.

Since the release of the 2014 Lower Hunter Water Plan, Hunter Water calculates yield in accordance with the methodology that was developed during the preparation of the LHWP. This methodology was endorsed through the governance structure of the 2014 LHWP.

Current modelling indicates that the Lower Hunter storages can supply an average of 76 billion litres of water each year without exceeding the 2014 LHWP level of service standards. The level of service standards were:

- Frequency of restrictions not to be more than once in 10 years on average
- Duration of restrictions to be not more than five per cent of the time
- The chance of reaching a very low level of storage that is near empty to be not more than one in 10,000

The level of service standards, and the associated yield, are to be reviewed with each major update of the LHWP. The first major update of the plan is currently underway.

4 ORGANISATIONAL SYSTEMS MANAGEMENT

4.1 Asset Management System (AMS)

4.1.1 Introduction

This chapter provides an overview of Hunter Water's asset management system (AMS). It reports on the asset management programs and activities completed by Hunter Water in 2017-18 and the results and outcomes of these activities. Furthermore, it reports on both the proposed future asset management programs and activities, significant changes to the asset management system and any major non-conformances during 2017-18.

4.1.2 Overview of Hunter Water's Asset Management System

Our physical assets comprise of water, wastewater 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 price of services and Hunter Water's 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 requires us to develop an AMS by 31 December 2017 that is consistent with the Australian Standard AS ISO 55001:2014. The AMS must be fully implemented by 1 July 2018. Until this is achieved, our asset management system must be implemented and carried out in accordance with WSAA's Aquamark benchmarking tool.

During 2017-18 we have transitioned our asset management system to be consistent with ISO 55001:2014, with external verification of this demonstrated through certification. This asset management system provides the framework to optimally manage asset lifecycles to achieve the agreed outcomes for customers, the environment and the community.

ISO 55000:2014 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"*.

Asset management practices aim to optimise service and financial risk through maximising current asset value, while governing operational and maintenance performance. Effective asset management is essential to provide services in the most cost-effective manner and to demonstrate 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 the organisation's overall integrated management systems (along with safety, environmental, quality and information security). The key elements of ISO 55001 are:

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

Our asset management system is guided by both our Asset Management Policy and Strategic Asset Management Plan. 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 the protection of 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 a workforce that embraces learning, innovation and change

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

4.1.3 Asset management activities and programs 2017-18

During 2017-18, we transitioned our asset management system to be consistent with ISO 55001:2014, with external verification through JAS-ANZ certification. Hunter Water is the first urban Australian water authority to be certified to the new ISO 55001:2014 standard.

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 which incorporates strategic alignment, document control, competency, communication and awareness.

Therefore, the asset management system initiatives undertaken through 2017-18 include a combination of improved management system, governance and system processes and procedures. Key activities and the results/outcomes of these activities are described in Table 4-1.

Table 4-1: AMS - Activities and programs completed in 2017-18

AMS Initiative	Activity / Program	Results / Outcomes
Asset management system	Asset Management Policy	The asset management policy has been updated to align with our 2017+3 Strategy.
	Strategic Asset Management Plan (SAMP)	The SAMP has been prepared and finalised and provides the architecture of the plans, processes and procedures to enable alignment between our 2017+3 Strategy, business activities and the initiatives being undertaken within each activity.
	Asset management leadership	We have initiated an asset management review process (executive managers) in which the strategic elements of the AMS are reviewed and improvement initiatives assessed and implemented. In addition, the asset management steering committee (group managers) is maintained and continues to review key areas for improvement at a technical level.
	Asset management audit	Through the AMS certification, we participated in three separate external audits which have involved both asset management technical and system specialists (involved in the creation of the ISO 55001) to review and improve our AMS.
	Technical change	Through the AMS transition, we have refined and implemented both an organisational change and technical change process to effectively manage risks.
	Enterprise risk management	We have improved the enterprise risk management framework with inclusion of risk appetite statements for the nominated risk profiles. The AMS has reviewed and incorporated these objectives within its approach to asset risk management.
	Stakeholder & community engagement	We have revamped our approach to stakeholder, customer and community engagement, with a suite of initiatives including strategic and local. These initiatives are integrated into the AMS through asset planning/creation and managing operational community and customer impacts.
	Awareness and training	We have revised and updated our asset management awareness and training, which is undertaken through the employee induction process, as well as through staff and contractor training.
Asset planning	Water resilience programme	We are improving our planning for water security by expanding the planning philosophy from traditional engineering assessment to incorporating 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.
	Certification of developer works	We have implemented a certification model for the creation of routine (simple) developer works.
	Critical mains flooding	We have undertaken industry-leading analysis of critical watermains to determine the impacts of, and potential mitigation solutions to, asset failures.
	Asset class planning	We have revised our asset planning process and procedures, including work flows and templates.

Investment management	Strategic planning	We have revised the strategic investment process through the implementation of strategic cases and programme business cases, including the use of Investment Logic Maps.
	Better Business Cases	We have consulted internally and assessed external, leading business case processes, and have subsequently implemented the Better Business Case model which uses a 'five case' framework consisting of a strategic, economic, commercial, financial and management case.
Asset standards	Design Codes	We have updated both the water supply code and the sewerage code (Hunter Water editions).
	Standard technical specifications	We have updated or created standard technical specifications for SCADA and automation equipment, lifting equipment, pressure equipment, chemical storage and delivery systems, work as constructed information, and preparation of civil, structural and mechanical engineering drawings.
	Approved products	The electrical and civil approved products within our asset portfolio have been updated.
Asset creation	Resource strategy	The project and contract management forward programme was reviewed and we have implemented a resource strategy which involves engagement of a programme and project management support contract.
Asset maintenance	Works management	We revised our works management (maintenance) process and procedures including work flows, procedures and templates.
Asset disposal	Asset disposal	We revised our asset disposal process and procedures, including work flows and templates.
Asset information	Information process	Our asset information collection and management process and procedures have been revised, including work flows and templates.

4.1.4 Proposed asset management activities and programs

We will continue to review and improve our asset management system to meet the defined asset management objectives. The asset management system initiatives planned to be undertaken through 2018-19 include a combination of improved management system, governance and system processes and procedures. The key initiatives are described in Table 4-2.

Table 4-2: AMS – proposed activities and programs

AMS Initiative	Activity / Program	Results / Outcomes	Timetable
Asset management system	Business planning	This initiative involves preparing business plans for each Hunter Water group (asset management function) - Service & Infrastructure Planning, Investment & Asset Planning, Infrastructure Delivery, Water Operations, Environmental Operations, Capability Engineering, Maintenance Delivery and Intelligent Networks.	Dec 2018
	Asset class plans	Continue rolling review, update and consolidation of our asset class plans in accordance with Hunter Water's document control system.	Dec 2018
	Training awareness	Provide asset management awareness training to all asset management groups through toolbox talks or group meetings.	Sep 2018
	Leadership	Continue to implement and embed management review through planning and coordination of both the executive management review and the asset management steering committee.	Sep 2018
	Procurement	Ensure that asset management objectives are included in the procurement arrangements through the contract management framework.	Aug 2018
Asset investment	Investment management	Finalise all our identified strategic cases and programme business cases associated with a 5-10 year planning period.	Jun 2019
	Capital portfolio	Review and prioritise our capital portfolio to meet our combined 2017+3 Strategy and asset management objectives.	Jun 2019
	Asset renewal	Review and update the forecast asset renewal investment to meet business objectives including the risk appetite statements	Jun 2019
Asset Planning	Critical Assets	Review and update the critical asset programme incorporating the enterprise risk management framework and risk appetite statements for all asset classes.	Jun 2019
Asset Maintenance	Preventive maintenance procedures	Review the currency of all planned maintenance work instructions (for all assets) and prepare a program to update these as required.	Dec 2018

4.1.5 Significant changes to the Asset Management System in 2017-18

We transitioned our asset management system to be consistent with ISO 55001:2014 through 2017-18, with external verification through JAS-ANZ certification. We are the first urban Australian water authority to be certified to the new ISO 55001:2014 standard.

Our enterprise risk management (ERM) framework was recently updated to include risk appetite statements and improvements to the risk rating matrix and likelihood table. Risk appetite statements were defined for specific business risks associated with elements of the Asset Management System. Asset-related risks are now being managed in accordance with the updated ERM.

4.1.6 Non-conformities in the Asset Management System and actions taken to resolve

There were no major non-conformities with our asset management system in 2017-18. Assessment of our organisational performance in AMCV (2016) showed that *"Hunter Water is performing at or above median levels of maturity compared to all participants and across all asset management functions investigated in this project."* The audit of our AMS identified minor non-conformities that have been included as improvement initiatives through 2018-19.

4.2 Environmental Management System (EMS)

4.2.1 Introduction

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/NZ ISO 14001:2004 Environmental Management Systems*.

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.

4.2.2 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 and drive environmental improvements for the organisation.

The EMP is reviewed and updated every two years. During 2017-18, we transitioned to a new EMP. In February 2018, our Board approved the 2018-2020 EMP which replaced the 2013-2017 EMP.

The 2018-2022 EMP is publically available on our website and has 20 key environmental objectives. These objectives guide organisational improvement and address our key responsibilities to the environment and community. Against each objective are one or more actions/programs, and set targets/indicators. The environmental objectives have been categorised into one of four initiative categories, as follows:

- Water service initiatives
- Wastewater service initiatives
- Stormwater service initiatives
- Business practice initiatives

As the reporting period falls across two plans, the approach adopted in this report is to structure our compliance and performance on our new 2018-2020 EMP and to also report on any significant actions/programs from the 2013-2017 EMP that continued during 2017-18.

4.2.3 Key environmental management activities/programs in 2017-18 and moving forward

Water service initiatives

Objective 1: Protection of drinking water catchments

Revised catchment management plan

In June 2018, we adopted a revised Catchment Management Plan (CMP). The Catchment Management Plan sets our strategic direction for catchment protection over the next four years. The improvement projects from the previous 2010 CMP have now largely been completed.

The new CMP identifies existing and potential risks to water quality in each of our drinking water catchments and proposes a suite of projects to address the highest risk aspects, in accordance with the Australian Drinking Water Guidelines framework.

Moving forward

The revised CMP proposes a program of catchment improvement projects, with a total program budget of approximately $3 million to be delivered from 2018 to 2022. Identified projects include the following:

- Erosion management works in locations such as the Seaham Weir Pool, Upper Chichester and Campvale.
- Sustainable agricultural management in the upper catchment areas, looking at improving agricultural practices on properties located near the Chichester, Paterson and Allyn Rivers. The project will identify needs, impacts and potential solutions for these areas, including stock types and density, chemical usage, farm management practices and fencing needs.
- Environmental compliance monitoring of high risk land use activities, including continuation of inspections of on-site sewage systems within drinking water catchment and identification and auditing of industrial activities within the drinking water catchments.

Collection and assessment of water quality data

The Williams River is a significant source of our drinking water. Baseline water quality monitoring for the Williams River catchment was completed in late 2017. This data has allowed us to establish a baseline understanding of river water quality and the main sources of nutrients in the catchment. It provides a baseline data set for the river that can be compared to future monitoring results to assess long term trends and effectiveness of catchment improvement projects.

During 2017-18, water quality data from 2012 to 2017 was analysed for the different water sources into Grahamstown Water Treatment Plant (WTP) to assess long term trends and to inform future initiatives. Source water into the plant includes water from the Chichester Dam catchment area, the Williams River catchment area, Grahamstown Dam catchment area and the Tomago and Tomaree groundwater supplies.

Moving Forward

Follow-up monitoring of the Williams River catchment will be undertaken in around 2021-22 to assess any changes and assist in evaluating the effectiveness of catchment improvement projects.

Over the next reporting period water quality data that has been collected over a five year period will be analysed for source water into Dungog Water Treatment Plant to assess long term trends.

Stabilisation of river banks along the Williams River

We have made a commitment to plant trees along the Williams River to reduce the nutrient loads into the river, thereby improving the water quality of one of our major sources of drinking water. This project involves fencing a 24 km section of the river previously in the Tillegra Dam project area to restrict cattle access to the river, and then planting trees to revegetate and stabilise the river bank.

During 2017-18, the fencing component of the project was completed and approximately 50% of planting completed.

Moving Forward

Further planting to be done, with completion expected by Dec 2018. Weed management works will be ongoing.

Reduction of water quality risk in Grahamstown Dam

During 2017-18, we progressed with planning for a new UV disinfection system at Grahamstown Water Treatment Plant (WTP). Funding was secured for further investigation of system design and environmental assessment. The system would provide reliable protection of drinking water from most pathogens and add to Hunter Water's multi-barrier approach to maintaining safe drinking water.

Moving Forward

During 2018-19, the design and environmental assessment of the UV system will be progressed. In parallel, a strategy review of Grahamstown WTP will be undertaken to investigate options to meet a future growth in demand on the plant and the enhancement of drinking water protection.

Management of risks arising from the operations of the Williamtown RAAF and PFAS contamination

We have continued to engage in consultation with the Department of Defence and multiple NSW Government agencies regarding the PFAS groundwater contamination associated with fire-fighting activities at the RAAF Base Williamtown. This has been achieved through involvement with the NSW PFAS Expert Panel led by the Office of the NSW Chief Scientist and Engineer.

We have also continued to have representation on the water working group that provides advice regarding interaction between PFAS contamination and the hydrological processes that underlie its migration through the environment.

Over 2017-18, Hunter Water developed the *PFAS Operating Strategy for the Tomago Borefields*, which has been endorsed by the NSW PFAS expert panel. The document outlines operating and monitoring strategies and response protocols to ensure that the water supply from the Tomago Borefields meets drinking water guidelines with respect to PFAS. This includes: identification of borelines that must not be operated, establishment of water quality objectives with respect to PFAS for individual borelines as well as blended groundwater entering the treatment plant, the requirements for regular monitoring of the water quality produced by each boreline (both when in operation and in between operation), and the development of boreline specific plans for borelines where low levels of PFAS have been detected.

Moving Forward:

Moving forward, we will continue to adhere to the PFAS Operating Strategy under the oversight of NSW Health. This means that Hunter Water will continue to monitor groundwater quality throughout the borefield and respond as required in accordance with the strategy. All monitoring and response actions are reviewed at regular meetings between Hunter Water and NSW Health.

Hunter Water will also continue regular meetings with RAAF on water quality issues and actively review water quality data provided to Hunter Water from Defence.

Hunter Water will also continue to be involved as a key stakeholder providing input into Defence's implementation of their PFAS remediation strategy.

Objective 2: Sustainable use of water resources

Compliance with water supply works and water use approvals

Over the reporting period, we operated in accordance with the water access and environmental flow requirements of our water supply works and water use Licence.

Moving forward

We plan for continuous improvements in our systems supporting the management of, notification and reporting on data collected for water management licence compliance.

Lower Hunter Water Plan (LHWP) to define the long term strategy for water security and drought response

The Lower Hunter Water Plan (LHWP) is a document developed by the Metropolitan Water Directorate in close consultation with Hunter Water, government agencies, stakeholders and the community. The LHWP

identifies a mix of water supply and demand measures to ensure water security in drought, as well as reliable supplies to meet the region's longer term needs.

The current LHWP was released in 2014. During 2017-18 work commenced with stakeholders on a revised and updated version of the document.

Moving Forward

We will continue to work on the LHWP with stakeholders. Immediate activities include the further development, analysis and screening of options. This process will be supported by application of a decision-making framework and conducting deliberative forums.

Reductions in non-revenue water

Non-revenue water is water that is consumed, but that we do not currently bill for. It includes water used and lost during the activity of water and wastewater treatment, leaking infrastructure, errors in water meter readings and illegal connections. We have a program to reduce non-revenue water.

During 2017-18, non-revenue water was reduced to 10.6 GL, an improvement of 0.5 GL on the previous year. Some of our specific non-revenue water projects undertaken in 2017-18 and proposed for 2018-19 are described in section 3. Moving forward we will continue to deliver on our program of non-revenue water initiatives.

Economic level of water conservation

Our Operating Licence requires us to develop an Economic Level of Water Conservation (ELWC) methodology for assessing water conservation projects. During 2017-18, we prepared a report outlining our approach and principles for developing our (ELWC) methodology and began designing and building the methodology.

Our ELWC methodology is designed to promote economically efficient investment in water conservation. It is a process for ranking the economic viability of candidate water conservation projects. It evaluates whether the cost to society of a water conservation project is less than the value of water that it saves. If so, it is considered economically efficient for us to implement the water conservation project.

Moving forward

We will submit a final ELWC methodology to IPART for approval in November 2018. Moving forward, we will use this tool to assist in determining which water saving projects are economically viable.

Implementation of water efficiency programs

We have undertaken a range of water efficiency activities and programs during 2017-18. These activities, along with our proposed programs for 2018-19, are described in detail in section 3.

Objective 3: A reduction in environmental and community impacts from watermain breaks

Water asset masterplan

A water asset resource plan is currently being developed aimed at reducing water main breaks.

Moving forward

This plan will be completed during 2018-19 and the actions will begin to be implemented.

Wastewater service initiatives

Objective 4: Undertake wastewater activities in a sustainable manner

Recycled water strategy

We are preparing a sustainable wastewater strategy as part of the organisation's objective to improve the sustainability of our operations. As an input to this strategy, during 2017-18 we commenced investigating opportunities for new recycled water schemes. This included recycled water schemes for open space irrigation, recycled water for greenfield residential development and a range of industrial reuse schemes.

Moving forward

The recycled water strategy will be complete by the end of 2018. Supporting the strategy is completion of a customer willingness to pay study for recycled water schemes.

Objective 5: Reduce environmental and community impacts from wastewater overflows

Investigation into impacts of overflows

During 2017-18, work continued on the Lake Macquarie Effects Based Assessment program, with modelling undertaken by Office of Environment and Heritage. This project is investigating the impacts on the lake of wet weather wastewater discharges compared to impacts from stormwater inflows. Multiple impact factors are being considered, including environmental, human health and aesthetics. This study will allow us to assess the relative benefits of various wastewater network upgrades and prioritise upgrades which have the greatest net environmental benefit.

Moving forward

The modelling work is due to be complete by October 2018. Following completion of modelling, the results and outputs will be assessed to determine an upgrade strategy for the wastewater network around Lake Macquarie (scheduled to be complete by the end of 2019). Following completion of the Lake Macquarie modelling, the process will be reviewed in collaboration with the EPA and planning will commence to apply the process to our other wastewater catchments.

Wastewater management masterplan

We have commenced scoping a masterplan for our wastewater system that is aimed at reducing the incidence of potential sources of pollution. To support development of the masterplan, we have progressed with work on the Lake Macquarie Masterplan, undertaking a risk, issues and opportunities investigation. This regional masterplan will be embedded within the overall masterplan.

The Hunter River Estuary Masterplan is another study currently underway that will support development of the broader wastewater management masterplan. Over the reporting period, work progressed on this plan with significant modelling and data capture work undertaken.

Moving forward

The Hunter River Estuary Masterplan is to be finalised, with a report to the EPA due in mid-2019. We will also undertake studies to address knowledge gaps in the Lake Macquarie system. Development of the overall masterplan will progress in coordination with our sustainable wastewater program.

Objective 6: Monitor the health of our waterways and beaches

Beachwatch program

Beachwatch (managed by the NSW Office of Environment and Heritage) is a program that monitors and reports on recreational water quality at swimming sites along the NSW coast. Each year (including 2017-18) we carry out sample collection and testing to provide input into the Beachwatch program. We also provide review and input into preparation of the annual Beachwatch report.

Moving forward

Our involvement in the Beachwatch program will continue in the future. We plan to review our current sample collection and testing schedule to ensure the program continues to be fit for purpose in matching program requirements.

Objective 7: Improved performance against environmental compliance obligations

Operation of wastewater treatment plants

During 2017-18, we met all requirements to operate, monitor and report on our treatment plants in accordance with EPA licence requirements. 14 of 20 treatment plants were compliant for the full financial year. This was an improvement of one compliant plant compared to the previous year.

Environmental compliance improvement program

We have developed a compliance improvement strategy that highlights key actions to be undertaken in order to drive compliance improvements across the business. Good progress in completing actions has been achieved during 2017-18.

Moving forward

Actions identified in the strategy will continue to be progressed throughout 2018-19, with a strong focus on wastewater treatment plant upgrades, improvement of chemical storage and handling and delivery of environmental training.

Odour complaints

We monitor the odour complaints that we receive in order to support our assessment of the need to undertake odour control actions. Hunter Water has a target to achieve less than 250 odour complaints per year (averaged over 5 years). Our average annual number of complaints over the past 5 years is 214, which is comfortably within our target.

Moving forward

Hunter Water is about to commence a program to renew our existing chemical dosing units that are used to assist with control of odour and corrosion in our wastewater system. This program is due for completion by 2021, and includes a strategic review of the requirement for units within the network and replacement of all active units with new infrastructure that has improved safety and operational control.

Objective 8: A reduction in carbon emissions from wastewater treatment activities

Renewable energy from biosolids

To reduce carbon emissions, we are investigating opportunities to generate renewable energy from biosolids (biosolids are an output stream from our wastewater treatment plants). During 2017-18, we commenced this work by improving our understanding of existing biosolids management. This included stakeholder workshops to assess the risks, issues and opportunities of our current system.

This work provided the basis for us to commence a renewable energy from biosolids options study. This included undertaking a feasibility study for having a centralised biosolids management approach with Lake Macquarie City Council. Initial indications suggest there may be some good opportunities in collaboration.

Moving forward

Work will continue to complete the options study. A renewable energy from biosolids strategy is programmed to be complete by December 2018.

Objective 9: Improved environmental outcomes from stormwater assets

Investigations into opportunities to naturalise stormwater assets

Over the reporting period, Hunter Water has been investigating opportunities to naturalise our stormwater assets at key locations. Naturalising a concrete channel will lead to improved amenity, environmental value and liveability. A stormwater naturalisation study for Hunter Water-owned concrete channels is currently underway and a draft report was received in June 2018. This study identifies the highest priority channels for naturalisation.

Hunter Water has also submitted an application for a Newcastle Port community grant for amenity improvement works to the Cottage Creek stormwater channel.

Moving forward

The stormwater naturalisation study is due for completion in late 2018. A willingness to pay study for stormwater amenity improvements will also be completed in September 2018.

Water sensitive urban design

Hunter Water has commenced engagement with stakeholders to review opportunities to improve water sensitive urban design. This has involved setting up and holding a quarterly interagency working group (Councils excluding Maitland and Dungog, Department of Planning and Hunter Development Corporation), and commencing the first stages of water sensitive cities benchmarking process.

Moving forward

Continue to engage with stakeholders at quarterly working groups, and development of a case for benchmarking the region by the end of 2018.

Business practice initiatives

Objective 10: The establishment of a work place culture that values sustainable work practices

Sustainability plan

Work has commenced on the development of a sustainability plan which will focus on our contribution to the United Nations Sustainable Development Goals. There are several key strategic planning initiatives underway that relate to sustainability. Investigations relating to carbon neutrality, water resilience, sustainable procurement, renewable energy generation, energy recovery from wastewater and improved waste management practices have been occurring during 2017-18.

Moving forward

In 2018-19, we will develop a sustainability dashboard and a strategic plan that will draw together all the different initiatives that are either in investigation phase or implementation phase. The dashboard will include key sustainability performance indicators by which we can benchmark its performance and report progress into the future.

Objective 11: Improved environmental work practices

Implement environmental audit program

During 2017-18, we completed five integrated audits for the EMS, WHS and quality management systems. The EMS performed well with only minor non-compliances identified across the five audits.

Moving forward: The integrated audit program will continue in 2018-19.

Environmental training of workforce

Extensive environmental training was rolled out during 2017-18 - including training for Electrical Mechanical Maintenance, Civil Maintenance and Infrastructure Delivery.

Moving forward

Training proposed for 2018-19 will include environmental training for the Program and Project Management (PPM) partnership team, heritage training, incident response training and general environmental/sustainability awareness training that will be undertaken as online training.

Objective 12: Relevant community and stakeholder consultation on environmental matters

Love Water Campaign

We launched our Love Water campaign in 2017 - our new primary water conservation messaging campaign, replacing the previous focus on Water Wise Rules. This campaign is discussed in section 3.2.2 of this report.

Moving forward

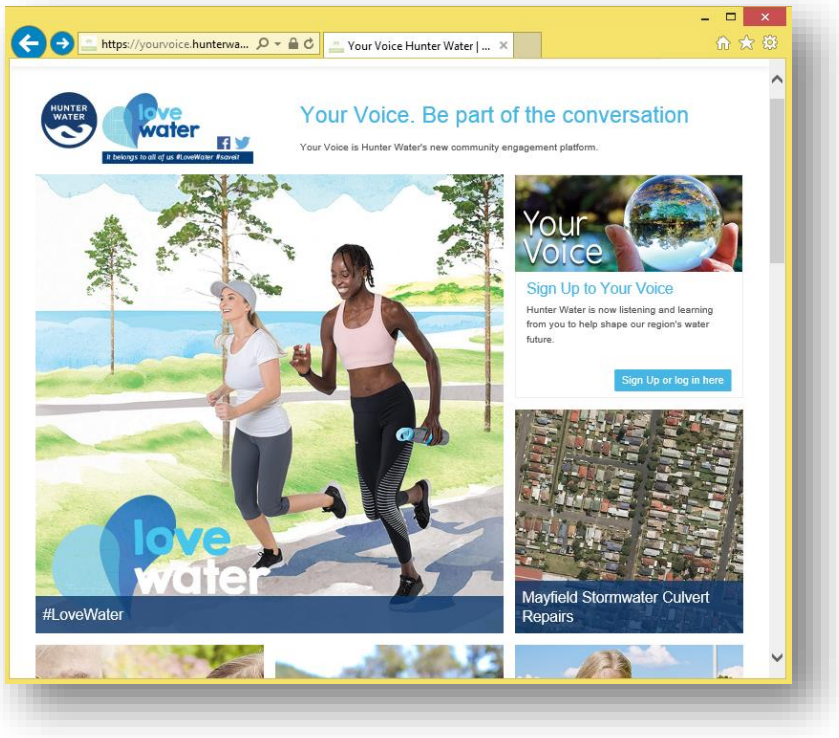
Over the 2018-19 reporting period, we will continue to promote the messages of the Love Water campaign, through both traditional and social media avenues. We are also utilising new advertising channels such as bus 'skins', murals on Hunter Water assets and signage upgrades. The Love Water messaging and brand will also be incorporated into our school education program and our community grants programme and events support.

Your Voice

Hunter Water's 'always on' community engagement approach aligns with our intent to become a learning organisation where customers become participants in the decisions of our organisation (instead of being passive consumers). Our new engagement platform is 'Your Voice' (www.yourvoice.hunterwater.com.au). Your Voice was launched in May 2018 and will play a critical role in encouraging community participation in initiatives across our entire organisation. Your Voice will help to develop conversations with our community and enable community sentiment to be better considered in our decisions and plans.

Moving forward: Now established, Your Voice will be home to ongoing community engagement with key sectors of the community. It will be a communications platform that will be used to facilitate conversations on Hunter Water initiatives as they are added to the website.

Figure 4-1: Front page of 'Your Voice' on our website (https://yourvoice.hunterwater.com.au/)



Informing the community about Hunter Water's activities and impacts on the environment

During 2017-18, we revamped traditional avenues of messaging to customers through development of 'The Fountain', a newsletter issued to every household across Greater Newcastle. The customer newsletter 'Making Waves' will also be inserted with all water bills.

Various PR and media events around environmental themes also occurred during 2017-18, including a water donation to save endangered birds at Hunter Wetlands; a 'what not to flush' campaign; our response to the Stockton beach erosion incident; waste to energy research partnership, and consultation on the Wyee Sewer Scheme.

We also measure community perception of our care for the environment through a regular telephone poll run by a third party provider.

Education programs and community presence

Our key education programs and community activities during 2017-18 are described in section 3.2.3.

Annual community sponsorship program

Our community sponsorship programs and partnerships are described in section 3.2.3.

We partner and work collaboratively with local conservation organisations (such as Port Stephens Koalas), community groups and charities to help educate about the importance of our environment and the impacts of our behaviour.

Moving forward

Hunter Water will continue to work with local groups to raise awareness about the value and importance of our water and the environment.

Internal and external communication guidelines

Guidelines for both internal and external communications were drafted in early 2018 and shown to the EMS certification auditors as part of the last surveillance audit in February 2018. The guidelines were deemed appropriate and are pending finalisation.

Willingness to pay study

We engaged our customers to assess their willingness-to-pay study for several important initiatives related to environment and sustainability. The feedback received from customers will be used to help us determine the support from the community for various initiatives.

The study sought to determine customers' willingness to pay for Hunter Water to undertake a range of discretionary activities, some of which may have a direct or indirect environmental benefit. The questions related to reducing greenhouse gas emissions, conserving water, increasing recycled water use and various stormwater issues (stormwater harvesting, improved amenity and flooding in the Wallsend area).

Hunter Water sent out survey invites to 3,000 customers in late June 2018. The survey was closed mid-July 2018, with around 700 complete responses. Hunter Water is currently analysing the results from the study responses.

Moving forward

A final report from the study is due in September 2018. We also plan to undertake customer engagement on the setting of our water usage price during IPART's upcoming review of our prices to understand our customers' views on their preferred mix of fixed water service and variable water usage charges. Part of the survey will elicit customer views on the role of pricing in driving water conservation behaviours.

Objective 13: Avoid environmental impacts and ensure the efficient use of resources

Environmental impact assessments

Environmental impact assessments were undertaken for the delivery of all new infrastructure. This includes construction contractors having construction environmental management plans for all relevant contracts. This practice will continue moving forward.

Objective 14: Create a sustainable supply chain

A sustainable supply chain

Hunter Water engaged a consultant to identify opportunities to improve the sustainability of procurement and to develop a sustainable procurement approach. This work is ongoing, however deliverables from the project to date include the development of a heat map that identifies threats and opportunities for sustainability initiatives in our major spending categories.

Moving forward

A roadmap for delivering the sustainable procurement approach will be finalised in September 2018.

Objective 15: Sustainable Land Management

Biobanking

BioBanking is a market-based scheme created under the *Threatened Species Conservation Act 1995.* Under the BioBanking scheme, biodiversity credits can be generated by landowners who commit to enhancing and protecting biodiversity on their land by entering into a biobanking agreement with the NSW Office of Environment anted Heritage (OEH). Biobanking agreements will be an important step towards biodiversity conservation and improving land management across our landholdings. Over the reporting period, a biobank agreement has been finalised with OEH for land we own at the Hunter Regional Botanic Gardens at Heatherbrae. Five other biobank agreement applications are currently with OEH for assessment.

A biodiversity credit sales strategy has been developed and will be used as biobanking agreements are created.

Moving forward

We plan to have up to five more biobanking agreements finalised during 2018-19.

Management of land contamination

We have a well-developed strategy for managing contaminated sites. The strategy has continued to be rolled out during 2017-18. Key elements of the work have included groundwater contamination assessments at our wastewater treatment works sites, improvements in the management of hazardous chemicals including a business case to construct new facilities that will ensure high levels of environmental and WHS compliance.

In January 2018, large ocean swells caused erosion of the Stockton Beach shoreline, resulting in exposure of the landfill material from an old council landfill operated on our land. Since this time, we have been working to stabilise the shoreline and to reduce the potential for further erosion of landfill to occur. Approximately 8,000 tonnes of landfill material has been removed from the land closest to the beach and taken to Summerhill Waste Facility. We have proposed to build a temporary coastal protection wall to minimise the risk of further landfill being exposed from coastal erosion events.

Moving forward

Groundwater contamination assessments are planned at Stockton and a number of treatment plant sites over the next twelve months. The contamination land management strategy will also be reviewed and updated during the next twelve months.

Planning approvals for the coastal protection wall at Stockton will continue, with construction of the works scheduled to commence in late 2018.

Weed management

Weed management programs have been implemented at a number of treatment plant sites over the past twelve months. Aquatic noxious weed control was also carried out within the waters and wetlands of Balickera Canal in accordance with our Environmental Protection Licence.

Hunter Water has been actively involved in the regional weeds committee, which has been looking at the best way to ensure that the requirements of the *Biosecurity Act 2015* are fulfilled.

Moving forward

We plan to prepare a program for weed management covering the next four years.

Objective 16: Effective contingency planning and management of environmental emergencies

Investigation of every environmental incident

We formally investigated (including root cause analysis) four environmental incidents in 2017-18, which is 100% compliance. Actions have been logged with responsible areas of the business. Progress will be tracked and reported until the actions are closed out.

Bushfire management

Our Bushfire Management Plan (BMP) has been reviewed and revised. Employees with responsibilities under the BMP have been identified and notified. Discussions have been held with the Rural Fire Service (RFS) and an agreement made to share Geographic Information System (GIS) data.

Moving forward

Implementation of the BMP, including sharing GIS data with the RFS and creation of new GIS layers for bushfire management and critical assets.

Objective 17: Conserve cultural heritage

Conservation of cultural heritage

Figure 4-2: 'The Res' – a 19th century underground drinking water reservoir located on The Hill

Our heritage assets represent a rich history of over 100 years of the organisation's operations to supply drinking water, treat wastewater and maintain effective drainage of stormwater.

A key conservation achievement during 2017-18 was the listing of Newcastle No. 1 and No. 2 reservoirs on the State Heritage Register in April 2018. These assets are of state heritage significance for their historical associations with the Walka and Chichester water supply schemes, the first and second water supply schemes for the Hunter district. Newcastle Reservoir No. 1 also demonstrates the importance of aesthetic treatment in nineteenth century NSW water supply infrastructure and as one of only two NSW water reservoirs known to feature tied brick arches. Newcastle Reservoir No. 2 is of state significance as an early application in NSW of reinforced concrete construction to a water reservoir on an urban site with design treatment dictated by the surrounding streetscape.

Moving forward

During 2018-19, we will continue activities working towards the conservation of our heritage assets. This includes reviewing the heritage asset management strategy and moveable heritage policy. A system will also be developed for managing our moveable assets, including making improvements to asset storage, asset documentation and conservation practices.

Objective 18: To be climate resilient

Climate change adaption strategy

Climate change poses potential risks and opportunities to Hunter Water due to changes in the frequency, distribution, intensity and duration of climate-related events. In order to improve business resilience and preparedness in relation to climate change, we are undertaking a comprehensive review of our climate change risk register. During 2017-18 consultants were engaged to lead this review and developed a comprehensive risk register and action plan that will form the basis for a major review our climate change adaptation strategy.

Moving forward

Finalisation of a revised strategy and development of action plans for high-risk assets.

Objective 19: To reduce greenhouse gas emissions

Smart Integrated Pump Scheduling (SIPS) project

This project is about pursuing cost-effective energy efficiency projects across the water distribution network through load shifting, capacity charge optimisation and improved operational efficiency. During 2017-18, project ground work has been carried out, including seeking expressions of interest, tender preparation, a live software trial and business case preparation.

Moving forward

The SIPS project will be delivered over the coming few years, with expected completion January 2020.

Carbon reduction studies

We have an aspirational goal of becoming carbon neutral. During 2017-18, various projects were carried out to support development of a carbon neutral strategy. This work included estimates of current scope 1 and 2 emissions and identifying and developing a range of carbon reduction initiatives (including commencing studies on renewable energy from biosolids, investigating low emissions fleet and floating solar).

Moving forward

Completion of studies to support the carbon neutral study, including carbon reduction options study (September 2018), estimate of scope 3 emissions (September 2018) and a customer willingness to pay study for carbon reduction initiatives. A complete carbon neutral strategy is targeted for completion by December 2018.

Energy monitoring and reporting framework

We measure and verify our energy savings (both financial and GWh) quarterly, to track performance of energy efficiency projects each month. Final quarter results for 2017-18 are not yet published due to latency in data accessibility. However, Q3 results forecast annual savings via energy efficiency initiatives to be $740,000 and 3.6 GWh year-to-date, compared to our full year target of $1m and 4.5 GWh.

Moving forward

To continue existing measurement and verification. However, the process will be reviewed to determine if a more efficient process is possible, including automation of the process / calculations (by July 2019).

Renewable energy

Measurement of existing renewable energy utilisation established, reported through to EMT via a monthly environmental report. It was found that we have only 28% utilisation of existing renewable energy assets. Major asset overhauls are required to reliably increase this number.

Moving forward

Hunter Water's renewable energy strategy will be finalised.

Objective 20: Improve environmental performance through the acquisition of applied knowledge

Research and development

To promote innovation and technical leadership, we have established a Research and Development (R&D) Committee, with frequent meetings held during the year. The use of a committee to make decisions on R&D projects was recently reviewed, and there is an update underway of our overall R&D Strategy.

Moving forward

A revised format and decision making process of the R&D Committee will be implemented. A revised R&D strategy will be finalised by December 2018.

4.2.4 Significant changes to the EMS in 2017-18

Following a third party certification audit in August 2017, we transitioned our EMS certification from ISO 14001:2004 to ISO 14001:2015. We were issued with a certificate of conformity to ISO 14001:2015 on 20 October 2017.

We implemented a new corporate Environmental Management Plan in February 2018. Our Environmental Management Plan 2018-2020, which is a key EMS document, replaces the existing EMP which has been in place since 2013.

Our enterprise risk management (ERM) framework was recently updated to include risk appetite statements and improvements to the risk rating matrix and likelihood table. Risk appetite statements were defined for specific business risks associated with elements of the Environmental Management System. Environment-related risks are now being managed in accordance with the updated ERM.

4.2.5 Major non-conformities with the EMS in 2017-18

No major non-conformances with the EMS were identified during third party certification audits or internal audits during 2017-18

In July 2017, we received a penalty notice from the Environment Protection Authority (EPA) relating to leaks of our Alum system and pre-lime dosing injection point at the Dungog Water Treatment Plant. The leaks were identified during an inspection undertaken by the EPA in May 2017.

4.3 Quality Management System (QMS)

4.3.1 Introduction

This chapter provides an overview of Hunter Water's performance in quality management. It reports on compliance with clause 4.3 of our Operating Licence and details the quality management programs and activities completed during 2017-18 and the results and outcomes of these activities. Furthermore, it reports on the proposed programs and activities for 2018-19. The chapter also reports on any non-conformances with, and significant changes made to, our quality management system.

4.3.2 Overview of Hunter Water's QMS

We have implemented and maintain a quality management system (QMS). The system consists of systematic processes to manage the core functions of the organisation and is implemented 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 achieved initial certification to ISO 9001:2008 *Quality Management Systems - Requirements* in August 2015 and later transitioned to ISO 9001:2015 *Quality Management Systems - Requirements* in June 2017. We have continuously maintained our certification and recently completed our triennial re-certification (June 2018).

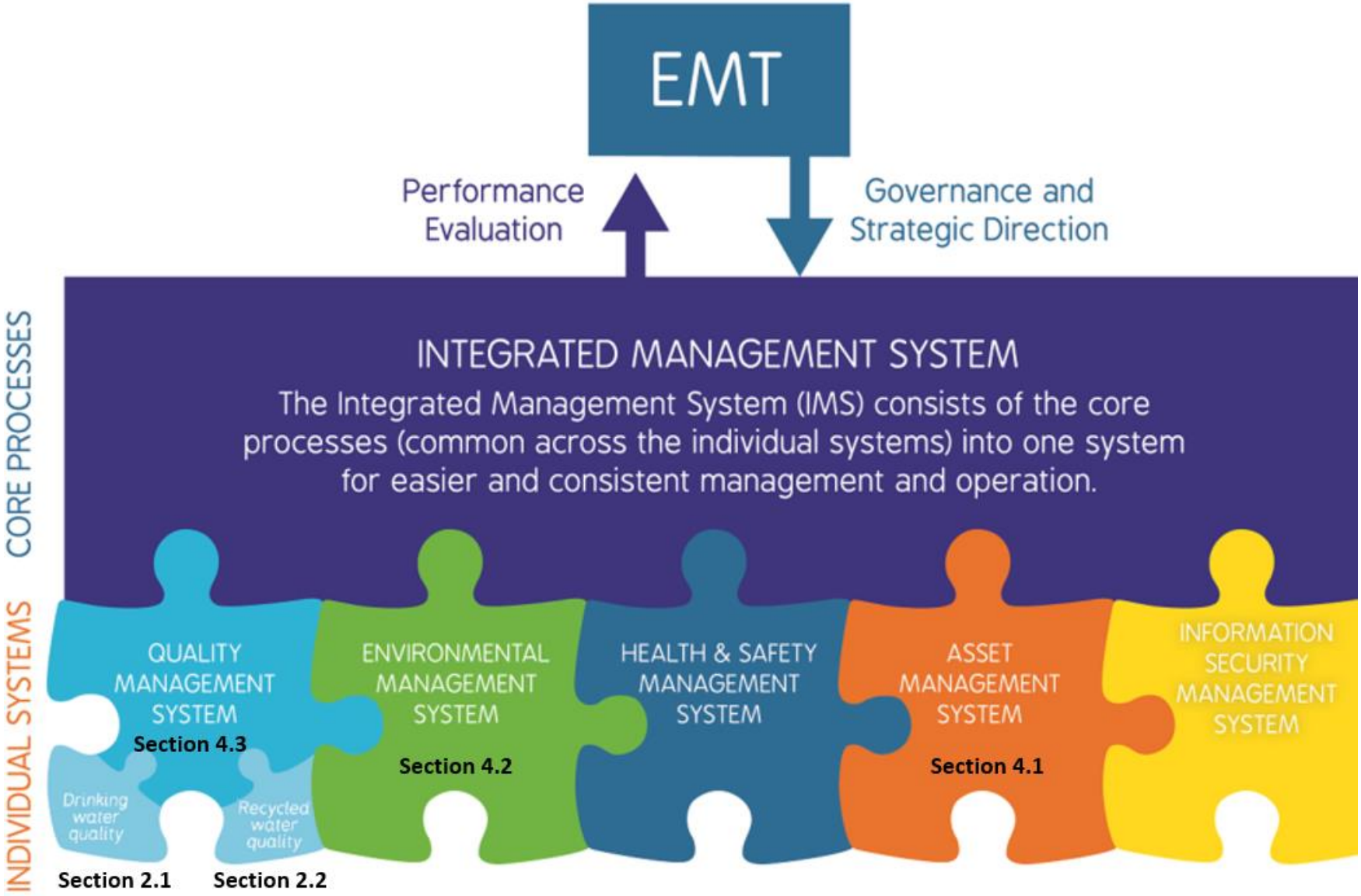
We have adopted an integrated approach to managing our management systems in the form of an Integrated Management System (IMS). The IMS provides processes, principles and guidelines across common functions of the different management systems. Individual management systems provide the subject matter expertise 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.

As a result of the integrated approach, only quality-specific requirements are managed directly by the quality management system. 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. The ADWG and AGWR are described in detail in section 2 of this report.

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 4-3: Overview of our Integrated Management System and the applicable sections of the compliance and performance report



4.3.3 QMS - activities and programs completed during 2017-18

Activities and programs completed in 2017-18 to meet the objectives of the QMS/IMS are described in Table 4-3.

Table 4-3 IMS/QMS - activities and programs completed in 2017-18

Objectives	Activity / Program	Results / Outcomes
IMS		
Continuous Improvement	Improve the induction pack for new starters to improve business awareness and understanding of the IMS, QMS, AMS, EMS and Work Health and Safety (WHS).	An improved induction pack has been developed. It will be rolled out in 2019 as part of the implementation of our new learning management system application.
Continuous improvement	Development of new procedures relating to incident investigation and root-cause analysis.	Procedures developed for use in identifying and addressing root causes. This includes investigations as both a result of incidents and undertaken pro-actively to understand emerging trends.
	Initial scoping and cost / benefit review of a new technical solution to capture and manage governance, risk, compliance and incident information.	Initial scoping and cost/benefit of an integrated incident and risk management application was completed. Due to the variety of applications on the market and the desire to purchase a prudent solution, we have elected to conduct further product demonstrations to better understand different functionality offerings and cost models. The project is scheduled to conduct an open tender in early 2019, with phase one roll-out by end of 2019.
	Initiate a program to align the certification dates of the separate management systems.	We engaged a new audit and certification provider in March 2018 via an open tender process. The next surveillance audit dates have been aligned and a program to align the certification dates has been developed. This has reduced the required number of audit days, resulting in lower cost and minimised disruption to the organisation during the audit period.
Compliance	Review and improve Hunter Water audit processes.	This review is ongoing. An integrated management system internal audit programme has been drafted and the integrated internal audit approach was piloted. Transition to a new audit & certification provider and lessons learned from the pilot has provided new inputs requiring further review.
	Implement a new document control technology solution.	A project to design and implement a new solution for managing control of documents that guide and govern our activities began in 2017-18 and is ongoing. This new solution will provide a single repository for all work practice documents, allowing for easier access and better control. Functional and design requirement workshops were conducted internally and with the solution provider.
QMS		
Compliance	Complete a gap analysis of the QMS against revised standards to ensure ongoing compliance with international standards.	The gap analysis was completed and all defined activities were completed.

	Certification to new QMS standard ISO 9001: 2015.	Re-certification was awarded in May 2018 for a 3-year period.
Meet stakeholder needs	Deliver customer hotspots program.	Continue to reduce asset-related repeat complaints.
	Improve accuracy of billing process.	Continue to reduce billing and account complaints.
	Maintain the accuracy of Section 50 'Formal Notice of Requirements' letters issued.	Achieved target of reduced correction and reissue of 'Formal Notice of Requirements' letters.
	Customer Engagement	Developed a strategy for engaging with customers, consumers and community to inform our long-term plans. Mapped customer segments to provide intelligence for future engagement activities
Continuous improvement	3-yearly internal audit program for QMS.	All quality audits have been completed in accordance with the schedule.
	Development Services strategy deployment and organisational wiring improvement program.	Key processes have been reviewed, remapped, optimised and standard operating procedures established. The Notice Letter has been converted to a digital output, signed electronically and emailed, saving postage and handling time.
	Formalising and improving monitoring and measurement of process and performance.	Continuing the review of current processes around key monitoring and measuring equipment such as flowmeters.

4.3.4 Proposed IMS and QMS activities and programs

Hunter Water considers there to be opportunities to improve and strengthen the QMS, particularly increasing the extent to which it is embedded across the organisation. Future proposed activities and programs to meet the objectives of the QMS/IMS are described in Table 4-4.

Table 4-4 IMS/QMS - Proposed quality management activities and programs

QMS / IMS Objectives	Activity / Program	Activity Objective
IMS		
Continuous improvement	Update Hunter Water's learning & development standard and related procedures	Identify, define and manage competency requirements across the organisation, specifically relating to the requirements of the management systems. Standard and procedures developed by June 2019.
	Implement a new integrated incident and risk management application to capture and manage governance, risk, compliance and incident information	Generate information to assist with obtaining high level visibility into organisational performance and assist with trending, analysis and identification of continuous improvement opportunities. Phase one roll-out to be completed by December 2019.
	Review and improve Hunter Water audit processes	This review is ongoing. Review to provide consistent terminology, audit outcomes and processes. Review to be completed by June 2019.
	Implement new work practice library (document control) technology solution	Design details and migration plans will be finalised, and the project is scheduled to go live to the organisation by December 2018.
Compliance	Map key processes and data input requirements for targeted information that will be managed in the new integrated incident and risk management application	Provide confidence the data collected within the new system is in alignment with our processes and data compliance requirements. Key processes in phase one roll-out completed by December 2019.
QMS		
Continuous improvement	Formalising and improving operational performance through improved quality monitoring processes	Continue to look for opportunities through focused quality metrics
	Quality engagement program	Implement a program to actively promote and educate internal stakeholders on the value of quality, process improvements and efficiency gains.
	Developer services programs	Continue to develop business processes that support development and allow for innovative solutions.
	Customer service strategy	Provide a consolidated view of customer service operations and strategic initiatives intended to

		improve customer experience. Customers will be invited to participate in this planning process to identify highly valued service attributes and test and validate strategic themes that are based on customer values and priorities. The strategy is planned to be completed by November 2018.
	Quality non-conformance program	Continue to build on the awareness and appropriate use of the quality non-conformance processes and undertaking robust analysis of results for emerging trends
Meet stakeholder needs	Customer engagement programs.	Continue to improve understanding of the needs and expectations of customers through a range of customer engagement programs and activities.
	Service levels customer engagement	Customer engagement on service levels to inform a review of the system performance standards and service level rebates ahead of IPART's next review of our Operating Licence.
Compliance	Reporting and Monitoring Protocol	Improve efficiency and accuracy of regulatory reporting by improving processes and documentation of data collection, processing and reporting.

4.3.5 Significant changes to the QMS in 2018-19

Continuous improvements to the QMS will be pursued during 2018-19 (as described in Table 4-4). These improvement activities and programs are considered to be refinements to the QMS and IMS rather than significant changes.

Our enterprise risk management (ERM) framework was recently updated to include risk appetite statements and improvements to the risk rating matrix and likelihood table. Risk appetite statements were defined for specific business risks associated with elements of the Quality Management System. Quality-related risks are now being managed in accordance with the updated ERM.

4.3.6 Major non-conformities in the QMS and actions taken to resolve them

There have been no major non-conformities in the QMS during 2017-18.

5 CUSTOMERS AND STAKEHOLDER RELATIONS

5.1 Introduction

This chapter describes the activities and achievements of our Customer and Community Advisory Group during 2017-18 and demonstrates our compliance with the Group's charter. Systemic problems arising from complaints are identified and the actions taken to resolve these problems are described. We also report on any changes that we have made to our customer contract, procedure for payment difficulties and actions of non-payment, customer and community advisory group charter, internal complaints handling procedure and our external dispute resolution scheme.

5.2 Customer and Community Advisory Group (CCAG)

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

5.2.1 Compliance with the Customer and Community Advisory Group Charter

Our compliance with the CCAG Charter is demonstrated in Table 5-1.

Table 5-1 Compliance with the requirements of our Customer and Community Advisory Group's charter in 2017-18

Mandatory content	Charter reference	Charter requirement	Compliance
Role	Purpose, objectives, duties and responsibilities, authority	Members are encouraged to present their views, provide advice and disseminate the information provided by Hunter Water.	Meeting minutes are available on Hunter Water's website (see https://yourvoice.hunterwater.com.au/ccag). Key matters raised in 2017-18 are described in section 5.2.2.
How members and the Chair of the customer advisory group will be appointed	Membership of the forum, and selection criteria	A person representing each of the interests listed in clause 5.4.3(b) and (c) of the Operating Licence will be included where practical. Expressions of Interest for membership remain open until the vacancies are filled.	There are currently no members representing people with disabilities, Aboriginal people, or low income households. Hunter Water used its best endeavours to include members of the required groups on the CCAG, including inviting applications via advertisement on the home page of Hunter Water's website.
Membership term	Membership of the forum	Two year term.	A number of new members joined the CCAG during 2017-18, and a number of members resigned. This ensured an appropriate level of turnover within the CCAG during the financial year. The matter of term lengths was discussed in the Strategic Review of the Group which commenced at the February 2018 meeting. As an outcome of this session, since the end of the financial year, an updated Charter has been prepared which outlines an updated term length and renewal processes.

Mandatory content	Charter reference	Charter requirement	Compliance
Operations	Meetings, forum protocol, conflict of interest.	Meetings will be held at least three times per year.	Meetings were held in October 2017, February 2018 and May 2018.
Types of matters raised and mechanisms. Tracking issues raised and responses	Objectives, duties and responsibilities.	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.	Agenda items have been called for in advance of meetings. Any issues requested are included in Questions on Notice in the Agenda and Minutes. Forum Members are also able to raise any topics (without notice) during General Business. Forum member questions are documented in the Minutes. Key matters raised in 2017-18 are described in section 5.2.2.
Communicating meeting outcomes	Reporting responsibilities.	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://yourvoice.hunterwater.com.au/ccag). Hunter Water's 2016-17 Annual Report. Items were included in the employee newsletters and on the home page of Hunter Water's website.
Procedures for monitoring issues raised at meetings	Hunter Water commitments	Meeting minutes include a summary list of actions	Hunter Water tracks actions through the meeting minutes, which are presented to the CCAG for endorsement and are published on Hunter Water's website.
Procedures for amending the charter	Document version	The Charter will be updated following 1 July 2017.	Hunter Water engaged the University of Technology Sydney's Institute for Sustainable Futures (ISF) to undertake a strategy session and review with CCAG members in February 2018. Actions were identified through this review and a path forward was agreed at the May 2018 meeting of the CCAG. An updated Charter, including agreed changes, is being considered at the August 2018 CCAG meeting.
Funding and resourcing	Meetings	Sitting fee set in accordance with the fees and charges set for Advisory Boards and Committees in the NSW Premier's Memorandum No.99-3, Guidelines for Government Boards and Committees.	The sitting fee for 2017-18 was $100 per meeting. Some Forum members elected not to receive the sitting fee.

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

5.2.2 Customer and Community Advisory Group activities and achievements 2017-18

In 2017-18, the CCAG considered a range of issues, including those recommended by Hunter Water, and self-generated topics that were 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.

5.2.3 Key matters and achievements in 2017-18

Strategic role of the Customer and Community Advisory Group

We engaged the University of Technology Sydney's Institute for Sustainable Futures (ISF) to undertake a strategy session and review with CCAG members in February 2018.

This review resulted in a comprehensive report, which outlined a range of actions to improve the operation of the CCAG. We presented a response to identified actions at the May 2018 meeting of the CCAG, with implementation of a number of actions commencing immediately (including modification to chairing protocols, an increased strategic focus of agendas, a web portal on Hunter Water's Your Voice website for the CCAG and increasing meeting frequency to quarterly).

Hunter Water's Strategic Direction

Across each meeting in 2017-18, the CCAG was engaged in detailed discussion about the future direction of Hunter Water and the initiatives identified in our 2017+3 Strategy.

Contamination at RAAF Base Williamtown

Contamination at the RAAF Base Williamtown poses a significant issue for the local community and Hunter Water. Across each of the CCAG meetings, Hunter Water provided an update on the current status of investigations and efforts to support the Williamtown community (including Hunter Water's project to provide reticulated water supplies to properties within the formal Investigation Zone).

Development process improvements

Local government representatives in particular expressed interest in Hunter Water's initiatives to better enable good development. This included receiving presentations on changes to the certification of works process and an overview of Hunter Water's *Growth Plan*.

5.3 Actions to address systemic problems arising from complaints

We have reduced complaint risk, in part via improvements to existing processes initially introduced during 2015-16 and updated during 2017-18, to further improve the prompt resolution of customer issues. Current processes provide a centralised first point of contact for all customer enquiries and complaints. The first point of contact is equipped to escalate cases that may require handling by an appropriate subject matter expert to ensure prompt response and resolution.

As a result of the first contact resolution strategy, we have initially responded to 100% of customers within three days for the second consecutive financial year.

We have resolved 96% of customer complaints within 10 working days, an increase of 1% from 2016-17.

We analyse performance indicators to identify systemic issues and then undertake actions to address these issues. In 2017-18, the largest complaint categories were billing/account and sewer odour complaints.

Billing complaints

Complaints about our billing are our highest customer complaint driver. The initiatives being undertaken to resolve these issues are:

- **Bill smoothing**

  We are currently replacing our billing system ('Billing System Refresh'). A key initiative of this project is to provide bill smoothing as a payment option for customers seeking more affordable scheduled fortnightly or monthly payments.

- **Bill presentation**

  Customers have requested bills that are easier to understand. Changes to details relating to the calculation of charges will provide improved transparency and clarity for customers.

- **Minimisation of bill errors**

  We are using additional resources to monitor and check our bill calculations in order to minimise bill errors.

- **Account Assistance Program**

  We provide assistance to customers who are struggling financially through affordable payment plans, holding of interest and provision of payment assistance through the payment assistance scheme (PAS). PAS is administered by community agencies such as St. Vincent de Paul, Samaritans and the Salvation Army.

- **Outreach visits**

  We make outreach visits to community agencies such as neighbourhood centres, Samaritans and the Salvation Army to engage with customers face to face and promote awareness of our assistance programs.

Sewer odour complaints

We have undertaken a range of actions to reduce sewer odour issues. These include:

- Investigating wastewater pumping stations that have an identified odour issue to determine whether odour control unit installations are necessary.
- Undertaking works to refresh the media at wastewater treatment plants with soil bed filters to control odour.
- Specifying odour control measures as part of the wastewater network design for new developments.
- Installing and operating chemical dosing systems at various locations in the wastewater network to mitigate odours.
- Conducting site inspections and odour logging in response to repeat reports of odour cases to ascertain if there is an issue with Hunter Water's wastewater system or if the odour may be from other sources such as shoreline seaweed.
- Providing information to customers on our website and twitter account regarding:
  - Weather events that may provide customers with possible reasons for sewer odour issues and possible mitigation responses to these events.
  - Sewer odour hotspots.
- Providing our contact centre employees with standard messaging and actions for responding to sewer odour related customer incidents and preparing these employees in order to ensure effective and accurate communication relating to sewer odour issues.

5.4 Changes to customer and stakeholder documentation and procedures

Hunter Water's Operating Licence Reporting Manual requires it to report any changes

5.4.1 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, payment terms and assistance options for customers experiencing financial hardship, and information on enquiries, complaints and disputes.

During 2015-16 and 2016-17, IPART conducted an end of term review of our Operating Licence. The NSW Government published a Gazettal notice dated 30 June 2017 approving the package.

A range of changes were made to the Customer Contract that came into effect on 1 July 2017. The changes were focused on making the document easier to understand, ensuring consistency with current legislation, improving clarity, and providing flexibility where it is mutually beneficial to both us and our customers.

The main changes to the Customer Contract were:

- Simpler structure, more logical sequencing of clauses, amendments to existing, and addition of new, definitions and interpretations;
- Improved clarity in relation to provisions that:
    - Do not extend to non-standard customers that are subject to separate agreements; or
    - Apply specifically to 'drinking water', reticulated 'recycled water' or both;
- Updated communication channels and methods for customers to obtain information, including via Hunter Water's website and email rather than telephoning;
- Updated maintenance responsibility descriptions and diagrams that accord with recently developed connection standards and planning decisions. The updates also address challenges with the former Customer Contract raised through customer enquiries and complaints; and
- Reference to an 'insolvency event' as an enabler to mitigate losses and potentially recover debt from non-residential customers.

5.4.2 Procedure for Payment Difficulties and Actions for Non-Payment

No changes made.

5.4.3 Customer Advisory Group Charter

No changes made.

5.4.4 Internal Complaints Handling Procedure

No changes made.

5.4.5 External dispute resolution scheme (EWON)

No changes made.

6 IPART INDICATORS

Table 6-1: Hunter Water's performance against IPART indicators

Code	Indicator name	2013-14	2014-15	2015-16	2016-17	2017-18
A1	Number of Properties that experience an Unplanned Water Interruption that lasts for more than five continuous hours	2,347	7,020	3,901	10,144	4,284
A2	Number of Properties that experience three or more Unplanned Water Interruptions that each lasts for more than one hours	1,653	1,959	1,488	742	3,228
A10	Number of Properties that experience a Water Pressure Failure	1,920	1,345	1,312	1,396	2,487
A11	Number of Properties that experience an Uncontrolled Wastewater Overflow in dry weather	3,370	3,469	2,951	3,244	3,352
A12	Number of Properties that experience three or more Uncontrolled Wastewater Overflows in dry weather	17	25	14	12	22

6.1 Analysis of problems of a systemic nature

Hunter Water has not identified any problems of a systemic nature arising from our performance against the IPART performance indicators included in Table 6-1.

7 GLOSSARY

7.1 Acronyms

Process	Description
AWTP	Advanced Water Treatment Plant
ADWG	Australian Drinking Water Guidelines
AGWR	Australian Guidelines for Water Recycling
AMS	Asset Management System
CT	Contact time
CTGM	Chichester Trunk Gravity Main
CCP	Critical control point
DOS	Disinfection Optimisation Strategy
DWQMS	Drinking Water Quality Management System
EC	Electrical Conductivity
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	NSW Environment Protection Authority
ERM	Enterprise Risk Management
EWON	Energy and Water Ombudsman of NSW
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
LHWP	Lower Hunter Water Plan
ML/day	Megalitres per day – one megalitre is a measure of volume equal to one million litres
MPN	Most Probable Number
NPR	National Performance Report
NTU	Nephelometric Turbidity Units
NWI	National Water Initiative
OEH	NSW Office of Environment and Heritage
QMS	Quality Management System
RWQMP	Recycled Water Quality Management Plan
RWQMS	Recycled Water Quality Management System
SCADA	Supervisory control and data acquisition
TRIP	Tillegra Riparian Improvement Project
WELS	Water Efficiency Labelling and Standards Scheme
WHS	Work Health and Safety
WSAA	Water Services Association of Australia – peak industry body for the Australian water industry
WTP	Water Treatment Plant
WWTW	Wastewater Treatment Works

7.2 Water treatment terminology

Process	Description
Aeration	Aeration is typically used as a first step in the treatment of groundwaters. The main function of aeration is to remove carbon dioxide and hydrogen sulphide from the water, and to add oxygen, which assists in iron removal. Water extracted from the Anna Bay Sandbeds and treated at Anna Bay and Nelson Bay Water Treatment Plants is naturally very low in iron and hydrogen sulphide, so the purpose of 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 the water, this causes tiny particles that are naturally present in the source water, when extracted, to stick together or coagulate. The heavier / larger coagulated material called '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.

7.3 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 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.

7.4 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 flocculant 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.