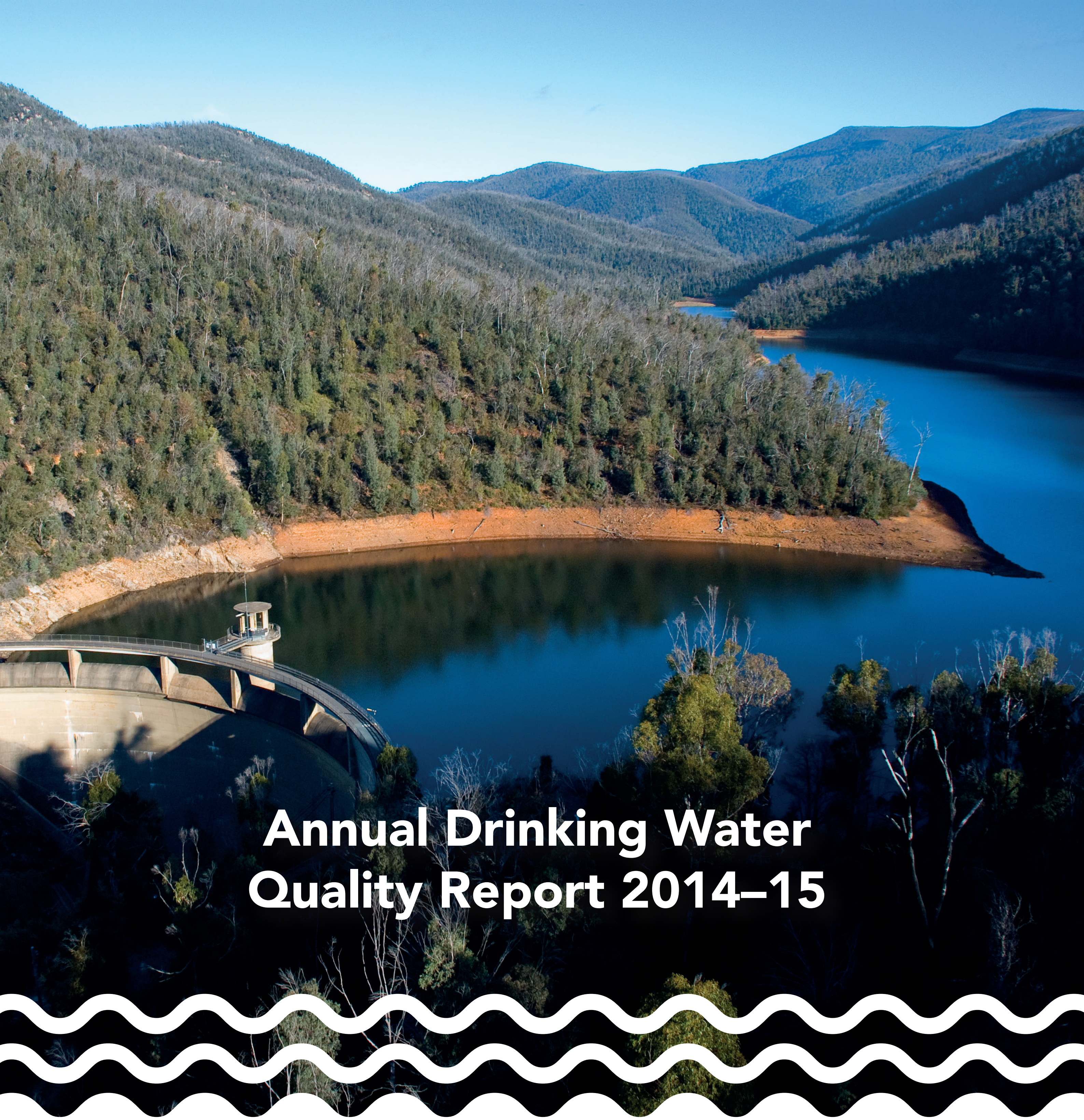

Annual Drinking Water Quality Report 2014–15

icon WATER

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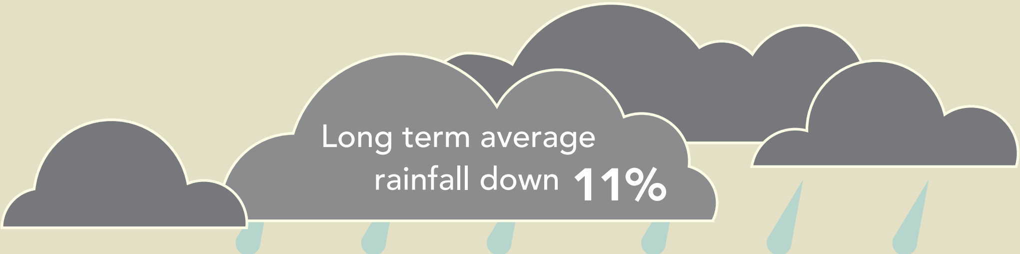


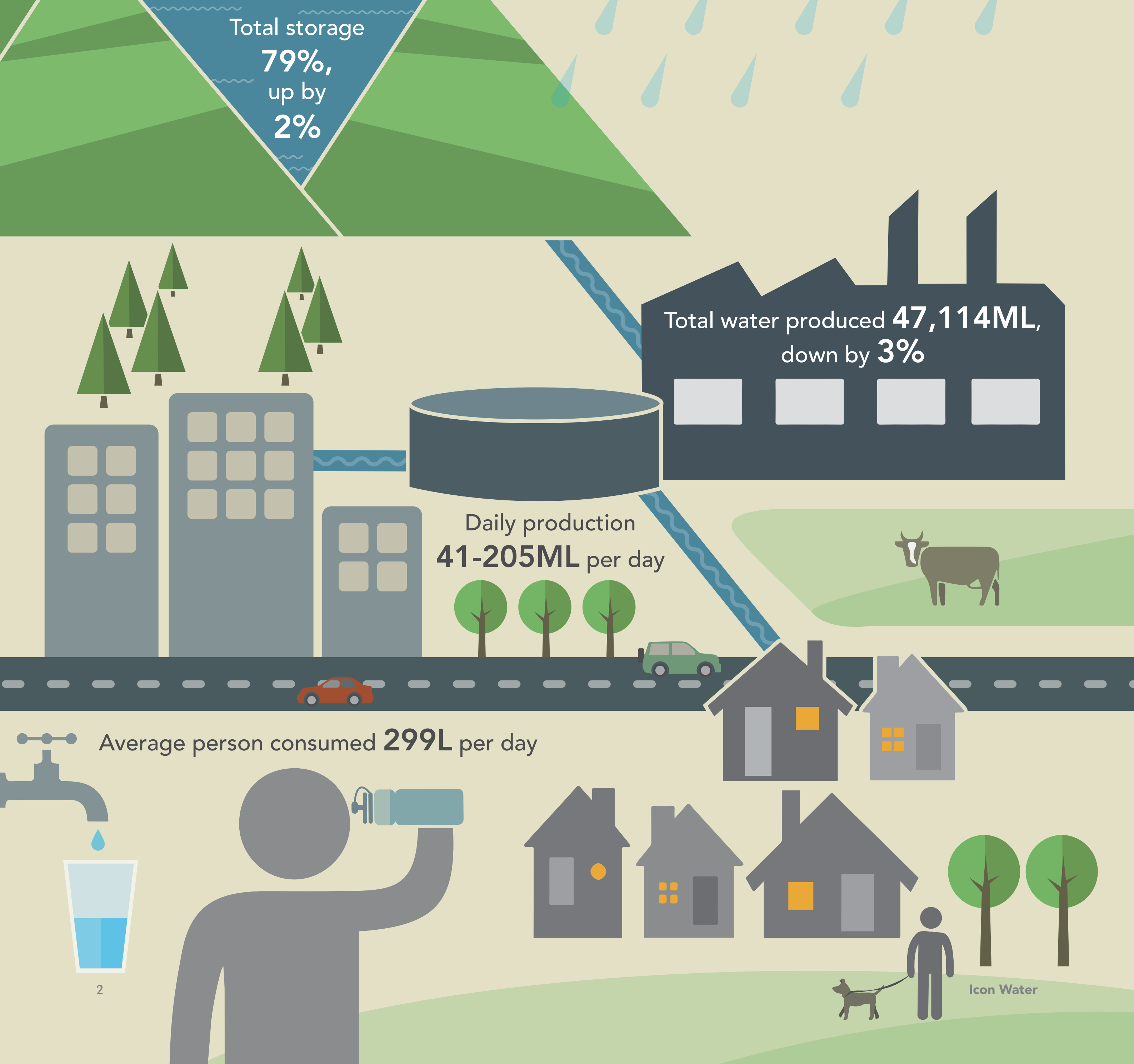
Summary

Icon Water supports and protects the community and the environment by providing safe, clean drinking water.

Icon Water carries out an extensive drinking water quality monitoring program that includes the catchments and storage reservoirs, treatment plants, service reservoirs and customers' taps. The information generated within this monitoring program assists Icon Water in its operations and ensures that high quality water is delivered to Canberra, Queanbeyan and Googong township.

At the end of June 2015, Canberra's four storage reservoirs were holding 79% of their total accessible capacity. Overall daily production of drinking water throughout the year ranged between 41–205 ML per day with a total of 47,114 ML of drinking water supplied to Canberra and Queanbeyan. This is a 3% decrease in the total water supplied to the community and equates to approximately 299 L/day/person and is slightly less than the last two years.

This report covers the period of 1 July 2014 to 30 June 2015.



1. Canberra's drinking water supply system

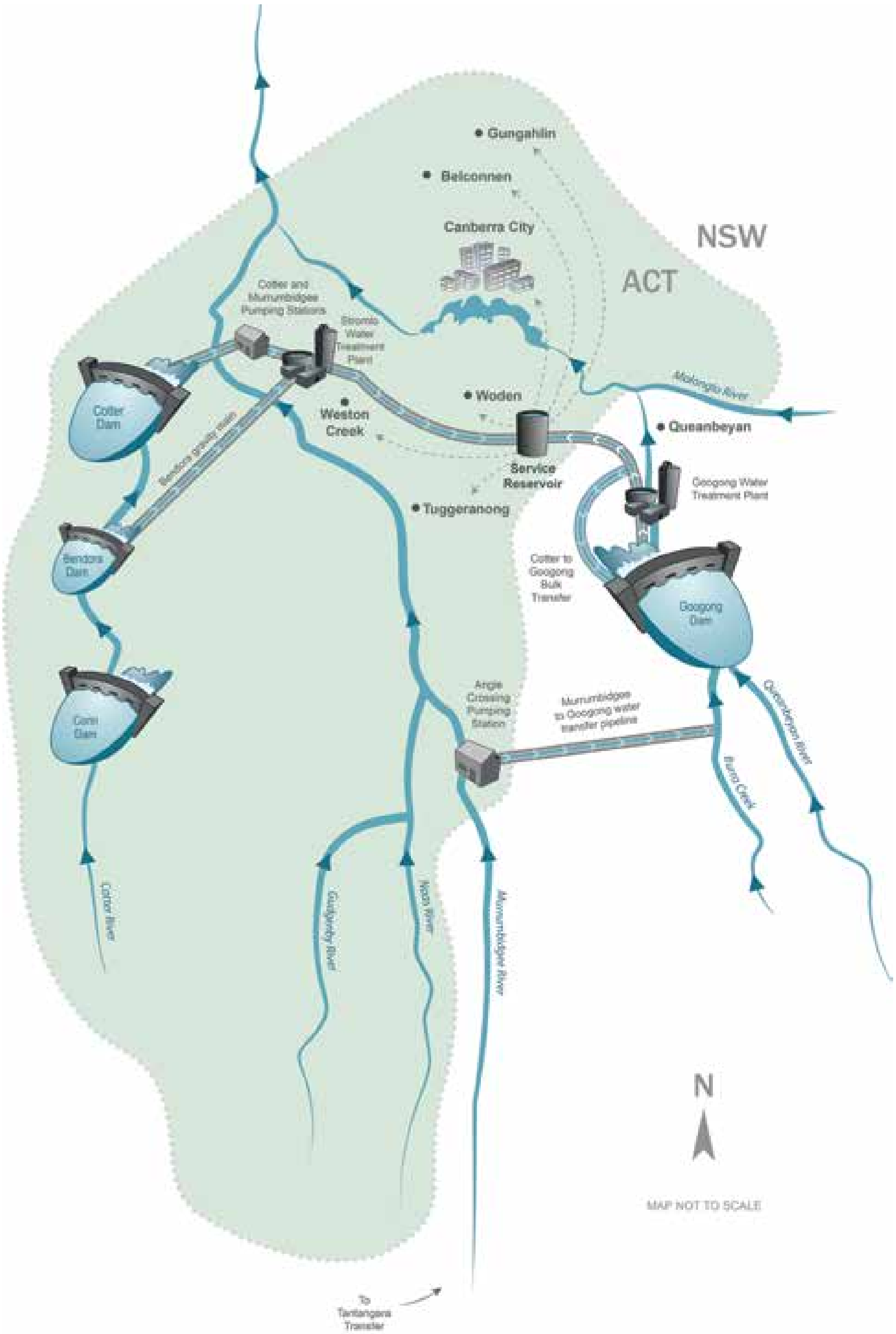
Canberra's drinking water is sourced from the Cotter River, Queanbeyan River and the Murrumbidgee River. The Cotter catchment is within the ACT and includes three storage reservoirs (Corin, Bendora and Cotter) whilst the Queanbeyan catchment lies within NSW and comprises one storage reservoir (Googong). Together with the ACT/ NSW Governments and the community, Icon Water protects and manages these catchments to ensure Canberra's drinking water supply remains amongst the best in the country.

Prior to distribution to the community, the water abstracted from the storage reservoirs is treated at water treatment plants (WTP) operated by Icon Water. The Mount Stromlo WTP has operated since 1967 and can treat water from the Cotter catchment and the Murrumbidgee River. The WTP survived the bushfires that devastated the ACT in 2003. In 2004 it received an upgrade to be able to continue supplying high quality water to Canberra despite the fire damage within the Cotter catchment. The Googong WTP has operated since 1979 and can treat water from the Queanbeyan catchment and the Murrumbidgee River (via the Murrumbidgee to Googong Transfer Pipeline). The Googong WTP is operated in conjunction with the Mount Stromlo WTP to supplement water supply during summer peak demands and enable essential maintenance to occur at the Mount Stromlo WTP.

Once treated, Icon Water distributes the water throughout Canberra utilising a complex network of pipelines and service reservoirs. Icon Water also supplies bulk water to Queanbeyan City Council, who distributes the water to Queanbeyan and Googong township. Icon Water operates and maintains 47 service reservoirs, 25 pump stations and over 3,200 km of water pipelines. This infrastructure is maintained and closely monitored to ensure the Canberra community receives good quality drinking water direct to their tap.

During the 2014–2015 year Icon Water supplied 47,114 ML of drinking water to Canberra, Queanbeyan and Googong township. The average daily production ranged from 41 ML to 205 ML. Overall the total volume of water supplied represents a decrease of 3% from the previous year.

Figure 1.1 Water supply system



Canberra and Queanbeyan's urban development is continuing to evolve and grow. The most recent estimates[1] put Canberra's population at 388,000 and Queanbeyan at 41,000, representing an average annual population growth of 1%. Based on these figures, the average per capita consumption was 299 L/day/person, which is slightly less than last year.

1 **Australian Bureau of Statistics, 3101.0 – Australian Demographic Statistics, Dec 2014 (released 25/06/2015) and 3218.0 – Regional Population Growth, Australia, 2013–14 (released 31/03/2015).**

2. Managing Canberra's drinking water supply

Multiple-barrier approach

Icon Water supports and protects the community and the environment by providing safe, clean drinking water.

Icon Water applies a multiple-barrier approach throughout its operations to protect the water supply from contaminants, including pathogenic microorganisms. This approach is consistent with the internationally recognised Hazard Analysis and Critical Control Point (HACCP) principles. Icon Water continues to retain external accreditation for the HACCP system implemented for the water supply system.

The drinking water supply barriers include the following:

- Source water protection to reduce contamination risks to water sources.
- Detention, settling and selective abstraction from the storage reservoirs to ensure the raw water quality utilised is the best available.
- Coagulation, flocculation, clarification* and dissolved air flotation at the WTPs to manage any turbidity present.
- Direct filtration at the WTPs to remove any turbidity and potential microorganisms.
- Disinfection of treated water at the WTPs using chlorine and ultraviolet (UV) light** to ensure any remaining harmful pathogens are removed.
- Maintaining chlorine disinfection residual in treated water throughout the distribution system to provide lasting microbiological protection to the community.
- Managing the integrity of distribution system assets to prevent against possible recontamination.

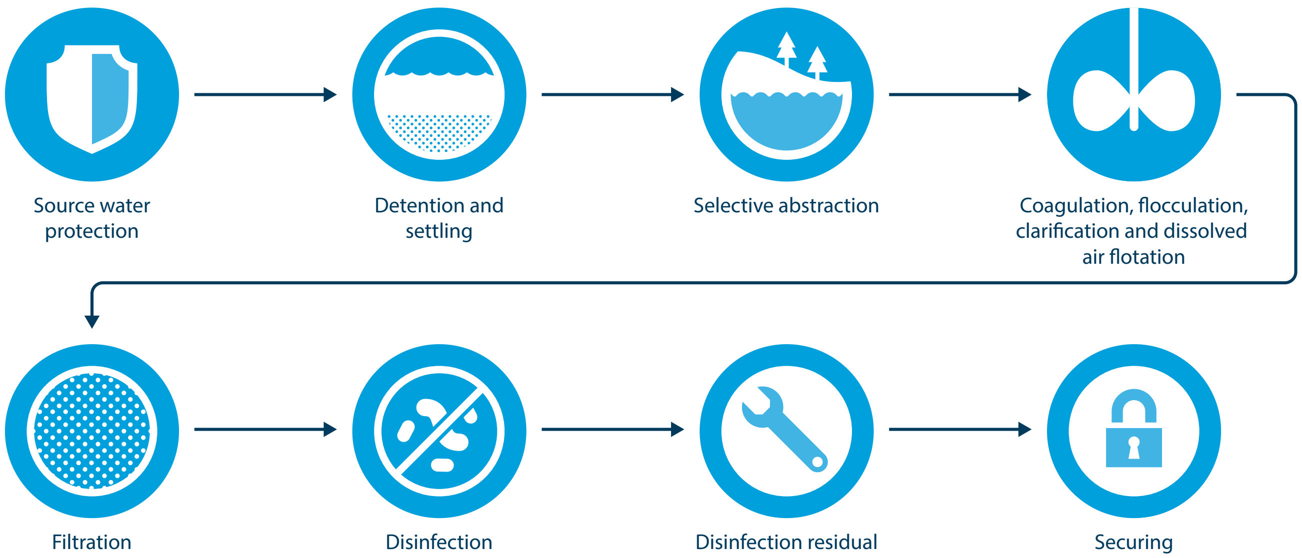
*Googong WTP only. **Mount Stromlo WTP only.

The performance of these barriers is managed and monitored utilising a range of different measures. This includes a source water protection program, real-time online analysers, internal laboratory testing and a routine verification sampling program conducted by an accredited independent laboratory. These measures enable Icon Water to take a preventative approach and safeguard Canberra's water supply against potential risks to public health.

The drinking water quality monitoring program measures physical, chemical and microbiological parameters of the water supplied to customers. The water quality testing results are verified for compliance with the Australian Drinking Water Guidelines (2011) (ADWG). The guidelines include two types of criteria that Icon Water utilise to manage the performance of the water supply system. These criteria are defined below:

- A health guideline value; which is the concentration or measure of a water quality characteristic that does not result in any significant risk to the consumer over a lifetime of consumption; and
- An aesthetic value; which is the concentration or measure of a water quality characteristic that is associated with acceptability of water to the consumer; for example appearance, taste and odour.

Figure 2.1 Drinking water supply barriers



Management framework

Icon Water holds the following licences for the operation of a drinking water distribution and supply service:

- Drinking Water Utility Licence, issued by the ACT Health Directorate under the Public Health Act 1997
- Utilities Service Licence, issued by the Independent Competition and Regulatory Commission (ICRC) under the Utilities Act 2000

Icon Water also complies with the Public Health (Drinking Water) Code of Practice (2007) (the Code) which was issued by ACT Health.

Icon Water operates the water supply system under an Integrated Management System (IMS) to meet quality, environmental, regulatory and workplace health and safety requirements. The IMS is certified and complies with the following Australian and international standards:

- AS/NZS ISO9001:2004. Quality management systems
- AS/NZS 4801:2004. Occupational health and safety management systems
- AS/NSZ ISO14001:2004. Environmental management systems
- CAC/RCP 1 – 1969, REV.4 – 2003. General principles of food hygiene and guidelines for the application of the HACCP system

Icon Water uses a preventative management approach to ensure the risks to water quality are minimised. Drinking water quality management is based on the ADWG Framework and the HACCP system. Both systems cover water production from the source water catchment to the customer's tap.

The externally certified HACCP system is designed specifically to suit the water supply process. It enhances the organisation's ability to meet the challenges of managing drinking water quality and ensures that the management of Canberra's drinking water quality is undergoing continuous evaluation and improvement.

3. Canberra's source water catchments

Source water supply

Canberra's source water catchments consist of Corin, Bendora and Cotter storage reservoirs on the Cotter River; the Googong storage reservoir on the Queanbeyan River and the Murrumbidgee River. Figure 3.2 shows the accessible capacity of each storage reservoir.

The majority of the Cotter River catchment is within the Namadgi National Park and is protected from human and domestic animal activities and faecal contamination, as well as other pollutants associated with urban development.

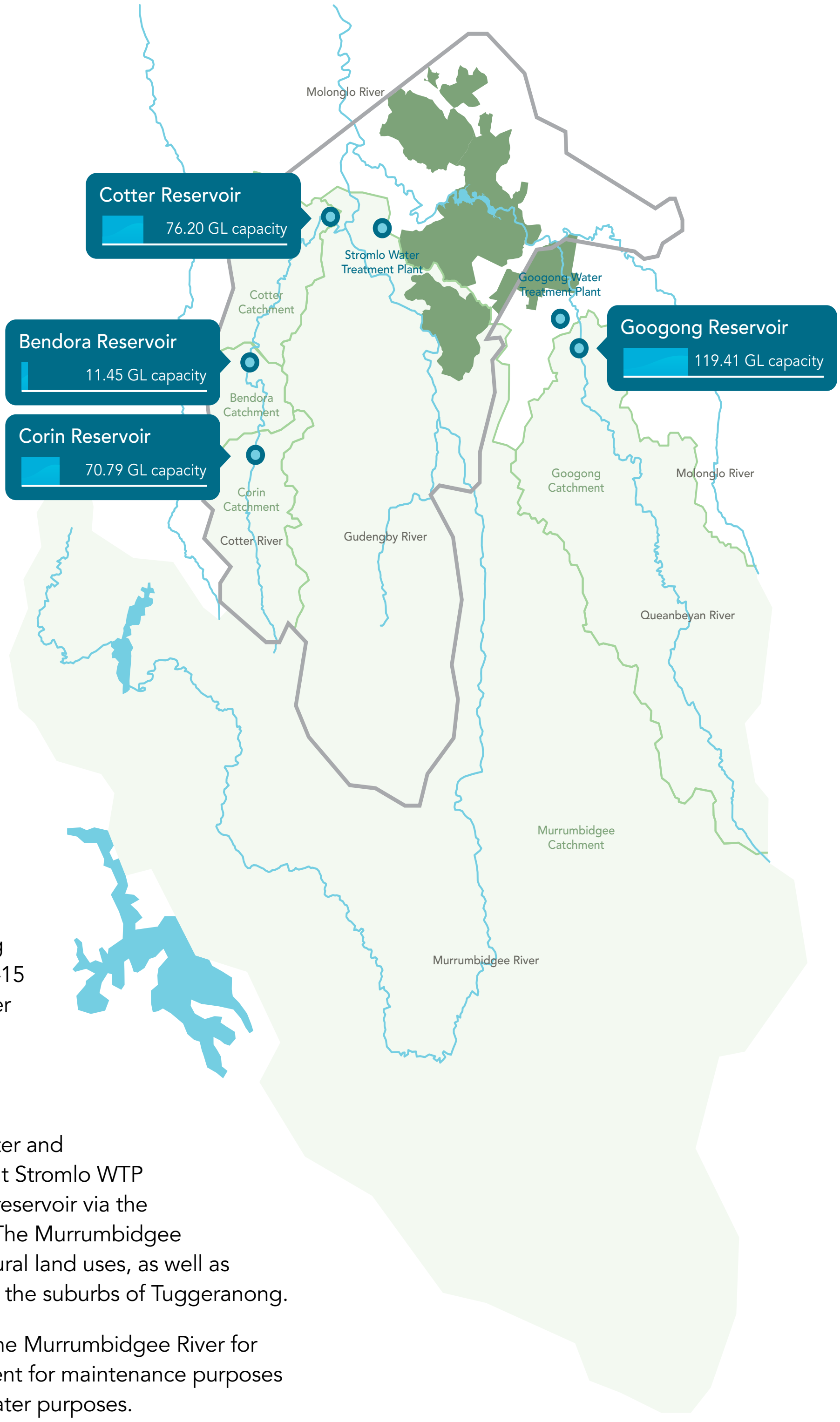
The Cotter River reservoirs have an accessible combined full capacity of 158.4 GL, which were 64% full at the end of June 2015.

During 2014–15 Cotter River reservoirs provided 86% of the water supplied to Canberra and Queanbeyan. Of this, Bendora reservoir contributed 99.9% and the Cotter reservoir supplied 0.1%.

The Queanbeyan River catchment, located to the south-east of Canberra, contains both developed and impacted land, which includes forestry reserves, rural pasture and rural residential properties. NSW state agencies and local government councils regulate land planning and manage activities in this catchment. ACT Parks and Conservation Services (PCS) manage the immediate area around the Googong reservoir and recreational access to the water body and foreshore.

The Googong reservoir on the Queanbeyan River is the largest of the four water supply reservoirs. At the end of June 2015 Googong reservoir was at 100% capacity. During 2014–15 Googong reservoir provided 14% of the water supplied to Canberra, Queanbeyan and Googng township.

Figure 3.1 Canberra's source water catchments



Water from the Murrumbidgee River can be abstracted and blended with water from Cotter and Bendora reservoirs for treatment at the Mount Stromlo WTP or abstracted and pumped to the Googong reservoir via the Murrumbidgee to Googong Water Transfer. The Murrumbidgee catchment includes a wide variety of agricultural land uses, as well as the towns of Cooma, Numeralla, Bredbo and the suburbs of Tuggeranong.

During 2014–15 water was abstracted from the Murrumbidgee River for environmental flows and to exercise equipment for maintenance purposes only. No water was abstracted for drinking water purposes.

The climate and storage reservoir capacity

Below average rainfall and inflows were experienced during 2014–15, including a particularly dry period from July to November. However, 2014–15 also experienced a wet summer, which resulted in a reduction in annual water consumption across Canberra and Queanbeyan. The rainfall at Canberra airport was 11% below the long term average and total evaporation was 3% above the long term average. Despite this, the total inflows to the four storage reservoirs totalled 148 GL, which is 5% above the average of the last 15 years. As a result, Icon Water's storage reservoirs remain at a healthy 79%, a small increase on the 77% storage recorded at the end of 2013–14.

Table 3.1 Rainfall, evaporation and reservoir capacity 2014–15

Total Rainfall (mm)	Long term average rainfall	Evaporation (mm)	Total reservoir capacity
550	617	1747	79%

Figure 3.2 Reservoir storage levels at 30 June 2015

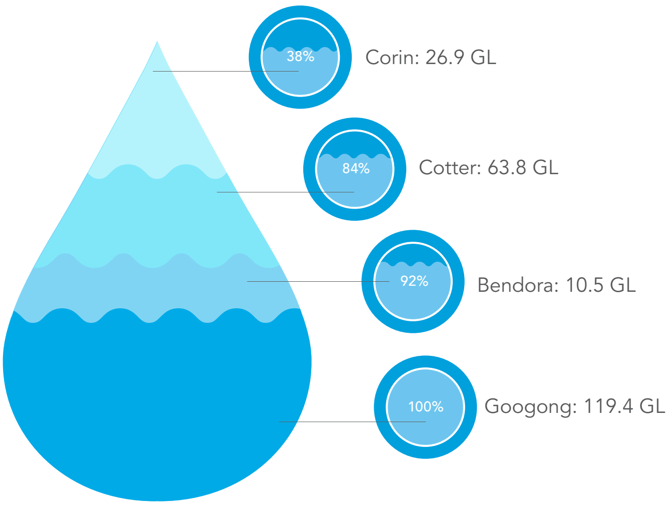


Figure 3.3 Source of drinking water supply for 2014–15

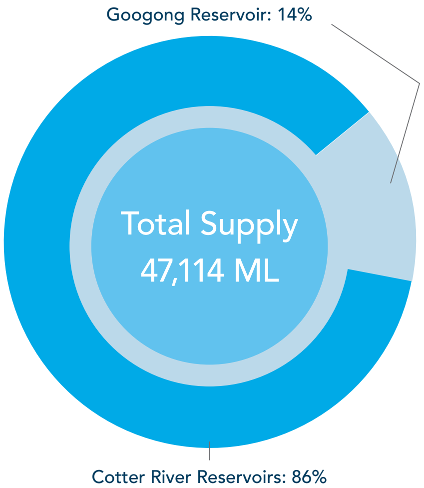
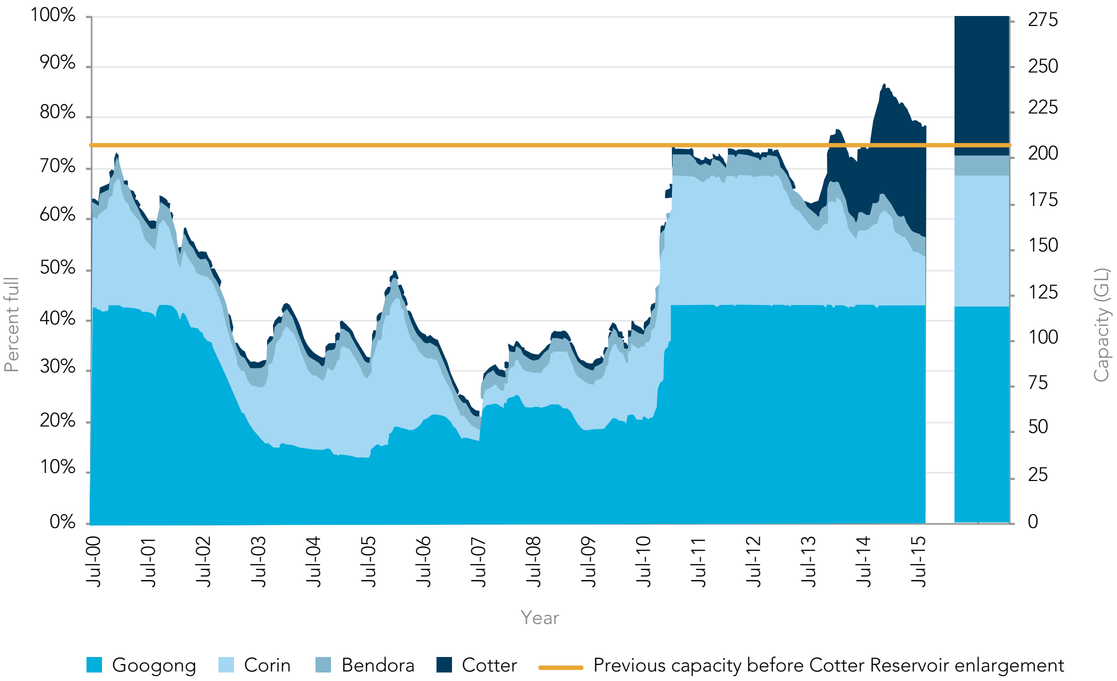


Figure 3.4 Reservoir storage as a percentage of the combined capacity of Corin, Bendora, Cotter and Googong reservoirs from 2000–2015



Bendora Dam, 2015

Source Water Protection Program

In 2014–2015, Icon Water continued to identify and mitigate potential contamination hazards within the catchments as a means to protect the quality of water sources for potable water supply. This is consistent with the Public Health (Drinking Water) Code of Practice (2007) and the Australian Drinking Water Guidelines (ADWG), which states that "catchment management and source water protection provide the first barrier for the protection of water quality". Fundamental to the protection of source water is the identification and management of potential risks to water quality and supply within the ACT drinking water catchments.

Through stakeholder engagement and various water flow, water quality and ecological condition monitoring, Icon Water continues to identify and report on hazards which ultimately have the potential to indicate increased risks or degrading water quality conditions.

The Source Water Protection Program (SWPP) commenced for Icon Water (formerly as ACTEW Corporation) as a five year pilot program (2008–2013). Based on the lessons learnt and relationships developed over that successful five year period, Icon Water is recognised as a regional catchment stakeholder by both NSW Local Government Areas and the ACT Government.

Key activities undertaken by Icon Water that assisted in the management and protection of source water in the 2014–15 year included:

- Policy and legal protections and enhancements.
- Community engagement and education activities and campaigns.
- On-ground works and monitoring.

Policy and legal protections

Icon Water has limited direct legislative power in the land management of the ACT and region's water supply catchments. Land management in the Cotter is the responsibility of the ACT Government; while the Queanbeyan and Murrumbidgee catchments are a mix of Government and private land management. As a result, one of Icon Water's key source water protection objectives is to influence the NSW and ACT regulatory frameworks which govern the water supply catchments. Key interactions undertaken by Icon Water in 2014–15 included:

- Representation on the ACT Government Interim Catchment Management Group (and associated Working Group).
- Positive engagement with NSW Government on changes to fishing regulations that may have impacts on source water quality in the Googong Reservoir.
- Information provision for the auditing of the Lower Cotter Catchment Strategic Plan of Management.

Community engagement and education

Much of the ACT and region's water supply catchment areas in Queanbeyan and Murrumbidgee are privately owned. Additionally, the community has a high level of interaction with the water quality in the catchments through recreational activities. Icon Water undertook a range of land manager engagement and community education activities throughout 2014–15 to influence land use and recreation, which included:

- The ongoing provision of financial support to allow for a WaterWatch position to be continued in the Cooma-Monaro region. This position coordinates the collection of water quality data across the region, and provides a further avenue to landholders to understand the linkages between land management and water quality protection.
- The ongoing provision of financial support to allow for the continuation of a part time role housed with the Southern ACT Catchment Group. This role engages with community and school groups to educate and emphasise the importance of maintaining healthy catchments, to protect our drinking water and the environment.
- Participation in a series of community events, using interactive displays to teach the community about their drinking water sources. Events included the Googong Dam Fishing Expo, a community radio interview and representation at local landowner education sessions in partnership with WaterWatch and NSW and ACT Government.
- The development of a Googong Dam Education and Engagement Strategy. The strategy drives engagement with the community on water quality protection messages through cooperative delivery with the Googong township developers, the school and the ACT Parks and Conservation Service (the land manager of the Googong Foreshores).

On-ground works and monitoring

In the ACT and region's water supply catchments, opportunities can arise where the delivery of on-ground works can be an effective mechanism at controlling localised source water quality impacts. Such opportunities typically include partnerships with other projects or organisations. The monitoring of water quality in the water supply catchments is critical in understanding the changing risks to source water throughout the catchment; which in turn informs on-ground works, policy interactions and community engagement programs.

Key on-ground works and water monitoring programs implemented by Icon Water in 2014–15 included:

- Implementation and finalisation of Cotter Catchment sediment control Memorandum of Understanding which saw the completion of a 5 year program of sediment control works being undertaken in the Lower Cotter catchment.
- Delivery of a suite of ecological monitoring programs in the Upper Murrumbidgee, Cotter catchment and Queanbeyan catchment.
- Development and beta-testing of a quantitative catchment risk assessment tool, which combines information on land use and water quality monitoring to determine contaminant source loads and priority areas for management on both catchment and sub-catchment scales.

Cotter Dam, 2015

Water quality in the raw water sources

Icon Water undertakes an extensive sampling and analysis program to monitor water quality in the storage reservoirs and the Murrumbidgee River. The program, which is developed in consultation with ACT Health, is continuously reviewed and managed to ensure it incorporates changes to the supply system and includes emerging issues in drinking water supply management. The parameters monitored within the raw water sources are detailed in Table 3.2. In addition to this program, the raw water sources also have continuous online monitoring for select parameters. This enables Icon Water to react to changes in the raw water quality and ensures the best quality water is abstracted for treatment and distribution to Canberra.

The water storage reservoirs assist to stabilise water quality through detention and settling of contaminants, although there are times when high inflows stir-up sediments or currents mix the reservoirs. Water offtakes at regular intervals in each of the reservoirs enable the most suitable quality water to be abstracted for treatment.

Table 3.2 Parameters monitored in raw water sources

Microbiological	Physicochemical	Chemical
Total coliforms	Temperature	Total and dissolved organic carbon
Escherichia coli (*E.coli*)	Conductivity	Nitrogen incl. oxidised N and ammonia
Heterotrophic bacteria	Turbidity	Phosphorous incl. phosphate
Phytoplankton incl. blue-green algae	Alkalinity	Chlorophyll-a
Cryptosporidium and *Giardia*	Colour	Total and dissolved metals
	UV absorbance	Herbicides and pesticides
	pH	Radionuclides
	Dissolved oxygen	Taste and odour compounds

Blue-green algae

Cyanobacteria or blue-green algae occurs naturally in water bodies, however when conditions are favourable, they can grow into excessive numbers termed blooms. Our storage reservoirs occasionally experience blue-green algae blooms, typically of *Anabaena circinalis* and *Microcystis aeruginosa* which can produce taste and odour compounds and toxins that are dangerous to humans and animals.

Icon Water carries out regular monitoring of blue-green algae in all the raw water sources. The extent and frequency of monitoring varies with the seasons, but is generally at its most frequent in the warmer months as algal blooms typically peak in summer. Agriculture and other development in the Queanbeyan and Murrumbidgee catchments increase the nutrient levels in the waterways making these raw water sources more susceptible to algal blooms.

Concentrations of blue-green algae (*Anabaena circinalis*) in the Googong reservoir were elevated intermittently throughout the 2014–2015 year. Googong WTP operated during July/August 2014 and January 2015. Levels of *Anabaena circinalis* in Googong reservoir were elevated during the August operation of the WTP. As such, Icon Water's blue-green algae response plan was activated and increased monitoring was conducted within the reservoir and at the Googong WTP. Under the Public Health (Drinking Water) Code of Practice (2007), ACT Health is consulted if elevated levels of blue-green algae are detected whilst abstraction for drinking water is occurring. Details of the notifications provided to ACT Health with respect to blue-green algae are provided in Section 7 of this report.

Blue-green algae (*Anabaena circinalis*) was first detected in elevated numbers in the Cotter reservoir in December 2013. Since then the numbers of blue-green algae have continued to decrease with only slightly elevated numbers present over the 2014–2015 summer. During 2014–2015 storage volumes in the Corin and Bendora reservoirs remained high and it was not necessary to abstract water from Cotter reservoir. Despite this, ongoing monitoring continued in the Cotter reservoir.

It is expected that the numbers will continue to decrease as the nutrient levels stabilise and the reservoir fills to full capacity for the first time.

Cryptosporidium and *Giardia*

Cryptosporidium and *Giardia* are microorganisms that can cause gastroenteritis. Infected people show either no symptoms or can suffer diarrhoea, vomiting and fever, and healthy people usually recover fully. There is a background level of infection by *Cryptosporidium* and *Giardia* in the community. These naturally occurring organisms are usually spread through contact with pets, farm animals or people who are already infected.

Testing methods for *Cryptosporidium* or *Giardia* are complex and if detected, it is difficult to confirm whether they are infectious to humans. Icon Water undertakes a routine monitoring program for *Cryptosporidium* and *Giardia* in the storage reservoirs and the Murrumbidgee River.

Cryptosporidium and *Giardia* are generally not detected in the Cotter Catchment storage reservoirs or the Googong Reservoir. Again during 2014–2015 they were not detected in the routine monitoring program samples collected.

Due to the lower levels of catchment protection and little detention time associated with the Murrumbidgee River water, frequent monitoring for *Cryptosporidium* and *Giardia* is carried out at the abstraction point. Furthermore, rainfall events can instigate additional monitoring if necessary. During 2014–15, no water was abstracted from the Murrumbidgee River for drinking water use; however samples were still taken from the Murrumbidgee River abstraction site as part of routine monitoring. All samples collected did not return any positive detections of *Cryptosporidium* and *Giardia*.

Pesticide and herbicide monitoring in drinking water supplies

Monitoring for pesticides and herbicides is undertaken in all drinking water sources. During 2014–15 there were no pesticide detections above ADWG health values in any of the four storage reservoirs or the Murrumbidgee River.

Corin Dam, June 2011

4. Water treatment operations

Total water production

Icon Water operates two water treatment plants (WTP)—the Mount Stromlo WTP treating water from the Cotter catchment reservoirs and the Murrumbidgee River and the Googong WTP treating water from Googong reservoir.

Under Icon Water's HACCP-based water quality management system five critical control points are applied in the supply system to ensure ACT, Queanbeyan and Googong township receive high quality water. Four of these critical control points exist in the WTP, highlighting the importance of the water treatment operations to the delivery of high quality water.

A summary of WTP operations over the 2014–2015 year is provided in the figures below.

Figure 4.1 Total water produced by treatment plant in 15/16

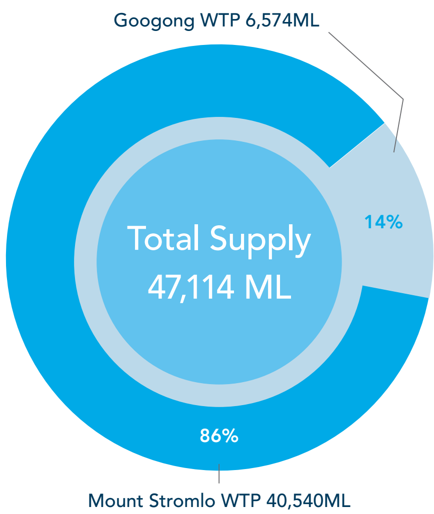


Figure 4.2 Monthly treated water production by treatment plant

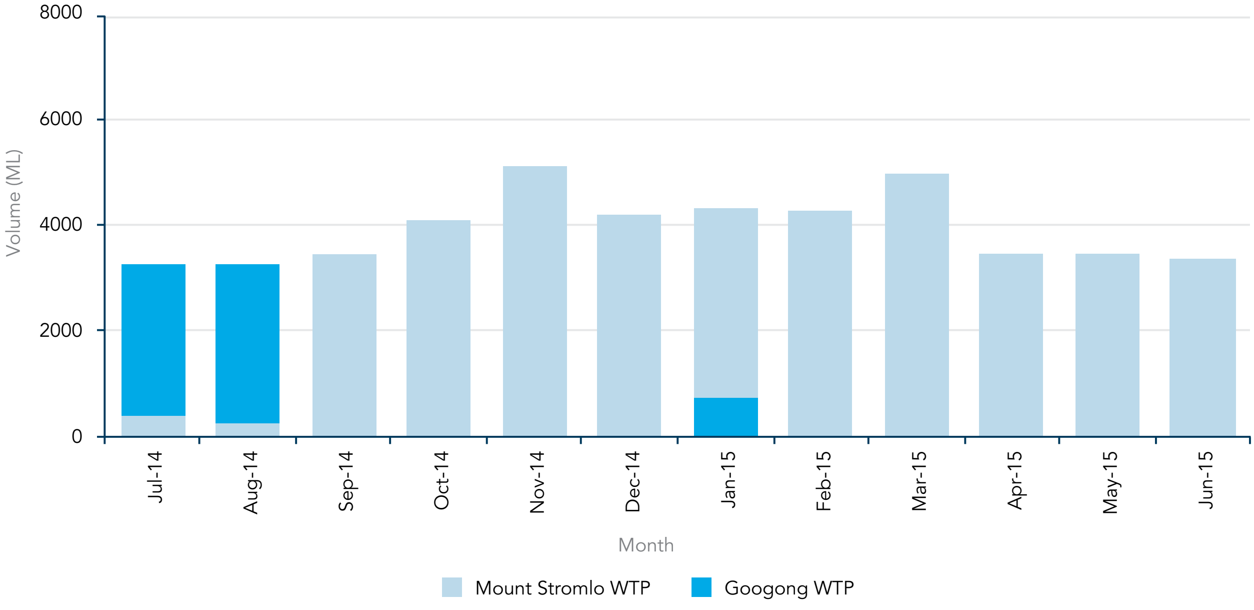
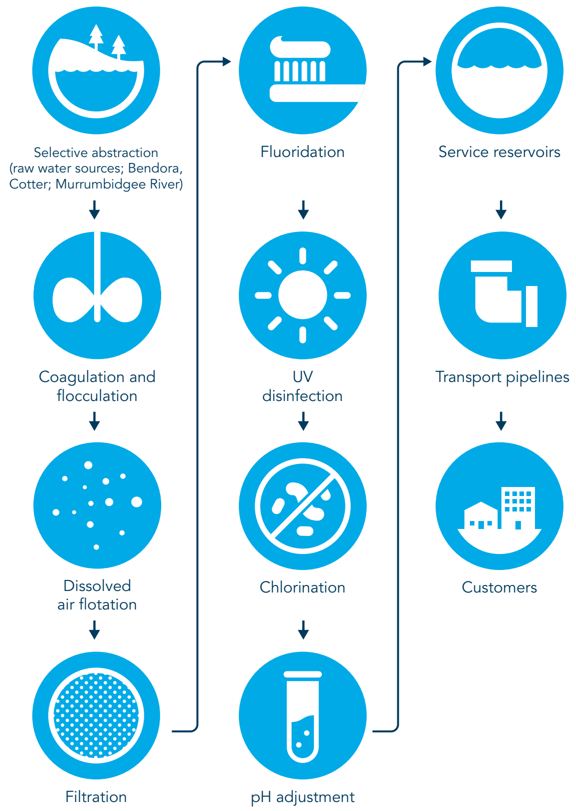


Figure 4.3 Water supply from catchment to Mount Stromlo WTP to customers' taps

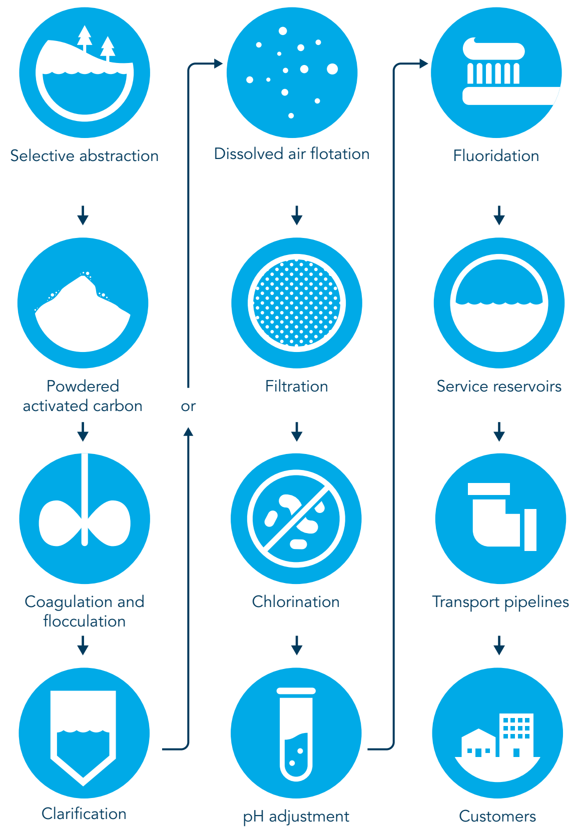


Mount Stromlo water treatment plant

Mount Stromlo WTP has a treatment capacity of 250 ML of water per day. Treatment processes are designed to remove contaminants in drinking water. The WTP can operate in two treatment process modes–direct filtration, and dissolved air flotation and filtration (DAFF). The dissolved air flotation treatment step is an optional treatment step which enhances treatment capabilities when poorer raw water quality is treated. The treatment process is shown in Figure 4.3 and described in the following list.

- Pre-treatment for pH adjustment and stabilisation with lime and carbon dioxide.
- Coagulation by liquid alum and/or polyaluminium chloride.
- Flocculation aided by polyelectrolyte.
- Dissolved air flotation (optional).
- Filtration.
- Fluoridation by sodium fluorosilicate.
- Disinfection by ultraviolet (UV) light.
- Disinfection by chlorination.
- pH adjustment and stabilisation with lime.

Figure 4.4 Water supply process from catchment to Googong WTP to customers' taps



Googong water treatment plant

Googong WTP has a treatment capacity of 270 ML of water per day. Googong WTP continues to be used in conjunction with Mount Stromlo WTP to meet summer peak demand and enable essential maintenance works to be carried out at Mount Stromlo WTP.

The water treatment process used at Googong WTP is as follows:

- Powdered-activated carbon (PAC) for toxin, taste and odour compound removal (if required).
- Coagulation by liquid aluminium sulphate.
- Flocculation aided by polyelectrolyte.
- Dissolved air flotation and filtration (DAFF) (augmented plant) or clarification and filtration (original plant), depending on operational mode.
- Disinfection by chlorination.
- pH adjustment and stabilisation with lime.
- Fluoridation by sodium fluorosilicate.

Mount Stromlo Water Treatment Plant, 2015

Water treatment plant performance

Extensive monitoring of process operations are required to ensure optimum performance of treatment barriers. Online analysers enable continual monitoring of key water quality parameters, which means that changes in the raw or process water quality are quickly identified and addressed. Turbidity, chlorine, pH, fluoride and UV dose (at Mount Stromlo WTP) are all monitored continuously to ensure the treatment processes are operating correctly. Regular laboratory monitoring includes analysis of *Escherichia coli* (*E.coli*), *Cryptosporidium* and *Giardia*. Table 4.1 shows average treated water quality values for both WTPs. The ADWG health guideline is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption.

Table 4.1 Final treated water quality at WTPs

Parameter		Units	ADWG	Mount Stromlo WTP	Googong WTP	ADWG compliance
			Health Value	Mean Result	Mean Result	Health Value
Giardia		cells/L	-	ND	ND	-
Cryptosporidium		cells/L	-	ND	ND	-
E.coli		MPN/100 mL	<1	<1	<1	✓
Chlorine	Free	mg/L	-	1.33	2.12	-
	Total	mg/L	5	1.36	2.35	✓
pH*		pH units	6.5–8.5*	7.4	7.5	✓
Fluoride		mg/L	1.5	0.84	0.79	✓

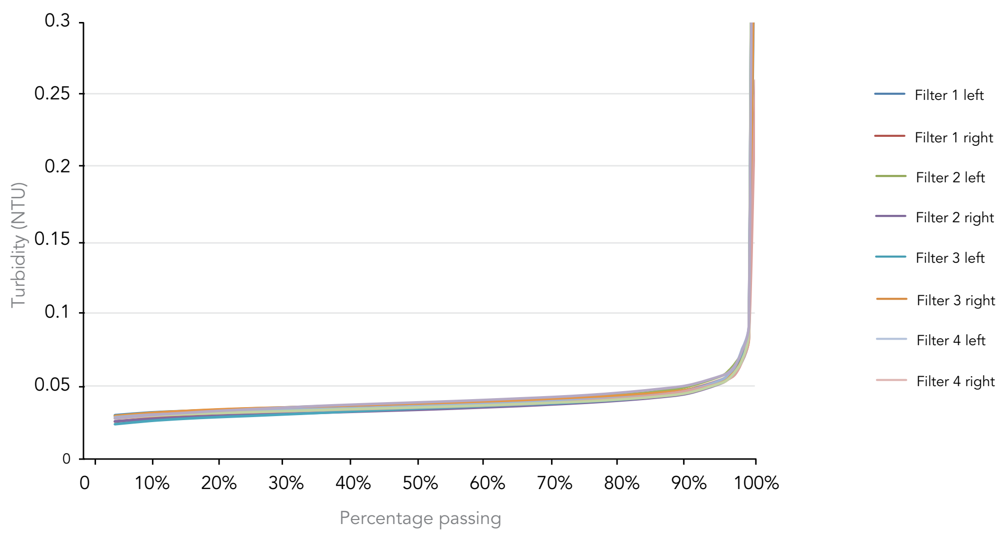
*aesthetic value only, no current ADWG health value; ND not detected

Turbidity

Turbidity is a measurement of the suspended and dissolved particulates in water. These include suspended colloidal particles, clay and silt. Water with a high level of turbidity often has a muddy or milky appearance. Continuous monitoring of turbidity at the WTP is undertaken and is used as a key indicator for filter performance. The ADWG states "Where filtration alone is used as the water treatment process to address identified risks from *Cryptosporidium* and *Giardia*, it is essential that filtration is optimised and consequently the target for the turbidity leaving the individual filter should be less than 0.2 NTU, and should not exceed 0.5 NTU at any time". Icon Water utilise this guidance and optimise operations to meet these targets at the WTP's. Individual filter turbidity performance for Mount Stromlo WTP is shown in Figure 4.5 and Googong WTP in Figure 4.6a and 4.6b. It can be seen that more than 98% of results for all direct filters at Mount Stromlo and Googong WTP produced water with turbidity below 0.2 NTU.

The Googong DAFF system was operated intermittently during a two week period in August 2014 for functional testing. As the system operated for such a short timeframe the graph is not statistically relevant.

Figure 4.5 Mount Stromlo WTP direct filter performance



Microbiological

The biggest risk to drinking water is microbiological contaminants. The treatment process is designed to remove the microbiological contaminants that may be present in raw water sources.

E.coli

The faecal indicator bacteria *E.coli* is used to determine whether potential faecal contamination has occurred. If *E.coli* is present in drinking water, it may suggest that enteric pathogenic microorganisms are present. The ADWG suggest that *E.coli* should not be detected in a minimum 100 mL sample of drinking water.

During 2014–2015 there were no *E.coli* detected in the treated water leaving the WTPs.

Cryptosporidium and *Giardia*

UV disinfection is used at the Mount Stromlo WTP to further reduce the risk of pathogens entering the drinking water supply. The UV system contains three parallel treatment trains, each of which have three banks of high-intensity, medium-pressure ultraviolet lamps. The quality of filtered water passing through the units is monitored online and each UV reactor includes sensors to continuously measure the UV irradiance in the water to ensure that an adequate UV dose is achieved. The power of each lamp is automatically regulated to ensure the required dose is maintained based on flow rate.

The UV system continued to reliably meet performance standards greater than 95%. In 2014–15, the total proportion of water on specification was greater than 99% (Figure 4.7).

Icon Water undertakes a routine monitoring program for *Cryptosporidium* and *Giardia* at the WTPs in the raw water received at the WTP and the final treated water. Any positive detections from the raw and treated water at the WTPs are reported to ACT Health which determines the level of public risk and is responsible for informing the public if there is a health concern.

Cryptosporidium and *Giardia* was not detected in any raw or final waters being treated at both the Mount Stromlo and Googong WTPs during 2014–2015.

Figure 4.6a Googong WTP direct filter performance

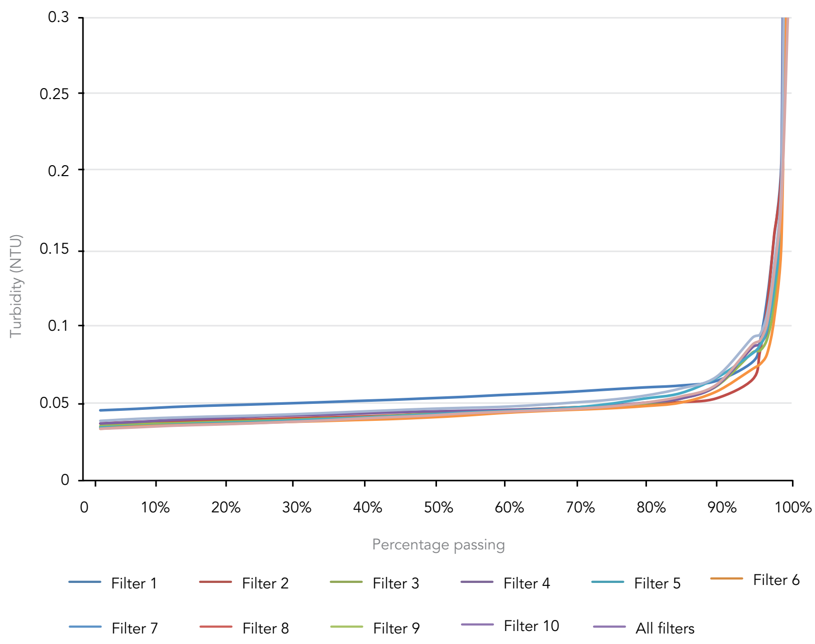
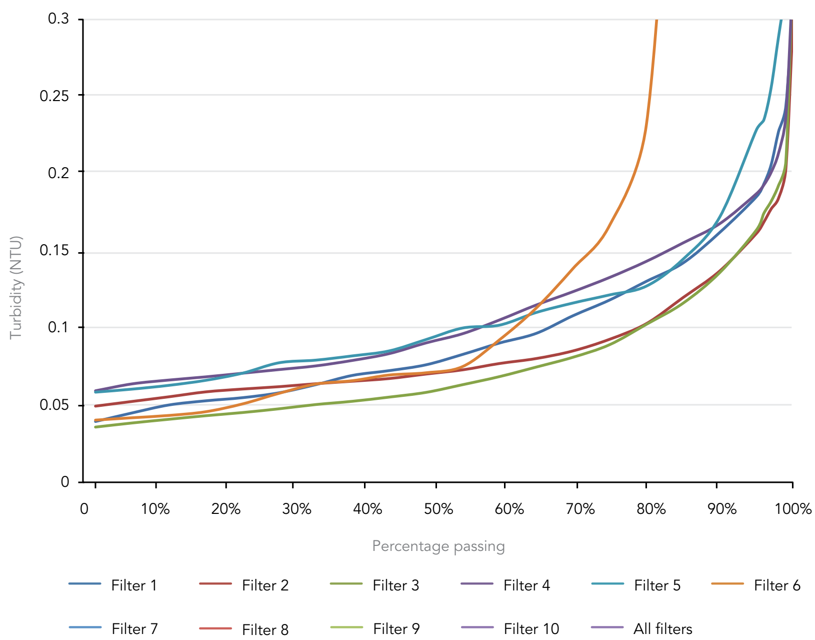


Figure 4.6b Googong WTP DAFF performance



Chlorine

All drinking water processed by the treatment plants is disinfected using chlorine. This chemical is widely used in treatment plants throughout the world to control microbiological contaminants, such as bacteria and viruses. Chlorine is added to Canberra's water at a concentration sufficient enough to disinfect the water leaving the treatment plant and to provide a free chlorine residual that will continue to protect against contamination in the distribution network. The ADWG health guideline for chlorine is 5 mg/L and the aesthetic value is 0.6 mg/L, which is based on an odour threshold. Some customers are sensitive to the taste or smell of chlorine and Icon Water endeavours to manage chlorination to optimise the concentrations at the customer's tap. Free chlorine concentration in the treated water leaving Mount Stromlo WTP was maintained at an average of 1.33 mg/L. Due to its geographical location, resulting in potential extended detention times, Googong WTP generally produces final treated water with a higher chlorine concentration (average of 2.12 mg/L).

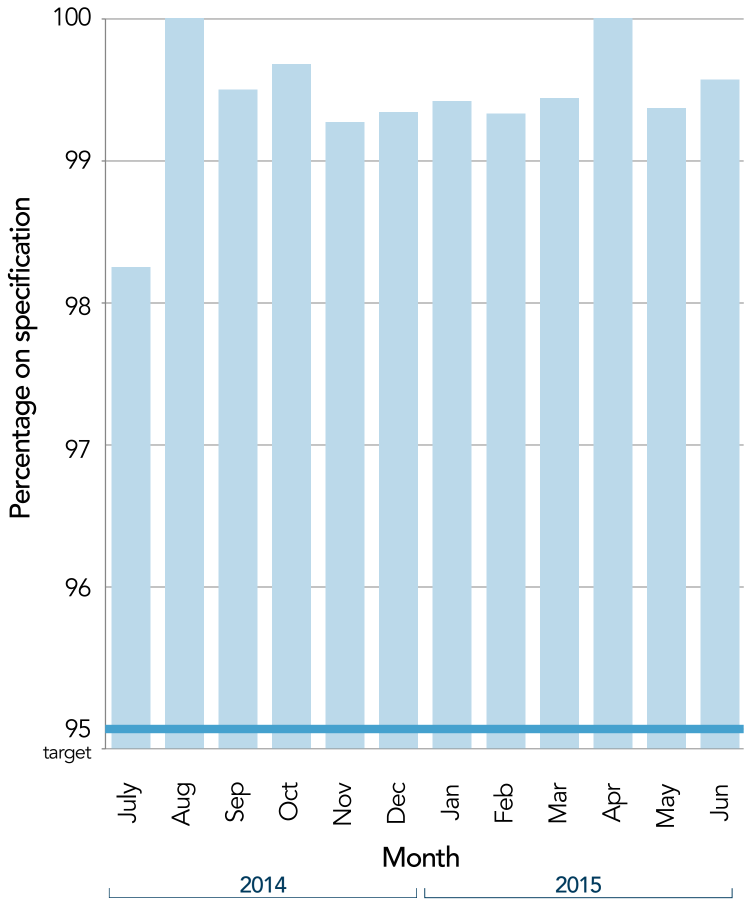
Fluoride

The Drinking Water Utility Licence, issued by ACT Health, requires fluoride to be added to the ACT's drinking water network at a concentration between 0.6 and 1.1 mg/L of drinking water. "The aim of water fluoridation is the adjustment of the natural fluoride concentration in fluoride deficient water to that recommended for optimal dental health" (NHMRC 2007). In 2014–2015 fluoride concentrations were maintained in the final treated water at Mount Stromlo WTP at an average of 0.84 mg/L and Googong WTP at an average of 0.79 mg/L.

pH

The pH of the drinking water is adjusted at the beginning of the treatment process and again prior to leaving the WTP. The pH of the water prior to coagulation and flocculation is decreased to between 6.0 and 6.2 to ensure it is within the effective range of the coagulant utilised. The ADWG advises that "chlorine disinfection efficiency is impaired above pH 8.0…whilst below 6.5 may be corrosive". As such the pH of the treated water is increased prior to distribution so that it is within the optimal range to ensure effective disinfection potential whilst also preventing potential corrosion of pipelines. The optimal pH range targeted by Icon Water is 6.5-8.5. The average pH of final treated water at the WTPs was between 7.4 and 7.5.

Figure 4.7 Mount Stromlo WTP UV disinfection perfomance



Mount Stromlo Water Treatment Plant, 2015

Mount Stromlo Water Treatment Plant, 2015

5. The distribution system

The drinking water distribution system is operated with a number of physical and chemical disinfection barriers in place to minimise the potential for contamination of the water.

Some of the physical barriers include:

- Sewerage mains are generally located deeper than the water network, minimising the risk of contamination through groundwater.
- The water distribution system is a closed network from the WTPs to customers' taps, preventing potential external contamination.
- The water mains are operated under positive pressure to prevent contaminants entering the network.
- Backflow prevention devices are installed at customer supply points to protect against contaminants entering the network.

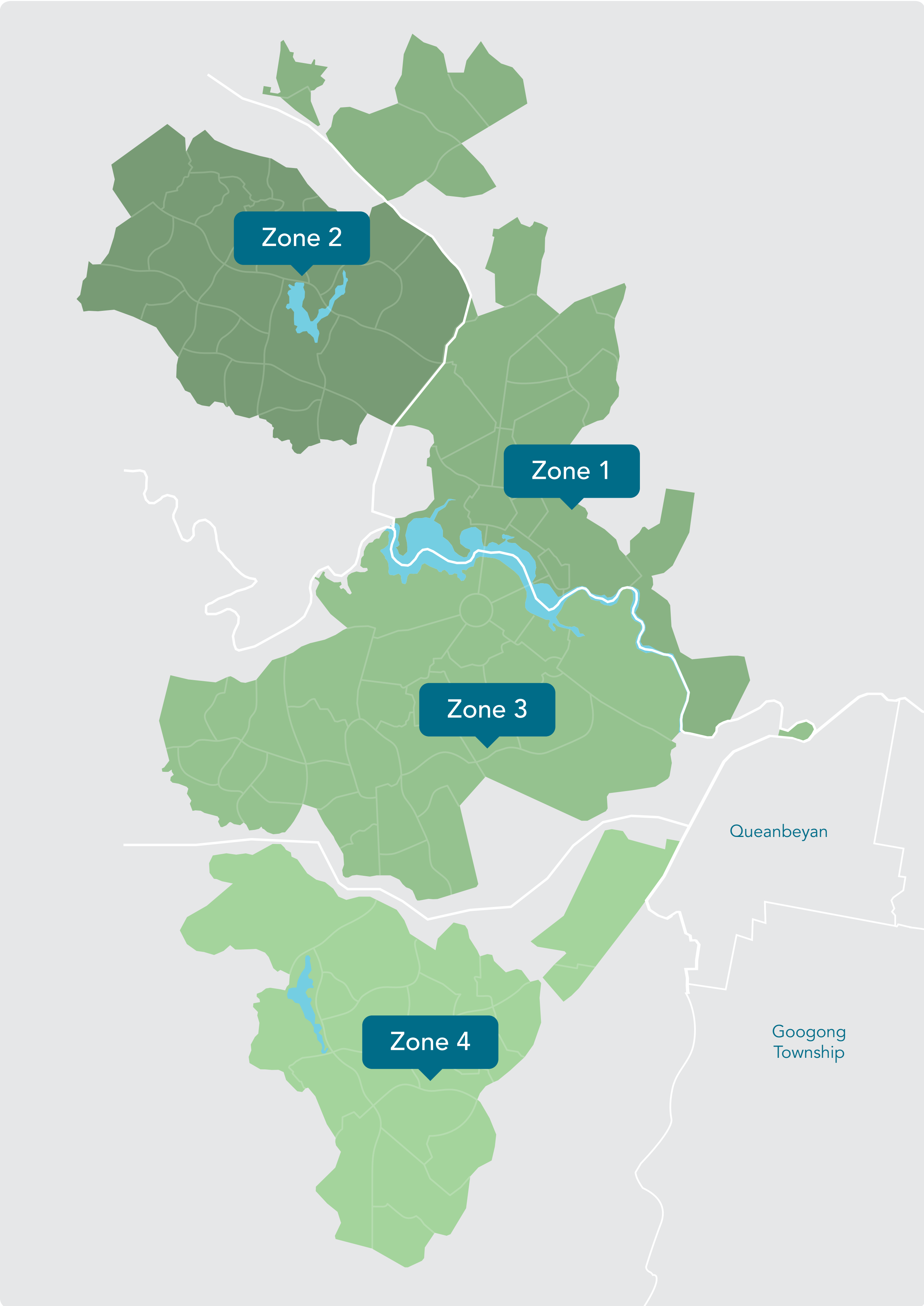
In addition to the physical barriers, a free residual chlorine concentration in the water distribution network is maintained to protect against microbiological contamination of the water between the WTP and the customer's tap.

The Canberra distribution system is divided into four water quality zones (see figure 5.1):

- water quality zone 1 – North Canberra and Gungahlin
- water quality zone 2 – Belconnen
- water quality zone 3 – South Canberra, Woden and Weston Creek
- water quality zone 4 – Tuggeranong

Icon Water also supplies bulk water via two supply points to Queanbeyan and a third supply point to Googong Township. Icon Water supplies this water under a Service Level Agreement with the Queanbeyan City Council.

Figure 5.1 Water quality monitoring zone map



Distribution service reservoirs

In 2014–15 Icon Water operated 47 service reservoirs and three tanks located throughout the city. These reservoirs receive water from the WTPs via bulk supply and trunk mains and provide storage for between 450 ML and 680 ML of water depending on demand. All Canberra service reservoirs are secure structures to ensure the integrity of the supply system is maintained and to prevent contamination from birds and animals. Regular inspections are carried out to assess their external condition and the security of the site. Reservoir cleaning is also routinely undertaken every three to five years, during which the reservoir is emptied, cleaned and inspected internally.

Frequent water quality monitoring occurs at each reservoir which includes sample analysis for, *E.coli* and total coliforms, heterotrophic bacteria, temperature, and chlorine to verify that the water quality complies with the ADWG and to optimise system operations. A summary of water quality analysis undertaken at the service reservoirs across all four water supply zones is presented in the Table 5.1.

Supply to customers' taps

Ensuring that high quality water is delivered to customers is a priority to Icon Water. A comprehensive routine drinking water quality monitoring program based on the ADWG verifies the water quality throughout the distribution system. Each month 84 random customer garden taps are monitored from a pool of over 350 sites throughout Canberra suburbs (21 samples from each water quality zone). The garden taps are used as they are easily accessible, provide static sample points in the distribution system allowing historical data acquisition, and they enable verification of the actual water received by customers. The parameters that are routinely tested are summarised in Table 5.2.

Table 5.1 Water quality at service reservoirs

Parameter		Units	ADWG Health Value	Service Reservoirs Mean Concentration	ADWG compliance Health Value
Escherichia coli (E.coli)		MPN/100 mL	<1	<1	✓
Total coliforms		MPN/100 mL	-	<1	-
Heterotrophic plate counts		CFU/1 mL	-	2	-
Chlorine	Free	mg/L	-	0.73	-
	Total	mg/L	5	0.84	✓
pH*		pH units	6.5–8.5*	7.66	✓

*aesthetic value only, no current ADWG health value

Table 5.2 Parameters monitored at customer taps

Microbiological	Physicochemical	Chemical
Total coliforms	Temperature	Chlorine
Escherichia coli (E.coli)	Conductivity	Fluoride
Heterotrophic bacteria	Turbidity	Metals
	Alkalinity	Trihalomethanes (THM)
	Colour	Haloacetic acids
	Total dissolved solids	Plasticisers
	pH	Polycyclic aromatic hydrocarbons (PAH)
	Hardness	

Disinfection in the distribution system

Chlorine is added to water in the final stages of treatment at Mount Stromlo and Googong WTPs. Water entering the distribution system needs to contain an appropriate free chlorine concentration, termed disinfection residual, when delivered to customer taps. This ensures that chlorine continues to provide protection against microbiological contamination in the distribution network. Chlorine and bacterial levels are frequently monitored in the distribution system.

The ADWG has a health guideline value of 5 mg/L and an aesthetic guideline value of 0.6 mg/L, which is based on an odour threshold. Some customers may be able to detect chlorine at lower concentrations. As the concentration of chlorine is relied upon to preserve water quality through the distribution system, maintaining adequate chlorine residual in drinking water is a high priority and Icon Water endeavours to manage the chlorine residual to optimise the concentrations at the customer's tap.

In 2014–15 the concentrations of free chlorine at customers' taps across all four water quality zones were below the ADWG health guideline level (5 mg/L). The concentrations ranged from 0.06 mg/L to 1.69 mg/L.

Whilst chlorine protects against microbiological contamination, it also reacts with naturally occurring organic matter to form a range of undesirable organic compounds including trihalomethanes (THMs).

The ADWG states that "total THMs should not exceed 0.25 mg/L and although system performance should encourage a reduction in THMs, disinfection should not be compromised, as non-disinfected water poses a significantly greater public health risk." High THM concentrations may indicate the presence of other chlorination by-products. The distribution of THM results for 2014–15, across all four water quality zones are shown in Figure 5.3. THM levels in Canberra's drinking water remain well below ADWG guidelines.

Microbiological monitoring

The WTPs are designed to remove any potential microbiological contaminants prior to distribution to customers, however as the water moves through the water distribution network there remains a small potential for re-contamination. As such Icon Water maintains an adequate free chlorine residual for continual disinfection and monitors for *E.coli* (faecal indicator) at customers' taps to ensure the water supplied is free from microbiological contamination.

The ADWG suggests that *E.coli* should not be detected in a minimum 100 mL sample of drinking water. During 2014–15, 100% of samples returned no detections of *E.coli* across all four water quality zones.

Figure 5.2 Free chlorine concentration at customers' taps

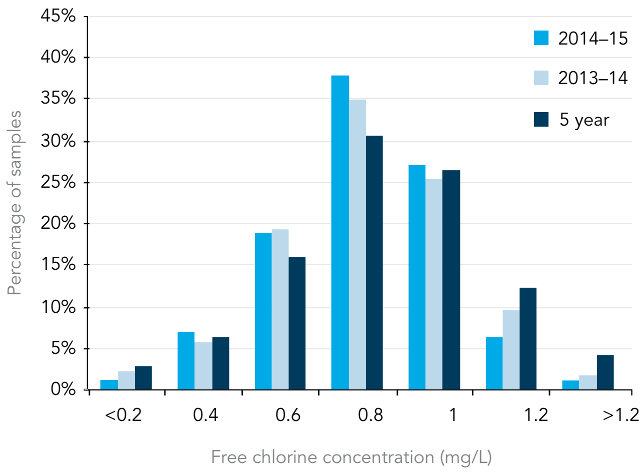


Figure 5.3 THM concentration at customers' taps

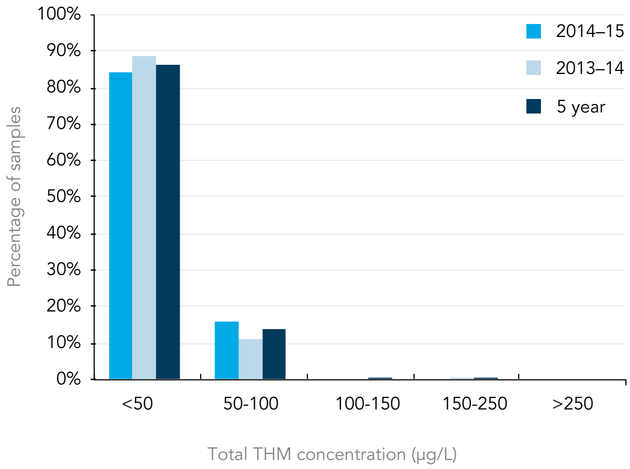
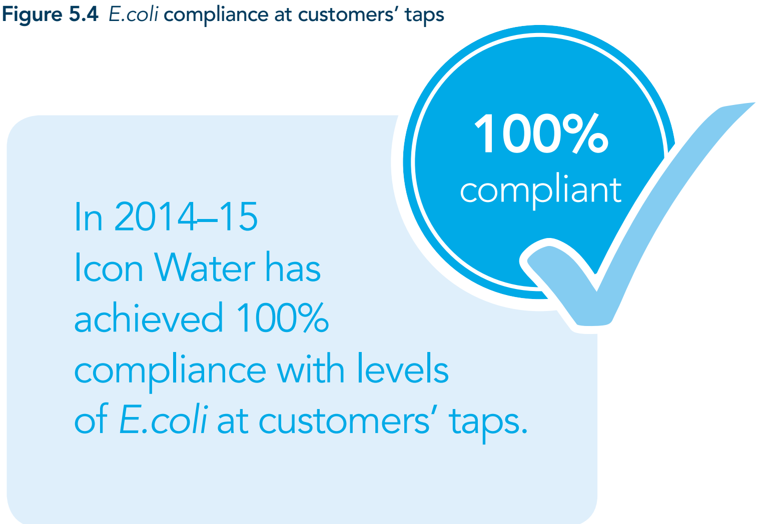


Figure 5.4 *E.coli* compliance at customers' taps



Physical and chemical monitoring

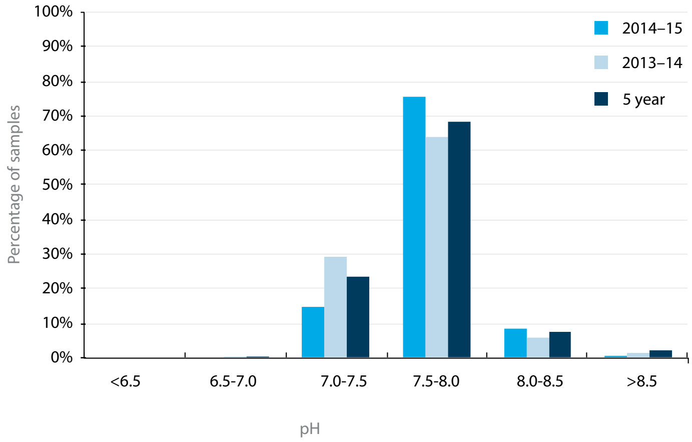
pH

A pH value in the range of 6.5 to 8.5 is optimal for water supply systems. In 2014–15, 99.6% of pH values measured at customers' taps across all four water quality zones were within this range.

pH increases through the distribution system due to leaching of lime from cement lined pipes and concrete service reservoirs. This increase is generally proportional to the detention time of the water within the distribution network.

The buffering capacity of water at the WTPs has continued to provide a positive impact on management of pH within the distribution system. The ADWG upper limit of 8.5 is set to minimise the potential for taste problems or scaling of water pipelines, however this is not of particular concern in Canberra due to the low mineral content of the drinking water.

Figure 5.5 pH at customers' taps



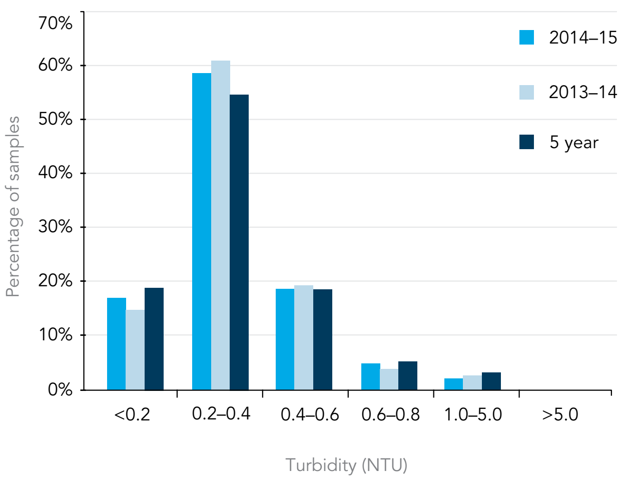
Chlorine disinfection is also affected by pH. As pH increases the disinfection potential of chlorine decreases. However, as pH decreases the corrosion potential of the water increases, which may lead to increased levels of contaminants, for example heavy metals, in the water and causing damage to assets. It is therefore necessary to balance pH in the network to minimise corrosion while ensuring effective disinfection is maintained. When high pH is detected in the customer tap sampling program the chlorine and microbiological results are reviewed to identify the appropriate corrective action to be taken. Generally the initial response is to review the supply path and if practical alter the operating level of the reservoir to reduce the detention time of the water in the network.

Turbidity

Turbidity is a measurement of the suspended and dissolved particulates in water. The ADWG does not outline a health value; however the aesthetic value is 5 nephelometric units (NTU)—a level of turbidity that is just noticeable in a glass.

The distribution of turbidity results for customer taps across all four water quality zones is shown in Figure 5.6 and a summary of the results is listed in Table 5.3.

Figure 5.6 Turbidity at customers' taps (2014–2105)



Colour

Colour is mainly present in the raw water because of a range of natural organic compounds from small hydrophilic acids, proteins and amino acids to larger humic and fulvic acids. These substances originate from organic matter through, or over which, the water has passed in the catchment. The majority of natural organic matter is removed by coagulation in the water treatment process. The ADWG does not outline a health value, however the aesthetic guideline for apparent colour is based on what is just noticeable in a glass of water. Results are reported in platinum-cobalt units (Pt-Co), and the aesthetic guideline is 15 Pt-Co. A summary of the results is listed in Table 5.3.

Metals

Iron

The ADWG aesthetic guideline value for iron is 0.3 mg/L, which is based on the taste threshold in water. The ADWG states that "insufficient data are available to determine a health-based guideline value for iron in drinking water". Iron is typically present in the water supply from the corrosion of iron or steel pipes or other components of the plumbing system. A summary of the results is listed in Table 5.3.

Manganese

Water percolating through soil and rocks can dissolve minerals that contain manganese. The ADWG health guideline value for manganese is 0.5 mg/L. Levels above the ADWG aesthetic guideline level of 0.1 mg/L can cause undesirable taste and staining of clothes during washing. At concentrations above 0.1 mg/L manganese can also contribute to the formation of biofilms on the insides of pipes, which may detach during high flows and appear as black particles. A summary of the results is listed in Table 5.3.

Copper

Copper is found naturally in raw water, generally in low concentrations. Drinking water from customers' taps may contain higher levels of copper if the water has been in contact with copper plumbing and fixtures containing copper. Sometimes copper levels may increase if water remains stagnant in the plumbing system for long periods, like school holiday periods or while residents are away from home for an extended time. Water which contains a high level of copper often has a blue/green appearance.

The ADWG sets an aesthetic limit of 1 mg/L for copper based on the potential for staining. Copper should not exceed 2 mg/L for health considerations. The guidelines state that "water that has been in stagnant contact (six hours or more) with copper pipes and fittings should not be used in the preparation of food and drink". A summary of the results is listed in Table 5.3.

Other compounds

Other substances that Icon Water monitors in the distribution network include a range semi volatile organic compounds (SVOC). SVOCs include chemicals such as plasticisers and hydrocarbons. Plasticisers are used in a broad range of products including food packaging, whilst hydrocarbons are utilised in an array of industrial applications. Icon Water monitor for these compounds within the distribution network in line with the ADWG.

Table 5.3 Summary of key physical and chemical monitoring at customers' taps

Parameter	Units	ADWG Health Value	ADWG Aesthetic Value	Minimum Concentration	Maximum Concentration	Mean Concentration	ADWG Compliance Health Value
pH	pH units	-	6.5 - 8.5	7.2	8.7	7.7	-
Turbidity	NTU	-	5	0.1	1.1	0.3	-
Colour	Pt-Co	-	15	1	3	1	-
Iron	mg/L	-	0.3	0.02	0.13	0.04	-
Manganese	mg/L	0.5	0.1	<0.0005	0.21	0.004	✓
Copper	mg/L	2	1	0.002	0.160	0.018	✓

6. Common water quality problems

Icon Water manages over 165,000 connections to the water network in the ACT. Occasionally customers experience problems with the quality of their water supply and contact Icon Water for advice. Any concern expressed by the community is investigated to determine the likely cause and, if required, corrective actions are taken. Enquiries and complaints are recorded along with the actions taken to rectify any problem.

Often issues related to water quality are short-term and may be associated with water main failures, maintenance work or a change in usage patterns within the water supply network. Valve operations required for maintenance work may reverse the direction of flow of water, disturbing the sediment and film on internal pipe surfaces, which may result in discoloured water. Where customers are likely to be affected by maintenance activities, Icon Water endeavours to notify customers.

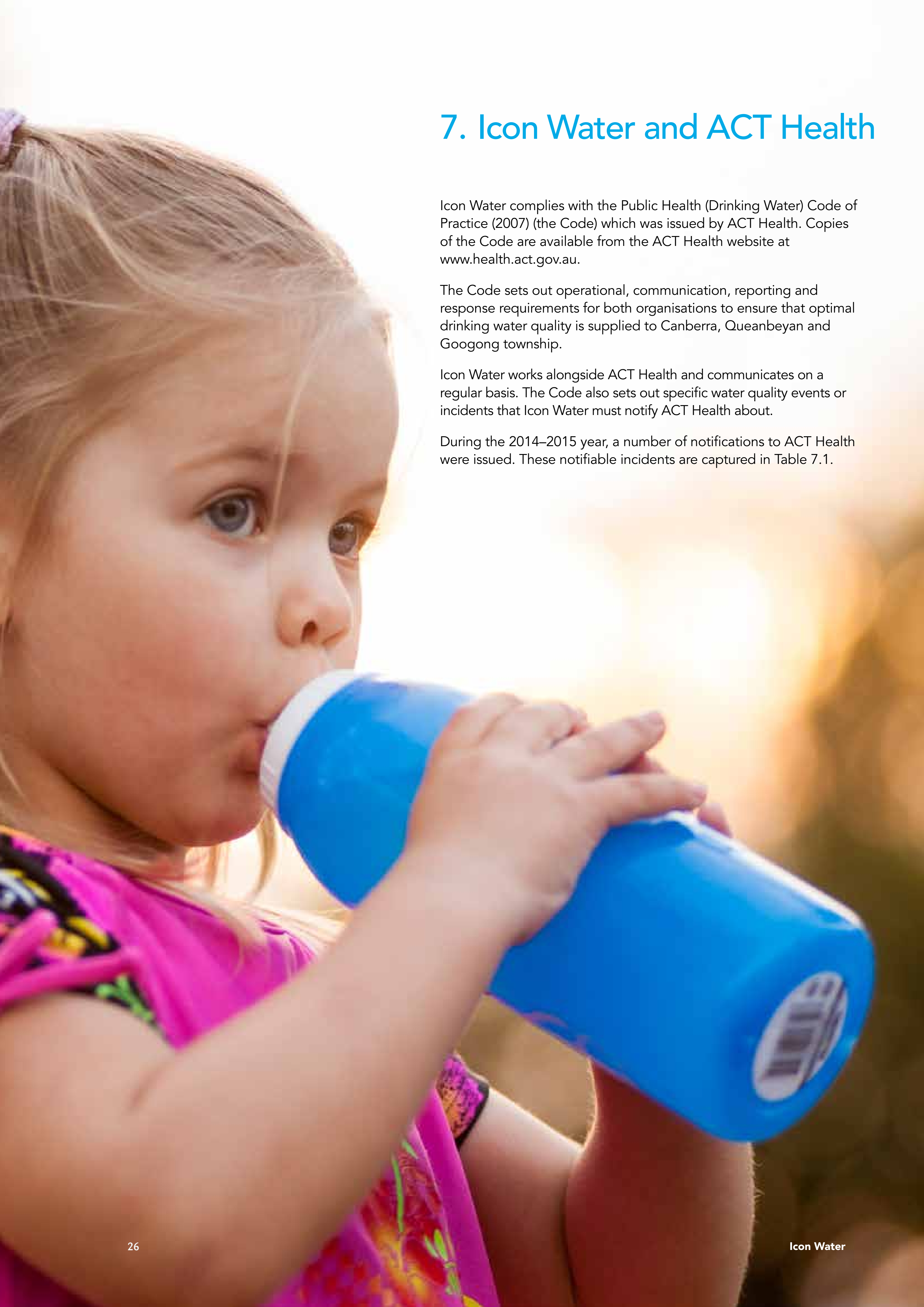
Customers are urged to contact Icon Water if they have any questions relating to water quality. During 2014–15 a total of 204 water quality complaints were received. Of the 205 complaints 52% of the cases were related to discoloured water. A summary of the types of complaints received is detailed in Table 6.1.

Icon Water utilises feedback from the community relating to water quality and network reviews following discoloured water events to better understand the network, and the impact that our operations have on network performance.

All complaints are taken seriously and we value feedback about our product.

Table 6.1 Water quality issues

Issue	Frequency	Comments
Colour; discoloured	107	Discoloured water is most often associated with maintenance work or a change in usage patterns but may also be associated with internal plumbing. Discoloured water resulting from maintenance work generally clears within a short period; however, if a customer continues to experience problems Icon Water may flush the mains to minimise further inconvenience.
Colour; white / cloudy	16	This usually presents as cloudy water resulting from air bubbles generated by flushing of the mains, hot water units or aerators on taps. If this does not clear over a short period of time the customer is invited to contact Icon Water for further advice.
Colour; blue / green	2	Blue or green water is associated with the corrosion of copper pipes.
Colour; staining	9	Deposits dislodged from domestic plumbing or from the water main can cause staining of washing or bathroom fittings. Icon Water's initial response is to flush the mains.
Smell; other	14	Miscellaneous smell enquires are investigated individually. These problems are usually short-term but may require investigation.
Smell or taste; chlorine	5	Chlorination is necessary for the disinfection of the water supply. Usually these enquiries relate to a change (increase or decrease) in the level of chlorine that a customer is receiving. These problems are usually aesthetic and short-term.
Taste; other	24	Miscellaneous taste enquiries are investigated individually. This also includes bitter and metallic tastes experienced by customers. These problems are usually short-term but may require further investigation.
Customer believed water to be unsafe	21	Customers may raise concern that the water is unsafe to drink. In most cases water is tested by an independent laboratory to ensure compliance with the Australian Drinking Water Guidelines.
Other	6	Issues not otherwise categorised
TOTAL	204	



7. Icon Water and ACT Health

Icon Water complies with the Public Health (Drinking Water) Code of Practice (2007) (the Code) which was issued by ACT Health. Copies of the Code are available from the ACT Health website at www.health.act.gov.au.

The Code sets out operational, communication, reporting and response requirements for both organisations to ensure that optimal drinking water quality is supplied to Canberra, Queanbeyan and Googong township.

Icon Water works alongside ACT Health and communicates on a regular basis. The Code also sets out specific water quality events or incidents that Icon Water must notify ACT Health about.

During the 2014–2015 year, a number of notifications to ACT Health were issued. These notifiable incidents are captured in Table 7.1.

Table 7.1 Summary of notifications and action taken by Icon Water

Source	Date	Criteria	Incident and Action Taken
Mount Stromlo WTP	04/07/14	Imminent serious public health risk (DWCoP 5.2b)	A fault in a valve on the inlet to the WTP caused the valve to open un-expectedly from 15% to 100% causing a large sudden increase of water into the WTP. This wave of water caused two UV lamps within the UV treatment system at Mount Stromlo WTP to break, consequently releasing less than 2 mL of elemental mercury into the water. The WTP was shut down and immediately isolated from the town supply. Googong WTP was started to ensure continuity of supply. Results from sampling revealed that majority of the mercury was contained within the Post UV Tank, which was subsequently drained and cleaned prior to bringing the WTP back online.
Raw water in the storage reservoir	7/08/14	Cyanobacteria	High risk cyanobacteria *Anabaena* was detected at a concentration of 2,697 cells/mL within the Googong storage reservoir, approximately 6 km upstream of the off take tower at a depth of 3 m. Googong WTP was online and water was being selectively abstracted from a depth of 15 m. In response to the detection Icon Water's blue-green algae response plan was activated. Taste and odour monitoring was conducted on a daily basis at the WTP and the Powdered Activated Carbon (PAC) system was placed on standby. Sampling was increased to twice weekly until the bloom declined. No complaints were received for taste or odour during this period.
Water within the distribution system at service reservoir	7/10/14	Imminent serious public health risk (DWCoP 5.2b) – Continuity of supply	A 450 mm water main failure at the Macarthur reservoir pump station resulted in approximately 10 ML of water being lost from the reservoir. This in turn threatened the continuity of supply to more than 3,000 residents in the Macarthur water supply zone. Icon Water activated our Water Supply and Sewerage Emergency Plan and formulated a plan to augment the reticulation network to maintain water supply until the water main could be repaired. Icon Water conducted modelling to predict the extent and severity of any discoloured water that was likely to occur as a result and supplied bottled water and refill water points within the affected areas. Water quality samples were also collected within the area to ensure the safety of the water supply and all samples collected returned resulted within the ADWG health criteria. The water main was repaired within approximately 38 hours of being identified.
Water within the distribution system at customer tap	15/12/14	Inorganic or organic chemicals with a health guideline value	Lead was detected above the ADWG in a tap at the Googong Foreshore. After further investigation it was suspected that the elevated lead concentration was from aged water within the service line that the sample was collected from. Icon Water continued to collect samples from the tap to monitor the water quality.
Water within the distribution system at customer tap	22/12/14	Inorganic or organic chemicals with a health guideline value	As above. Following several detections of lead above the Canberra average, Icon Water are investigating options for replacement of infrastructure in the area.
Treated water entering the distribution system	18/02/15	98th percentile of values less than 0.5 NTU and 95th percentile values less than 0.2 NTU	Filter turbidity values are generally initially higher during filter start-up but improve during the filter run. Filter number 1 was removed from service after one run time due to an unusual backwashing pattern. Given that the filter operated for less than 24 hours prior to being removed from service the percentile values for the monthly filter performance were statistically irrelevant.

8. Managing Canberra's water quality into the future

Icon Water is committed to the continuous improvement of water quality management practices. The Strategic Water Quality Improvement Plan outlines drinking water quality improvement projects which are proposed and underway in the ACT drinking water supply system. Many of these are longer term projects and updates of the status of these projects along with any new projects are outlined in this plan.

A selection of projects from 2014–15 and those planned for 2015–16 are detailed below.

Water quality risk management

Supply chain hazard analysis and risk assessment

Hazard analysis and risk assessments were conducted on the water supply chain at the implementation of the Drinking Water Quality Management Plan (Icon Water's HACCP based system) and updated as operating requirements changed. During 2014–15 a thorough review and update of both the hazard identification and associated risk assessments was completed from catchment to customer tap. This process included cross business representation and over 30 workshops to ensure all aspects had been considered.

WSAA Health Based Target Manual Implementation Trial

The next revision of the ADWG is very likely to include health-based performance targets (HBTs) for microbial drinking water quality. A draft methodology was developed by Water Services Association Australia (WSSA) for performing HBT assessments of source waters and WTPs. WSAA proposed a microbial safety target of 1 µDALY per person per year. This is equivalent to <1 additional case of gastrointestinal illness per day in a city of 500,000 people. The approach considered the performance of the WTP in relation to the condition of the catchments and where it sits on the 'Water Safety Continuum', as opposed to being a pass or fail metric.

Icon Water ran a trial utilising this methodology on the Googong WTP direct filtration stream. The WTP met the 1 µDALY requirement, placing the direct filtration stream of the plant in the 'safe' part of the continuum. Icon Water will assess the dissolved air flotation stream of Googong WTP and Mount Stromlo WTP once further clarity is provided on the future direction of HBTs.

Source water protection program

Catchment risk assessment and prioritisation

Icon Water is currently implementing an updated Source Water Protection Strategy. The updated strategy calls for a review and update of the catchment risk assessments. During 2014–15 Icon Water has been working on refining the catchment risk prioritisation tool; Source Water Assessment Monitoring Prioritisation (SWAMP) Tool. Once complete this tool will help Icon Water to analyse high risk areas and key threatening processes and engage with landholders and managers to identify opportunities to assist in the delivery of on-ground remedial works.

Construction of enlarged Cotter Dam, 2011

Applied research and development projects related to water quality assessment or improvement

Nutrient and carbon dynamics from inundated vegetation in the enlarged Cotter reservoir

Icon Water has been collating data to assess the fate of carbon in the enlarged Cotter reservoir since 2012. As the enlarged Cotter reservoir fills, it will inundate 216 hectares of mixed vegetation which release carbon into the water. This project is continuing to investigate the amount of carbon released; the speed at which it is released and the biological and physical processes that will degrade the carbon over time. The project is estimated for completion in 2017.

Alum recovery and recycling

Large quantities of sludge high in aluminium concentration are produced as a by-product from the use of aluminium-based coagulants in drinking water treatment processes. In Australia, much of this sludge is regarded as a waste product and is disposed to sewer or landfill and a high environmental and financial cost. To date, given the high concentration of aluminium, no other purposes (garden soil, fertiliser etc.) for the sludge have been identified. Icon Water has teamed with consultancy firm GHD, the Victorian SmartWater Fund, SEQWater and several Victorian water utilities to investigate ways to identify possible resource recovery options. The final GHD report was completed in 2015 and the findings will now be applied to Icon Water's situation to determine if the resource recovery is a sustainable option for the future.

Water treatment plants

Chlorine dosing system upgrades

Chlorine dosing is recognised as a Critical Control Point (CCP) in the Hazard Analysis and Critical Control Point (HACCP) drinking water quality risk management system. The chlorine system is critical to the operation of the WTP and ensures disinfection is continued into the reticulation network. This project will provide renewal of aged assets and upgrade to the existing systems at both WTPs to ensure their ongoing serviceability and reliability. This project is scheduled for completion in late 2016.

Googong WTP waste wash water and sludge system upgrade

Googong WTP was constructed in the 1970's with sludge handling capacity as recommended during design. Since construction, raw water quality and treatment processes have changed, increasing the quantity of wash water and solids which are produced by the plant. This project will improve the efficiency and capacity of the wash water and sludge handling process by upgrading to mechanical sludge dewatering and removal systems, improving SCADA monitoring and modifying existing valves and pipework. This project is scheduled for completion in late 2015.

Distribution system

Valve condition assessment program

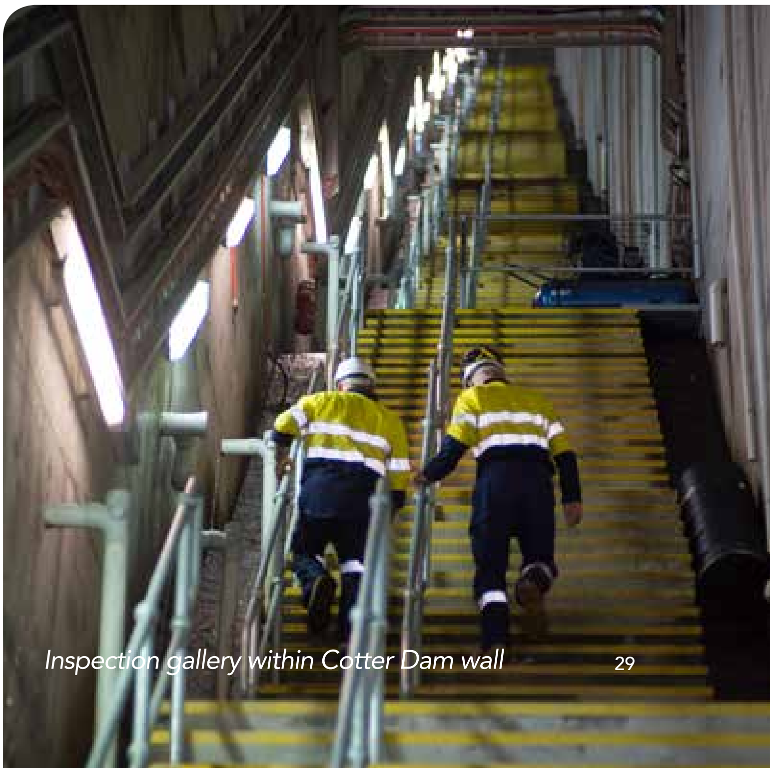
Icon Water maintains and assesses the condition of over 2300 reticulation network valves on a routine basis. Most valves are between 100 and 150 mm diameter and are exercised on an eight year cycle to determine the condition and status of the valves.

To aid this work a program has been developed using an automated valve operating truck equipped with GPS to assess the condition of these valves. It is essential that the correct status of a valve is recorded as valves are required to isolate the system during emergencies and closed valves can act as dead ends within the network which may cause flow reversals or discoloured water. This work is ongoing and is a critical project to ensure an efficient distribution network.

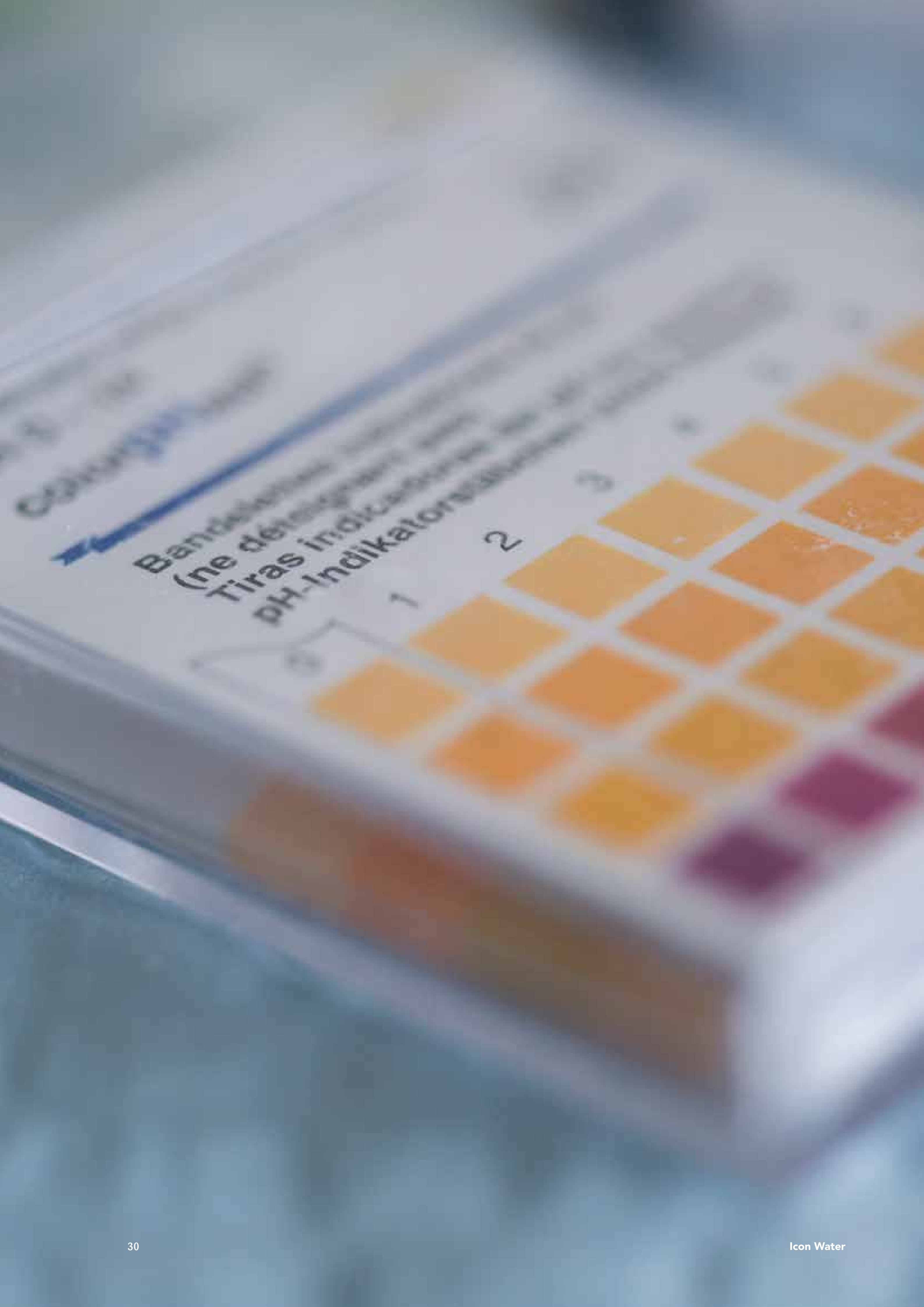
Reticulation sampling point review and implementation

During 2014–15 the routine water quality monitoring program at customer taps was reviewed. The review included an assessment of the sample points to ensure the quantity and distribution of the points continued to meet legislative requirements. The sample points are used to verify water quality within the reticulation network and it is necessary to ensure there are enough points based on population per suburb and spatial distribution.

Given the continual growth of Canberra, Icon Water has requested additional participation from the community to participate in the program. New sample points are being added to the program in targeted locations after an assessment of the suitability of the sample point. The program remains under continuous review and Icon Water are interested in hearing from interested participants. Further information on participation in the program can be found on our website **iconwater.com.au/qualitymonitoring** or contacting Icon Water Talk to Us **02 6248 3111**.



Inspection gallery within Cotter Dam wall



9. Laboratory analysis

Icon Water contracts ALS Global to collect and analyse drinking water samples. The monitoring program is defined by a Service Level Agreement, which is revised annually to reflect Icon Water's changing needs and priorities.

ALS Global operates a NATA-registered laboratory. NATA provides specific technical evaluation combined with international recognition by its overseas counterparts, enabling laboratories accredited by NATA to be recognised worldwide.

As part of its NATA registration, ALS Global participates in regular audits and proficiency testing whereby results for identical samples are compared with other NATA-registered laboratories. The most recent NATA audits carried out in the chemistry area in February 2014 and in the biological area in January 2015 identified no accreditation non-compliance. All results for NATA proficiency testing in the past 12 months were within the "acceptable" statistical range.

The Canberra distribution network is divided into four water quality zones based on population, hydraulic characteristics and geography. These zones are used in Icon Water operations to assess the quality of drinking water supplied to the customers' tap. All data is presented in the following tables;

- Table 9.1 Summary data for all water quality zones
- Table 9.2 Summary data for water quality zone 1: North Canberra and Gungahlin
- Table 9.3 Summary data for water quality zone 2: Belconnen
- Table 9.4 Summary data for water quality zone 3: South Canberra, Woden and Weston Creek
- Table 9.5 Summary data for water quality zone 4: Tuggeranong

Table 9.1 Summary data for all water quality zones

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Microbiological									
E.Coli	APHA 9223 B	MPN/100mL	<1	<1	1008	<1	<1	<1	<1
Total Coliforms	APHA 9223 B	MPN/100mL	–	<1	1008	<1	2	<1	<1
Heterotrophic Plate Count	APHA 9215 B	CFU/mL	–	<1	1007	<1	4500	18	12
Physical									
Asbestos	AS 4964–2000	Present/ Absent	–	Absent	120	Absent	Absent	–	–
Conductivity	APHA 2510 B	uS/cm	–	<2	120	82	180	109	180
pH	APHA 4500–H B	pH	–	<1	1008	7.2	8.7	7.7	8.2
Temperature	APHA 2550 B	deg. C	–	<0.1	480	8.2	27	16.8	23.5
Total Dissolved Solids	APHA 2540 C	mg/L	–	<20	120	32	140	69	120
True colour	Lachat QuikChem Method, Color in Waters 10–308–00–1–A	Pt.Co	–	<1	480	<1	3	1	2
Turbidity	APHA 2130 B	NTU	–	<0.1	480	0.1	1.1	0.3	0.7
Inorganic									
Alkalinity bicarb	APHA 2320 A/B	mg/L	–	<0.1	240	32.9	46.5	40.0	45.0
Alkalinity carb	APHA 2320 A/B	mg/L	–	<0.1	240	<0.1	3.6	3.2	3.6
Alkalinity hydrox	APHA 2320 A/B	mg/L	–	<0.1	240	<0.1	<0.1	<0.1	<0.1
Alkalinity total	APHA 2320 A/B	mg/L	–	<1	240	33	47	40	45
Aluminium Acid Soluble	US EPA 200.8	ug/L	–	<5	120	19	52	31	43
Calcium Dissolved	US EPA 200.7	mg/L	–	<0.05	120	11.00	20.00	14.28	18.05
Chloride	APHA 21st Ed. 2005, Part 4110 B	mg/L	–	<0.1	48	1.4	8.1	3.8	7.7

Table 9.1 Summary data for all water quality zones (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Chlorine Combined	APHA 4500–CL G	mg/L	–	<0.03	1008	<0.03	0.69	0.11	0.23
Chlorine Free	APHA 4500–CL G	mg/L	–	<0.03	1008	0.06	1.69	0.72	1.06
Chlorine Total	APHA 4500–CL G	mg/L	5	<0.03	1008	0.14	1.80	0.82	1.15
Cyanide	APHA 4500_CN	mg/L	0.08	<0.004	48	<0.004	<0.004	<0.004	<0.004
Fluoride	APHA 4500–FC	mg/L	1.5	<0.1	120	0.54	0.95	0.82	0.92
Hardness Total	APHA 2340 B	mg/L	–	<0.1	120	31.0	63.0	41.2	59.0
Iodide	VIC–CM078	mg/L	0.5	<0.01	48	<0.01	<0.05	<0.01	<0.01
Magnesium Dissolved	US EPA 200.7	mg/L	–	<0.05	120	0.63	4.10	1.32	3.61
Nitrate	APHA 21st Ed. 2005, Part 4110 B	mg/L	50	<0.1	48	<0.1	0.1	<0.1	<0.1
Potassium Dissolved	US EPA 200.7	mg/L	–	<0.1	48	0.4	1.9	0.7	1.9
Sodium Dissolved	US EPA 200.7	mg/L	–	<0.1	48	2.6	7.9	3.7	7.5
Sulphate	APHA 21st Ed. 2005, Part 4110 B	mg/L	500	<0.4	48	0.6	30	5	28.7
Total Metals									
Aluminium Total	US EPA 200.8	ug/L	–	<9	120	20	87	36	57
Antimony Total	US EPA 200.8	ug/L	3	<3	120	<3	<3	<3	<3
Arsenic Total	US EPA 200.8	ug/L	10	<1	120	<1	<1	<1	<1
Barium Total	US EPA 200.8	ug/L	2000	<2	120	3	7	4	6
Beryllium Total	US EPA 200.8	ug/L	60	<0.1	120	<0.1	2.1	0.1	0.1
Boron Total	US EPA 200.7	mg/L	4	<0.01	48	<0.01	<0.01	<0.01	<0.01
Cadmium Total	US EPA 200.8	ug/L	2	<0.05	120	<0.05	0.34	<0.05	<0.05
Chromium Total	US EPA 200.8	ug/L	50	<2	120	<2	<2	<2	<2
Cobalt Total	US EPA 200.8	ug/L	–	<0.2	120	<0.2	<0.2	<0.2	<0.2
Copper Total	US EPA 200.8	ug/L	2000	<1	480	<1	160	18	46
Iron Total	US EPA 200.7	mg/L	–	<0.02	240	<0.02	0.13	<0.02	<0.02
Lead Total	US EPA 200.8	ug/L	10	<0.2	240	<0.2	2.0	0.2	0.7
Manganese Total	US EPA 200.7	mg/L	0.5	<0.001	480	0.001	0.210	0.004	0.011
Manganese Total	US EPA 200.8	ug/L	500	<0.5	120	<0.5	15.0	2.8	8.9
Mercury Total	US EPA 200.8	ug/L	1	<0.1	48	<0.1	<0.1	<0.1	<0.1
Molybdenium Total	US EPA 200.8	ug/L	50	<1	120	<1	<1	<1	<1
Nickel Total	US EPA 200.8	ug/L	20	<1	120	<1	2	<1	<1
Selenium Total	US EPA 200.8	ug/L	10	<2	120	<2	<2	<2	<2
Silver Total	US EPA 200.8	ug/L	100	<1	120	<1	<1	<1	<1
Zinc Total	US EPA 200.8	ug/L	–	<5	120	<5	14	3	9
Haloacetic Acids									
Bromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<5	240	<5	<5	<5	<5
Bromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	240	<1	6	1	4
Bromodichloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	240	<1	8	2	6
Dibromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	240	<1	<1	<1	<1
Dibromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	240	<10	16	16	16
Dichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<10	240	4	52	16	38

Table 9.1 Summary data for all water quality zones (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Monochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	240	<1	3	2	3
Tribromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	240	<10	<10	<10	<10
Trichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<1	240	10	70	23	51
Trihalomethanes									
Bromoform	VIC–CM047	mg/L	–	<0.001	239	<0.001	0.002	<0.001	<0.001
Chloroform	VIC–CM047	mg/L	–	<0.001	239	0.012	0.083	0.031	0.067
Dibromochloromethane	VIC–CM047	mg/L	–	<0.001	239	<0.001	0.024	<0.001	<0.001
Dichlorobromomethane	VIC–CM047	mg/L	–	<0.001	239	<0.001	0.046	0.003	0.009
Trihalomethanes Total	VIC–CM047	mg/L	0.25	<0.001	239	0.013	0.150	0.034	0.075
Semi Voltaile Organic Compounds (SVOC)									
Anilines and Benzidines									
2 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4
3 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4
3,3 Dichlorobenzidine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
4 Chloroaniline	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
4 Nitroaniline	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Aniline	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Carbazole	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Dibenzofuran	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Chlorinated Hydrocarbons									
1,2 Dichlorobenzene	US EPA 3510/8270	ug/L	1500	<2	120	<2	<2	<2	<2
1,2,4 Trichlorobenzene	US EPA 3510/8270	ug/L	30	<2	120	<2	<2	<2	<2
1,3 Dichlorobenzene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
1,4 Dichlorobenzene	US EPA 3510/8270	ug/L	40	<2	120	<2	<2	<2	<2
Hexachlorobenzene	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4
Hexachlorobutadiene	US EPA 3510/8270	ug/L	0.7	<2	120	<2	<2	<2	<2
Hexachlorocyclopentadiene	US EPA 3510/8270	ug/L	–	<10	120	<10	<10	<10	<10
Hexachloroethane	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Hexachloropropylene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Pentachlorobenzene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Haloethers									
4 Bromophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
4 Chlorophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Bis(2–chloroethoxy) methane	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Bis(2–chloroethyl) ether	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Nitroaromatics and Ketones									
1 Naphthylamine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
1,3,5 Trinitrobenzene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
2 Picoline	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
2,4 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4
2,6 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4

Table 9.1 Summary data for all water quality zones (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
4–Aminobiphenyl	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
4–Nitroquinoline–N–oxide	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
5 Nitro–o–toluidine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Acetophenone	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Azobenzene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Chlorobenzilate	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Dimethylaminoazobenzene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Isophorone	US EPA 3510/8270	ug/L	100	<2	120	<2	<2	<2	<2
Nitrobenzene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Pentachloronitrobenzene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Phenacetin	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Pronamide	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Nitrosamines									
Methapyrilene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
N–Nitrosodibutylamine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
N–Nitrosodiethylamine	US EPA 3510/8270	ug/L	0.1	<2	120	<2	<2	<2	<2
N–Nitrosodi–n–propylamine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
N–Nitrosodiphenyl & Diphenylamine	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4
N–Nitrosomethylethylamine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
N–Nitrosomorpholine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
N–Nitrosopiperidine	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
N–Nitrosopyrrolidine	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4
Organochlorine Pesticides									
4,4 DDD	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
4,4 DDE	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
4,4 DDT	US EPA 3510/8270	ug/L	9	<4	120	<4	<4	<4	<4
Aldrin	US EPA 3510/8270	ug/L	0.3	<2	120	<2	<2	<2	<2
alpha BHC	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
alpha Endosulfan	US EPA 3510/8270	ug/L	20	<2	120	<2	<2	<2	<2
beta BHC	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
beta Endosulfan	US EPA 3510/8270	ug/L	20	<2	120	<2	<2	<2	<2
delta BHC	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Dieldrin	US EPA 3510/8270	ug/L	3	<2	120	<2	<2	<2	<2
Endrin	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Endosulfan sulfate	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
gamma BHC	US EPA 3510/8270	ug/L	10	<2	120	<2	<2	<2	<2
Heptachlor	US EPA 3510/8270	ug/L	0.3	<2	120	<2	<2	<2	<2
Heptachlor epoxide	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Organophosphorous Pesticides									
Chlorfenvinphos	US EPA 3510/8270	ug/L	2	<2	120	<2	<2	<2	<2
Chlorpyrifos	US EPA 3510/8270	ug/L	10	<2	120	<2	<2	<2	<2

Table 9.1 Summary data for all water quality zones (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Chlorpyrifos–methyl	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Diazinon	US EPA 3510/8270	ug/L	4	<2	120	<2	<2	<2	<2
Dichlorvos	US EPA 3510/8270	ug/L	5	<2	120	<2	<2	<2	<2
Dimethoate	US EPA 3510/8270	ug/L	7	<2	120	<2	<2	<2	<2
Ethion	US EPA 3510/8270	ug/L	4	<2	120	<2	<2	<2	<2
Fenthion	US EPA 3510/8270	ug/L	7	<2	120	<2	<2	<2	<2
Malathion	US EPA 3510/8270	ug/L	70	<2	120	<2	<2	<2	<2
Pirimphos–ethyl	US EPA 3510/8270	ug/L	90	<2	120	<2	<2	<2	<2
Prothiofos	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Phenolic Compounds									
2,3,4,6 Tetrachlorophenol	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
2,4 Dichlorophenol	US EPA 3510/8270	ug/L	200	<2	120	<2	<2	<2	<2
2,4 Dimethylphenol	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
2,4,5 Trichlorophenol	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
2,4,6 Trichlorophenol	US EPA 3510/8270	ug/L	20	<2	120	<2	<2	<2	<2
2,6 Dichlorophenol	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
2 Chlorophenol	US EPA 3510/8270	ug/L	300	<2	120	<2	<2	<2	<2
2 Methylphenol	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
2 Nitrophenol	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
3– & 4–Methylphenol	US EPA 3510/8270	ug/L	–	<4	120	<4	<4	<4	<4
4–Chloro–3–Methylphenol	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Pentachlorophenol	US EPA 3510/8270	ug/L	10	<4	120	<4	<4	<4	<4
Phenol	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Phthalates									
Bis(2–ethylhexyl) phthalate	US EPA 3510/8270	ug/L	10	<5/ <10	120	<5	<10	<10	<10
Butyl benzyl phthalate	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Diethyl phthalate	US EPA 3510/8270	ug/L	–	<2	120	<2	5	<2	<2
Dimethyl phthalate	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Di–n–butyl phthalate	US EPA 3510/8270	ug/L	–	<2	120	<2	2	<2	<2
Di–n–octylphthalate	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons									
2 Chloronaphthalene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
2 Methylnaphthalene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
3 Methylcholanthrene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
7,12 Dimethylbenz(a)anthracene	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Acenaphthene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Acenaphthene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Acenaphthylene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Acenaphthylene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Anthracene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Anthracene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1

Table 9.1 Summary data for all water quality zones (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<0.5	120	<0.5	<1	<0.5	<0.5
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<2	120	<0.5	<2	<2	<2
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Benzo(b)fluoranthene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Benzo(k)fluoranthene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Benzo(b) & Benzo(k)fluoranthene	US EPA 3510/8270	ug/L	–	<4	120	<1	<4	<4	<4
Chrysene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Chrysene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Fluoranthene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Fluoranthene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Fluorene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Fluorene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
N–2 Fluorenyl Acetamide	US EPA 3510/8270	ug/L	–	<2	120	<2	<2	<2	<2
Naphthalene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Naphthalene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Phenanthrene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Phenanthrene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Pyrene	US EPA 3510/8270	ug/L	–	<1	120	<1	<1	<1	<1
Pyrene	US EPA 3510/8270	ug/L	–	<2	120	<1	<2	<2	<2
Polycyclic Aromatic Hydrocarbons Total	US EPA 3510/8270	ug/L	–	<0.5	120	<0.5	<0.5	<0.5	<0.5

ADWG	Australian Drinking Water Guidelines – Health Guideline Value
CFU/mL	colony forming units per millilitre
Deg C	degrees Celsius
ug/L	micrograms per litre
mg/L	milligrams per litre
uS/cm	micro siemens per centimetre
MPN	most probable number
NTU	nephelometric units
Pt-Co	platinum-cobalt units

The 95th percentile is a statistical calculation based on 'normal' distribution. In the context of this report, it estimates the value for which 95% of all the water that passes through the distribution system in this 12 month period falls below.

Table 9.2 Summary data for water quality zone 1: North Canberra and Gungahlin

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Microbiological									
E.Coli	APHA 9223 B	MPN/100mL	<1	<1	252	<1	<1	<1	<1
Total Coliforms	APHA 9223 B	MPN/100mL	–	<1	252	<1	2	<1	<1
Heterotrophic Plate Count	APHA 9215 B	CFU/mL	–	<1	252	<1	44	1	4
Physical									
Asbestos	AS 4964–2000	Present/ Absent	–	Absent	24	Absent	Absent	–	–
Conductivity	APHA 2510 B	uS/cm	–	<2	24	86	180	105	180
pH	APHA 4500–H B	pH	–	<1	252	7.3	8.7	7.7	7.9
Temperature	APHA 2550 B	deg. C	–	<0.1	120	8.2	24.9	16.5	23.5
Total Dissolved Solids	APHA 2540 C	mg/L	–	<20	24	42	140	68	117
Turbidity	APHA 2130 B	NTU	–	<0.1	120	0.13	0.83	0.3	0.7
True colour	Lachat QuikChem Method, Color in Waters 10–308–00–1–A	Pt.Co	–	<1	120	<1	2	1	2
Inorganic									
Alkalinity bicarb	APHA 2320 A/B	mg/L	–	<0.1	60	34.9	46.5	40.1	45.1
Alkalinity carb	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	<0.1	<0.1	<0.1
Alkalinity hydrox	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	<0.1	<0.1	<0.1
Alkalinity total	APHA 2320 A/B	mg/L	–	<1	60	35	47	40	45
Aluminium Acid Soluble	US EPA 200.8	ug/L	–	<5	24	20	43	28	38
Calcium Dissolved	US EPA 200.7	mg/L	–	<0.05	24	11.00	19.00	14.17	18.85
Chloride	APHA 21st Ed. 2005, Part 4110 B	mg/L	–	<0.1	12	2.9	8.1	3.5	5.5
Chlorine Combined	APHA 4500–CL G	mg/L	–	<0.03	252	<0.03	0.32	0.11	0.25
Chlorine Free	APHA 4500–CL G	mg/L	–	<0.03	252	0.15	1.38	0.80	1.19
Chlorine Total	APHA 4500–CL G	mg/L	5	<0.03	252	0.29	1.52	0.90	1.32
Cyanide	APHA 4500_CN	mg/L	0.08	<0.004	12	<0.004	<0.004	<0.004	<0.004
Fluoride	APHA 4500–FC	mg/L	1.5	<0.1	24	0.54	0.95	0.82	0.91
Hardness Total	APHA 2340 B	mg/L	–	<0.1	24	33	61	40	59
Iodide	VIC–CM078	mg/L	0.5	<0.05	12	<0.01	<0.05	<0.01	<0.01
Magnesium Dissolved	US EPA 200.7	mg/L	–	<0.05	24	0.63	3.40	1.15	3.31
Nitrate	APHA 21st Ed. 2005, Part 4110 B	mg/L	50	<0.1	12	<0.1	0.1	<0.1	<0.1
Potassium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	0.4	1.9	0.6	1.2
Sodium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	2.6	7.3	3.4	5.0
Sulphate	APHA 21st Ed. 2005, Part 4110 B	mg/L	500	<0.4	12	0.6	30	3.2	14.1
Total Metals									
Aluminium Total	US EPA 200.8	ug/L	–	<9	24	23	56	33	47
Antimony Total	US EPA 200.8	ug/L	3	<3	24	<3	<3	<3	<3
Arsenic Total	US EPA 200.8	ug/L	10	<1	24	<1	<1	<1	<1

Table 9.2 Summary data for water quality zone 1: North Canberra and Gungahlin (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Boron Total	US EPA 200.7	mg/L	4	<0.01	12	<0.01	<0.01	<0.01	<0.01
Barium Total	US EPA 200.8	ug/L	2000	<2	24	3	7	4	6
Beryllium Total	US EPA 200.8	ug/L	60	<0.1	24	<0.1	<0.1	<0.1	<0.1
Cadmium Total	US EPA 200.8	ug/L	2	<0.05	24	<0.05	<0.05	<0.05	<0.05
Chromium Total	US EPA 200.8	ug/L	50	<2	24	<2	<2	<2	<2
Cobalt Total	US EPA 200.8	ug/L	–	<0.2	24	<0.2	<0.2	<0.2	<0.2
Copper Total	US EPA 200.8	ug/L	2000	<1	120	<1	160	22	76
Iron Total	US EPA 200.7	mg/L	–	<0.02	60	<0.02	0.05	<0.02	<0.02
Lead Total	US EPA 200.8	ug/L	10	<0.2	60	<0.2	2	0.3	0.9
Manganese Total	US EPA 200.8	ug/L	500	<0.5	24	<0.5	5.5	2.3	3.8
Manganese Total	US EPA 200.7	mg/L	0.5	<0.001	120	0.001	0.024	0.004	0.012
Mercury Total	USEPA 200.8	ug/L	1	<0.1	12	<0.1	<0.1	<0.1	<0.1
Molybdenum Total	US EPA 200.8	ug/L	50	<1	24	<1	<1	<1	<1
Nickel Total	US EPA 200.8	ug/L	20	<1	24	<1	1	1	<1
Selenium Total	US EPA 200.8	ug/L	10	<2	24	<2	<2	<2	<2
Silver Total	US EPA 200.8	ug/L	100	<1	24	<1	<1	<1	<1
Zinc Total	US EPA 200.8	ug/L	–	<5	24	<5	14	4	14
Haloacetic Acids									
Bromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<5	60	<1	<5	<5	<5
Bromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	5	1	5
Bromodichloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	7	2	6
Dibromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	<1	<1	<1
Dibromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	<10	<10	<10
Dichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<10	60	7	44	16	40
Monochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	3	2	2
Tribromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	<10	<10	<10
Trichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<1	60	10	55	22	51
Trihalomethanes									
Bromoform	VIC–CM047	mg/L	–	<0.001	60	<0.001	<0.001	<0.001	<0.001
Chloroform	VIC–CM047	mg/L	–	<0.001	60	0.012	0.079	0.029	0.066
Dibromochloromethane	VIC–CM047	mg/L	–	<0.001	60	<0.001	0.001	<0.001	<0.001
Dichlorobromomethane	VIC–CM047	mg/L	–	<0.001	60	<0.001	0.012	0.003	0.010
Trihalomethanes Total	VIC–CM047	mg/L	0.25	<0.001	60	0.013	0.092	0.032	0.076
Semi Voltaile Organic Compounds (SVOC)									
Anilines and Benzidines									
2 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
3 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
3,3 Dichlorobenzidine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Chloroaniline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Nitroaniline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Aniline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2

Table 9.2 Summary data for water quality zone 1: North Canberra and Gungahlin (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Carbazole	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dibenzofuran	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Chlorinated Hydrocarbons									
1,2 Dichlorobenzene	US EPA 3510/8270	ug/L	1500	<2	24	<2	<2	<2	<2
1,2,4 Trichlorobenzene	US EPA 3510/8270	ug/L	30	<2	24	<2	<2	<2	<2
1,3 Dichlorobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
1,4 Dichlorobenzene	US EPA 3510/8270	ug/L	40	<2	24	<2	<2	<2	<2
Hexachlorobenzene	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
Hexachlorobutadiene	US EPA 3510/8270	ug/L	0.7	<2	24	<2	<2	<2	<2
Hexachlorocyclopentadiene	US EPA 3510/8270	ug/L	–	<10	24	<10	<10	<10	<10
Hexachloroethane	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Hexachloropropylene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pentachlorobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Haloethers									
4 Bromophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Chlorophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Bis(2–chloroethyl) ether	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Bis(2–chloroethoxy) methane	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Nitroaromatics and Ketones									
1 Naphthylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
1,3,5 Trinitrobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2 Picoline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
2,6 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
4 Aminobiphenyl	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Nitroquinoline–N–oxide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
5 Nitro–o–toluidine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Acetophenone	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Azobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Chlorobenzilate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dimethylaminoazobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Isophorone	US EPA 3510/8270	ug/L	100	<2	24	<2	<2	<2	<2
Nitrobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pentachloronitrobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Phenacetin	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pronamide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Nitrosamines									
Methapyrilene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosodibutylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosodiethylamine	US EPA 3510/8270	ug/L	0.1	<2	24	<2	<2	<2	<2
N–Nitrosodi–n–propylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2

Table 9.2 Summary data for water quality zone 1: North Canberra and Gungahlin (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
N–Nitrosodiphenyl & Diphenylamine	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
N–Nitrosomethylethylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosomorpholine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosopiperidine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosopyrrolidine	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
Organochlorine Pesticides									
4,4 DDD	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4,4 DDE	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4,4 DDT	US EPA 3510/8270	ug/L	9	<4	24	<4	<4	<4	<4
Aldrin	US EPA 3510/8270	ug/L	0.3	<2	24	<2	<2	<2	<2
alpha BHC	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
alpha Endosulfan	US EPA 3510/8270	ug/L	20	<2	24	<2	<2	<2	<2
beta BHC	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
beta Endosulfan	US EPA 3510/8270	ug/L	20	<2	24	<2	<2	<2	<2
delta–BHC	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dieldrin	US EPA 3510/8270	ug/L	3	<2	24	<2	<2	<2	<2
Endrin	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Endosulfan sulfate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
gamma–BHC	US EPA 3510/8270	ug/L	10	<2	24	<2	<2	<2	<2
Heptachlor	US EPA 3510/8270	ug/L	0.3	<2	24	<2	<2	<2	<2
Heptachlor epoxide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Organophosphorous Pesticides									
Chlorfenvinphos	US EPA 3510/8270	ug/L	2	<2	24	<2	<2	<2	<2
Chlorpyrifos	US EPA 3510/8270	ug/L	10	<2	24	<2	<2	<2	<2
Chlorpyrifos–methyl	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Diazinon	US EPA 3510/8270	ug/L	4	<2	24	<2	<2	<2	<2
Dichlorvos	US EPA 3510/8270	ug/L	5	<2	24	<2	<2	<2	<2
Dimethoate	US EPA 3510/8270	ug/L	7	<2	24	<2	<2	<2	<2
Ethion	US EPA 3510/8270	ug/L	4	<2	24	<2	<2	<2	<2
Fenthion	US EPA 3510/8270	ug/L	7	<2	24	<2	<2	<2	<2
Malathion	US EPA 3510/8270	ug/L	70	<2	24	<2	<2	<2	<2
Pirimphos–ethyl	US EPA 3510/8270	ug/L	90	<2	24	<2	<2	<2	<2
Prothiofos	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Phenolic Compounds									
2,3,4,6 Tetrachlorophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4 Dichlorophenol	US EPA 3510/8270	ug/L	200	<2	24	<2	<2	<2	<2
2,4 Dimethylphenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4,5 Trichlorophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4,6 Trichlorophenol	US EPA 3510/8270	ug/L	20	<2	24	<2	<2	<2	<2
2,6 Dichlorophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2 Chlorophenol	US EPA 3510/8270	ug/L	300	<2	24	<2	<2	<2	<2
2 Methylphenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2

Table 9.2 Summary data for water quality zone 1: North Canberra and Gungahlin (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
2 Nitrophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
3– & 4 Methylphenol	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
4–Chloro–3 Methylphenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pentachlorophenol	US EPA 3510/8270	ug/L	10	<4	24	<4	<4	<4	<4
Phenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Phthalates									
Bis(2–ethylhexyl) phthalate	US EPA 3510/8270	ug/L	10	<5/ <10	24	<5	<10	<10	<10
Butyl benzyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Diethyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	5	<2	<2
Dimethyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Di–n–butyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Di–n–octylphthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons									
2 Chloronaphthalene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2 Methylnaphthalene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
3 Methylcholanthrene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
7,12 Dimethylbenz(a) anthracene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Acenaphthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Acenaphthene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Acenaphthylene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Acenaphthylene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Anthracene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Anthracene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<0.5	24	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<2	24	<2	<2	<2	<2
Benzo(b)fluoranthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benzo(k)fluoranthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benzo(b) & Benzo(k) fluoranthene	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Chrysene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Chrysene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Fluoranthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Fluoranthene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Fluorene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Fluorene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1

Table 9.2 Summary data for water quality zone 1: North Canberra and Gungahlin (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–2 Fluorenyl Acetamide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Naphthalene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Naphthalene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Phenanthrene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Phenanthrene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pyrene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Pyrene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons Total	US EPA 3510/8270	ug/L	–	<0.5	24	<0.5	<0.5	<0.5	<0.5

ADWG Australian Drinking Water Guidelines – Health Guideline Value
CFU/mL colony forming units per millilitre
Deg C degrees Celsius
ug/L micrograms per litre
mg/L milligrams per litre
uS/cm micro siemens per centimetre
MPN most probable number
NTU nephelometric units
Pt-Co platinum-cobalt units

The 95th percentile is a statistical calculation based on 'normal' distribution. In the context of this report, it estimates the value for which 95% of all the water that passes through the distribution system in this 12 month period falls below.

Table 9.3 Summary data for water quality zone 2: Belconnen

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Microbiological									
E.Coli	APHA 9223 B	MPN/100mL	<1	<1	252	<1	<1	<1	<1
Total Coliforms	APHA 9223 B	MPN/100mL	–	<1	252	<1	2	<1	<1
Heterotrophic Plate Count	APHA 9215 B	CFU/mL	–	<1	252	<1	4500	1	4
Physical									
Asbestos	AS 4964–2000	Present/ Absent	–	Absent	36	Absent	Absent	–	–
Conductivity	APHA 2510 B	uS/cm	–	<2	36	86	180	113	180
pH	APHA 4500–H B	pH	–	<1	252	7.2	8.4	7.8	8.1
Temperature	APHA 2550 B	deg. C	–	<0.1	120	9.9	25.1	16.8	23.5
Total Dissolved Solids	APHA 2540 C	mg/L	–	<20	36	38	120	73	113
True colour	Lachat QuikChem Method, Color in Waters 10–308–00–1–A	Pt.Co	–	<1	120	<1	2	1	2
Turbidity	APHA 2130 B	NTU	–	<0.1	120	0.1	1.1	0.4	0.7
Inorganic									
Alkalinity bicarb	APHA 2320 A/B	mg/L	–	<0.1	60	35.4	45.9	40.0	44.7
Alkalinity carb	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	<0.1	<0.1	<0.1
Alkalinity hydrox	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	<0.1	<0.1	<0.1
Alkalinity total	APHA 2320 A/B	mg/L	–	<1	60	35	46	40	45
Aluminium Acid Soluble	US EPA 200.8	ug/L	–	<5	36	20	52	31	48
Calcium Dissolved	US EPA 200.7	mg/L	–	<0.05	36	12.00	20.00	14.64	18.25
Chloride	APHA 21st Ed. 2005, Part 4110 B	mg/L	–	<0.1	12	1.4	7.9	4.0	7.7
Chlorine Combined	APHA 4500–CL G	mg/L	–	<0.03	252	<0.03	0.69	0.11	0.23
Chlorine Free	APHA 4500–CL G	mg/L	–	<0.03	252	0.11	1.25	0.69	0.97
Chlorine Total	APHA 4500–CL G	mg/L	5	<0.03	252	0.19	1.36	0.80	1.07
Cyanide	APHA 4500_CN	mg/L	0.08	<0.004	12	<0.004	<0.004	<0.004	<0.004
Fluoride	APHA 4500–FC	mg/L	1.5	<0.1	36	0.6	0.95	0.8	0.9
Hardness Total	APHA 2340 B	mg/L	–	<0.1	36	33	60	42.5	60.0
Iodide	VIC–CM078	mg/L	0.5	<0.05	12	<0.01	<0.05	<0.01	<0.01
Magnesium Dissolved	US EPA 200.7	mg/L	–	<0.05	36	0.70	4.00	1.44	3.65
Nitrate	APHA 21st Ed. 2005, Part 4110 B	mg/L	50	<0.1	12	<0.1	0.1	0.1	0.1
Potassium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	0.4	1.9	0.8	1.8
Sodium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	2.7	7.6	4.1	7.6
Sulphate	APHA 21st Ed. 2005, Part 4110 B	mg/L	500	<0.4	12	0.6	28	7.2	26.9
Total Metals									
Aluminium Total	US EPA 200.8	ug/L	–	<9	36	23	70	38	60
Antimony Total	US EPA 200.8	ug/L	3	<3	36	<3	<3	<3	<3
Arsenic Total	US EPA 200.8	ug/L	10	<1	36	<1	<1	<1	<1
Barium Total	US EPA 200.8	ug/L	2000	<2	36	2.7	6.3	4.04	6.10

Table 9.3 Summary data for water quality zone 2: Belconnen (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Beryllium Total	US EPA 200.8	ug/L	60	<0.1	36	<0.1	<0.1	<0.1	<0.1
Boron Total	US EPA 200.7	mg/L	4	<0.01	12	<0.01	<0.01	<0.01	<0.01
Cadmium Total	US EPA 200.8	ug/L	2	<0.05	36	<0.05	<0.05	<0.05	<0.05
Chromium Total	US EPA 200.8	ug/L	50	<2	36	<2	<2	<2	<2
Cobalt Total	US EPA 200.8	ug/L	–	<0.2	36	<0.2	<0.2	<0.2	<0.2
Copper Total	US EPA 200.8	ug/L	2000	<1	120	1	110	16	37
Iron Total	US EPA 200.7	mg/L	–	<0.02	60	<0.02	0.13	0.05	0.11
Lead Total	US EPA 200.8	ug/L	10	<0.2	60	<0.2	1	0.2	0.6
Manganese Total	US EPA 200.7	mg/L	0.5	<0.001	120	0.001	0.210	0.006	0.011
Manganese Total	US EPA 200.8	ug/L	500	<0.5	36	<0.5	11	3.2	10.5
Mercury Total	USEPA 200.8	ug/L	1	<0.1	12	<0.1	<0.1	<0.1	<0.1
Molybdenum Total	US EPA 200.8	ug/L	50	<1	36	<1	<1	<1	<1
Nickel Total	US EPA 200.8	ug/L	20	<1	36	<1	1	<1	<1
Selenium Total	US EPA 200.8	ug/L	10	<2	36	<2	<2	<2	<2
Silver Total	US EPA 200.8	ug/L	100	<1	36	<1	<1	<1	<1
Zinc Total	US EPA 200.8	ug/L	–	<5	36	<5	12	<5	<5
Haloacetic Acid									
Bromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<5	60	<5	<5	<5	<5
Bromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	5	1	4
Bromodichloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	7	2	6
Dibromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	<1	<1	<1
Dibromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	<10	<10	<10
Dichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<10	60	7	42	17	36
Monochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	3	<1	2
Tribromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	<10	<10	<10
Trichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<1	60	10	54	24	51
Trihalomethanes									
Bromoform	VIC–CM047	mg/L	–	<0.001	59	<0.001	0.002	<0.001	<0.001
Chloroform	VIC–CM047	mg/L	–	<0.001	59	0.014	0.077	0.031	0.063
Dibromochloromethane	VIC–CM047	mg/L	–	<0.001	59	<0.001	0.024	<0.001	<0.001
Dichlorobromomethane	VIC–CM047	mg/L	–	<0.001	59	<0.001	0.046	0.004	0.009
Trihalomethanes Total	VIC–CM047	mg/L	0.25	<0.001	59	0.015	0.150	0.036	0.072
Semi Voltaile Organic Compounds (SVOC)									
Anilines and Benzidines									
2 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
2 Picoline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
3 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
3,3 Dichlorobenzidine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Chloroaniline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Nitroaniline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Aniline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Carbazole	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dibenzofuran	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2

Table 9.3 Summary data for water quality zone 2: Belconnen (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Chlorinated Hydrocarbons									
1,2 Dichlorobenzene	US EPA 3510/8270	ug/L	1500	<2	36	<2	<2	<2	<2
1,2,4 Trichlorobenzene	US EPA 3510/8270	ug/L	30	<2	36	<2	<2	<2	<2
1,3 Dichlorobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
1,4 Dichlorobenzene	US EPA 3510/8270	ug/L	40	<2	36	<2	<2	<2	<2
Hexachlorobenzene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
Hexachlorobutadiene	US EPA 3510/8270	ug/L	0.7	<2	36	<2	<2	<2	<2
Hexachlorocyclopentadiene	US EPA 3510/8270	ug/L	–	<10	36	<10	<10	<10	<10
Hexachloroethane	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Hexachloropropylene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pentachlorobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Haloethers									
4 Bromophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Chlorophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Bis(2–chloroethoxy) methane	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Bis(2–chloroethyl) ether	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Nitroaromatics and Ketones									
1 Naphthylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
1,3,5 Trinitrobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2,4 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
2,6 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
4 Aminobiphenyl	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Nitroquinoline–N–oxide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
5 Nitro–o–toluidine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Acetophenone	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Azobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Chlorobenzilate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dimethylaminoazobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Isophorone	US EPA 3510/8270	ug/L	100	<2	36	<2	<2	<2	<2
Nitrobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pentachloronitrobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Phenacetin	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pronamide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Nitrosamines									
Methapyrilene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosodibutylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosodiethylamine	US EPA 3510/8270	ug/L	0.1	<2	36	<2	<2	<2	<2
N–Nitrosodi–n–propylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosodiphenyl & Diphenylamine	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
N–Nitrosomethylethylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosomorpholine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosopiperidine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosopyrrolidine	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4

Table 9.3 Summary data for water quality zone 2: Belconnen (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Organochlorine Pesticides									
4,4 DDD	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4,4 DDE	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4,4 DDT	US EPA 3510/8270	ug/L	9	<4	36	<4	<4	<4	<4
Aldrin	US EPA 3510/8270	ug/L	0.3	<2	36	<2	<2	<2	<2
alpha BHC	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
alpha Endosulfan	US EPA 3510/8270	ug/L	20	<2	36	<2	<2	<2	<2
beta BHC	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
beta Endosulfan	US EPA 3510/8270	ug/L	20	<2	36	<2	<2	<2	<2
delta–BHC	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dieldrin	US EPA 3510/8270	ug/L	3	<2	36	<2	<2	<2	<2
Endrin	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Endosulfan sulfate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
gamma–BHC	US EPA 3510/8270	ug/L	10	<2	36	<2	<2	<2	<2
Heptachlor	US EPA 3510/8270	ug/L	0.3	<2	36	<2	<2	<2	<2
Heptachlor epoxide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Organophosphorous Pesticides									
Chlorfenvinphos	US EPA 3510/8270	ug/L	2	<2	36	<2	<2	<2	<2
Chlorpyrifos	US EPA 3510/8270	ug/L	10	<2	36	<2	<2	<2	<2
Chlorpyrifos–methyl	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Diazinon	US EPA 3510/8270	ug/L	4	<2	36	<2	<2	<2	<2
Dichlorvos	US EPA 3510/8270	ug/L	5	<2	36	<2	<2	<2	<2
Dimethoate	US EPA 3510/8270	ug/L	7	<2	36	<2	<2	<2	<2
Ethion	US EPA 3510/8270	ug/L	4	<2	36	<2	<2	<2	<2
Fenthion	US EPA 3510/8270	ug/L	7	<2	36	<2	<2	<2	<2
Malathion	US EPA 3510/8270	ug/L	70	<2	36	<2	<2	<2	<2
Pirimphos–ethyl	US EPA 3510/8270	ug/L	90	<2	36	<2	<2	<2	<2
Prothiofos	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Phenolic Compounds									
2,3,4,6 Tetrachlorophenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2,4 Dichlorophenol	US EPA 3510/8270	ug/L	200	<2	36	<2	<2	<2	<2
2,4 Dimethylphenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2,4,5 Trichlorophenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2,4,6 Trichlorophenol	US EPA 3510/8270	ug/L	20	<2	36	<2	<2	<2	<2
2,6 Dichlorophenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2 Chlorophenol	US EPA 3510/8270	ug/L	300	<2	36	<2	<2	<2	<2
2 Methylphenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2 Nitrophenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
3– & 4 Methylphenol	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
4–Chloro–3 Methylphenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pentachlorophenol	US EPA 3510/8270	ug/L	10	<4	36	<4	<4	<4	<4
Phenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2

Table 9.3 Summary data for water quality zone 2: Belconnen (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Phthalates									
Bis(2–ethylhexyl) phthalate	US EPA 3510/8270	ug/L	10	<5/ <10	36	<5	<10	<10	<10
Butyl benzyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Diethyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dimethyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Di–n–butyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	2	<2	<2
Di–n–octylphthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons									
2 Chloronaphthalene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2 Methylnaphthalene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
3 Methylcholanthrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
7,12 Dimethylbenz(a) anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Acenaphthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Acenaphthene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Acenaphthylene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Acenaphthylene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Anthracene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<0.5	36	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<2	36	<2	<2	<2	<2
Benzo(b)fluoranthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benzo(k)fluoranthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benzo(b) & Benzo(k) fluoranthene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Chrysene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Chrysene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Fluoranthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Fluoranthene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Fluorene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Fluorene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–2 Fluorenyl Acetamide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Naphthalene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Naphthalene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Phenanthrene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1

Table 9.3 Summary data for water quality zone 2: Belconnen (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Phenanthrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pyrene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Pyrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons Total	US EPA 3510/8270	ug/L	–	<0.5	36	<0.5	<0.5	<0.5	<0.5

ADWG	Australian Drinking Water Guidelines – Health Guideline Value
CFU/mL	colony forming units per millilitre
Deg C	degrees Celsius
ug/L	micrograms per litre
mg/L	milligrams per litre
uS/cm	micro siemens per centimetre
MPN	most probable number
NTU	nephelometric units
Pt-Co	platinum-cobalt units

The 95th percentile is a statistical calculation based on 'normal' distribution. In the context of this report, it estimates the value for which 95% of all the water that passes through the distribution system in this 12 month period falls below.

Table 9.4 Summary data for water quality zone 3: South Canberra, Woden and Weston Creek

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Mircrobiological									
E.Coli	APHA 9223 B	MPN/100mL	<1	<1	252	<1	<1	<1	<1
Total Coliforms	APHA 9223 B	MPN/100mL	–	<1	252	<1	<1	<1	<1
Heterotrophic Plate Count	APHA 9215 B	CFU/mL	–	<1	251	<1	150	2	4
Physical									
Asbestos	AS 4964–2000	Present/ Absent	–	Absent	36	Absent	Absent	–	–
Conductivity	APHA 2510 B	uS/cm	–	<2	36	82	180	107	170
pH	APHA 4500–H B	pH	–	<1	252	7.2	8.4	7.7	7.9
Temperature	APHA 2550 B	deg. C	–	<0.1	120	9.6	25.5	16.8	23.6
Total Dissolved Solids	APHA 2540 C	mg/L	–	<20	36	32	120	66	113
True colour	Lachat QuikChem Method, Color in Waters 10–308–00–1–A	Pt.Co	–	<1	120	<1	3	1	2
Turbidity	APHA 2130 B	NTU	–	<0.1	120	0.1	0.9	0.3	0.6
Inorganic									
Alkalinity bicarb	APHA 2320 A/B	mg/L	–	<0.1	60	32.9	45.4	39.2	44.4
Alkalinity carb	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	<0.1	<0.1	<0.1
Alkalinity hydrox	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	<0.1	<0.1	<0.1
Alkalinity total	APHA 2320 A/B	mg/L	–	<1	60	33	45	39	44
Aluminium Acid Soluble	US EPA 200.8	ug/L	–	<5	36	19	51	31	42
Calcium Dissolved	US EPA 200.7	mg/L	–	<0.05	36	11.00	18.00	13.92	17.00
Chloride	APHA 21st Ed. 2005, Part 4110 B	mg/L	–	<0.1	12	2.6	7.7	4.0	7.6
Chlorine Combined	APHA 4500–CL G	mg/L	–	<0.03	252	<0.03	0.29	0.10	0.23
Chlorine Free	APHA 4500–CL G	mg/L	5	<0.03	252	0.14	1.69	0.72	1.06
Chlorine Total	APHA 4500–CL G	mg/L	5	<0.03	252	0.27	1.80	0.82	1.15
Cyanide	APHA 4500_CN	mg/L	0.08	<0.004	12	<0.004	<0.004	<0.004	<0.004
Fluoride	APHA 4500–FC	mg/L	1.5	<0.1	36	0.7	0.9	0.8	0.9
Hardness Total	APHA 2340 B	mg/L	–	<0.1	36	31.0	59.0	40.1	57.3
Iodide	VIC–CM078	mg/L	0.5	<0.05	12	<0.01	<0.05	<0.01	<0.01
Magnesium Dissolved	US EPA 200.7	mg/L	–	<0.05	36	0.73	4.10	1.35	3.83
Nitrate	APHA 21st Ed. 2005, Part 4110 B	mg/L	50	<0.1	12	<0.1	<0.1	<0.1	<0.1
Potassium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	0.4	1.9	0.7	1.7
Sodium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	2.8	7.4	3.8	7.2
Sulphate	APHA 21st Ed. 2005, Part 4110 B	mg/L	500	<0.4	12	0.6	29	5.7	28.5
Total Metals									
Aluminium Total	US EPA 200.8	ug/L	–	<9	36	20	87	36	48
Antimony Total	US EPA 200.8	ug/L	3	<3	36	<3	<3	<3	<3
Arsenic Total	US EPA 200.8	ug/L	10	<1	36	<1	<1	<1	<1
Barium Total	US EPA 200.8	ug/L	2000	<2	36	3	6	4	6

Table 9.4 Summary data for water quality zone 3: South Canberra, Woden and Weston Creek (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Beryllium Total	US EPA 200.8	ug/L	60	<0.1	36	<0.1	2.1	<0.1	<0.1
Boron Total	US EPA 200.7	mg/L	4	<0.01	12	<0.01	<0.01	<0.01	<0.01
Cadmium Total	US EPA 200.8	ug/L	2	<0.05	36	<0.05	0.34	<0.05	<0.05
Chromium Total	US EPA 200.8	ug/L	50	<2	36	<1	<2	<2	<2
Cobalt Total	US EPA 200.8	ug/L	–	<0.2	36	<0.2	<0.2	<0.2	<0.2
Copper Total	US EPA 200.8	ug/L	2000	<1	120	3	160	17	37
Iron Total	US EPA 200.7	mg/L	–	<0.02	60	<0.02	0.07	<0.02	<0.02
Lead Total	US EPA 200.8	ug/L	10	<0.2	60	<0.2	0.9	0.4	0.7
Manganese Total	US EPA 200.7	mg/L	0.5	<0.001	120	0.001	0.014	0.004	0.011
Manganese Total	US EPA 200.8	ug/L	500	<0.5	36	0.5	15.0	3.77	10.38
Mercury Total	USEPA 200.8	ug/L	1	<0.1	12	<0.1	<0.1	<0.1	<0.1
Molybdenum Total	US EPA 200.8	ug/L	50	<1	36	<1	<1	<1	<1
Nickel Total	US EPA 200.8	ug/L	20	<1	36	<1	2	1	2
Selenium Total	US EPA 200.8	ug/L	10	<2	36	<2	<2	<2	<2
Silver Total	US EPA 200.8	ug/L	100	<1	36	<1	<1	<1	<1
Zinc Total	US EPA 200.8	ug/L	–	<5	36	<5	14	4	9
Haloacetic Acid									
Bromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<5	60	<5	<5	<5	<5
Bromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	6	1	6
Bromodichloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	8	2	7
Dibromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	<1	<1	<1
Dibromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	<10	<10	<10
Dichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<10	60	5	52	16	37
Mononchloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	3	1	2
Tribromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	<10	<10	<10
Trichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<1	60	10	70	23	52
Trihalomethanes									
Bromoform	VIC–CM047	mg/L	–	<0.001	60	<0.001	<5	<0.001	<0.001
Chloroform	VIC–CM047	mg/L	–	<0.001	60	0.013	0.082	0.029	0.065
Dibromochloromethane	VIC–CM047	mg/L	–	<0.001	60	<5	<0.001	<0.001	<0.001
Dichlorobromomethane	VIC–CM047	mg/L	–	<0.001	60	<5	0.010	0.003	0.009
Trihalomethanes Total	VIC–CM047	mg/L	0.25	<0.001	60	0.014	0.091	0.032	0.073
Semi Voltaile Organic Compounds (SVOC)									
Anilines and Benzidines									
2 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
3 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
3,3 Dichlorobenzidine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Chloroaniline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Nitroaniline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Aniline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Carbazole	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2

Table 9.4 Summary data for water quality zone 3: South Canberra, Woden and Weston Creek (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Dibenzofuran	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Chlorinated Hydrocarbons									
1,2 Dichlorobenzene	US EPA 3510/8270	ug/L	1500	<2	36	<2	<2	<2	<2
1,2,4 Trichlorobenzene	US EPA 3510/8270	ug/L	30	<2	36	<2	<2	<2	<2
1,3 Dichlorobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
1,4 Dichlorobenzene	US EPA 3510/8270	ug/L	40	<2	36	<2	<2	<2	<2
Hexachlorobenzene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
Hexachlorobutadiene	US EPA 3510/8270	ug/L	0.7	<2	36	<2	<2	<2	<2
Hexachlorocyclopentadiene	US EPA 3510/8270	ug/L	–	<10	36	<10	<10	<10	<10
Hexachloroethane	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Hexachloropropylene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pentachlorobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Haloethers									
4 Bromophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Chlorophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Bis(2–chloroethoxy) methane	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Bis(2–chloroethyl) ether	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Nitroaromatics and Ketones									
1 Naphthylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
1,3,5 Trinitrobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2 Picoline	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2,4 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
2,6 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
4 Aminobiphenyl	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4 Nitroquinoline–N–oxide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
5 Nitro–o–toluidine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Acetophenone	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Azobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Chlorobenzilate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dimethylaminoazobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Isophorone	US EPA 3510/8270	ug/L	100	<2	36	<2	<2	<2	<2
Nitrobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pentachloronitrobenzene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Phenacetin	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pronamide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Nitrosamines									
Methapyrilene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosodibutylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosodiethylamine	US EPA 3510/8270	ug/L	0.1	<2	36	<2	<2	<2	<2
N–Nitrosodi–n–propylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosodiphenyl & Diphenylamine	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4

Table 9.4 Summary data for water quality zone 3: South Canberra, Woden and Weston Creek (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
N–Nitrosomethylethylamine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosomorpholine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosopiperidine	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–Nitrosopyrrolidine	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
Organochlorine Pesticides									
4,4 DDD	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4,4 DDE	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
4,4 DDT	US EPA 3510/8270	ug/L	9	<4	36	<4	<4	<4	<4
Aldrin	US EPA 3510/8270	ug/L	0.3	<2	36	<2	<2	<2	<2
alpha BHC	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
alpha Endosulfan	US EPA 3510/8270	ug/L	20	<2	36	<2	<2	<2	<2
beta BHC	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
beta Endosulfan	US EPA 3510/8270	ug/L	20	<2	36	<2	<2	<2	<2
delta–BHC	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dieldrin	US EPA 3510/8270	ug/L	3	<2	36	<2	<2	<2	<2
Endrin	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Endosulfan sulfate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
gamma–BHC	US EPA 3510/8270	ug/L	10	<2	36	<2	<2	<2	<2
Heptachlor	US EPA 3510/8270	ug/L	0.3	<2	36	<2	<2	<2	<2
Heptachlor epoxide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Organophosphorous Pesticides									
Chlorfenvinphos	US EPA 3510/8270	ug/L	2	<2	36	<2	<2	<2	<2
Chlorpyrifos	US EPA 3510/8270	ug/L	10	<2	36	<2	<2	<2	<2
Chlorpyrifos–methyl	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Diazinon	US EPA 3510/8270	ug/L	4	<2	36	<2	<2	<2	<2
Dichlorvos	US EPA 3510/8270	ug/L	5	<2	36	<2	<2	<2	<2
Dimethoate	US EPA 3510/8270	ug/L	7	<2	36	<2	<2	<2	<2
Ethion	US EPA 3510/8270	ug/L	4	<2	36	<2	<2	<2	<2
Fenthion	US EPA 3510/8270	ug/L	7	<2	36	<2	<2	<2	<2
Malathion	US EPA 3510/8270	ug/L	70	<2	36	<2	<2	<2	<2
Pirimphos–ethyl	US EPA 3510/8270	ug/L	90	<2	36	<2	<2	<2	<2
Prothiofos	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Phenolic Compounds									
2,3,4,6 Tetrachlorophenol	US EPA 3510/8270	ug/L	–	<2	36	<1	<2	<2	<2
2,4,5 Trichlorophenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2,4 Dichlorophenol	US EPA 3510/8270	ug/L	200	<2	36	<2	<2	<2	<2
2,4 Dimethylphenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2,4,6 Trichlorophenol	US EPA 3510/8270	ug/L	20	<2	36	<2	<2	<2	<2
2,6 Dichlorophenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2 Chlorophenol	US EPA 3510/8270	ug/L	300	<2	36	<2	<2	<2	<2
2 Methylphenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2 Nitrophenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
3– & 4 Methylphenol	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4

Table 9.4 Summary data for water quality zone 3: South Canberra, Woden and Weston Creek (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
4–Chloro–3 Methylphenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pentachlorophenol	US EPA 3510/8270	ug/L	10	<4	36	<4	<4	<4	<4
Phenol	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Phthalates									
bis(2–ethylhexyl) phthalate	US EPA 3510/8270	ug/L	10	<5/ <10	36	<5	<10	<10	<10
Butyl benzyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Diethyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dimethyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Di–n–butyl phthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	2	<2	<2
Di–n–octylphthalate	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons									
2 Chloronaphthalene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
2 Methylnaphthalene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
3 Methylcholanthrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
7,12 Dimethylbenz(a) anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Acenaphthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Acenaphthene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Acenaphthylene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Acenaphthylene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Anthracene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<0.5	36	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<2	36	<2	<2	<2	<2
Benzo(b)fluoranthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benzo(k)fluoranthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benzo(b) & Benzo(k) fluoranthene	US EPA 3510/8270	ug/L	–	<4	36	<4	<4	<4	<4
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Chrysene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Chrysene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Fluoranthene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Fluoranthene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Fluorene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Fluorene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
N–2 Fluorenyl Acetamide	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2

Table 9.4 Summary data for water quality zone 3: South Canberra, Woden and Weston Creek (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Naphthalene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Naphthalene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Phenanthrene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Phenanthrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Pyrene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Pyrene	US EPA 3510/8270	ug/L	–	<2	36	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons Total	US EPA 3510/8270	ug/L	–	<0.5	36	<0.5	<0.5	<0.5	<0.5

ADWG	Australian Drinking Water Guidelines – Health Guideline Value
CFU/mL	colony forming units per millilitre
Deg C	degrees Celsius
ug/L	micrograms per litre
mg/L	milligrams per litre
uS/cm	micro siemens per centimetre
MPN	most probable number
NTU	nephelometric units
Pt-Co	platinum-cobalt units

The 95th percentile is a statistical calculation based on 'normal' distribution. In the context of this report, it estimates the value for which 95% of all the water that passes through the distribution system in this 12 month period falls below.

Table 9.5 Summary data for water quality zone 4: Tuggeranong

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Microbiological									
E.Coli	APHA 9223 B	MPN/ 100mL	<1	<1	252	<1	<1	<1	<1
Total Coliforms	APHA 9223 B	MPN/ 100mL	–	<1	252	<1	<1	<1	<1
Heterotrophic Plate Count	APHA 9215 B	CFU/mL	–	<1	252	<1	1200	7	7
Physical									
Asbestos	AS 4964–2000	Present/ Absent	–	Absent	24	Absent	Absent	–	–
True colour	Lachat QuikChem Method, Color in Waters 10–308–00–1–A	Pt.Co	–	<1	120	<1	2	1	2
Conductivity	APHA 2510 B	uS/cm	–	<2	24	88	180	111	170
pH	APHA 4500–H B	pH	–	<1	252	7.2	8.7	7.9	8.4
Temperature	APHA 2550 B	deg. C	–	<0.1	120	9.2	27.0	17.1	24.0
Total Dissolved Solids	APHA 2540 C	mg/L	–	<20	24	35	120	69	109
Turbidity	APHA 2130 B	NTU	–	<0.1	120	0.1	1.0	0.3	0.5
Inorganic									
Alkalinity bicarb	APHA 2320 A/B	mg/L	–	<0.1	60	35.0	46.2	40.9	44.8
Alkalinity carb	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	3.6	0.2	0.1
Alkalinity carb	APHA 2320 A/B	mg/L	–	0.05	60	0.05	3.60	0.16	0.05
Alkalinity hydrox	APHA 2320 A/B	mg/L	–	<0.1	60	<0.1	<0.1	<0.1	<0.1
Alkalinity total	APHA 2320 A/B	mg/L	–	<1	60	35	47	41	46
Aluminium Acid Soluble	US EPA 200.8	ug/L	–	<5	24	19	44	32	41
Calcium Dissolved	US EPA 200.7	mg/L	–	<0.05	24	11.00	20.00	14.38	18.70
Chloride	APHA 21st Ed. 2005, Part 4110 B	mg/L	–	<0.1	12	2.9	7.7	3.6	5.8
Chlorine Combined	APHA 4500–CL G	mg/L	–	<0.03	252	<0.03	0.44	0.12	0.25
Chlorine Free	APHA 4500–CL G	mg/L	–	<0.03	252	0.06	1.36	0.67	1.00
Chlorine Total	APHA 4500–CL G	mg/L	5	<0.03	252	0.14	1.65	0.77	1.07
Cyanide	APHA 4500_CN	mg/L	0.08	<0.004	12	<0.004	<0.004	<0.004	<0.004
Fluoride	APHA 4500–FC	mg/L	1.5	<0.1	24	0.7	0.095	0.8	0.9
Hardness Total	APHA 2340 B	mg/L	–	<0.1	24	32	63	42.0	58.7
Iodide	VIC–CM078	mg/L	0.5	<0.01	12	<0.01	<0.05	<0.01	<0.01
Magnesium Dissolved	US EPA 200.7	mg/L	–	<0.05	24	0.67	3.60	1.30	3.23
Nitrate	APHA 21st Ed. 2005, Part 4110 B	mg/L	50	<0.1	12	<0.1	0.1	<0.1	<0.1
Potassium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	0.4	1.8	0.7	1.6
Sodium Dissolved	US EPA 200.7	mg/L	–	<0.1	12	2.6	7.9	3.5	6.0
Sulphate	APHA 21st Ed. 2005, Part 4110 B	mg/L	500	<0.4	12	0.7	29.0	3.9	16.7
Total Metals									
Aluminium Total	US EPA 200.8	ug/L	–	<9	24	21	57	37	50
Antimony Total	US EPA 200.8	ug/L	3	<3	24	<3	<3	<3	<3
Arsenic Total	US EPA 200.8	ug/L	10	<1	24	<1	<1	<1	<1
Barium Total	US EPA 200.8	ug/L	2000	<2	24	3	6	4	6
Beryllium Total	US EPA 200.8	ug/L	60	<0.1	24	<0.1	<1	<0.1	<0.1

Table 9.5 Summary data for water quality zone 4: Tuggeranong (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Boron Total	US EPA 200.7	mg/L	4	<0.01	12	<0.01	<0.01	<0.01	<0.01
Cadmium Total	US EPA 200.8	ug/L	2	<0.05	24	<0.05	<0.05	<0.05	<0.05
Chromium Total	US EPA 200.8	ug/L	50	<2	24	<2	<2	<2	<2
Cobalt Total	US EPA 200.8	ug/L	–	<0.2	24	<0.2	<1	<0.2	<0.2
Copper Total	US EPA 200.8	ug/L	2000	<1	120	2	110	17	52
Iron Total	US EPA 200.7	mg/L	–	<0.02	60	<0.02	<0.02	<0.02	<0.02
Lead Total	US EPA 200.8	ug/L	10	<0.2	60	<0.2	0.5	<0.2	0.3
Manganese Total	US EPA 200.7	mg/L	0.5	<0.001	120	0.001	0.027	0.004	0.008
Manganese Total	US EPA 200.8	ug/L	500	<0.5	24	0.6	7.6	2.5	6.6
Mercury Total	USEPA 200.8	ug/L	1	<0.1	12	<0.1	<0.1	<0.1	<0.1
Molybdenium Total	US EPA 200.8	ug/L	50	<1	24	<1	<1	<1	<1
Nickel Total	US EPA 200.8	ug/L	20	<1	24	<1	1	<1	<1
Selenium Total	US EPA 200.8	ug/L	10	<2	24	<2	<2	<2	<2
Silver Total	US EPA 200.8	ug/L	100	<1	24	<1	<1	<1	<1
Zinc Total	US EPA 200.8	ug/L	–	<5	24	<5	5	<5	<5
Haloacetic Acids									
Bromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<5	60	<5	<5	<5	<5
Bromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	5	1	4
Bromodichloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	8	2	6
Dibromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	<1	<1	<1
Dibromochloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	16	<10	<10
Dichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<10	60	4	42	16	36
Mononchloroacetic Acid	ALS: HS/GC/FID	ug/L	–	<1	60	<1	3	2	3
Tribromoacetic Acid	ALS: HS/GC/FID	ug/L	–	<10	60	<10	<10	<10	<10
Trichloroacetic Acid	ALS: HS/GC/FID	ug/L	100	<1	60	10	58	24	49
Trihalomethanes									
Bromoform	VIC–CM047	mg/L	–	<0.001	60	<0.001	<0.001	<0.001	<0.001
Chloroform	VIC–CM047	mg/L	–	<0.001	60	0.013	0.083	0.033	0.067
Dibromochloromethane	VIC–CM047	mg/L	–	<0.001	60	<0.001	<0.001	<0.001	<0.001
Dichlorobromomethane	VIC–CM047	mg/L	–	<0.001	60	0.001	0.009	0.003	0.007
Trihalomethanes Total	VIC–CM047	mg/L	0.25	<0.001	60	0.014	0.090	0.036	0.074
Semi Voltaile Organic Compounds (SVOC)									
Anilines and Benzidines									
2 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
3 Nitroaniline	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
3,3 Dichlorobenzidine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Chloroaniline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Nitroaniline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Aniline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Carbazole	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dibenzofuran	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2

Table 9.5 Summary data for water quality zone 4: Tuggeranong (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Chlorinated Hydrocarbons									
1,2 Dichlorobenzene	US EPA 3510/8270	ug/L	1500	<2	24	<2	<2	<2	<2
1,2,4 Trichlorobenzene	US EPA 3510/8270	ug/L	30	<2	24	<2	<2	<2	<2
1,3 Dichlorobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
1,4 Dichlorobenzene	US EPA 3510/8270	ug/L	40	<2	24	<2	<2	<2	<2
Hexachlorobenzene	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
Hexachlorobutadiene	US EPA 3510/8270	ug/L	0.7	<2	24	<2	<2	<2	<2
Hexachlorocyclopentadiene	US EPA 3510/8270	ug/L	–	<10	24	<10	<10	<10	<10
Hexachloroethane	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Hexachloropropylene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pentachlorobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Haloethers									
4 Bromophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Chlorophenyl phenyl ether	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Bis(2–chloroethoxy) methane	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Bis(2–chloroethyl) ether	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Nitroaromatics and Ketones									
1 Naphthylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
1,3,5 Trinitrobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2 Picoline	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
2,6 Dinitrotoluene	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
4 Aminobiphenyl	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4 Nitroquinoline–N–oxide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
5 Nitro–o–toluidine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Acetophenone	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Azobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Chlorobenzilate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dimethylaminoazobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Isophorone	US EPA 3510/8270	ug/L	100	<2	24	<2	<2	<2	<2
Nitrobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pentachloronitrobenzene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Phenacetin	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pronamide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Nitrosamines									
Methapyrilene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Naphthalene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
N–Nitrosodibutylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosodiethylamine	US EPA 3510/8270	ug/L	0.1	<2	24	<2	<2	<2	<2
N–Nitrosodi–n–propylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosodiphenyl & Diphenylamine	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4

Table 9.5 Summary data for water quality zone 4: Tuggeranong (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
N–Nitrosomethylethylamine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosomorpholine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosopiperidine	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
N–Nitrosopyrrolidine	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
Organochlorine Pesticides									
4,4 DDD	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4,4 DDE	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
4,4 DDT	US EPA 3510/8270	ug/L	9	<4	24	<4	<4	<4	<4
Aldrin	US EPA 3510/8270	ug/L	0.3	<2	24	<2	<2	<2	<2
alpha BHC	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
alpha Endosulfan	US EPA 3510/8270	ug/L	20	<2	24	<2	<2	<2	<2
beta BHC	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
beta Endosulfan	US EPA 3510/8270	ug/L	20	<2	24	<2	<2	<2	<2
delta–BHC	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dieldrin	US EPA 3510/8270	ug/L	3	<2	24	<2	<2	<2	<2
Endrin	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Endosulfan sulfate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
gamma–BHC	US EPA 3510/8270	ug/L	10	<2	24	<2	<2	<2	<2
Heptachlor	US EPA 3510/8270	ug/L	0.3	<2	24	<2	<2	<2	<2
Heptachlor epoxide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Organophosphorous Pesticides									
Chlorfenvinphos	US EPA 3510/8270	ug/L	2	<2	24	<2	<2	<2	<2
Chlorpyrifos	US EPA 3510/8270	ug/L	10	<2	24	<2	<2	<2	<2
Chlorpyrifos–methyl	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Diazinon	US EPA 3510/8270	ug/L	4	<2	24	<2	<2	<2	<2
Dichlorvos	US EPA 3510/8270	ug/L	5	<2	24	<2	<2	<2	<2
Dimethoate	US EPA 3510/8270	ug/L	7	<2	24	<2	<2	<2	<2
Ethion	US EPA 3510/8270	ug/L	4	<2	24	<2	<2	<2	<2
Fenthion	US EPA 3510/8270	ug/L	7	<2	24	<2	<2	<2	<2
Malathion	US EPA 3510/8270	ug/L	70	<2	24	<2	<2	<2	<2
Pirimphos–ethyl	US EPA 3510/8270	ug/L	90	<2	24	<2	<2	<2	<2
Prothiofos	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Phenolic Compounds									
2 Chlorophenol	US EPA 3510/8270	ug/L	300	<2	24	<2	<2	<2	<2
2 Methylphenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2 Nitrophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,3,4,6 Tetrachlorophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4 Dichlorophenol	US EPA 3510/8270	ug/L	200	<2	24	<2	<2	<2	<2
2,4 Dimethylphenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4,5 Trichlorophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2,4,6 Trichlorophenol	US EPA 3510/8270	ug/L	20	<2	24	<2	<2	<2	<2

Table 9.5 Summary data for water quality zone 4: Tuggeranong (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
2,6 Dichlorophenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
3– & 4 Methylphenol	US EPA 3510/8270	ug/L	–	<4	24	<4	<4	<4	<4
4–Chloro–3 Methylphenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Pentachlorophenol	US EPA 3510/8270	ug/L	10	<4	24	<4	<4	<4	<4
Phenol	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Phthalates									
Bis(2–ethylhexyl) phthalate	US EPA 3510/8270	ug/L	10	<5/ <10	24	<5	<10	<10	<10
Butyl benzyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Diethyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Dimethyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Di–n–butyl phthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Di–n–octylphthalate	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons									
2 Chloronaphthalene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
2 Methylnaphthalene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
3 Methylcholanthrene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
7,12 Dimethylbenz(a)anthracene	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Acenaphthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Acenaphthene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Acenaphthylene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Acenaphthylene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Anthracene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Anthracene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benz(a)anthracene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<0.5	24	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	US EPA 3510/8270	ug/L	0.01	<2	24	<0.5	<2	<2	<2
Benzo(b)fluoranthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benzo(k)fluoranthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benzo(b) & Benzo(k) fluoranthene	US EPA 3510/8270	ug/L	–	<4	24	<1	<4	<4	<4
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Benzo(g,h,i)perylene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Chrysene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Chrysene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Dibenz(a,h)anthracene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Fluoranthene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Fluoranthene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Fluorene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Fluorene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1

Table 9.5 Summary data for water quality zone 4: Tuggeranong (cont)

Analyte	Method ID	Units	ADWG (Health)	Limit of Reporting	Number of Samples	Minimum	Maximum	Mean	95th Percentile
Indeno(1,2,3–cd)pyrene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
N–2 Fluorenyl Acetamide	US EPA 3510/8270	ug/L	–	<2	24	<2	<2	<2	<2
Naphthalene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Phenanthrene	US EPA 3510/8270	ug/L	–	<1	36	<1	<1	<1	<1
Phenanthrene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Pyrene	US EPA 3510/8270	ug/L	–	<1	24	<1	<1	<1	<1
Pyrene	US EPA 3510/8270	ug/L	–	<2	24	<1	<2	<2	<2
Polycyclic Aromatic Hydrocarbons Total	US EPA 3510/8270	ug/L	–	<0.5	24	<0.5	<0.5	<0.5	<0.5

ADWG	Australian Drinking Water Guidelines – Health Guideline Value
CFU/mL	colony forming units per millilitre
Deg C	degrees Celsius
ug/L	micrograms per litre
mg/L	milligrams per litre
uS/cm	micro siemens per centimetre
MPN	most probable number
NTU	nephelometric units
Pt-Co	platinum-cobalt units

The 95th percentile is a statistical calculation based on 'normal' distribution. In the context of this report, it estimates the value for which 95% of all the water that passes through the distribution system in this 12 month period falls below.

10. References

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11. Abbreviations

ACT	Australian Capital Territory
ADWG	Australian Drinking Water Guidelines (2011)
ALS	ALS Global
AS/NZS	Australian Standards/New Zealand Standards
CFU	colony forming units
DAFF	dissolved air flotation and filtration
DWCoP/Code	Public Health (Drinking Water) Code of Practice (2007)
GL	gigalitre
HACCP	Hazard Analysis and Critical Control Point
HBT	Health based targets
ICRC	Independent Competition and Regulatory Commission
ISO	International Standards Organisation
km	kilometre
L	litre
ML	megalitre
ug	micrograms
uS	micro Siemens
mg	milligram
mL	millilitre
mm	millimetre
mm^3	millimetres cubed
MPN	most probable number
NATA	National Association of Testing Authorities
ND	Not detect
NHMRC/NRMMC	National Health and Medical Research Council/ Natural Resource Management Ministerial Council
NTU	nephelometric turbidity units
NSW	New South Wales
%	percent
PAH	polycyclic aromatic hydrocarbons
PAC	powdered activated carbon
PCS	Parks and Conservation Services
Pt-Co	platinum-cobalt units
SWAMP	Source Water Assessment Monitoring Prioritisation
SWPP	Source Water Protection Program
THM	trihalomethanes
UV	ultraviolet light
WSAA	Water Services Association of Australia
WTP	Water Treatment Plant