

Drinking Water Quality

Annual report **2003-04**

Water Corporation

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Our commitment to you



The Water Corporation is committed to effective management of our drinking water supplies to provide a safe, high-quality product that consistently meets the Australian Drinking Water Guidelines*, consumer and other regulatory requirements.

To achieve this, and in partnership with stakeholders and relevant agencies, the Corporation will:

- manage water quality at all points along the delivery chain from source water to the consumer;
- be a strong advocate for source protection, committed to primacy of drinking water quality over other land uses;
- use a risk-based approach to identify and manage potential threats to water quality;
- comply with the health related criteria of the Australian Drinking Water Guidelines and work to progressively improve compliance with aesthetic criteria;
- integrate the needs and expectations of our consumers, stakeholders, regulators and employees into our planning;
- establish regular monitoring of the quality of drinking water and effective reporting mechanisms to provide relevant and timely information, and promote confidence in the water supply and its management;
- develop appropriate contingency planning and incident response capability;
- participate in appropriate research and development activities to ensure continued understanding of drinking water quality issues and performance;
- contribute to setting industry regulations and guidelines, and other standards relevant to public health and the water cycle;
- continually improve our practices by assessing performance against corporate commitments and stakeholder expectations.

The Corporation will implement and maintain a drinking water quality management system consistent with the Australian Drinking Water Guidelines to effectively manage the risks to drinking water quality.

All managers and employees involved in the supply of drinking water are responsible for understanding, implementing, maintaining and continuously improving the drinking water quality management system.

Dr Jim Gill
CHIEF EXECUTIVE OFFICER

* The Water Corporation's current compliance requirement is the 1987 Guidelines for Drinking Water Quality in Australia; however it is currently working towards progressive compliance with the 1996 Australian Drinking Water Guidelines by 2005. Compliance with further updates is also expected on a progressive basis.

INTRODUCTION

The Water Corporation is committed to providing drinking water that is both safe and pleasant to drink to over 250 cities, towns and small communities scattered throughout Western Australia. We operate some of the most extensive water supply schemes in the world. The Goldfields and Agricultural Water Supply and Great Southern Towns Water Supply schemes supply water to some 3 million hectares of farmland, numerous communities and towns.

Even though we were faced with many difficult issues this year including ongoing drought over much of the State, we still achieved outstanding results. All of our localities complied with the health related requirements set by the Department of Health.

While our health related performance is outstanding, we recognise there are significant challenges ahead of us in relation to our aesthetic performance. This is especially the case in some of our small country water supplies, where there are limited sources of drinking water available, and where installation of treatment can come at a very high cost. Our commitment to improve aesthetic performance includes a multi-million program to improve treatment facilities at nine towns in the Murchison and Goldfields. The first project in this program, a reverse osmosis (desalination) treatment plant at Leonora was commissioned in 2004.

Our Operating Licence currently requires us to comply with the 1987 Guidelines for Drinking Water Quality in Australia. However in agreement with the Department of Health, we have committed to progressive compliance with the more stringent 1996 Guidelines by 2005. To achieve this we are well advanced with an \$87 million program of capital improvements covering some 2500 individual projects.

One of the key issues identified in our customer research is that customers require more information about their water quality. This report is the second annual report providing our customers with detailed information on drinking water quality in an open and honest manner. We recognise that feedback from our customers is a vital source of information to help us continuously improve our management of drinking water quality, and we extend an open invitation for readers to respond with their opinions and suggestions. If you require additional water quality information, please telephone 13 13 75.

Where Does Your Water Come From?

Perth Region

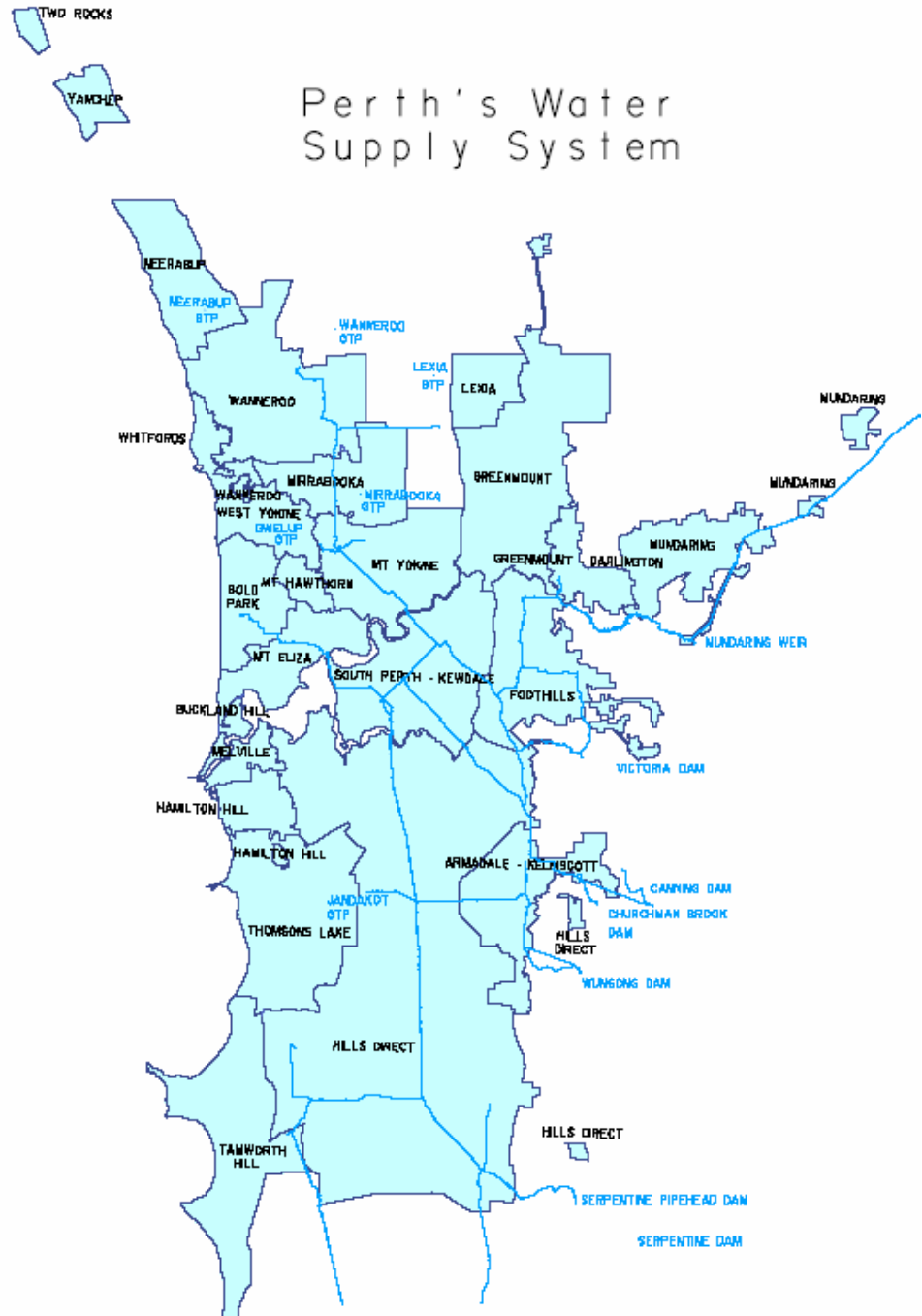
The Perth metropolitan area and Mandurah share a supply system that draws on both surface and groundwater sources, known as the Perth Integrated Water Supply System (IWSS).

Surface water comes from nine dams in the Darling Range: South and North Dandalup, Conjurunup, Serpentine, Wungong, Churchmans Brook, Canning, Mundaring and Victoria. Water is also supplied from Stirling and Samson Dams in the South West Region.

Groundwater is drawn from the Yarragadee, Leederville and shallow aquifers. Most of the 180 bores are located in Perth's northern suburbs and pine plantations. Groundwater is treated at one of six groundwater treatment plants. There are also twelve independent artesian bores pumping water directly into service reservoirs. Sometimes customers receive a mix of groundwater and surface water, to optimize the amount of water available. The percentage of each depends on the seasonal groundwater production capability.

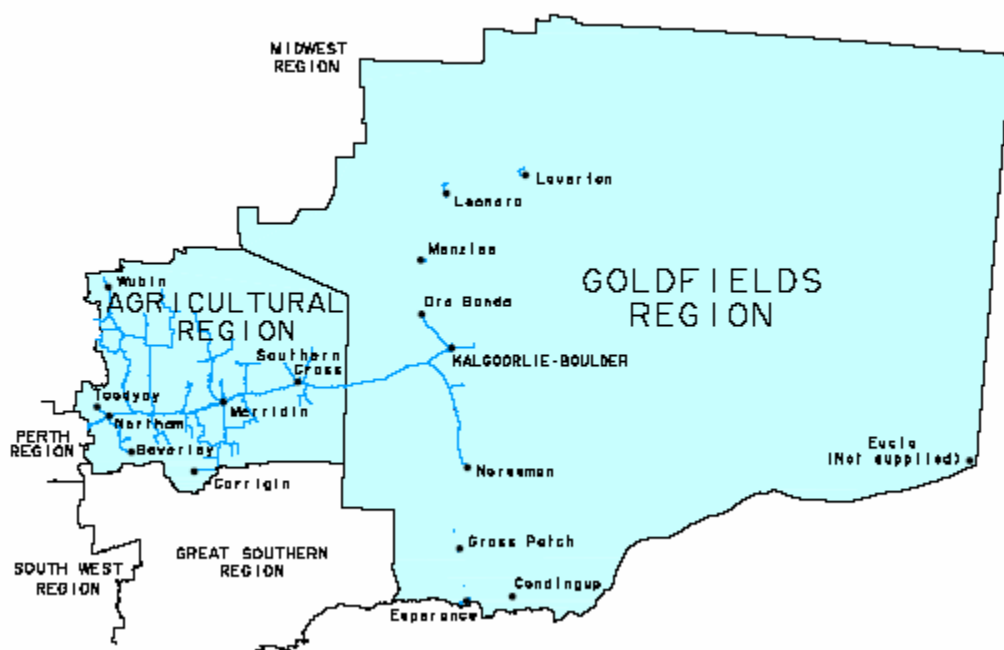
Yanchep and Two Rocks are special cases in the Perth Region, which have their own independent ground water supplies. Eventually these two will become part of the IWSS. Drought conditions have forced us to significantly change the way the system is operated to preserve our limited surface water supplies by maximising ground water production. It is now possible to supply all of Perth and Mandurah with ground water for a limited period if required (refer to Improving Your Water Quality: First Rains Project).

During the review period, there was an environmental assessment of the proposal to build a 45-gigalitre per year seawater desalination plant at Kwinana. In July 2004, the project received State Government approval. When operational in 2006, the desalination plant will be the largest plant of its type in the Southern Hemisphere and will boost water supply to the IWSS by 17 percent with the desalinated water entering the metro scheme through Thomsons Lake Reservoir.



Goldfields & Agricultural Regions

The Goldfields and Agricultural Water Supply Scheme (GAWS) provides the majority of the water to towns in these regions. Water is sourced from Mundaring Weir near Perth, which is part of the Perth Integrated Water Supply Scheme. This year, the drought has necessitated pumping significant quantities of ground water into Mundaring Reservoir to supplement supply.



Approximately half of the localities in the region can receive a proportion of their supply from local ground and surface water sources. The town of Eucly is not supplied by the Corporation but included on the map to show the eastern extent of WA.

Great Southern Region

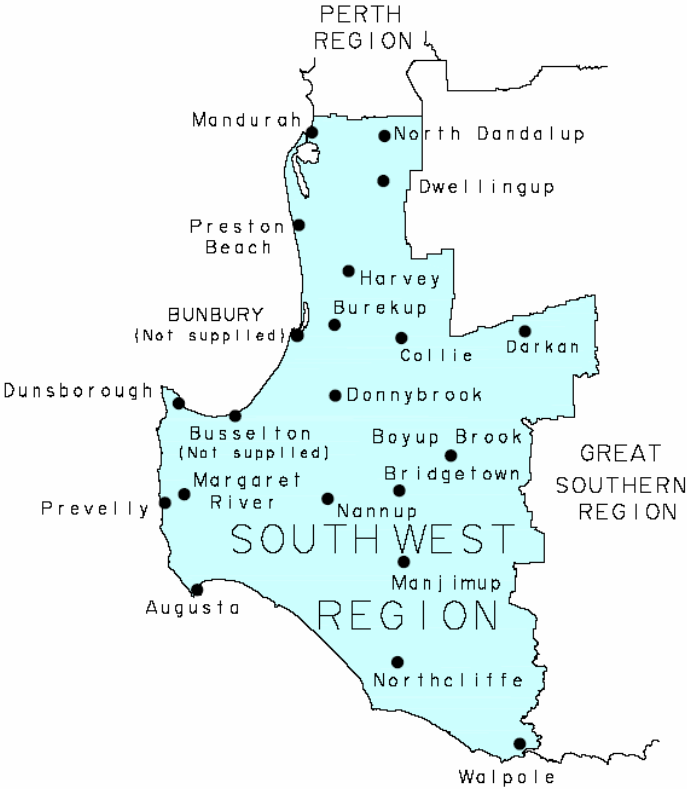
The major schemes in the Great Southern Region include the Great Southern Towns Water Supply Scheme (GSTWS) and the Lower GSTWS. Harris Dam is the major source for the GSTWS, however approximately half the localities have local sources (primarily surface water), which can contribute to supply if required.



The Lower GSTWS, which supplies Albany and Mt Barker, has two sources including a series of borefields to the south west, and surface water sources to the north east of Albany. The remaining localities in the region have local supplies and are not connected to a major scheme.

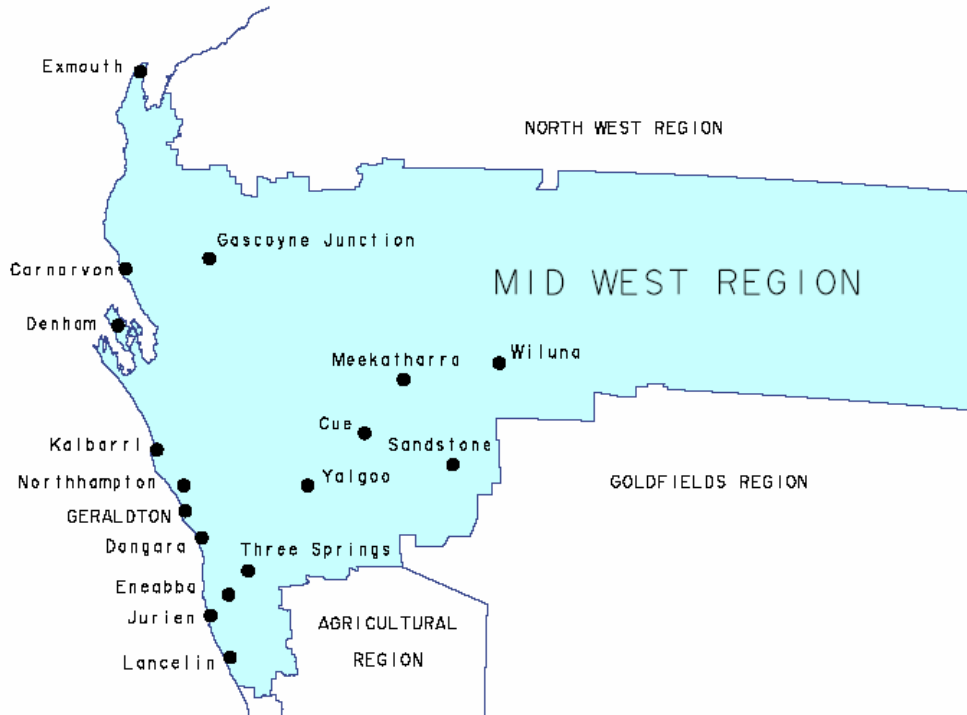
South West Region

Towns in the South West Region obtain water from a number of surface and ground water sources that are largely independent and not connected to a major scheme. Harvey, Waroona, Hamel, Binningup and Myalup are exceptions, being supplied from the Perth Integrated Water Supply System. The towns of Busselton and Bunbury are not supplied by the Corporation.



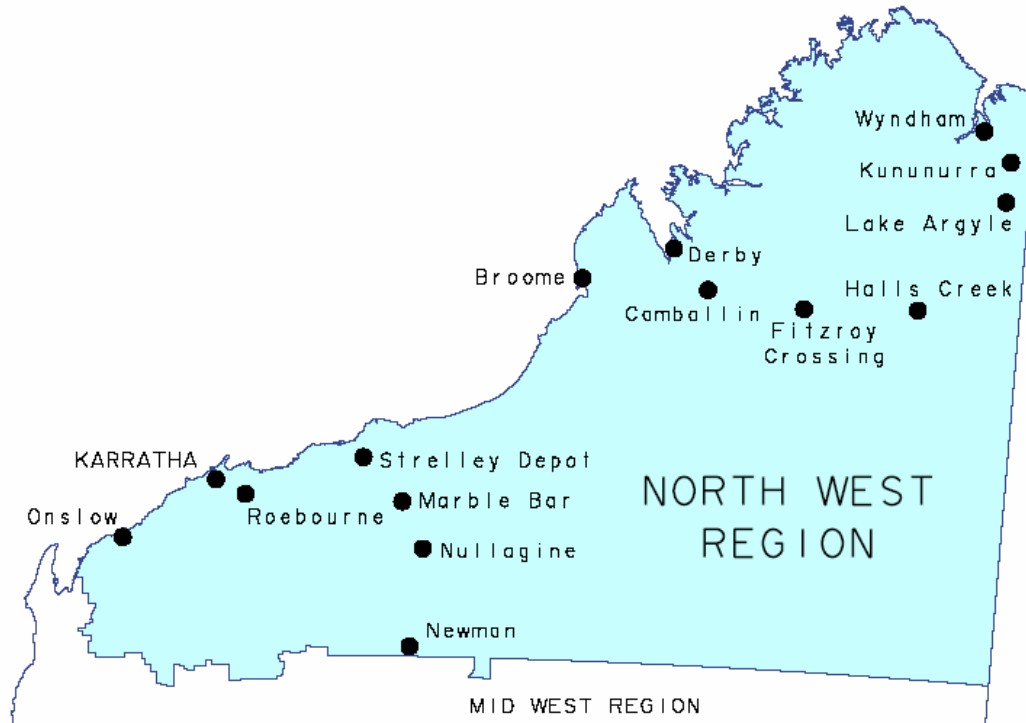
Mid West Region

The Mid West Region uses independent ground water sources almost exclusively. Yuna, near Northampton, is an exception, being supplied from a surface water source.



North West Region

The West Pilbara Water Supply Scheme supplies customers in Karratha, Dampier and the neighbouring towns of Roebourne, Wickham and Pt Samson. The scheme has two sources, Harding Dam and Millstream bores which have been used at different times of the year depending on water quality constraints. We have completed the \$31-million Harding Dam water treatment plant to improve the water quality in the West Pilbara and ensure year-round use of Harding Dam. The remainder of the supplies in the North West Region have independent surface and groundwater sources that are not connected to a major scheme. A seawater desalination plant is being constructed on the Burrup Peninsula to supply process water to the industrial precinct in the King Bay – Hearson Cove area.



What Drinking Water Guidelines Must We Meet?

The Operating Licence issued by the Economic Regulatory Authority requires that we comply with the guidelines for health related characteristics as set out in the 1987 NHMRC Guidelines for Drinking Water Quality in Australia.

In relation to aesthetic parameters, the Corporation's Operating Licence states that we "should aim to comply as far as practicable, with the Guidelines for not directly health related" characteristics as set out in the document. However, bearing in mind the high levels of public expenditure which would be required to achieve full compliance in respect of some small water supplies, it is accepted that achievement of this aim may take many years".

In 1996, the National Health and Medical Research Council (NHMRC) updated the Australian Drinking Water Guidelines (ADWG). In general, the 1996 guidelines require more samples to be taken, more parameters to be tested and higher performance standards to be achieved. They also require robust multiple barriers to contamination to be in place. The Water Corporation commenced preparation for introduction of the 1996 ADWG in 1997 and has already achieved substantial compliance with these stringent guidelines across the state (98% of localities fully comply with health related requirements.) In the Memorandum of Understanding (MoU) with Department of Health (DoH) the Corporation committed to the following timetable for compliance with the 1996 ADWG.

- December 2002 - Metropolitan area (achieved)
- December 2003 - Towns with more than 1000 people (achieved)
- December 2005 - Towns with less than 1000 people

For further information on the Corporation's program of improvements to ensure ongoing compliance with the 1996 ADWG refer to the section on Improving Your Water Quality.

How is Your Water Treated?

Water Treatment Plants

The specific water quality characteristics of every source dictate the type of treatment required. In instances where water comes from fully protected catchment areas, very little treatment is required – just disinfection. In other cases, a series of steps are required to ensure that the drinking water delivered to every house is safe and palatable.

Groundwater, which is pumped from underground aquifers, is treated to remove dissolved gases, dissolved iron and manganese, colour and turbidity, as required. In Perth, groundwater treatment plants at Wanneroo, Lexia, Mirrabooka, Gwelup and Jandakot aerate the water to increase the amount of dissolved oxygen and remove both carbon dioxide and hydrogen sulphide.

A coagulant (alum) is also added, which speeds the settling out of turbidity (soil particles), iron and natural organic matter. The clarified water is then passed through sand and coal filters to remove any remaining particles. Similar processes occur in many country centres.

At Neerabup Water Treatment Plant, technology has been introduced to soften the water and reduce salinity. This is the first such process to be applied in the Southern Hemisphere, and reduces the problems of scale in kettles and hot water systems, and soap that fails to lather.

Disinfection

Disinfection is our primary barrier against harmful bacteria in our water supply systems. Chlorination is the most common form of disinfection used by the Water Corporation and other utilities throughout the world. The concentration of chlorine is maintained within a tight range to ensure adequate disinfection is achieved without affecting the aesthetic quality of our water.

Other forms of disinfection used by the Water Corporation include chloramination and ultraviolet light. Chloramination involves the use of chlorine and ammonia to produce a more persistent disinfectant. It is used in the Goldfields and Agricultural Water Supply Scheme to help maintain a disinfectant residual in the extensive pipe network. Ultraviolet light is used in combination with chlorination at a small number of towns.

Fluoridation

The addition of fluoride to drinking water supplies (fluoridation) has a beneficial effect on teeth where the natural fluoride concentration is low. Fluoride is found naturally in most water sources, varying from less than 0.1 mg/L in surface waters through to greater than the health guideline value of 1.5 mg/L in some ground water sources.

In Western Australia, fluoridation is regulated by the Fluoridation of Public Water Supplies Act 1966, which is administered by the Department of Health. An advisory committee oversees fluoridation and makes recommendations to the Minister for Health.

The Water Corporation is required to fluoridate the following localities and schemes: Albany, Manjimup, Mt Barker, Esperance, Great Southern Towns Water Supply Scheme, Perth Integrated Water Supply Scheme, Goldfields and Agricultural Water Supply Scheme, Geraldton, Exmouth, and the West Pilbara Water Supply Scheme.

The fluoride dose rates have been set to provide consumers with a prescribed amount of fluoride based on water consumption. Water consumption is typically proportional to ambient temperatures, and therefore different dose rates have been set for various parts of the State. Dunsborough is a special case where the fluoride found naturally in the groundwater is sufficiently high to require de-fluoridation.

Ensuring the Safety of Your Water

Multiple Barrier Approach

Prevention of contamination and minimisation of potential hazards is an essential part of providing you with safe drinking water. The 1996 Australian Drinking Water Guidelines introduce the concept of using multiple barriers to ensure the safety of drinking water. Typical barriers include

- Protected catchments
- Large reservoirs with long water detention times
- Disinfection of water
- Maintaining residual disinfection throughout the reticulation system
- Ensuring that tanks and reservoirs are sealed to prevent ingress of contamination

The Water Corporation has been working hard to implement the multiple barrier approach throughout its drinking water systems and to achieve this we are well advanced with an \$87 million program of capital improvements covering some two and a half thousand individual projects.

Monitoring

In accordance with drinking water guidelines the Water Corporation has an extensive drinking water quality monitoring program to confirm the safety of the water we provide our customers. We take over 30,000 water samples each year from water sources, treatment plants and pipe networks which supply our customers, and have in excess of 100,000 individual analyses performed by our contracted analytical laboratories.

All our water quality monitoring and reporting is coordinated through our Water Quality Management System (WQMS). This software was developed 'in house' and is used to create our sampling programs, review performance and automatically alert us and the Department of Health of any sample results outside the guidelines.

The Department of Health

The Department of Health is the regulator of drinking water quality in Western Australia. In 2001, the Water Corporation entered into a Memorandum of Understanding (MoU) with the Department of Health. The MoU connects all facets of nationally and internationally recognised drinking water guidelines, standards, and quality management assurance systems.

The MoU requires the Water Corporation to notify the Department within 24 hours when any sample exceeds a set health value or defined aesthetic criteria or where any other event could pose a public health risk.

The department reviews all of the Corporation's monitoring results and corrective actions. The Department of Health also carried out a biennial audit of the Corporation's water quality data and reporting management systems to provide assurance of ongoing satisfactory performance.

Incident Response

While every effort is made to prevent water quality incidents from occurring, there will inevitably be times when things go wrong due to equipment failure, human error or unforeseen events. The Water Corporation has incident management plans and procedures to manage such events with the minimum possible impact on water quality and where necessary to involve the Department of Health and minimise the risk to public health.

Understanding Water Quality Test Results

The following summaries are intended to assist the reader interpret the results presented in this report. Additional information can be obtained by referring to the Fact Sheets contained in the Australian Drinking Water Guidelines published by the National Health and Medical Research Council.

In relation to the relevant guideline for each parameter in **Appendix B**, it should be noted that the 1987 ADWG does not include guideline values for all parameters. For the purpose of this report, the approach taken has been to use the 1987 guideline unless one does not exist, and where this occurs, to use the 1996 guideline in its place. The guidelines specify the number of samples to be collected. Generally, as the population increases then more samples are required. Furthermore, the selection of chemical parameters is governed by whether the samples are collected from raw, treated or reticulated water.

Total Coliforms

Coliforms are a broad group of bacteria including *Escherichia coli* and other thermotolerant coliforms. They may be found in the absence of faecal contamination. The presence of low numbers of coliforms does not mean the water is unsafe to drink, however it is an indication that an adequate disinfection residual has not been maintained throughout the pipe network. The compliance target for the 1987 guidelines has been interpreted by the Advisory Committee for the Purity of Water as requiring between 75% and 90.25% of samples to be free of any coliform organisms (depending on the population size receiving the water supply).

Thermotolerant Coliforms

Thermotolerant coliforms are a subgroup of total coliforms and are a more specific indicator of faecal contamination. Detections of thermotolerant coliforms are taken very seriously. The 1987 Guidelines has a compliance target of between 75% and 95% of samples being free of thermotolerant coliforms (dependent on population size). As an example, where the population is 30,000 or more, 95% of samples must be free of thermotolerant coliforms.

Thermophilic Naegleria

Thermophilic Naegleria refers to a group of amoebae which includes *Naegleria fowleri*, the organism that causes the waterborne disease primary amoebic meningoencephalitis (PAM). In the context of this report, thermophilic Naegleria refers to those tolerant to 42°C. The Department of Health has set a compliance target of between 75% and 95% of samples being free of thermophilic Naegleria (dependent on population size).

Fluoride

Fluorine is one of the most abundant elements in the Earth's crust, and is typically found as the fluoride ion or as organic or inorganic fluorides. It is found naturally in groundwater

supplies, and is present in most food and beverage products and toothpaste. Additional fluoride is added to a number of water supplies in Western Australia as directed by the Minister for Health (refer to How is your Water Treated? - Fluoridation). The fluoride concentration after dosing is set by the Fluoridation of Public Water Supplies Advisory Committee, and does not exceed 1 mg/L. Notwithstanding this, the 1987 health guideline for fluoride is 3 mg/L, which is applicable to both fluoridated and non-fluoridated localities.

Aluminium (acid-soluble)

Acid-soluble aluminium in water primarily originates from the addition of aluminium sulphate (Alum) in the water treatment process. Alum is a coagulant that is added to aid the removal of colour and turbidity. Aluminium can accumulate in pipe sediments, and be re-suspended during periods of rapid changes to flow patterns. The 1987 Guidelines specify an aesthetic guideline of 0.2 mg/L.

True Colour

Colour in water originates mainly from soil and vegetable matters, such as leaves, in the catchment. Corroding metal pipes can also colour the water, with iron producing a brownish colour and copper a faint blue colour. The 1987 Guidelines specify an aesthetic guideline of 15 TCU (True Colour Units). As a guide, 15 TCU is just noticeable in a glass.

Hardness (as calcium carbonate)

Hardness comes from the presence of minerals such as calcium and magnesium, expressed as calcium carbonate. Water with hardness in the range 60 mg/L to 200 mg/L is considered good quality, below 60mg/L, the water is soft and possibly corrosive. Elevated hardness causes scale to form on hot water pipes and heating elements and prevents soap from lathering. Hardness can be an important issue when purchasing appliances such as dishwashers. The 1987 Guidelines specify an aesthetic guideline of 500 mg/L. To convert the hardness values presented in this report to dH (German degree) units, divide by 17.8. To convert hardness to mmol (millimol) units, divide by 100.

Iron

Iron occurs naturally in water as a result of contact with soil or rock in the catchment. It can accumulate in pipe

sediments, and be re-suspended during periods of rapid changes to flow patterns. Elevated concentrations cause "dirty water" and can stain laundry. The 1987 Guidelines specify an aesthetic guideline of 0.3 mg/L.

Manganese

Manganese in water can come from contact with soil or rock in the catchment. It can accumulate in pipe sediments, and be re-suspended during periods of rapid changes to flow patterns. Elevated manganese can make water look black and stain laundry. The 1987 Guidelines specify an aesthetic guideline of 0.1 mg/L.

pH

pH is a measure of water acidity (pH 7 is neutral). The 1987 Guidelines specify a lower and upper aesthetic value of 6.5 and 8.5 respectively. The guidelines allow for a pH of up to 9.2 for new concrete tanks and cement lined pipes, which can significantly increase the pH for a short period of time. Elevated pH is often caused by calcium carbonate leaching from the protective cement lining of the pipes after long transit times. This characteristic is found at a number of localities on our large water supply schemes.

Where low pH is experienced, this is typically a characteristic of the source supplying the locality. Buffering is a treatment process that stabilises the pH of the water, and is discussed in more detail in the section Improving Your Water Quality.

Total Dissolved Solids

Total dissolved solids (TDS) consists of natural salts and organic matter that are dissolved in the water. Water with low TDS can taste flat, while water with high TDS tastes salty and causes scaling in pipes, fittings and household appliances. The 1987 Guidelines specify a guideline of 1000 mg/L.

Turbidity

Turbidity is the cloudy appearance of water caused by the presence of suspended matter. The 1987 Guidelines specify an aesthetic guideline of 5 NTU.

Nitrate (as Nitrogen)

In Western Australia, elevated nitrate concentrations are usually due to the natural process of plant decay underground that has occurred over geological time.

The 1996 guidelines specify a health guideline of 11.3 mg/L (measured as nitrogen) for infants less than 3 months old and a guideline of 22.6 mg/L (measured as nitrogen) for all other persons. Nitrate poisoning is very rare and to date no case, due to nitrate in drinking water, has been recorded in Western Australia.

Where the nitrate concentration is between 11.3 and 22.6 mg/L, and there is no alternative supply, water providers may apply to the Department of Health for an exemption from the guideline. The following localities have been granted exemption from compliance with the nitrate guidelines by the Department of Health:

Mid West Region

Cue	Meekatharra	Mt Magnet
Nabawa	New Norcia	Sandstone
Wiluna	Yalgoo	

Goldfields & Agricultural Region

Laverton	Leonora	Menzies
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In these towns, the Community Health Nurse provides advice to nursing mothers regarding the use of alternative water for the preparation of bottle feeds. The Corporation provides bottled water free of charge via the community Health Nurse as required. The Water Corporation has committed to improving the water quality at the above localities as discussed in Improving Your Water Quality.

Trihalomethanes

Trihalomethanes (THM's) are present in drinking water as a by-product of disinfection using chlorination (and chloramination to a lesser extent). The Water Corporation is required to comply with the 1996 health guideline of 0.25 mg/L.

Sample Groups

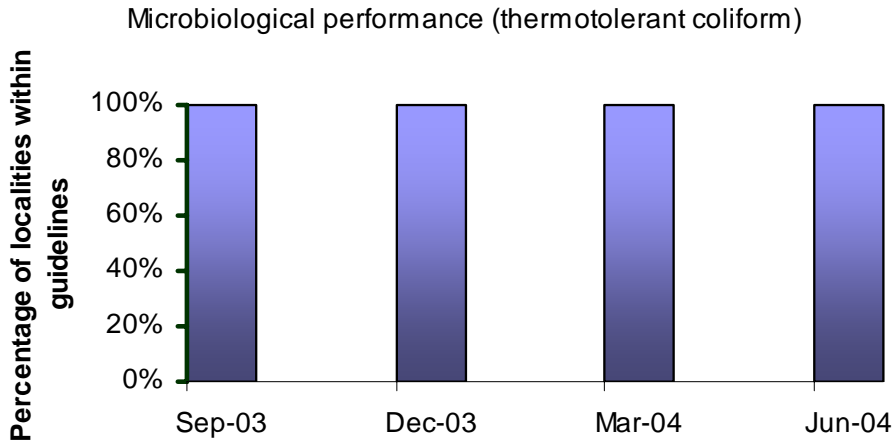
Refer **Appendix A** for a list of the constituents within the metals, hydrocarbons, pesticides, radiological and chemical (Other) sample groups, and their respective guideline values.

Performance at a Glance

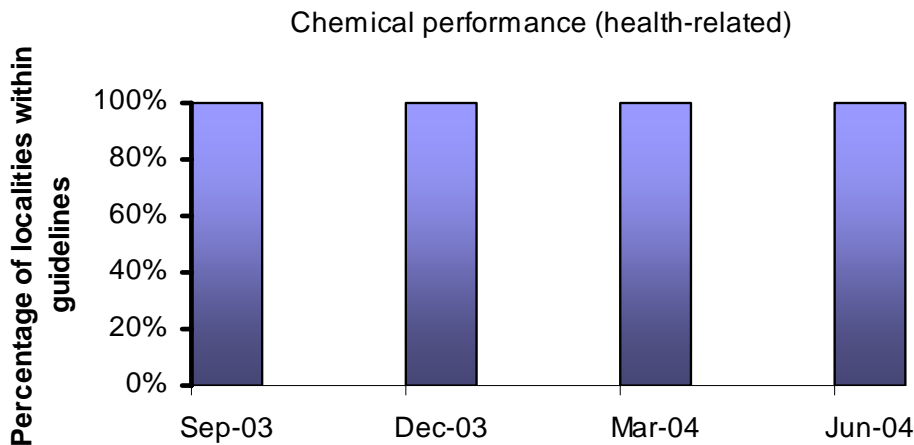
The following graphs show overall performance for all Water Corporation localities for 2003/04.

Health Related Performance

The microbiological performance speaks for itself with 100 percent of localities complying with the most important indicator of faecal contamination throughout the year.

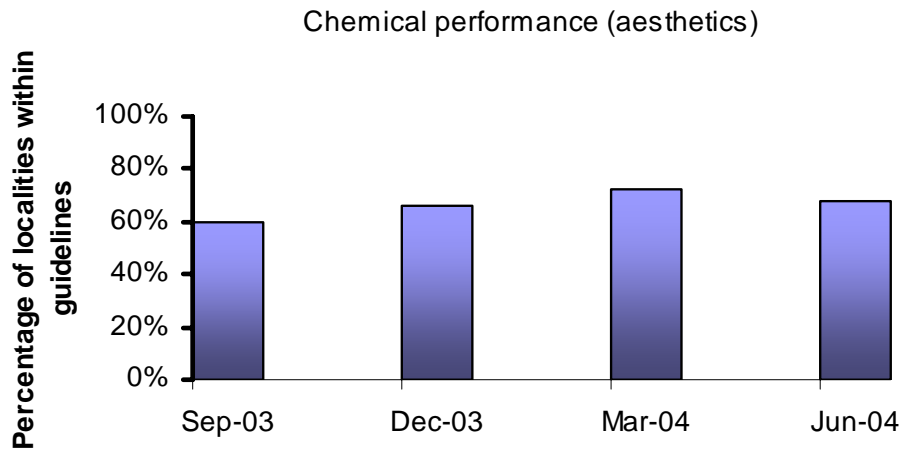


Compliance with health related chemical guidelines are also very high with 100 percent of localities complying. As most chemical guidelines are based on lifetime exposure and have large safety factors, an occasional result outside the guidelines does not mean the water is unsafe to drink. For this report, compliance has been met if the mean concentrations for the year are less than the Guideline value. However, if a sample result exceeds the maximum concentration recommended in the Guidelines, it is responded to quickly and appropriate remedial actions are undertaken. The Department of Health is notified of all exceptions and is closely involved in the response process.



Non-Health Related Performance

While we strive to meet the NHMRC Guidelines for "aesthetic" characteristics, this is very difficult to achieve in a state as vast as Western Australia. This is especially the case in some of our small country water supplies, where there are limited sources of drinking water available, and where installation of treatment can come at a very high cost.



We are committed to improving all aspects of drinking water quality, however improvements in aesthetic water quality are often hard to achieve. The State Government (through the ministers for Health and Water Resources) have recognised that meeting the aesthetic requirements of the NHMRC Guidelines will require considerable expenditure and may take many years.

Detailed Performance Review

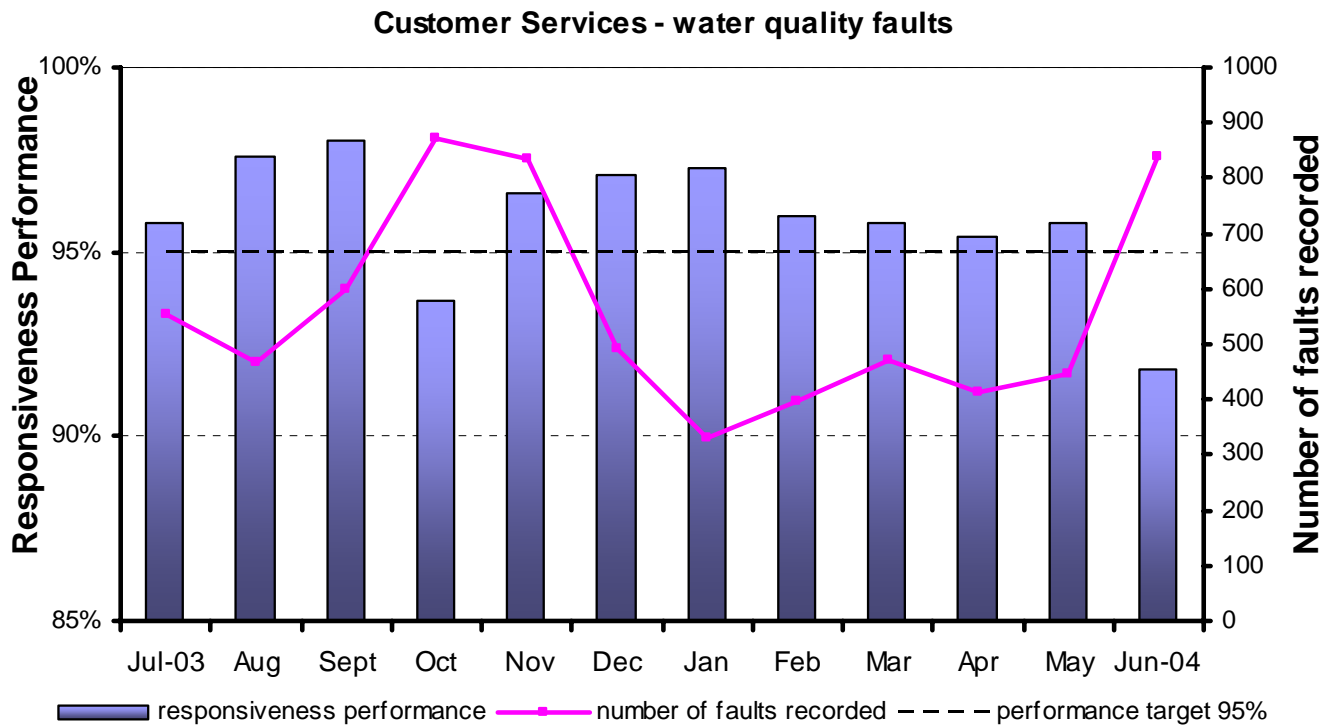
The link to **Appendix B** shows a detailed summary of test results for each locality throughout the State.

Customer Expectations

Customer Complaints

Water quality related complaints are reported and monitored each year to identify any trends and areas for improvement. In 2003/04 our Operations Centre received approximately 16,000 water quality related complaints. Of these, about 68 percent related to dirty water, 7 percent to taste and odour and 14 percent to stained laundry.

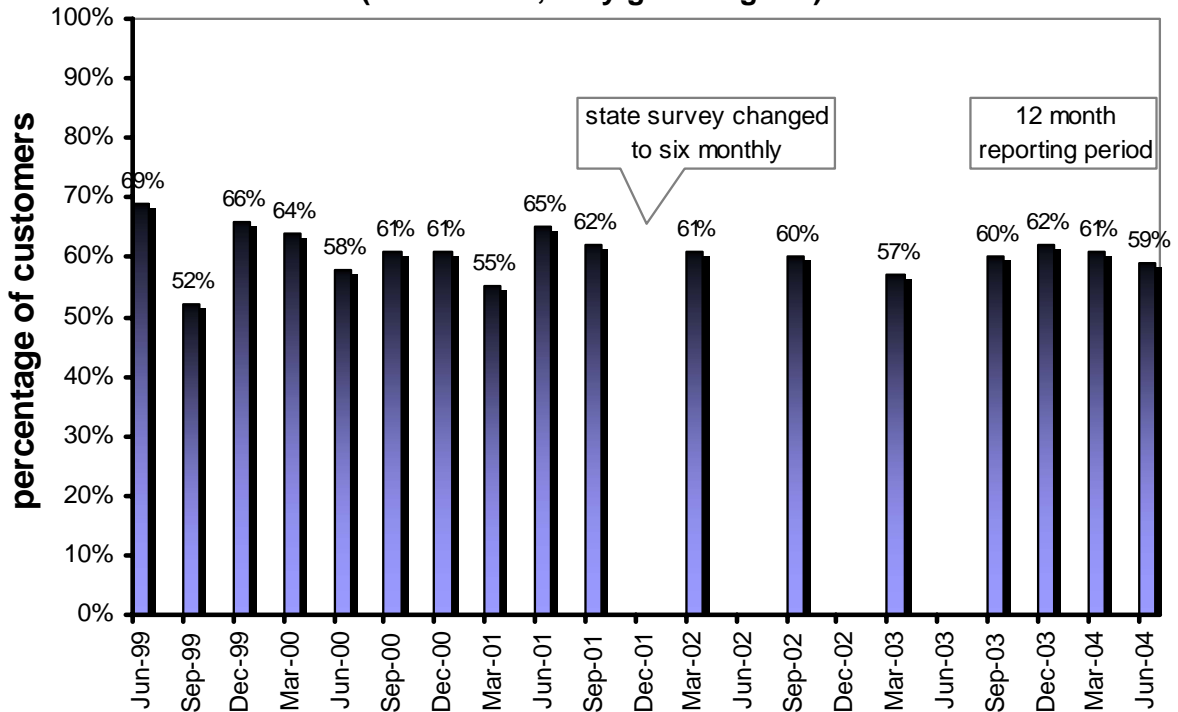
Our Customer Charter (link) states that the Water Corporation will respond promptly, within 2 hours, to any reports of poor water quality. In 2003/04, once a complaint was recorded, we responded to 96 percent of them within the target of two hours (see Figure below).



Customer Research

On a quarterly basis, the Corporation asks its customers for their perceptions of water quality (taste). The following chart shows that these perceptions have been fairly steady with about 60 percent of customers expressing satisfaction with their water quality over the past 12 months.

**Residential perceptions of taste of water
(% excellent, very good & good)**



During the reporting period, customers were approached for comment on their suggestions for improving water quality. In summary, these comments included:

- improve the taste of the water and reduce the smell of chlorine,
- reduce the colour of the water,
- reduce the mineral content of the water, and
- examine the role of seawater desalination as a source of drinking water for Perth IWSS.

Customers also indicated that they require more information about water quality and there should be on-going communication to gather information on customer expectations of water quality, particularly with reference to a drying climate. In response, this annual report is a major step towards providing detailed water quality information to our customers in an open and honest manner.

Improving Your Water Quality

1996 Guidelines Compliance Program

Currently the Water Corporation is required to comply with the health requirements of the 1987 NHMRC Guidelines for Drinking Water Quality in Australia. In September 2000, the Board of the Water Corporation approved a strategy to progressively implement the 1996 NHMRC Australian Drinking Water Quality Guidelines. The 1996 Guidelines Compliance Program is a program developed in consultation with the Department of Health. We have committed to achieving compliance by the end of 2002 for the Perth metropolitan area, 2003 for country towns with a population of greater than 1000, and 2005 for all other localities. In doing so, we embarked on an \$87 million program of capital improvements covering some two and a half thousand individual projects.

These projects will ensure robust multiple barriers to contamination are in place from “catchment to tap” for all Corporation schemes. Examples of the work being undertaken include:

Source Protection

- Improved signage and fencing on catchment areas to reduce risk of contamination from human and animal activities.

Water Treatment

- Additional treatment plants to meet the lower chemical concentrations recommended by the 1996 ADWG and to provide an additional barrier to microbiological contamination.

Chlorination

- Additional chlorination plants in 28 country towns to ensure the important chlorine barrier is maintained throughout the pipe networks which supply customers.
- Replacement of existing chlorination plants with state-of-the-art equipment providing high performance and reliability.

Tank roofs

- Construction, repair, replacement of roofs on all reservoirs and tanks to ensure stored water cannot be contaminated from rainwater ingress.

Pipes and pipelines

- Construction of new pipelines to prevent stagnation of water in tanks and reservoirs.

Monitoring and Control Systems

- Installation of instrumentation which allows critical water quality parameters to be continuously monitored.
- Unsatisfactory performance can be detected quickly and remedial actions initiated.

Major Capital Projects

In addition to the 1996 Guidelines Compliance Program, the Water Corporation is constructing a number of major assets to improve water quality. These include:

- a new water treatment plant at Harding Dam (\$31million) now completed to improve water quality in the West Pilbara and ensure year round use of Harding Dam
- a major upgrade at the Two Peoples Bay Water Treatment Plant in Albany (\$1million) and

- State approval of a 45-gigalitre/year seawater desalination plant at Kwinana to supply potable water to the Perth IWSS. These assets significantly improve the quality of water provided to customers.

Samson WTP

In 2004, a filtration water treatment plant at Samson Dam was commissioned that supplies Waroona and the IWSS.

Aesthetic Water Quality Program

The Water Corporation recognises that its customers appreciate water that is not only safe to drink, but tastes good too. This is why we have committed to a program to improve the aesthetic characteristics of the water we provide. The Aesthetic Water Quality Program is a multi-million commitment to improve treatment facilities for the following country towns:

Leonora (complete)	Wiluna	Laverton
Menzies	Mt Magnet	Yalgoo
Meekatharra	Cue	Sandstone

Binningup and Myalup were recently connected to the IWSS resulting in customers at those towns enjoying water with lower TDS and hardness. The Program also includes additional funding to implement a range of operational enhancements designed to improve water quality management within the Perth Integrated Water Supply System. These include optimising and enhancing the treatment process at ground water treatment plants, and installing on-line chlorine analysers within the distribution system so that changes in water quality can be detected quickly and acted on at the earliest opportunity.

Enhancements to Our Water Quality Management System

To improve the management of water quality sampling and reporting, the Water Corporation has developed its own highly sophisticated software system. The system is designed to assist with the scheduling of water quality samples and with reporting results to our regulators and customers as required.

Operation of the World's First Large-Scale MIEX® Plant

A problem with occasional “swampy taste and odour” has existed in the North West corridor of Perth for many years, and arises from minute traces of the organic compound dimethyl trisulphide (DMTS). The precursor to the formation of DMTS is thought to exist in groundwater sourced from the Gnangara Mound and treated at the Wanneroo Water Treatment Plant (WTP). In response to this issue, the Water Corporation has commissioned and now operates the world's first large-scale MIEX® treatment facility at the Wanneroo WTP.

The MIEX[®] process removes naturally occurring organic constituents from the water. These constituents are believed to contribute to the taste and odour problem. Since MIEX[®] was introduced, the chlorine residuals have been reduced and there have been no DMTS incidents. Currently 50 percent of the production from the Wanneroo WTP is receiving this additional treatment, and research is under way to determine if expansion of the facility is justified.

Calgon[®] Dosing Program

Calgon[®] dosing is a cost-effective method of scale prevention that has been successfully used at a number of localities where hard water is found naturally. To date, this treatment is installed at the following locations:

Augusta	Menzies
Esperance	Wiluna
Albany	Meekatharra
Millstream (Karratha)	Jurien
Sandstone	Hall's Creek
Cue	Laverton
Mt Magnet	Yanchep
Preston Beach	Two Rocks
Exmouth	Newman
Guilderton	Leonora
Ledge Point	Yalgoo

We have received positive feedback following installation of these facilities, which are lowering customer costs for plumbing maintenance and electrical power consumption. There is an ongoing capital program of \$100,000 per year allocated to install Calgon[®] treatment to three new localities each year through to about 2006.

Implementation of Buffering

Many source waters in Western Australia are naturally slightly corrosive. This can diminish the life of pipelines by leaching lime from their protective cement lining. In addition, aesthetic problems can arise from corrosion of customers copper plumbing, leaving blue staining in the toilet and on bathroom sinks. Buffering is a treatment process that stabilises the pH of the water and therefore reduces its corrosive nature. The Water Corporation has committed to installing buffering at all new water treatment plants, and to retrofit existing metropolitan treatment plants when major upgrades are undertaken. A timeframe has not been set for these works, however it is estimated that it could take about 10 years to complete. In 2001 the Harvey-Stirling Scheme began supplying water to the metropolitan area. This was the first metropolitan hills source to be buffered. This was followed by the Samson Treatment Plant and the new plant at Harding Dam, is also buffered.

Research and Development Program

The Water Corporation contributes about \$200,000 annually for water quality research to the Water Services Association of Australia (WSAA) and the Cooperative Research Centre for Water Quality and Treatment. In addition, the Water Corporation undertakes important research locally in association with Curtin University, CSIRO and international consultants. The following Water Corporation research projects related to water quality improvements were under way or completed in 2003/04:

- Taste and odour in small dams – Granular activated carbon pilot plants were constructed at Salmon Gums, Pingrup and Borden following an investigation in conjunction with the Cooperative Research Centre for Water Quality and Treatment.
- DMTS investigations – Integrated research is being conducted on biofilm formation in distribution systems, biological filtration, chemistry and microbiology by Curtin University, CSIRO and international consultants.
- MIEX[®] – Intensive monitoring and process optimisation is occurring.
- “Plastic Taste” investigations – Research is continuing at Curtin University.
- Copper corrosion studies are continuing in association with CSIRO.
- pH and alkalinity correction trials in streams with limestone.
- Calcite pellets re-use trials.
- Water quality modelling – Chlorine residuals.
- Hydrodynamic model of Mundaring Weir.
- Customer surveys as new sources or improvements in treatment come on line.

First Rains Project

The current drought situation facing the Water Corporation has resulted in a number of surface water storages in the Perth, Great Southern and South West regions being at record low levels. The Water Corporation recognised this as a significant risk to our ability to maintain good water quality should a severe storm event or heavy first winter rains occur.

A combination of catchment ‘flush’, exposed banks and limited buffering capacity will mean that any significant runoff, or strong wind event, could result in a rapid deterioration in the quality of water in storage. The First Rains Project initiated a series of asset improvements totalling \$2.8 million and developed innovative approaches to water quality improvement.

The outcome of the project is that, under a winter demand situation, the water requirements of the metropolitan area together with Mandurah, Pinjarra and Harvey could be totally supplied from ground water sources. The ability to maintain a minimum supply to the Goldfields and Agricultural Water Supply was also accommodated. The Corporation is now well placed to deal with a major rain event that affects the use of our metropolitan hills sources.

Framework for Management of Drinking Water Quality

The NHMRC Australian Drinking Water Guidelines (ADWG) is the main reference for drinking water quality in Australia. One of the shortcomings of the Guidelines was identified as its reliance on compliance monitoring as a mechanism for managing drinking water quality. In response to this, the NHMRC produced the Framework for Management of Drinking Water Quality in 2001.

The Framework is a quality management approach designed specifically for the water industry and

incorporates a preventive risk management approach from catchment to consumer. It provides a holistic approach to drinking water quality management that is supportive of removing the implied emphasis on compliance monitoring and focuses on maintaining the integrity of water supply systems and barriers to ensure the protection of public health.

Implementation of the Framework in Western Australia will require a high degree of cooperation across many government agencies. The Water Corporation is playing a lead role in developing the necessary partnership arrangements and coordination mechanisms to implement the Framework in this State.

Conclusion

Supplying safe drinking water is our highest priority. In 2003/04, we achieved outstanding compliance results for health related characteristics and met all our health targets for drinking water quality set by the Department of health. However, we have significant challenges in meeting the aesthetic requirements of the Guidelines. This is especially the case in some of our small country water supplies, where there are limited sources of water available, and where installation of treatment is very expensive.

Although we meet all our obligations under our Operating Licence, we recognise there is always scope for improvement. Our major focus in the short term is to meet the requirements of the more stringent 1996 Guidelines. Significant progress has been made in this area. Our longer term vision is to implement the Framework for Water Quality Management.

One of the key issues identified in our customer research is that customers require more information about their water quality. This report is a significant step towards providing customers with detailed water quality information in an open and honest manner.

Appendix A – List of parameters within sampling groups

This appendix lists the individual constituents included in the sampling groups referred to in this report.

Metals

Constituent	Health Guideline (mg/L)	Guideline	Sampling Location
Antimony	0.003	1996	Reticulation System
Cadmium	0.005	1987	Reticulation System
Chromium	0.05	1987/96	Reticulation System
Copper	2	1996	Reticulation System
Lead	0.05	1987	Reticulation System
Nickel	0.02	1996	Reticulation System
Zinc	*	1996	Reticulation System
Arsenic	0.05	1987	Water Source
Barium	0.7	1996	Water Source
Beryllium	*	1996	Water Source
Boron	4	1996	Water Source
Mercury	0.001	1987/96	Water Source
Molybdenum	0.05	1996	Water Source
Selenium	0.01	1987/96	Water Source
Silver	0.1	1996	Water Source
Uranium	0.02	1996	Water Source

Hydrocarbons

Constituent	Health Guideline (mg/L)	Guideline	Sampling Location
Benzo(a)pyrene	0.00001	1996	Reticulation System
di(2-ethylhexyl) adipate	*	1996	Reticulation System
di(2-ethylhexyl) phthalate	0.01	1996	Reticulation System
Dialkyltins	*	1996	Reticulation System
Toluene	0.8	1996	Reticulation System
Tributyltin oxide	0.001	1996	Reticulation System
Xylene	0.6	1996	Reticulation System
1,1,1-trichloroethane	*	1996	Water Source
1,1-dichloroethane	*	1996	Water Source
1,1-dichloroethene	0.0003	1987	Water Source
1,2-dichlorobenzene	1.5	1996	Water Source
1,2-dichloroethane	0.01	1987	Water Source
1,2-dichloroethene	0.06	1996	Water Source
1,3-dichlorobenzene	*	1996	Water Source
1,4-dichlorobenzene	0.04	1996	Water Source
Benzene	0.01	1987	Water Source
Chlorobenzene	0.3	1996	Water Source
Dichloromethane	0.004	1996	Water Source
Ethylbenzene	0.3	1996	Water Source
Ethylenediamine			
tetraacetic acid	0.25	1996	Water Source
Hexachlorobutadiene	0.0007	1996	Water Source
Nitrilotriacetic acid	0.2	1996	Water Source
Styrene	0.03	1996	Water Source
Tetrachloroethene	0.01	1987	Water Source
Trichlorobenzenes (total)	0.03	1996	Water Source
Trichloroethene	0.03	1987	Water Source
Trichloroethylene	*	1996	Water Source
Vinyl chloride	0.0003	1996	Water Source

* The 1996 guidelines state there is insufficient data to set a guideline based on health considerations.

Pesticides The following pesticides are specifically analysed for by one of our contracted analytical laboratories:

Constituent	Health value mg/L	Guideline
2,4-dichlorophenoxyacetic acid	0.1	1987
Aldrin	0.001	1987
Atrazine	0.04	1996
Chlordane	0.006	1987
Chlorpyrifos	0.01	1996
DDT (total isomers)	0.003	1987
Dieldrin	0.001	1987
Heptachlor & heptachlor epoxide (total)	0.003	1987
Lindane	0.1	1987
Simazine	0.02	1996

In addition to the above specific analyses, screening for a large number of other pesticides is undertaken on all samples (refer Appendix C for full list). Any detection is further analysed and the result reported to the Water Corporation.

Other Health Related Chemicals

This group currently includes Cyanide (1987 guideline of 0.1 mg/L) and Iodide (1996 guideline of 0.1 mg/L).

Appendix B – Summary of Test Results

Perth Region

- Health Related Tables 1 & 2
- Aesthetic Tables 3 & 4

Mid West Region

- Health Related Tables 5 & 6
- Aesthetic Tables 7 & 8

Goldfields & Agricultural Regions

- Health Related Tables 9 & 10
- Aesthetic Tables 11 & 12

South West Region

- Health Related Tables 13 & 14
- Aesthetic Tables 15 & 16

Great Southern Region

- Health Related Tables 17 & 18
- Aesthetic Tables 19 & 20

North West Region

- Health Related Tables 21 & 22
- Aesthetic Tables 23 & 24

All Regions data

PDF file link

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Table 1 Health Related Variables

Perth Metropolitan Locality	Total Coliforms				Thermotolerant Coliforms				Thermophilic Naegleria			Fluoride			Hydrocarbons		Metals		
	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with Thermophilic Naegleria	Requirement Met	Concentration (mg/L)			Samples Taken	Guideline Met	Samples Taken	Guideline Met	
												Min	Max	Mean					
Armadale/Kelmscott	195	4	18	✓	195	0	0	✓	32	0	✓	21	0.60	0.95	0.82	3	✓	3	✓
Bold Park	208	0	0	✓	208	0	0	✓	39	0	✓	38	0.35	0.95	0.80	2	✓	3	✓
Buckland Hill	115	0	0	✓	115	0	0	✓	12	0	✓	11	0.65	0.90	0.75	1	✓	1	✓
Foothills	132	1	2	✓	132	0	0	✓	34	0	✓	38	0.30	0.90	0.75		(2)	2	✓
Greenmount	186	2	1	✓	186	0	0	✓	18	0	✓	27	0.70	0.95	0.76	1	✓	1	✓
Greenmount/Darlington	105	0	0	✓	105	0	0	✓	25	0	✓	20	0.70	0.85	0.78	1	✓	1	✓
Hamilton Hill	155	2	11	✓	155	0	0	✓	18	0	✓	24	0.75	0.85	0.80	2	✓	2	✓
Hills Direct	508	0	0	✓	508	0	0	✓	129	0	✓	81	0.65	1.20	0.84	7	✓	11	✓
Lexia	80	0	0	✓	80	0	0	✓	20	0	✓	20	0.75	0.90	0.82	1	✓	3	✓
Melville	145	0	0	✓	145	0	0	✓	38	0	✓	43	0.65	0.85	0.75	2	✓	3	✓
Mirrabooka	233	1	3	✓	233	1	1	✓	25	0	✓	30	0.75	0.90	0.83	3	✓	4	✓
Mt. Eliza	358	0	0	✓	358	0	0	✓	86	0	✓	51	0.65	0.90	0.74	2	✓	4	✓
Mt. Hawthorn	97	0	0	✓	97	0	0	✓	16	0	✓	22	0.70	0.90	0.77	1	✓	1	✓
Mt. Yokine	403	0	0	✓	403	0	0	✓	43	0	✓	47	0.50	0.85	0.74	2	✓	2	✓
Mundaring	110	0	0	✓	110	0	0	✓	22	0	✓	26	0.75	0.95	0.80	2	✓	2	✓
Neerabup	118	0	0	✓	118	0	0	✓	18	0	✓	26	0.80	0.95	0.88	1	✓	2	✓
South Perth/Kewdale	416	0	0	✓	416	0	0	✓	46	0	✓	43	0.70	0.95	0.78	1	✓	2	✓
Tamworth Hill	234	0	0	✓	234	0	0	✓	12	0	✓	19	0.75	0.95	0.88	2	✓	3	✓
Thomsons Lake	153	0	0	✓	153	0	0	✓	26	0	✓	25	0.75	0.95	0.83	2	✓	2	✓
Two Rocks	106	0	0	✓	106	0	0	✓	12	0	✓				(1)		(2)	2	✓
Wanneroo	303	0	0	✓	303	0	0	✓	29	0	✓	38	0.40	0.90	0.80	5	✓	3	✓
West Yokine	211	0	0	✓	211	0	0	✓	24	0	✓	30	0.70	1.00	0.83	2	✓	2	✓
Whitfords	125	0	0	✓	125	0	0	✓	12	0	✓	19	0.60	0.85	0.72	1	✓	1	✓
Yanchep	106	0	0	✓	106	0	0	✓	12	0	✓				(1)	1	✓	2	✓

(1) Non-fluoridated locality. (2) No samples required in this 12 month period.

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Table 2 Health Related Variables

Perth Metropolitan Locality	Nitrate					Pesticides		Radiological		Trihalomethanes					Other Health Related	
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Guideline Met	Samples Taken	Guideline Met	Concentration (ug/L)			Guideline Met	Samples Taken	Requirement Met	
		Min	Max	Mean						Min	Max	Mean				
Armadale/Kelmscott	1	<0.05	<0.05	<0.05	✓	5	✓			4	32	98	70	✓	2	✓
Bold Park	2	<0.05	<0.05	<0.05	✓	1	✓	1	✓	5	76	125	100	✓	2	✓
Buckland Hill										5	142	221	180	✓	1	✓
Foothills										10	97	169	141	✓		(1)
Greenmount	2	0.3	0.6	0.5	✓					4	15	165	81	✓	1	✓
Greenmount/Darlington										3	160	211	182	✓	1	✓
Hamilton Hill	2	<0.05	<0.05	<0.05	✓					8	79	169	131	✓	2	✓
Hills Direct	14	<0.05	0.3	0.1	✓	25	✓	7	✓	17	31	154	106	✓		(1)
Lexia	2	<0.05	<0.05	<0.05	✓	2	✓	1	✓	5	62	118	93	✓		(1)
Melville	5	<0.05	0.1	0.1	✓	1	✓	1	✓	8	100	207	141	✓	2	✓
Mirrabooka	6	<0.05	0.3	0.1	✓	9	✓	3	✓	4	139	187	170	✓	1	✓
Mt. Eliza	4	<0.05	0.2	<0.05	✓	2	✓	2	✓	8	99	226	146	✓	2	✓
Mt. Hawthorn	2	0.4	0.4	0.4	✓					3	87	156	126	✓	1	✓
Mt. Yokine	12	<0.05	0.6	0.3	✓	11	✓	4	✓	6	136	229	160	✓	2	✓
Mundaring	7	0.1	0.4	0.2	✓	4	✓	1	✓	4	56	74	67	✓	1	✓
Neerabup	4	1.4	1.8	1.7	✓	1	✓	1	✓	5	49	82	65	✓	1	✓
South Perth/Kewdale										7	134	183	155	✓	1	✓
Tamworth Hill	12	<0.05	0.1	<0.05	✓	2	✓	2	✓	5	58	159	125	✓	2	✓
Thomsons Lake	6	<0.05	<0.05	<0.05	✓	4	✓	1	✓	5	29	164	107	✓	1	✓
Two Rocks	1	1.0	1.0	1.0	✓	1	✓	1	✓	4	6	10	9	✓		(1)
Wanneroo	6	<0.05	0.7	0.3	✓	3	✓			15	57	206	112	✓	2	✓
West Yokine	4	0.6	0.7	0.6	✓	4	✓	1	✓	4	75	114	93	✓	1	✓
Whitfords	2	0.4	1.1	0.8	✓	1	✓			4	73	136	105	✓	1	✓
Yanchep	2	0.8	1.1	0.9	✓	1	✓	1	✓	4	4	6	5	✓		(1)

(1) No samples required in this 12 month period.

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Table 3 Aesthetic Variables

Perth Metropolitan	Aesthetic Variables																			
	Aluminium					Hardness					Iron					Manganese				
	Locality	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)		
Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	
Armadale/Kelmscott	9	<0.008	0.080	0.019	✓	1	30	30	30	✓	10	0.035	0.158	0.082	✓	10	<0.002	0.028	0.006	✓
Bold Park	9	<0.008	0.024	<0.008	✓	2	37	55	46	✓	9	0.030	0.100	0.071	✓	10	<0.002	0.020	0.006	✓
Buckland Hill	5	0.010	0.026	0.018	✓	Refer to Mt Eliza					5	0.060	0.100	0.072	✓	5	0.006	0.012	0.008	✓
Foothills	9	0.012	0.028	0.017	✓	Refer to Mt Yokine & Hills Direct					9	0.045	0.095	0.071	✓	9	<0.002	0.018	0.010	✓
Greenmount	6	<0.008	0.018	0.010	✓	2	90	110	100	✓	6	0.006	0.080	0.032	✓	6	<0.002	0.012	0.004	✓
Greenmount/Darlington	5	0.014	0.016	0.015	✓	Refer to Mt Yokine & Hills Direct					5	0.055	0.080	0.068	✓	5	0.008	0.014	0.010	✓
Hamilton Hill	10	0.010	0.020	0.016	✓	2	77	87	82	✓	10	0.018	0.045	0.031	✓	10	0.006	0.012	0.009	✓
Hills Direct	32	<0.008	0.060	0.025	✓	14	19	66	34	✓	33	0.012	0.320	0.096	✓	33	0.002	0.055	0.010	✓
Lexia	7	0.012	0.028	0.020	✓	2	149	168	159	✓	7	0.008	0.040	0.019	✓	7	0.004	0.018	0.010	✓
Melville	14	<0.008	0.036	0.018	✓	5	52	78	65	✓	14	0.045	0.148	0.074	✓	14	0.002	0.032	0.009	✓
Mirrabooka	10	0.010	0.050	0.026	✓	6	59	146	114	✓	8	0.008	0.055	0.018	✓	8	<0.002	0.010	0.002	✓
Mt. Eliza	13	<0.008	0.042	0.014	✓	4	52	99	80	✓	11	0.020	0.220	0.073	✓	13	0.002	0.090	0.016	✓
Mt. Hawthorn	6	<0.008	0.018	0.012	✓	2	115	116	116	✓	6	0.050	0.090	0.067	✓	6	0.004	0.016	0.010	✓
Mt. Yokine	19	<0.008	0.026	0.011	✓	12	51	113	93	✓	15	0.012	0.119	0.067	✓	21	<0.002	0.048	0.012	✓
Mundaring	10	0.010	0.065	0.027	✓	5	91	102	97	✓	10	0.030	0.220	0.098	✓	10	0.004	0.020	0.009	✓
Neerabup	9	<0.008	0.022	0.012	✓	4	148	180	163	✓	9	0.014	0.060	0.024	✓	9	<0.002	0.004	<0.002	✓
South Perth/Kewdale	6	<0.008	0.022	0.013	✓	Refer to Mt Yokine & Hills Direct					8	0.055	0.132	0.096	✓	8	0.006	0.020	0.014	✓
Tamworth Hill	16	0.012	0.060	0.030	✓	12	28	78	61	✓	17	0.050	0.140	0.086	✓	17	<0.002	0.044	0.014	✓
Thomsons Lake	10	<0.008	0.060	0.026	✓	6	77	188	134	✓	10	0.004	0.141	0.051	✓	10	0.002	0.034	0.014	✓
Two Rocks	4	<0.008	<0.008	<0.008	✓	1	223	223	223	✓	4	<0.003	0.006	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Wanneroo	20	<0.008	0.075	0.025	✓	6	51	113	95	✓	20	0.006	0.090	0.021	✓	20	0.002	0.106	0.027	✓
West Yokine	8	<0.008	0.010	<0.008	✓	4	162	185	173	✓	8	0.030	0.065	0.044	✓	8	<0.002	0.004	<0.002	✓
Whitfords	7	0.016	0.020	0.019	✓	2	100	138	119	✓	7	0.010	0.040	0.021	✓	7	0.002	0.044	0.024	✓
Yanchep	6	<0.008	<0.008	<0.008	✓	2	199	206	203	✓	6	<0.003	<0.003	<0.003	✓	6	<0.002	<0.002	<0.002	✓

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Table 4 Aesthetic Variables

Perth Metropolitan	Aesthetic Variables																			
	pH					TDS					True Colour					Turbidity				
	Locality	Samples Taken	Value (pH units)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Value (TCU)			Guideline Met	Samples Taken	Value (NTU)		
Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	
Armadale/Kelmscott	10	6.38	7.14	6.86	✓	1	156	156	156	✓	10	<1	3	<1	✓	10	0.4	2.0	0.8	✓
Bold Park	10	7.06	7.57	7.25	✓	1	200	200	200	✓	10	<1	2	<1	✓	10	0.1	0.6	0.4	✓
Buckland Hill	5	7.70	8.05	7.84	✓	Refer to Mt Eliza					5	<1	1	<1	✓	5	0.3	0.6	0.4	✓
Foothills	9	7.31	8.02	7.68	✓	Refer to Mt Yokine					9	<1	2	<1	✓	9	0.1	0.9	0.3	✓
Greenmount	6	7.86	8.64	8.27	✓	2	449	510	480	✓	6	<1	<1	<1	✓	6	<0.1	0.3	<0.1	✓
Greenmount/Darlington	5	8.12	8.31	8.19	✓	Refer to Mt Yokine & Hills Direct					5	<1	<1	<1	✓	5	0.2	0.3	0.2	✓
Hamilton Hill	10	7.33	7.64	7.49	✓	2	369	455	412	✓	10	<1	2	<1	✓	10	0.2	0.4	0.3	✓
Hills Direct	33	5.54	8.35	7.02	✓	14	116	300	178	✓	33	<1	4	<1	✓	33	0.2	6.6	0.9	✓
Lexia	7	6.92	8.13	7.51	✓	2	330	350	340	✓	7	<1	2	<1	✓	7	<0.1	0.2	0.2	✓
Melville	14	7.52	7.97	7.75	✓	4	517	540	532	✓	14	<1	2	<1	✓	14	0.1	0.9	0.4	✓
Mirrabooka	10	6.66	7.86	7.16	✓	4	395	445	425	✓	10	<1	2	<1	✓	10	<0.1	4.0	0.6	✓
Mt. Eliza	13	7.45	7.85	7.67	✓	2	521	559	540	✓	13	<1	2	<1	✓	13	<0.1	2.0	0.4	✓
Mt. Hawthorn	6	7.19	7.82	7.57	✓	2	514	541	528	✓	6	<1	<1	<1	✓	6	0.1	0.2	0.2	✓
Mt. Yokine	21	7.16	8.02	7.69	✓	6	506	559	544	✓	21	<1	5	<1	✓	21	<0.1	0.7	0.2	✓
Mundaring	10	7.71	8.08	7.94	✓	5	422	468	447	✓	10	2	7	4	✓	10	0.4	3.4	1.2	✓
Neerabup	9	7.81	7.98	7.87	✓	4	417	500	462	✓	9	<1	1	<1	✓	9	0.2	0.6	0.3	✓
South Perth/Kewdale	8	7.19	7.91	7.57	✓	Refer to Mt Yokine & Hills Direct					8	<1	<1	<1	✓	8	0.1	0.5	0.3	✓
Tamworth Hill	17	6.27	8.47	8.03	✓	12	143	215	202	✓	17	<1	3	2	✓	17	0.3	1.6	0.8	✓
Thomsons Lake	10	6.42	8.20	7.29	✓	6	415	741	602	✓	10	<1	1	<1	✓	10	0.2	1.6	0.5	✓
Two Rocks	4	7.35	7.44	7.40	✓	1	510	510	510	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Wanneroo	20	6.64	7.94	7.46	✓	6	298	494	450	✓	20	<1	2	<1	✓	20	0.1	1.4	0.3	✓
West Yokine	8	7.00	7.14	7.06	✓	4	481	511	494	✓	8	<1	<1	<1	✓	8	0.1	0.3	0.1	✓
Whitfords	8	7.68	8.10	7.89	✓	2	421	455	438	✓	8	<1	<1	<1	✓	7	0.1	0.6	0.3	✓
Yanchep	6	7.34	7.54	7.47	✓	2	455	472	464	✓	6	<1	3	<1	✓	6	<0.1	<0.1	<0.1	✓

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Table 5 Health Related Variables

Mid West Locality	Total Coliforms				Thermotolerant Coliforms				Thermophilic Naegleria			Fluoride			Hydrocarbons		Metals		
	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with Thermophilic Naegleria	Requirement Met	Concentration (mg/L)			Samples Taken	Guideline Met	Samples Taken	Guideline Met	
												Min	Max	Mean					
Badgingarra	12	0	0	✓	12	0	0	✓	8	0	✓				(1)		(2)	2	✓
Bindoon /Chittering	53	0	0	✓	53	0	0	✓	34	0	✓				(1)		(2)	2	✓
Bolgart	13	0	0	✓	13	0	0	✓	9	0	✓				(1)		(2)	3	✓
Calingiri	13	0	0	✓	13	0	0	✓	9	0	✓				(1)		(2)	3	✓
Carnamah	14	0	0	✓	14	0	0	✓	14	0	✓				(1)		(2)	2	✓
Carnarvon	67	0	0	✓	67	0	0	✓	67	0	✓				(1)		(2)	5	✓
Cervantes	52	0	0	✓	52	0	0	✓	34	0	✓				(1)		(2)	2	✓
Coomberdale	14	0	0	✓	14	0	0	✓	9	0	✓				(1)		(2)	2	✓
Coorow	14	0	0	✓	14	0	0	✓	14	0	✓				(1)		(2)	1	✓
Cue	13	0	0	✓	13	0	0	✓	13	0	✓				(1)		(2)	3	✓
Dandaragan	13	0	0	✓	13	0	0	✓	9	0	✓				(1)		(2)	2	✓
Denham	52	0	0	✓	52	0	0	✓	52	0	✓				(1)		(2)	2	✓
Dongara/Denison	53	0	0	✓	53	0	0	✓	53	0	✓				(1)		(2)	2	✓
Eneabba	14	0	0	✓	14	0	0	✓	14	0	✓				(1)		(2)	2	✓
Exmouth	67	0	0	✓	67	0	0	✓	66	0	✓	28	0.50	0.85	0.71		(2)	2	✓
Gascoyne Junction	13	0	0	✓	13	0	0	✓	12	0	✓				(1)		(2)	2	✓
Geraldton	186	0	0	✓	186	0	0	✓	186	0	✓	66	0.15	0.95	0.58 (3)		(2)	3	✓
Gingin	53	0	0	✓	53	0	0	✓	34	0	✓				(1)		(2)	3	✓
Greenhead	51	0	0	✓	51	0	0	✓	51	0	✓				(1)		(2)	1	✓
Guilderton	53	0	0	✓	53	0	0	✓	34	0	✓				(1)		(2)	2	✓
Horrocks	53	0	0	✓	53	0	0	✓	53	0	✓				(1)		(2)	2	✓
Jurien Bay	52	0	0	✓	52	0	0	✓	34	0	✓				(1)		(2)	2	✓
Kalbarri	53	0	0	✓	53	0	0	✓	53	0	✓				(1)		(2)	2	✓
Lancelin	52	1	1	✓	52	0	0	✓	34	0	✓				(1)		(2)	2	✓
Latham	14	1	2	✓	14	1	1	✓	14	0	✓				(1)		(2)	1	✓
Ledge Point	53	0	0	✓	53	0	0	✓	34	0	✓				(1)		(2)	2	✓
Leeman	52	0	0	✓	52	0	0	✓	52	0	✓				(1)		(2)	2	✓
Meekatharra	53	0	0	✓	53	0	0	✓	53	0	✓				(1)		(2)	6	✓
Mingenew	13	0	0	✓	13	0	0	✓	13	0	✓				(1)		(2)	2	✓
Moora	52	0	0	✓	52	0	0	✓	34	0	✓				(1)		(2)	2	✓
Morawa	53	0	0	✓	53	0	0	✓	53	0	✓				(1)		(2)	2	✓
Mt Magnet	53	0	0	✓	53	0	0	✓	53	0	✓				(1)		(2)	6	✓
Mullewa	12	0	0	✓	12	0	0	✓	12	0	✓				(1)		(2)	2	✓
Nabawa	13	1	57	✓	13	0	0	✓	13	0	✓				(1)		(2)	2	✓
New Norcia	13	0	0	✓	13	0	0	✓	9	0	✓				(1)		(2)	3	✓
Northampton	53	0	0	✓	53	0	0	✓	53	0	✓				(1)		(2)	2	✓
Perenjori	14	0	0	✓	14	0	0	✓	14	0	✓				(1)		(2)	1	✓
Piawaning	13	0	0	✓	13	0	0	✓	9	0	✓				(1)		(2)	1	✓
Port Kalbarri	13	0	0	✓	13	0	0	✓	13	0	✓				(1)		(2)	2	✓
Sandstone	14	0	0	✓	14	0	0	✓	14	0	✓				(1)		(2)	5	✓
Seabird	14	0	0	✓	14	0	0	✓	8	0	✓				(1)		(2)	2	✓
Seaview Park	14	0	0	✓	14	0	0	✓	8	0	✓				(1)		(2)	2	✓
Sovereign Hills	14	0	0	✓	14	0	0	✓	8	0	✓				(1)		(2)	2	✓
Three Springs	14	0	0	✓	14	0	0	✓	14	0	✓				(1)		(2)	2	✓
Watheroo	13	0	0	✓	13	0	0	✓	9	0	✓				(1)		(2)	2	✓
Wiluna	13	0	0	✓	13	0	0	✓	14	0	✓				(1)		(2)	2	✓
Woodridge	14	0	0	✓	14	0	0	✓	8	0	✓				(1)		(2)	2	✓
Yalgoo	13	0	0	✓	13	0	0	✓	13	0	✓				(1)		(2)	7	✓
Yerecoin	13	0	0	✓	13	0	0	✓	9	0	✓				(1)	1	✓	2	✓
Yuna	13	0	0	✓	13	0	0	✓	13	0	✓				(1)		(2)	2	✓

(1) Non-fluoridated locality. (2) No samples required in this 12 month period. (3) Geraldton fluoridation plant was off-line for major repairs. This resulted in the reduced number of samples meeting the recommended range (0.7 to 1.0 mg/L).

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Table 6 Health related variables

Mid West Locality	Nitrate				Pesticides		Radiological		Trihalomethanes				Other Health Related			
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Guideline Met	Samples Taken	Guideline Met	Samples Taken	Concentration (ug/L)			Requirement Met	Samples Taken	Guideline Met
		Min	Max	Mean							Min	Max	Mean			
Badgingarra	2	0.2	0.2	0.2	✓	1	✓	(2)	2	2	7	5	✓		(2)	
Bindoon /Chittering	2	<0.05	<0.05	<0.05	✓	1	✓	1	✓	2	11	27	19	✓	(2)	
Bolgart	8	4.4	8.6	5.7	✓	2	✓	2	✓	2	7	9	8	✓	(2)	
Calingiri	2	3.6	5.7	4.7	✓	1	✓	(2)	2	14	17	16	✓	(2)		
Carnamah	2	0.1	0.1	0.1	✓	1	✓	1	✓	2	16	20	18	✓	(2)	
Carnarvon	2	0.7	0.7	0.7	✓	4	✓	(2)	2	4	6	5	✓	(2)		
Cervantes	2	2.2	2.8	2.5	✓	1	✓	(2)	2	21	29	25	✓	(2)		
Coomberdale	2	<0.05	<0.05	<0.05	✓	1	✓	(2)	5	76	160	115	✓	(2)		
Coorow		Refer to Carnamah							2	7	8	8	✓	(2)		
Cue	8	10.0	11.0	10.6	(1)	2	✓	(2)	2	10	24	17	✓	(2)		
Dandaragan	2	<0.05	<0.05	<0.05	✓	1	✓	(2)	2	10	22	16	✓	(2)		
Denham	2	0.2	0.2	0.2	✓	1	✓	1	✓	2	4	12	8	✓	(2)	
Dongara/Denison	4	2.9	3.7	3.3	✓	1	✓	1	✓	2	14	19	17	✓	(2)	
Eneabba	2	<0.05	<0.05	<0.05	✓	1	✓	1	✓	2	12	12	12	✓	(2)	
Exmouth	2	1.5	1.7	1.6	✓	1	✓	1	✓	2	3	6	5	✓	(2)	
Gascoyne Junction	2	<0.05	0.1	0.1	✓	1	✓	(2)	2	92	112	102	✓	(2)		
Geraldton	2	0.7	0.9	0.8	✓	1	✓	(2)	4	23	29	26	✓	(2)		
Gingin	2	<0.05	<0.05	<0.05	✓	2	✓	1	✓	2	3	6	5	✓	(2)	
Greenhead		Refer to Leeman							2	4	10	7	✓	(2)		
Guilderton	2	5.4	5.5	5.5	✓	1	✓	(2)	2	12	17	15	✓	(2)		
Horrocks	2	<0.05	<0.05	<0.05	✓	1	✓	(2)	1	23	23	23	✓	(2)		
Jurien Bay	2	2.1	2.4	2.3	✓	1	✓	(2)	2	16	25	21	✓	(2)		
Kalbarri	2	0.6	0.7	0.6	✓	1	✓	(2)	2	6	8	7	✓	(2)		
Lancelin	2	0.9	1.0	0.9	✓	1	✓	(2)	2	<4	5	<4	✓	(2)		
Latham		Refer to Morawa							2	<4	<4	<4	✓	(2)		
Ledge Point	2	3.5	3.5	3.5	✓	1	✓	(2)	2	14	21	18	✓	(2)		
Leeman	2	0.8	0.8	0.8	✓	1	✓	1	✓	2	4	6	5	✓	(2)	
Meekatharra	7	13.0	14.5	14.0	(1)	2	✓	2	✓	2	6	7	7	✓	(2)	
Mingenew	2	1.9	2.1	2.0	✓	1	✓	(2)	2	3	6	5	✓	(2)		
Moora	2	<0.05	<0.05	<0.05	✓	1	✓	(2)	2	35	40	38	✓	(2)		
Morawa	2	0.1	0.1	0.1	✓	1	✓	(2)	2	3	12	8	✓	(2)		
Mt Magnet	6	12.5	15.5	14.3	(1)	1	✓	1	✓	2	7	16	12	✓	1	
Mullewa	4	0.3	0.9	0.5	✓	1	✓	1	✓	2	30	47	39	✓	(2)	
Nabawa	6	7.0	9.8	8.2	✓	1	✓	(2)	2	12	36	24	✓	(2)		
New Norcia	6	11.5	13.5	12.7	(1)	1	✓	1	✓	2	7	10	9	✓	(2)	
Northampton	2	<0.05	<0.05	<0.05	✓	1	✓	1	✓	2	26	37	32	✓	(2)	
Perenjori		Refer to Morawa							2	10	28	19	✓	(2)		
Piawaning		Refer to Yerecoin							2	29	66	48	✓	(2)		
Port Kalbarri	2	0.1	0.1	0.1	✓	1	✓	1	✓	2	3	8	9	✓	(2)	
Sandstone	6	10.5	12.5	11.3	(1)	1	✓	(2)	2	<4	5	<4	✓	(2)		
Seabird	2	0.1	0.2	0.2	✓	1	✓	(2)	3	36	41	38	✓	(2)		
Seaview Park	2	3.0	3.0	3.0	✓	1	✓	(2)	2	6	6	6	✓	(2)		
Sovereign Hills	2	1.5	2.5	2.0	✓	1	✓	(2)	2	31	44	38	✓	(2)		
Three Springs	2	0.2	0.7	0.4	✓	1	✓	4	✓	2	3	4	4	✓	(2)	
Watheroo	2	<0.05	<0.05	<0.05	✓	1	✓	(2)	2	130	152	141	✓	(2)		
Wiluna	6	16.0	20.5	18.7	(1)	1	✓	1	✓	2	2	18	10	✓	(2)	
Woodridge	2	9.2	9.7	9.5	✓	4	✓	(2)	2	8	23	16	✓	(2)		
Yalgoo	6	17.5	18.5	17.9	(1)	1	✓	1	✓	2	9	13	11	✓	1	
Yerecoin	2	3.8	4.4	4.1	✓	5	✓	1	✓	2	64	65	65	✓	(2)	
Yuna	2	0.5	0.6	0.6	✓	5	✓	(2)	2	51	57	54	✓	(2)		

(1) Cue, Meekatharra, Mount Magnet, New Norcia, Sandstone, Wiluna and Yalgoo have been granted an exemption from compliance with the nitrate guideline by the Department of Health. The water supplied is harmless to adults and children over the age of 3 months of age. Carers of infants younger than three months should seek advice from the Community Health Nurse regarding the use of alternative water sources for the preparation of bottle feeds. Treatment plants are planned to be commissioned for the localities. These improvements will bring the nitrate concentration below the guideline value. (2) No samples required in this 12 month period.

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Table 7 Aesthetic Variables

Mid West Locality	Aluminium				Hardness				Iron				Manganese							
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met					
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean		Min	Max	Mean		
Badgingarra	4	<0.008	<0.008	<0.008	✓	2	45	48	47	✓	4	0.012	0.020	0.016	✓	4	0.004	0.006	0.005	✓
Bindoon /Chittering	3	<0.008	<0.008	<0.008	✓	2	42	44	43	✓	4	0.012	0.028	0.022	✓	4	0.006	0.040	0.024	✓
Bolgart	6	<0.008	<0.008	<0.008	✓	4	31	128	96	✓	6	<0.003	0.024	0.015	✓	6	<0.002	<0.002	<0.002	✓
Calingiri	4	<0.008	<0.008	<0.008	✓	2	113	117	115	✓	5	0.004	0.035	0.019	✓	5	<0.002	0.004	<0.002	✓
Carnamah	4	<0.008	<0.008	<0.008	✓	2	116	117	117	✓	4	0.006	0.095	0.046	✓	4	<0.002	0.044	0.023	✓
Carnarvon	4	<0.008	<0.008	<0.008	✓	2	134	155	145	✓	4	<0.003	0.060	0.020	✓	4	<0.002	0.004	<0.002	✓
Cervantes	4	<0.008	<0.008	<0.008	✓	2	327	343	335	✓	4	<0.003	0.006	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Coomberdale	4	0.016	0.090	0.046	✓	2	70	70	70	✓	4	0.220	1.200	0.638	(1)	4	0.006	0.030	0.016	✓
Coorow	2	<0.008	<0.008	<0.008	✓	Refer to Carnamah				2	0.016	0.065	0.041	✓	2	<0.002	<0.002	<0.002	✓	
Cue	6	<0.008	<0.008	<0.008	✓	4	182	197	187	✓	6	0.004	0.018	0.009	✓	6	<0.002	<0.002	<0.002	✓
Dandaragan	4	<0.008	<0.008	<0.008	✓	2	86	91	89	✓	4	0.070	0.169	0.130	✓	4	0.004	0.008	0.007	✓
Denham	4	<0.008	0.012	<0.008	✓	2	71	87	79	✓	4	0.139	0.220	0.169	✓	4	<0.002	<0.002	<0.002	✓
Dongara/Denison	6	<0.008	<0.008	<0.008	✓	4	108	114	111	✓	6	0.020	0.139	0.060	✓	6	<0.002	0.010	0.005	✓
Eneabba	4	<0.008	<0.008	<0.008	✓	2	96	109	103	✓	4	0.016	0.040	0.026	✓	4	<0.002	0.004	<0.002	✓
Exmouth	4	<0.008	<0.008	<0.008	✓	2	323	333	328	✓	4	<0.003	0.006	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Gascoyne Junction	4	<0.008	0.010	<0.008	✓	2	125	168	147	✓	4	0.010	0.014	0.013	✓	4	<0.002	0.026	0.013	✓
Geraldton	12	<0.008	<0.008	<0.008	✓	2	111	118	115	✓	12	0.012	0.055	0.034	✓	12	<0.002	<0.002	<0.002	✓
Gingin	4	<0.008	<0.008	<0.008	✓	2	30	30	30	✓	4	0.060	0.187	0.098	✓	4	<0.002	0.014	0.005	✓
Greenhead	2	<0.008	0.010	<0.008	✓	Refer to Leeman				2	0.014	0.035	0.025	✓	2	<0.002	<0.002	<0.002	✓	
Guilderton	4	<0.008	<0.008	<0.008	✓	2	272	318	295	✓	4	<0.003	0.004	<0.003	✓	4	<0.002	0.004	<0.002	✓
Horrocks	4	<0.008	<0.008	<0.008	✓	2	135	136	136	✓	4	0.050	0.151	0.104	✓	4	0.004	0.014	0.009	✓
Jurien Bay	4	<0.008	<0.008	<0.008	✓	2	305	311	308	✓	4	<0.003	0.018	0.008	✓	4	<0.002	<0.002	<0.002	✓
Kalbarri	4	<0.008	<0.008	<0.008	✓	2	64	68	66	✓	4	0.008	0.016	0.012	✓	4	<0.002	<0.002	<0.002	✓
Lancelin	4	<0.008	<0.008	<0.008	✓	2	271	277	274	✓	4	<0.003	2.600	0.650	(2)	4	<0.002	0.070	0.018	✓
Latham	2	<0.008	0.008	<0.008	✓	Refer to Morawa				2	0.018	0.140	0.079	✓	2	<0.002	0.004	<0.002	✓	
Ledge Point	4	<0.008	<0.008	<0.008	✓	2	259	262	261	✓	4	<0.003	0.004	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Leeman	4	<0.008	<0.008	<0.008	✓	2	97	101	99	✓	4	0.016	0.040	0.028	✓	4	<0.002	<0.002	<0.002	✓
Meekatharra	5	<0.008	<0.008	<0.008	✓	3	278	350	305	✓	4	<0.003	0.004	0.002	✓	4	<0.002	<0.002	<0.002	✓
Mingenew	4	<0.008	<0.008	<0.008	✓	2	86	87	87	✓	4	0.022	0.035	0.027	✓	4	<0.002	0.004	<0.002	✓
Moora	4	<0.008	<0.008	<0.008	✓	2	61	63	62	✓	4	0.022	0.085	0.056	✓	4	<0.002	0.002	<0.002	✓
Morawa	4	<0.008	<0.008	<0.008	✓	2	63	68	66	✓	4	0.010	0.030	0.019	✓	4	<0.002	0.048	0.022	✓
Mt Magnet	4	<0.008	<0.008	<0.008	✓	2	246	247	247	✓	4	<0.003	0.008	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Mullewa	6	<0.008	<0.008	<0.008	✓	4	127	178	151	✓	6	0.016	0.155	0.073	✓	6	<0.002	0.010	0.006	✓
Nabawa	4	<0.008	<0.008	<0.008	✓	2	102	129	116	✓	4	0.004	0.016	0.008	✓	4	<0.002	<0.002	<0.002	✓
New Norcia	4	<0.008	<0.008	<0.008	✓	2	71	79	75	✓	5	0.018	0.065	0.046	✓	5	<0.002	<0.002	<0.002	✓
Northampton	4	<0.008	<0.008	<0.008	✓	2	373	410	392	✓	4	0.040	0.106	0.082	✓	4	0.010	0.036	0.019	✓
Perenjori	2	<0.008	<0.008	<0.008	✓	Refer to Morawa				2	0.030	0.090	0.060	✓	2	<0.002	<0.002	<0.002	✓	
Piawaning	2	<0.008	<0.008	<0.008	✓	Refer to Yerecoin				2	0.020	0.026	0.023	✓	2	<0.002	<0.002	<0.002	✓	
Port Kalbarri	4	<0.008	<0.008	<0.008	✓	2	117	120	119	✓	4	0.016	0.028	0.021	✓	4	0.004	0.048	0.026	✓
Sandstone	4	<0.008	<0.008	<0.008	✓	2	318	320	319	✓	4	<0.003	<0.003	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Seabird	4	<0.008	<0.008	<0.008	✓	2	89	91	90	✓	4	0.018	0.080	0.037	✓	4	<0.002	<0.002	<0.002	✓
Seaview Park	4	<0.008	<0.008	<0.008	✓	2	205	206	206	✓	4	<0.003	0.006	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Sovereign Hills	4	<0.008	<0.008	<0.008	✓	2	190	262	226	✓	4	<0.003	0.014	0.008	✓	4	<0.002	0.010	0.003	✓
Three Springs	3	<0.008	<0.008	<0.008	✓	2	76	98	87	✓	4	0.035	0.112	0.082	✓	4	0.002	0.018	0.009	✓
Watheroo	4	<0.008	<0.008	<0.008	✓	2	207	208	208	✓	4	0.090	0.190	0.140	✓	4	0.008	0.016	0.013	✓
Wiluna	4	<0.008	<0.008	<0.008	✓	2	344	345	345	✓	4	<0.003	0.008	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Woodridge	4	<0.008	<0.008	<0.008	✓	2	263	272	268	✓	4	<0.003	0.006	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Yalgoo	4	<0.008	<0.008	<0.008	✓	2	356	359	358	✓	4	<0.003	0.004	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Yerecoin	4	<0.008	<0.008	<0.008	✓	2	97	126	112	✓	4	0.018	0.095	0.041	✓	4	<0.002	<0.002	<0.002	✓
Yuna	2	0.044	0.080	0.062	✓	2	29	39	34	✓	2	0.135	0.197	0.166	✓	2	0.004	0.016	0.010	✓

(1) Coomberdale - the elevated iron is a natural characteristic of the groundwater in the area

(2) Lancelin - the mean is inflated by a single high result following a dirty water incident.

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Table 8 Aesthetic Variables

Mid West Locality	pH				TDS				True Colour				Turbidity							
	Samples Taken	Value (pH units)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Value (TCU)			Guideline Met	Samples Taken	Value (NTU)			Guideline Met
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean			Min	Max	Mean	
Badgingarra	4	5.87	7.06	6.52	✓	2	483	602	543	✓	4	<1	<1	<1	✓	4	<0.1	0.3	0.2	✓
Bindoon /Chittering	4	6.56	7.10	6.86	✓	2	413	431	422	✓	4	<1	<1	<1	✓	4	<0.1	0.2	<0.1	✓
Bolgart	6	6.45	7.18	6.82	✓	4	205	623	484	✓	6	<1	<1	<1	✓	6	<0.1	0.8	0.5	✓
Calingiri	4	5.62	6.89	6.42	(1)	2	605	639	622	✓	4	<1	<1	<1	✓	4	<0.1	0.8	0.3	✓
Carnamah	4	5.91	6.59	6.18	(1)	2	759	801	780	✓	4	<1	<1	<1	✓	4	0.1	1.0	0.4	✓
Carnarvon	4	7.62	7.79	7.70	✓	2	429	498	464	✓	4	<1	<1	<1	✓	4	0.1	0.2	0.2	✓
Cervantes	4	7.21	7.24	7.23	✓	2	990	1100	1045	(2)	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Coomberdale	4	7.61	8.92	8.19	✓	2	484	497	491	✓	4	<1	3	2	✓	4	0.3	2.0	0.9	✓
Coorow	2	6.52	9.03	7.78	✓	Refer to Carnamah				2	<1	<1	<1	✓	2	<0.1	1.6	0.8	✓	
Cue	6	7.28	7.78	7.53	✓	4	788	813	804	✓	6	<1	<1	<1	✓	6	<0.1	0.3	<0.1	✓
Dandaragan	4	6.41	6.64	6.56	✓	2	586	600	593	✓	4	<1	<1	<1	✓	4	0.4	0.8	0.6	✓
Denham	4	7.56	7.93	7.69	✓	2	525	597	561	✓	4	<1	1	<1	✓	4	<0.1	0.3	0.2	✓
Dongara/Denison	6	7.27	7.52	7.40	✓	4	829	854	841	✓	6	<1	<1	<1	✓	6	0.1	0.3	0.3	✓
Eneabba	4	6.66	6.82	6.75	✓	2	643	665	654	✓	4	<1	<1	<1	✓	4	0.1	0.2	0.2	✓
Exmouth	4	7.29	7.39	7.34	✓	2	800	831	816	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Gascoyne Junction	4	7.28	7.36	7.32	✓	2	496	639	568	✓	4	<1	<1	<1	✓	4	0.2	0.4	0.3	✓
Geraldton	12	6.97	7.96	7.48	✓	2	821	824	823	✓	12	<1	<1	<1	✓	12	0.1	0.4	0.2	✓
Gingin	4	5.85	6.49	6.15	(1)	2	225	242	234	✓	4	<1	<1	<1	✓	4	<0.1	0.3	<0.1	✓
Greenhead	2	6.89	7.06	6.98	✓	Refer to Leeman				2	<1	<1	<1	✓	2	0.1	0.1	0.1	✓	
Guilderton	4	7.32	7.53	7.38	✓	2	770	987	879	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Horrocks	4	6.12	6.25	6.20	(1)	2	1180	1180	1180	(2)	4	<1	<1	<1	✓	4	0.3	0.9	0.6	✓
Jurien Bay	4	7.22	7.42	7.33	✓	2	810	810	810	✓	4	<1	<1	<1	✓	4	<0.1	0.2	<0.1	✓
Kalbarri	4	6.46	6.72	6.57	✓	2	382	388	385	✓	4	<1	<1	<1	✓	4	<0.1	0.1	<0.1	✓
Lancelin	4	7.30	7.35	7.33	✓	2	675	695	685	✓	4	<1	<1	<1	✓	4	<0.1	0.4	<0.1	✓
Latham	2	7.07	8.28	7.68	✓	Refer to Morawa				2	<1	<1	<1	✓	2	0.2	0.2	0.2	✓	
Ledge Point	4	7.28	7.68	7.45	✓	2	715	723	719	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Leeman	4	6.56	7.11	6.79	✓	2	564	573	569	✓	4	<1	<1	<1	✓	4	<0.1	0.2	<0.1	✓
Meekatharra	5	7.05	7.91	7.64	✓	2	1040	1060	1060	(2)	4	<1	1	0.5	✓	5	<0.1	0.6	<0.1	✓
Mingenew	4	6.74	6.88	6.80	✓	2	748	760	754	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Moora	4	5.48	7.06	6.41	(1)	2	452	468	460	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Morawa	4	6.31	6.75	6.50	✓	2	609	611	610	✓	4	<1	<1	<1	✓	4	<0.1	0.3	<0.1	✓
Mt Magnet	4	7.58	7.89	7.76	✓	2	842	900	871	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Mullewa	6	5.98	7.98	6.87	✓	4	859	1160	1020	(2)	6	<1	<1	<1	✓	6	0.1	1.2	0.4	✓
Nabawa	4	6.47	6.64	6.52	✓	2	644	687	666	✓	4	<1	<1	<1	✓	4	<0.1	0.3	<0.1	✓
New Norcia	4	6.28	6.44	6.35	(1)	2	366	414	390	✓	4	<1	<1	<1	✓	4	2.8	4.4	3.9	✓
Northampton	4	6.78	7.03	6.88	✓	2	1260	1340	1300	(2)	4	<1	<1	<1	✓	4	0.4	1.6	1.0	✓
Perenjori	2	6.44	7.26	6.85	✓	Refer to Morawa				2	<1	<1	<1	✓	2	<0.1	<0.1	<0.1	✓	
Piawaning	2	6.97	7.16	7.07	✓	Refer to Yerecoin				2	<1	<1	<1	✓	2	<0.1	<0.1	<0.1	✓	
Port Kalbarri	4	6.05	6.35	6.21	(1)	2	728	729	729	✓	4	<1	<1	<1	✓	4	<0.1	0.4	0.2	✓
Sandstone	4	7.03	7.16	7.09	✓	2	924	957	941	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Seabird	4	7.37	7.62	7.45	✓	2	515	533	524	✓	4	<1	<1	<1	✓	4	<0.1	1.2	0.4	✓
Seaview Park	4	7.40	7.51	7.44	✓	2	532	536	534	✓	4	<1	<1	<1	✓	4	<0.1	0.2	<0.1	✓
Sovereign Hills	4	7.51	7.84	7.68	✓	2	539	695	617	✓	4	<1	<1	<1	✓	4	<0.1	0.2	<0.1	✓
Three Springs	4	6.51	7.33	6.94	✓	2	698	779	739	✓	4	<1	<1	<1	✓	4	0.1	0.8	0.4	✓
Watheroo	4	6.95	7.15	7.04	✓	2	503	505	504	✓	4	<1	2	<1	✓	4	0.1	0.8	0.4	✓
Wiluna	4	7.66	7.94	7.79	✓	2	769	803	786	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Woodridge	4	7.34	7.47	7.39	✓	2	532	542	537	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Yalgoo	4	7.15	7.43	7.31	✓	2	1020	1060	1040	(2)	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Yerecoin	4	6.07	7.39	6.65	✓	2	428	515	472	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Yuna	2	7.70	9.15	8.43	✓	2	213	326	270	✓	2	<1	<1	<1	✓	2	4.8	6.6	5.7	(3)

(1) Low pH is a characteristic of the source supplying the locality. (2) Elevated TDS is a natural characteristic of the source. (3) Elevated turbidity at Yuna is a characteristic of the source.

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Table 9 Health Related Variables

Goldfields and Agricultural	Total Coliforms				Thermotolerant Coliforms				Thermophilic Naegleria			Fluoride			Hydrocarbons		Metals		
	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with Thermophilic Naegleria	Requirement Met	Samples Taken	Concentration (mg/L)			Samples Taken	Guideline Met	Samples Taken	Guideline Met
													Min	Max	Mean				
Bakers Hill	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.79		(2)	1	✓
Ballidu	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.80	0.76		(2)	1	✓
Beacon	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.50	0.85	0.68		(2)		(3)
Bencubbin	12	0	0	✓	12	0	0	✓	8	1	✓	12	0.60	0.85	0.76		(2)	2	✓
Beverley	27	0	0	✓	27	0	0	✓	8	0	✓	12	0.70	0.80	0.78		(2)	1	✓
Bind Bindi	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.70	0.85	0.78		(2)	1	✓
Broad Arrow	12	1	1	✓	12	0	0	✓	8	0	✓	12	0.75	0.90	0.79		(2)	1	✓
Bruce Rock	24	0	0	✓	24	0	0	✓	16	0	✓	12	0.70	0.80	0.76		(2)	2	✓
Bullfinch	12	0	0	✓	12	0	0	✓	8	2	✓	12	0.75	0.80	0.76		(2)	1	✓
Buntine	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.55	0.80	0.73		(2)	2	✓
Cadoux	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.79		(2)	1	✓
Condingup	12	0	0	✓	12	0	0	✓	8	0	✓				(1)		(2)	5	✓
Coolgardie	52	0	0	✓	52	0	0	✓	8	0	✓	12	0.75	0.85	0.79		(2)	1	✓
Corrigin	53	0	0	✓	53	0	0	✓	8	0	✓	14	0.75	0.80	0.78		(2)	2	✓
Cunderdin	53	0	0	✓	53	0	0	✓	8	0	✓	13	0.70	0.85	0.78		(2)	1	✓
Dalwallinu	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.65	0.80	0.76		(2)	1	✓
Dowerin	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.80	0.78		(2)	1	✓
Esperance	79	0	0	✓	79	0	0	✓	51	0	✓	53	0.65	1.20	0.90		(2)	3	✓
Gibson	12	0	0	✓	12	0	0	✓	8	0	✓				(1)	2	✓	3	✓
Goomalling	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.70	0.80	0.77		(2)	1	✓
Grass Patch	12	0	0	✓	12	0	0	✓	8	0	✓				(1)		(2)	2	✓
Grass Valley	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.78		(2)	1	✓
Kalannie	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.70	0.80	0.76		(2)	1	✓
Kalgoorlie	109	1	4	✓	109	0	0	✓	68	0	✓	51	0.70	0.90	0.79		(2)	2	✓
Kellerberrin	54	0	0	✓	54	0	0	✓	8	0	✓	14	0.70	0.80	0.77		(2)	1	✓
Koolyanobbing	12	1	3	✓	12	0	0	✓	8	0	✓	12	0.70	0.95	0.79		(2)	1	✓
Koorda	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.79		(2)	1	✓
Kununoppin	12	0	0	✓	12	0	0	✓	8	1	✓	12	0.75	0.80	0.78		(2)	1	✓
Laverton	12	0	0	✓	12	0	0	✓	8	0	✓				(1)		(2)	5	✓
Leonora	51	0	0	✓	51	0	0	✓	6	0	✓				(1)		(2)	2	✓
Meckering	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.70	0.80	0.75		(2)	1	✓
Menzies	12	1	6	✓	12	0	0	✓	8	0	✓				(1)	1	✓	2	✓
Merredin	53	0	0	✓	53	0	0	✓	34	0	✓	53	0.75	0.80	0.78		(2)	1	✓
Miling	12	0	0	✓	12	0	0	✓	8	1	✓	12	0.75	0.85	0.78		(2)	1	✓
Mt Walker	12	0	0	✓	12	0	0	✓	8	0	✓				(1)		(2)	2	✓
Mukinbudin	12	1	16	✓	12	1	26	✓	8	0	✓	12	0.55	0.85	0.68		(2)	2	✓
Muntadgin	12	0	0	✓	12	0	0	✓	8	0	✓				(1)		(2)	2	✓
Narembeen	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.50	0.85	0.68		(2)	2	✓
Norseman	53	0	0	✓	53	0	0	✓	5	0	✓	13	0.75	0.85	0.81		(2)	1	✓
Northam	65	0	0	✓	65	0	0	✓	44	0	✓	52	0.70	0.85	0.78		(2)	2	✓
Nungarin	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.90	0.79		(2)	1	✓
Ora Banda	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.80		(2)	1	✓
Pithara	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.70	0.80	0.76		(2)	1	✓
Quairading	53	0	0	✓	53	0	0	✓	8	0	✓	12	0.75	0.85	0.78		(2)	1	✓
Salmon Gums	12	0	0	✓	12	0	0	✓	8	0	✓				(1)		(2)	3	✓
Southern Cross	51	1	1	✓	51	0	0	✓	8	0	✓	12	0.75	0.85	0.78		(2)	1	✓
Tammin	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.79		(2)	1	✓
Toodyay	51	0	0	✓	51	0	0	✓	8	0	✓	12	0.70	0.80	0.78		(2)	1	✓
Trayning	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.90	0.80		(2)	1	✓
Warralakin	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.80		(2)	1	✓
Westonia	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.80	0.79		(2)	1	✓
Wongan Hills	53	0	0	✓	53	0	0	✓	8	0	✓	12	0.75	0.80	0.78		(2)	2	✓
Wubin	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.70	0.85	0.77		(2)	2	✓
Wundowie	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.85	0.78		(2)	1	✓
Wyalkatchem	12	0	0	✓	12	0	0	✓	8	0	✓	12	0.75	0.80	0.77		(2)	1	✓
York	53	0	0	✓	53	0	0	✓	17	0	✓	53	0.70	0.85	0.78		(2)	1	✓

(1) Non-fluoridated locality. (2) No samples required in this 12 month period. (3) No samples taken in this 12 month period. Samples taken in June 2003 and July 2004 met the guidelines

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Table 10 Health Related Variables

Goldfields and Agricultural	Health Related Variables																
	Locality	Samples Taken	Nitrate			Guideline Met	Pesticides		Radiological		Samples Taken	Trihalomethanes			Guideline Met	Other Health Related	
			Min	Max	Mean		Samples Taken	Guideline Met	Samples Taken	Guideline Met		Min	Max	Mean		Samples Taken	Guideline Met
Bakers Hill	2	0.8	0.9	0.8	✓		(2)		(3)	2	18	64	41	✓		(3)	
Ballidu	4	0.7	1.1	0.9	✓		(2)		(3)	2	40	92	66	✓	1	✓	
Beacon	4	0.7	0.9	0.8	✓		(2)		(3)	2	57	66	62	✓	1	✓	
Bencubbin	3	<0.05	0.2	0.1	✓	4	✓		(3)	2	102	119	111	✓	1	✓	
Beverley	2	0.6	0.6	0.6	✓		(2)		(3)	2	30	79	55	✓		(3)	
Bind Bindi	2	0.9	0.9	0.9	✓		(2)		(3)	2	87	200	144	✓	1	✓	
Broad Arrow		Refer to Kalgoorlie					(2)		(3)	4	61	128	105	✓		(3)	
Bruce Rock	4	0.7	1.0	0.8	✓	1	✓		(3)	2	26	80	53	✓		(3)	
Bullfinch	4	0.6	1.2	0.8	✓		(2)		(3)	4	5	182	62	✓	1	✓	
Buntine	4	0.3	1.0	0.6	✓	4	✓		(3)	2	57	245	151	✓	1	✓	
Cadoux	2	0.5	0.8	0.6	✓		(2)		(3)	2	35	136	86	✓	1	✓	
Codingup	4	0.1	0.2	0.1	✓	1	✓		(3)	2	10	25	18	✓	1	✓	
Coolgardie	2	0.6	0.7	0.7	✓		(2)		(3)	5	38	175	92	✓	1	✓	
Corrigin	8	0.6	1.0	0.7	✓		(2)		(3)	4	27	265	162	✓	1	✓	
Cunderdin	8	0.2	0.3	0.2	✓		(2)		(3)	2	25	88	57	✓	1	✓	
Dalwallinu		Refer to Pithara					(2)		(3)	4	81	180	143	✓	1	✓	
Dowerin	2	0.3	0.3	0.3	✓		(2)		(3)	2	33	88	61	✓	1	✓	
Esperance	4	1.8	2.1	2.0	✓	2	✓		(3)	2	41	78	60	✓		(3)	
Gibson	2	0.1	1.0	0.5	✓	2	✓		(3)	2	25	60	43	✓		(3)	
Goomalling	2	0.2	0.2	0.2	✓		(2)		(3)	2	40	98	69	✓	1	✓	
Grass Patch	4	<0.05	0.4	0.1	✓	4	✓	1	✓	2	34	65	50	✓		(3)	
Grass Valley	2	0.2	0.2	0.2	✓		(2)		(3)	2	28	100	64	✓	1	✓	
Kalannie	2	0.7	1.1	0.9	✓		(2)		(3)	2	33	115	74	✓	1	✓	
Kalgoorlie	6	0.4	0.6	0.5	✓		(2)		(3)	9	55	193	128	✓	2	✓	
Kellerberrin	2	0.2	0.3	0.2	✓		(2)		(3)	2	26	77	52	✓	1	✓	
Koolyanobbing	2	0.6	0.7	0.7	✓		(2)		(3)	4	58	231	128	✓	1	✓	
Koorda	4	0.7	1.0	0.8	✓		(2)		(3)	2	31	122	77	✓	1	✓	
Kununoppin	2	0.3	0.7	0.5	✓		(2)		(3)	2	47	86	67	✓	1	✓	
Laverton	4	2.1	13.5	6.0	(1)	1	✓		(3)	4	25	50	36	✓	1	✓	
Leonora	1	10.5	10.5	10.5	(1)	1	✓		(3)	2	<4	6	<4	✓	1	✓	
Meckering	2	0.2	0.2	0.2	✓		(2)		(3)	2	35	105	70	✓	1	✓	
Menzies	2	5.6	5.6	5.6	✓	1	✓	1	✓	2	34	145	90	✓	3	✓	
Merredin	4	0.2	0.4	0.3	✓		(2)		(3)	2	47	54	51	✓	1	✓	
Miling	2	0.8	0.9	0.8	✓		(2)		(3)	2	73	78	76	✓	1	✓	
Mt Walker	4	<0.05	0.1	<0.05	✓	1	✓		(3)	2	28	118	73	✓		(3)	
Mukinbudin	4	0.1	0.8	0.3	✓	4	✓		(3)	2	16	35	26	✓	1	✓	
Muntadgin	4	0.5	0.9	0.7	✓	4	✓		(3)	1	87	87	87	✓		(3)	
Narembeen	7	0.1	0.9	0.4	✓	3	✓		(3)	2	12	14	13	✓		(3)	
Norseman	4	0.5	0.5	0.5	✓		(2)		(3)	2	34	127	81	✓		(3)	
Northam	4	0.3	0.6	0.4	✓		(2)		(3)	4	40	52	46	✓	2	✓	
Nungarin	2	0.2	0.3	0.3	✓	1	✓		(3)	2	40	61	51	✓	1	✓	
Ora Banda	2	0.6	0.8	0.7	✓		(2)		(3)	4	74	227	173	✓	1	✓	
Pithara	4	0.7	1.1	0.9	✓		(2)		(3)	2	69	174	122	✓	1	✓	
Quairading	2	0.4	0.7	0.5	✓		(2)		(3)	2	104	120	112	✓	1	✓	
Salmon Gums	8	0.3	0.3	0.3	✓	8	✓	2	✓	4	65	120	102	✓	2	✓	
Southern Cross	2	0.2	0.6	0.4	✓		(2)		(3)	2	34	44	39	✓	1	✓	
Tammin	2	0.2	0.3	0.2	✓		(2)		(3)	2	35	62	49	✓		(3)	
Toodyay	2	0.2	0.3	0.3	✓		(2)		(3)	2	38	85	62	✓	1	✓	
Trayning	2	0.3	0.7	0.5	✓		(2)		(3)	2	40	96	68	✓	1	✓	
Warralakin	2	0.4	0.7	0.5	✓		(2)		(3)	2	31	41	36	✓		(3)	
Westonia	2	0.3	0.7	0.5	✓		(2)		(3)	2	17	50	34	✓		(3)	
Wongan Hills	4	0.2	0.9	0.5	✓	4	✓		(3)	2	28	90	59	✓	1	✓	
Wubin	6	0.7	1.1	0.9	✓	4	✓		(3)	4	125	221	177	✓	1	✓	
Wundowie	2	0.2	0.3	0.3	✓		(2)		(3)	2	41	81	61	✓	1	✓	
Wyalkatchem	2	0.7	0.9	0.8	✓		(2)		(3)	2	50	144	97	✓	1	✓	
York	2	0.2	0.4	0.3	✓		(2)		(3)	2	40	59	50	✓	1	✓	

(1) Laverton and Leonora have been granted an exemption from compliance with the nitrate guidelines by the Department of Health. The water supplied is harmless to adults and children over three months of age. Carers of infants less than three months should seek advice from their community health nurse regarding the use of alternative water sources for the preparation of bottle feeds. Treatment plants are planned for these two localities. (2) Pesticides are sampled from the raw water source. For these localities please refer to Mundaring Weir in the Perth Metropolitan region. (3) No samples required in this 12 month period.

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Table 11 Aesthetic Variables

Goldfields and Agricultural

Locality	Aluminium					Hardness					Iron					Manganese				
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean			Min	Max	Mean	
Bakers Hill	2	0.010	0.018	0.014	✓	Refer to Mundaring (Perth Metropolitan)					2	0.050	0.050	0.050	✓	2	0.004	0.004	0.004	✓
Ballidu	4	<0.008	0.022	<0.008	✓	4	111	124	116	✓	4	0.024	0.240	0.097	✓	4	<0.002	0.008	0.004	✓
Beacon	4	<0.008	0.020	0.013	✓	4	92	130	110	✓	4	0.026	0.055	0.039	✓	4	<0.002	0.006	0.003	✓
Bencubbin	5	<0.008	0.055	0.023	✓	3	77	124	95	✓	5	0.045	0.095	0.076	✓	5	0.004	0.016	0.012	✓
Beverley	4	0.016	0.026	0.019	✓	Refer to Mundaring (Perth Metropolitan)					4	0.075	0.196	0.127	✓	4	0.002	0.022	0.011	✓
Bind Bindi	4	<0.008	0.010	<0.008	✓	Refer to Cunderdin					4	0.006	0.035	0.016	✓	4	<0.002	<0.002	<0.002	✓
Broad Arrow	4	0.012	0.044	0.022	✓	Refer to Kalgoorlie					4	0.085	0.260	0.140	✓	4	0.002	0.006	0.004	✓
Bruce Rock	8	<0.008	0.018	0.012	✓	4	97	123	110	✓	8	0.018	0.114	0.056	✓	8	<0.002	0.012	0.003	✓
Bullfinch	8	<0.008	0.018	<0.008	✓	4	100	127	115	✓	8	0.026	0.168	0.071	✓	8	<0.002	0.012	0.004	✓
Buntine	2	0.014	0.030	0.022	✓	2	119	123	121	✓	2	0.026	0.060	0.043	✓	2	<0.002	0.002	<0.002	✓
Cadoux	2	<0.008	0.018	0.009	✓	2	106	111	109	✓	2	0.055	0.065	0.060	✓	2	0.002	0.004	0.003	✓
Condingup	4	<0.008	<0.008	<0.008	✓	4	74	76	76	✓	4	0.035	0.105	0.059	✓	4	0.002	0.004	0.003	✓
Coolgardie	5	0.018	0.028	0.021	✓	2	100	110	105	✓	6	0.028	0.155	0.095	✓	6	<0.002	0.006	0.004	✓
Corrigin	8	<0.008	0.020	0.011	✓	8	102	126	117	✓	8	0.018	0.108	0.057	✓	8	<0.002	0.006	<0.002	✓
Cunderdin	6	0.018	0.030	0.022	✓	6	95	102	99	✓	6	0.040	0.095	0.064	✓	6	<0.002	0.010	0.005	✓
Dalwallinu	4	0.008	0.065	0.026	✓	Refer to Pithara					4	0.060	1.000	0.314	(2)	4	0.002	0.050	0.015	✓
Dowerin	4	<0.008	0.032	0.015	✓	Refer to Cunderdin					4	0.035	0.161	0.082	✓	4	0.004	0.010	0.006	✓
Esperance	5	<0.008	<0.008	<0.008	✓	4	322	334	330	✓	6	<0.003	0.164	0.053	✓	6	<0.002	<0.002	<0.002	✓
Gibson	6	<0.008	0.012	<0.008	✓	2	23	29	26	✓	6	0.060	1.800	0.445	(1)	6	<0.002	0.006	0.003	✓
Goomalling	4	<0.008	0.034	0.015	✓	Refer to Mundaring (Perth Metropolitan)					4	0.045	0.187	0.092	✓	4	0.004	0.010	0.006	✓
Grass Patch	8	0.090	0.210	0.141	✓	4	94	153	122	✓	8	0.014	0.085	0.041	✓	8	<0.002	<0.002	<0.002	✓
Grass Valley	2	0.022	0.028	0.025	✓	Refer to Mundaring (Perth Metropolitan)					2	0.035	0.060	0.048	✓	2	0.002	0.004	0.003	✓
Kalannie	2	0.010	0.012	0.011	✓	2	111	117	114	✓	2	0.024	0.070	0.047	✓	2	<0.002	0.002	<0.002	✓
Kalgoorlie	16	0.010	0.120	0.026	✓	6	102	115	109	✓	16	0.018	0.550	0.131	✓	16	<0.002	0.010	0.003	✓
Kellerberrin	1	0.020	0.020	0.020	✓	Refer to Cunderdin					2	0.040	0.065	0.053	✓	2	0.002	0.006	0.004	✓
Koolyanobbing	4	<0.008	0.075	0.019	✓	Refer to Merredin					4	0.022	1.400	0.400	(2)	4	<0.002	0.065	0.016	✓
Koorda	4	<0.008	0.022	0.012	✓	4	110	115	113	✓	4	0.035	0.147	0.074	✓	4	0.002	0.006	0.003	✓
Kununoppin	4	0.010	0.034	0.019	✓	Refer to Cunderdin					4	0.110	0.197	0.166	✓	4	0.004	0.014	0.008	✓
Laverton	6	<0.008	<0.008	<0.008	✓	4	26	288	115	✓	8	<0.003	0.012	0.004	✓	8	<0.002	<0.002	<0.002	✓
Leonora	3	<0.008	<0.008	<0.008	✓	1	397	397	397	✓	3	<0.003	0.004	<0.003	✓	3	<0.002	<0.002	<0.002	✓
Meckering	2	0.008	0.020	0.014	✓	Refer to Mundaring (Perth Metropolitan)					2	0.022	0.045	0.034	✓	2	<0.002	0.004	<0.002	✓
Menzies	4	0.012	0.060	0.035	✓	2	239	293	266	✓	4	0.004	0.010	0.008	✓	4	<0.002	0.070	0.035	✓
Merredin	4	0.022	0.044	0.031	✓	2	100	107	104	✓	4	0.050	0.194	0.110	✓	4	0.004	0.020	0.011	✓
Miling	4	<0.008	<0.008	<0.008	✓	Refer to Cunderdin					4	0.006	0.045	0.020	✓	4	<0.002	<0.002	<0.002	✓
Mt Walker	8	0.014	0.032	0.021	✓	4	9	10	9	✓	8	0.035	0.240	0.091	✓	8	<0.002	0.034	0.010	✓
Mukinbudin	4	0.014	0.026	0.020	✓	2	66	106	86	✓	4	0.055	0.095	0.081	✓	4	<0.002	0.016	0.007	✓
Muntadgin	8	<0.008	0.028	0.016	✓	4	101	108	104	✓	8	0.026	0.153	0.071	✓	8	<0.002	0.006	0.003	✓
Narembeen	9	0.016	0.065	0.034	✓	5	73	103	89	✓	9	0.060	0.360	0.156	✓	9	0.002	0.006	0.004	✓
Norseman	5	0.008	0.026	0.015	✓	2	117	127	122	✓	6	0.016	0.100	0.046	✓	6	<0.002	0.004	<0.002	✓
Northam	4	0.022	0.028	0.024	✓	Refer to Mundaring (Perth Metropolitan)					4	0.070	0.111	0.091	✓	4	0.002	0.008	0.004	✓
Nungarin	4	<0.008	0.040	0.020	✓	Refer to Merredin					4	0.035	0.165	0.080	✓	4	<0.002	0.008	0.004	✓
Ora Banda	6	0.008	0.018	0.012	✓	2	121	132	127	✓	6	0.004	0.035	0.017	✓	6	<0.002	<0.002	<0.002	✓
Pithara	4	<0.008	0.012	<0.008	✓	4	113	123	117	✓	4	0.035	0.111	0.067	✓	4	<0.002	0.006	<0.002	✓
Quairading	5	<0.008	0.024	0.011	✓	Refer to Cunderdin					5	0.055	0.149	0.087	✓	5	0.002	0.010	0.006	✓
Salmon Gums	12	0.010	0.080	0.037	✓	8	93	111	101	✓	12	0.016	0.140	0.049	✓	12	<0.002	0.004	<0.002	✓
Southern Cross	3	<0.008	0.034	0.011	✓	Refer to Merredin					4	0.075	0.176	0.116	✓	4	0.004	0.008	0.005	✓
Tammin	2	0.026	0.034	0.030	✓	Refer to Cunderdin					2	0.050	0.109	0.080	✓	2	<0.002	0.004	<0.002	✓
Toodyay	4	<0.008	0.048	0.029	✓	Refer to Mundaring (Perth Metropolitan)					4	0.040	0.176	0.084	✓	4	0.004	0.020	0.009	✓
Trayning	4	0.014	0.038	0.022	✓	Refer to Cunderdin					4	0.026	0.240	0.121	✓	4	<0.002	0.022	0.007	✓
Warralakin	4	0.010	0.036	0.018	✓	Refer to Merredin					4	0.022	0.146	0.071	✓	4	0.004	0.006	0.005	✓
Westonia	2	0.016	0.018	0.017	✓	Refer to Merredin					2	0.060	0.080	0.070	✓	2	0.002	0.004	0.003	✓
Wongan Hills	8	<0.008	0.020	<0.008	✓	4	109	117	113	✓	8	0.026	0.174	0.082	✓	8	<0.002	0.008	0.004	✓
Wubin	3	<0.008	0.014	0.009	✓	4	130	144	136	✓	4	0.022	0.105	0.067	✓	4	<0.002	0.004	<0.002	✓
Wundowie	2	0.018	0.028	0.023	✓	Refer to Mundaring (Perth Metropolitan)					2	0.040	0.105	0.073	✓	2	0.002	0.004	0.003	✓
Wyalkatchem	2	0.012	0.014	0.013	✓	2	106	109	108	✓	2	0.035	0.070	0.053	✓	2	<0.002	0.004	<0.002	✓
York	5	0.016	0.075	0.035	✓	Refer to Mundaring (Perth Metropolitan)					5	0.030	0.158	0.083	✓	5	0.002	0.018	0.008	✓

(1) Elevated iron is a natural characteristic of the source supplying this locality. (2) Elevated iron can occur when sediments in the pipeline are disturbed, due to sudden changes in flow.

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Table 12 Aesthetic Variables

Goldfields and Agricultural

Locality	pH				TDS				True Colour				Turbidity							
	Samples Taken	Value (pH units)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Value (TCU)			Guideline Met	Samples Taken	Value (NTU)			Guideline Met
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean			Min	Max	Mean	
Bakers Hill	2	7.44	7.55	7.50	✓	Refer to Mundaring (Perth Metropolitan)				2	1	3	2	✓	2	0.4	0.5	0.5	✓	
Ballidu	4	5.64	6.86	6.37	(2)	4	457	492	475	✓	4	<1	3	2	✓	4	0.1	1.0	0.4	✓
Beacon	4	7.54	9.10	8.35	✓	4	355	518	425	✓	4	2	3	2	✓	4	0.1	0.3	0.2	✓
Bencubbin	5	7.63	8.51	8.01	✓	3	300	496	384	✓	5	1	6	3	✓	5	0.4	2.8	1.0	✓
Beverley	4	8.15	8.90	8.51	(1)	Refer to Mundaring (Perth Metropolitan)				4	2	4	3	✓	4	0.4	1.6	0.9	✓	
Bind Bind	4	8.53	8.74	8.60	(1)	Refer to Cunderdin				4	<1	3	<1	✓	4	<0.1	0.2	<0.1	✓	
Broad Arrow	4	7.38	7.90	7.63	✓	Refer to Kalgoorlie				4	<1	3	2	✓	4	0.5	1.6	1.0	✓	
Bruce Rock	8	7.22	8.95	7.86	✓	4	435	491	455	✓	8	<1	3	<1	✓	8	0.1	0.7	0.3	✓
Bullfinch	8	8.56	9.11	8.83	(1)	4	420	495	462	✓	8	<1	2	<1	✓	8	0.2	0.9	0.5	✓
Buntine	2	7.61	8.36	7.99	✓	2	430	467	449	✓	2	<1	<1	<1	✓	2	0.1	1.0	0.6	✓
Cadoux	2	8.56	8.59	8.58	(1)	2	445	461	453	✓	2	2	3	3	✓	2	0.3	0.4	0.4	✓
Condingup	4	6.68	6.73	6.70	✓	4	993	1040	1013	(3)	4	<1	<1	<1	✓	4	<0.1	0.4	0.2	✓
Coolgardie	6	7.01	7.51	7.20	✓	2	433	473	453	✓	6	<1	2	<1	✓	6	0.2	2.2	0.8	✓
Corrigin	8	7.56	9.12	8.61	(1)	8	413	502	465	✓	8	<1	3	<1	✓	8	<0.1	0.7	0.4	✓
Cunderdin	6	7.64	7.88	7.76	✓	6	418	452	436	✓	6	1	3	2	✓	6	0.7	1.8	1.2	✓
Dalwallinu	4	7.90	8.61	8.21	✓	Refer to Pithara				4	1	2	2	✓	4	0.2	4.8	1.5	✓	
Dowerin	4	8.56	8.91	8.76	(1)	Refer to Cunderdin				4	1	5	3	✓	4	0.4	1.6	0.7	✓	
Esperance	6	7.36	7.53	7.43	✓	4	753	788	769	✓	6	<1	<1	<1	✓	6	<0.1	0.8	0.2	✓
Gibson	6	6.19	6.35	6.28	(2)	2	419	578	499	✓	6	<1	3	<1	✓	6	0.2	18.0	3.5	✓
Goomalling	4	8.63	8.84	8.71	(1)	Refer to Mundaring (Perth Metropolitan)				4	1	6	3	✓	4	0.3	1.6	0.7	✓	
Grass Patch	8	7.57	8.16	7.77	✓	4	222	383	300	✓	8	<1	<1	<1	✓	8	0.6	2.0	1.1	✓
Grass Valley	2	7.70	8.05	7.88	✓	Refer to Mundaring (Perth Metropolitan)				2	1	4	3	✓	2	0.5	1.0	0.8	✓	
Kalannie	2	7.73	8.04	7.89	✓	2	443	476	460	✓	2	<1	1	<1	✓	2	0.2	0.4	0.3	✓
Kalgoorlie	16	6.98	9.12	7.71	✓	6	431	462	449	✓	16	<1	3	<1	✓	16	0.2	2.6	0.8	✓
Kellerberrin	2	7.76	7.82	7.79	✓	Refer to Cunderdin				2	1	7	4	✓	2	0.6	1.4	1.0	✓	
Koolyanobbing	4	8.41	8.70	8.60	(1)	Refer to Merredin				4	<1	3	2	✓	4	0.2	10.0	2.7	✓	
Koorda	4	7.40	7.77	7.56	✓	4	445	476	458	✓	4	1	3	2	✓	4	0.3	1.4	0.6	✓
Kununoppin	4	8.59	9.37	8.95	(1)	Refer to Cunderdin				4	<1	5	2	✓	4	1.0	2.4	1.7	✓	
Laverton	8	7.47	7.92	7.65	✓	4	269	971	507	✓	8	<1	<1	<1	✓	8	<0.1	0.3	<0.1	✓
Leonora	3	7.39	7.43	7.41	✓	1	1400	1400	1400	(3)	3	<1	<1	<1	✓	3	<0.1	0.2	<0.1	✓
Meckering	2	8.35	8.76	8.56	(1)	Refer to Mundaring (Perth Metropolitan)				2	1	4	3	✓	2	0.6	0.7	0.7	✓	
Menzies	4	7.19	7.44	7.34	✓	2	607	748	678	✓	4	<1	3	<1	✓	4	0.4	1.0	0.6	✓
Merredin	4	7.45	7.66	7.57	✓	2	429	466	448	✓	4	2	2	2	✓	4	0.4	2.6	1.5	✓
Miling	4	8.54	8.86	8.74	(1)	Refer to Cunderdin				4	<1	2	<1	✓	4	0.1	0.2	0.2	✓	
Mt Walker	8	5.95	7.15	6.46	(2)	4	49	57	52	✓	8	2	6	4	✓	8	0.3	4.2	1.5	✓
Mukinbudin	4	7.32	8.36	7.82	✓	2	281	474	378	✓	4	3	3	3	✓	4	0.6	1.2	0.8	✓
Muntadgin	8	7.21	8.31	7.65	✓	4	445	508	468	✓	8	<1	2	<1	✓	8	0.1	1.4	0.5	✓
Narembreen	9	7.16	7.76	7.57	✓	5	301	460	387	✓	9	2	5	3	✓	9	1.4	5.2	3.5	✓
Norseman	6	7.76	8.63	8.15	✓	2	457	497	477	✓	6	<1	<1	<1	✓	6	0.2	0.3	0.2	✓
Northam	4	7.73	8.08	7.89	✓	Refer to Mundaring (Perth Metropolitan)				4	2	4	3	✓	4	0.4	1.8	1.2	✓	
Nungarin	4	8.25	8.51	8.35	✓	Refer to Merredin				4	1	4	2	✓	4	0.3	1.6	1.0	✓	
Ora Banda	6	8.31	8.87	8.70	(1)	2	456	491	474	✓	6	<1	<1	<1	✓	6	0.1	0.2	0.2	✓
Pithara	4	7.56	8.45	8.02	✓	4	449	488	462	✓	4	<1	1	<1	✓	4	<0.1	0.4	0.2	✓
Quairading	5	7.82	8.35	8.15	✓	Refer to Cunderdin				5	2	3	2	✓	5	0.3	1.4	0.6	✓	
Salmon Gums	12	7.18	8.51	7.76	✓	8	312	359	329	✓	12	<1	<1	<1	✓	12	0.4	4.2	1.2	✓
Southern Cross	4	7.52	7.96	7.65	✓	Refer to Merredin				4	2	4	3	✓	4	0.4	2.0	0.9	✓	
Tammin	2	8.11	8.17	8.14	✓	Refer to Cunderdin				2	2	3	3	✓	2	0.4	1.6	1.0	✓	
Toodyay	4	8.18	8.33	8.26	✓	Refer to Mundaring (Perth Metropolitan)				4	2	5	4	✓	4	0.3	1.8	0.7	✓	
Trayning	4	6.78	9.20	8.09	✓	Refer to Cunderdin				4	<1	3	<1	✓	4	0.1	1.4	0.8	✓	
Warralakin	4	7.31	8.21	7.77	✓	Refer to Merredin				4	2	4	3	✓	4	0.2	1.2	0.6	✓	
Westonia	2	7.41	8.41	7.91	✓	Refer to Merredin				2	3	3	3	✓	2	<0.1	0.6	0.3	✓	
Wongan Hills	8	8.02	9.16	8.80	(1)	4	439	476	457	✓	8	2	4	3	✓	8	0.2	2.0	0.7	✓
Wubin	4	8.33	8.63	8.45	✓	4	484	507	495	✓	4	<1	4	<1	✓	4	0.1	0.4	0.3	✓
Wundowie	2	8.06	8.07	8.07	✓	Refer to Mundaring (Perth Metropolitan)				2	2	4	3	✓	2	0.5	2.0	1.3	✓	
Wyalkatchem	2	7.55	8.19	7.87	✓	2	445	453	449	✓	2	2	3	3	✓	2	0.2	0.4	0.3	✓
York	5	8.16	8.31	8.22	✓	Refer to Mundaring (Perth Metropolitan)				5	2	6	3	✓	5	0.3	1.8	1.0	✓	

(1) Elevated pH is caused by leaching of calcium carbonate from the protective cement lining of the pipes after long water transit times. This characteristic is found in a number of our localities on our large water supply schemes. Experience shows that pH at this level is not objectionable to our customers. (2) Low pH is a characteristic of the source supplying the locality. Experience shows that at this level the pH is not objectionable to our customers. (3) The elevated TDS at Leonora and Condingup is a natural characteristic of the sources supplying these localities. A new water treatment plant has been commissioned at Leonora in 2004.

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Table 13 Health related variables

South West Locality	Total Coliforms				Thermotolerant Coliforms				Thermophilic Naegleria			Fluoride			Hydrocarbons		Metals		
	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with Thermophilic Naegleria	Requirement Met	Concentration (mg/L)			Samples Taken	Guideline Met	Samples Taken	Guideline Met	
												Min	Max	Mean					
Allanson	14	1	1	✓	14	0	0	✓	6	0	✓	11	0.10	0.90	0.74	1	✓	1	✓
Augusta	53	0	0	✓	53	0	0	✓	26	0	✓				(1)	1	✓	4	✓
Australind	79	0	0	✓	79	0	0	✓	39	0	✓				(1)	2	✓	5	✓
Balingup	17	0	0	✓	17	0	0	✓	8	0	✓				(1)		(2)	3	✓
Binningup	53	1	1	✓	53	0	0	✓	13	0	✓	8	0.75	0.85	0.79	1	✓	1	✓
Boyanup	13	0	0	✓	13	0	0	✓	7	0	✓	1	0.15	0.15	0.15	1	✓	5	✓
Boyup Brook	52	0	0	✓	52	0	0	✓	13	0	✓				(1)		(2)	2	✓
Bridgetown	52	1	6	✓	52	1	2	✓	26	0	✓				(1)		(2)	2	✓
Brunswick Junction	53	0	0	✓	53	0	0	✓	13	0	✓				(1)	3	✓	3	✓
Capel	53	0	0	✓	53	0	0	✓	13	0	✓				(1)	2	✓	3	✓
Collie	67	1	1	✓	67	0	0	✓	32	1	✓	53	<0.10	0.95	0.77		(2)	4	✓
Cowaramup	13	0	0	✓	13	0	0	✓	7	0	✓				(1)	2	✓	2	✓
Dalyellup	53	0	0	✓	53	0	0	✓	13	0	✓				(1)		(2)	2	✓
Dardanup	14	0	0	✓	14	0	0	✓	6	0	✓	1	<0.10	<0.10	<0.10	1	✓	5	✓
Darkin	14	0	0	✓	14	0	0	✓	6	0	✓	13	0.35	0.90	0.74		(2)	1	✓
Donnybrook	53	0	0	✓	53	0	0	✓	26	0	✓	1	<0.10	<0.10	<0.10	1	✓	4	✓
Dunsborough	66	0	0	✓	66	0	0	✓	33	0	✓				(1)	1	✓	7	✓
Dwellingup	13	0	0	✓	13	0	0	✓	7	0	✓				(1)	1	✓	2	✓
Eaton	66	0	0	✓	66	0	0	✓	33	0	✓				(1)	1	✓	4	✓
Greenbushes	26	0	0	✓	26	0	0	✓	13	0	✓				(1)	1	✓	2	✓
Harvey	53	0	0	✓	53	0	0	✓	26	0	✓	51	<0.10	1.00	0.68		(2)	1	✓
Hester TWS	13	0	0	✓	13	0	0	✓	6	0	✓				(1)		(2)	2	✓
Kirup	14	0	0	✓	14	0	0	✓	6	0	✓				(1)		(2)	2	✓
Logue Brook	14	1	1	✓	14	0	0	✓	6	0	✓				(1)	1	✓	2	✓
Mandurah	252	1	1	✓	252	0	0	✓	124	0	✓	53	0.40	1.00	0.78	1	✓	3	✓
Manjimup	66	0	0	✓	66	0	0	✓	32	0	✓	53	0.60	0.95	0.79	1	✓	6	✓
Margaret River	66	0	0	✓	66	0	0	✓	33	0	✓				(1)	1	✓	2	✓
Mullalyup	13	0	0	✓	13	0	0	✓	5	0	✓				(1)		(2)	1	✓
Myalup	14	0	0	✓	14	0	0	✓	6	0	✓	8	0.75	0.90	0.82	1	✓	2	✓
Nannup	13	0	0	✓	13	0	0	✓	7	0	✓					1	✓	2	✓
North Dandalup	14	0	0	✓	14	0	0	✓	6	0	✓	14	0.30	1.30	0.96		(2)	1	✓
Northcliffe	27	0	0	✓	27	0	0	✓	13	0	✓				(1)		(2)	3	✓
Park Ridge	53	0	0	✓	53	0	0	✓	13	0	✓				(1)	2	✓	3	✓
Pemberton	52	0	0	✓	52	1	1	✓	13	0	✓				(1)	1	✓	2	✓
Peppermint Grove	13	1	10	✓	13	0	0	✓	7	0	✓				(1)	3	✓	4	✓
Pinjarra	53	0	0	✓	53	1	2	✓	26	0	✓	53	0.20	1.00	0.79		(2)	1	✓
Preston Beach	52	0	0	✓	52	0	0	✓	7	0	✓				(1)		(2)	2	✓
Quinninup	14	1	2	✓	14	0	0	✓	6	0	✓				(1)	1	✓	2	✓
Walpole	52	1	3	✓	52	0	0	✓	13	0	✓				(1)	4	✓	9	✓
Waroona	52	0	0	✓	52	0	0	✓	25	0	✓	37	0.80	1.00	0.90	2	✓	2	✓
Yarloop	14	0	0	✓	14	0	0	✓	6	0	✓				(1)	1	✓	2	✓

(1) Non-fluoridated locality (2) No samples required in this 12 month period.

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Table 14 Health related variables

South West Locality	Nitrate				Pesticides			Radiological		Trihalomethanes				Other Health Related			
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Exceeds	Guideline Met	Samples Taken	Guideline Met	Samples Taken	Concentration (ug/L)			Requirement Met	Samples Taken	Guideline Met
		Min	Max	Mean								Min	Max	Mean			
Allanson	Refer to Collie																
Augusta	8	<0.05	1.0	0.4	✓	2	0	✓	6	✓	4	18	38	27	✓	(1)	
Australind	4	<0.05	<0.05	<0.05	✓	4	0	✓	1	✓	2	5	15	10	✓	(1)	
Balingup	6	<0.05	0.1	<0.05	✓	3	0	✓	1	✓	4	112	209	160	✓	1	
Binningup	2	<0.05	<0.05	<0.05	✓	2	0	✓		(1)	4	32	147	107	✓	1	
Boyanup	3	<0.05	<0.05	<0.05	✓	3	0	✓	1	✓	3	<4	<4	<4	✓	1	
Boyup Brook	4	<0.05	<0.05	<0.05	✓	4	0	✓	3	✓	4	70	148	117	✓	(1)	
Bridgetown	8	<0.05	<0.05	<0.05	✓	1	0	✓		(1)	4	23	85	62	✓	(1)	
Brunswick Junction	4	0.1	0.2	0.1	✓	6	0	✓		(1)	4	38	191	99	✓	1	
Capel	4	<0.05	<0.05	<0.05	✓	2	0	✓		(1)	2	3	19	11	✓	(1)	
Collie	4	<0.05	0.1	<0.05	✓	5	0	✓	1	✓	4	28	81	57	✓	(1)	
Cowaramup	2	<0.05	0.1	<0.05	✓			(1)		(1)	3	110	173	150	✓	2	
Dalyellup	4	<0.05	0.1	<0.05	✓	4	0	✓	1	✓	2	27	52	40	✓	(1)	
Dardanup	4	<0.05	0.1	0.1	✓	3	0	✓	1	✓	3	<4	<4	<4	✓	1	
Darkin	Refer to Collie																
Donnybrook	3	1.2	1.9	1.4	✓	2	0	✓	1	✓	2	12	18	15	✓	1	
Dunsborough	4	<0.05	<0.05	<0.05	✓	8	0	✓	2	✓	2	17	21	19	✓	1	
Dwellingup	4	0.7	0.9	0.8	✓	4	0	✓		(1)	2	27	131	79	✓	(1)	
Eaton	2	<0.05	<0.05	<0.05	✓	8	0	✓		(1)	2	10	15	13	✓	1	
Greenbushes	4	<0.05	0.1	<0.05	✓	1	0	✓	1	✓	4	74	131	109	✓	1	
Harvey	Refer to Waroona																
Hester TWS	4	<0.05	<0.05	<0.05	✓	1	0	✓		(1)	2	68	138	103	✓	(1)	
Kirup	4	<0.05	<0.05	<0.05	✓	1	0	✓	1	✓	4	70	163	132	✓	(1)	
Logue Brook	4	<0.05	0.4	0.1	✓	2	0	✓	1	✓	2	47	97	72	✓	(1)	
Mandurah	4	<0.05	0.1	<0.05	✓	1	0	✓	1	✓	8	56	153	110	✓	(1)	
Manjimup	6	<0.05	0.1	<0.05	✓	4	0	✓	2	✓	4	64	127	99	✓	2	
Margaret River	4	<0.05	<0.05	<0.05	✓	4	0	✓	1	✓	4	69	123	99	✓	(1)	
Mullalyup	Refer to Kirup																
Myalup	2	<0.05	<0.05	<0.05	✓	2	0	✓		(1)	3	88	165	123	✓	1	
Nannup	4	<0.05	0.1	<0.05	✓	1	0	✓		(1)	4	109	190	147	✓	(1)	
North Dandalup	Refer to Hills Direct (Perth metropolitan)																
Northcliffe	4	0.7	2.3	1.8	✓	8	0	✓	2	✓	2	14	50	32	✓	(1)	
Park Ridge	4	<0.05	<0.05	<0.05	✓	2	0	✓	2	✓	4	96	135	112	✓	(1)	
Pemberton	4	<0.05	0.2	0.1	✓	4	0	✓	1	✓	2	6	29	18	✓	(1)	
Peppermint Grove	2	<0.05	<0.05	<0.05	✓	8	0	✓	2	✓	2	<4	<4	<4	✓	1	
Pinjarra	Refer to Hills Direct (Perth metropolitan)																
Preston Beach	4	1.0	1.2	1.1	✓	1	0	✓	1	✓	4	65	236	176	✓	(1)	
Quinninup	4	<0.05	0.3	0.1	✓	4	0	✓		(1)	4	46	212	129	✓	(1)	
Walpole	4	<0.05	0.1	<0.05	✓	8	0	✓		(1)	4	37	138	105	✓	2	
Waroona	1	<0.05	<0.05	<0.05	✓	1	0	✓		(1)	2	102	136	119	✓	2	
Yarloop	4	<0.05	0.7	0.2	✓	4	0	✓	1	✓	2	88	100	94	✓	(1)	

(1) No samples required in this 12 month period.

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Table 15 Aesthetic Variables

South West Locality	Aluminium				Hardness				Iron				Manganese							
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean			Min	Max	Mean	
Allanson	2	0.014	0.014	0.014	✓	Refer to Collie				2	0.070	0.085	0.078	✓	2	0.010	0.018	0.014	✓	
Augusta	16	<0.008	<0.008	<0.008	✓	8	48	380	210	✓	16	<0.003	0.150	0.063	✓	16	<0.002	0.006	<0.002	✓
Australind	6	<0.008	<0.008	<0.008	✓	4	80	84	82	✓	6	0.075	0.220	0.122	✓	6	0.004	0.016	0.008	✓
Balingup	6	<0.008	0.016	<0.008	✓	6	60	85	76	✓	6	0.070	0.115	0.090	✓	6	0.006	0.024	0.015	✓
Binningup	4	<0.008	0.044	0.026	✓	2	63	379	221	✓	5	0.010	0.133	0.057	✓	5	0.008	0.125	0.056	✓
Boyanup	4	<0.008	<0.008	<0.008	✓	3	105	108	106	✓	4	0.004	0.012	0.008	✓	4	<0.002	<0.002	<0.002	✓
Boyup Brook	4	0.014	0.050	0.028	✓	4	40	81	58	✓	4	0.149	0.320	0.200	✓	4	<0.002	0.016	0.007	✓
Bridgetown	12	0.020	0.075	0.045	✓	8	32	44	37	✓	12	0.123	0.460	0.229	✓	12	0.002	0.018	0.008	✓
Brunswick Junction	8	0.008	0.048	0.022	✓	4	35	85	49	✓	8	0.022	0.166	0.073	✓	8	<0.002	0.038	0.006	✓
Capel	8	<0.008	<0.008	<0.008	✓	4	46	47	46	✓	8	0.050	0.090	0.068	✓	8	<0.002	<0.002	<0.002	✓
Collie	8	0.008	0.022	0.015	✓	4	23	45	33	✓	8	0.040	0.135	0.075	✓	8	<0.002	0.010	0.007	✓
Cowaramup	6	0.012	0.020	0.014	✓	2	49	49	49	✓	6	0.104	0.175	0.137	✓	6	0.004	0.010	0.007	✓
Dalyellup	8	<0.008	0.060	<0.008	✓	4	81	84	83	✓	8	0.131	1.200	0.382	(3)	8	0.008	0.085	0.020	✓
Dardanup	7	<0.008	<0.008	<0.008	✓	4	26	28	27	✓	7	0.008	0.026	0.016	✓	7	<0.002	<0.002	<0.002	✓
Darkin	4	0.014	0.030	0.018	✓	Refer to Collie				4	0.055	0.109	0.076	✓	4	<0.002	0.008	0.005	✓	
Donnybrook	5	0.036	0.080	0.064	✓	3	67	82	73	✓	5	0.014	0.045	0.031	✓	5	0.002	0.100	0.027	✓
Dunsborough	7	<0.008	0.060	0.020	✓	4	42	62	55	✓	7	0.006	0.040	0.014	✓	7	<0.002	<0.002	<0.002	✓
Dwellingup	8	0.170	0.420	0.293	(1)	4	29	30	30	✓	8	0.065	0.196	0.122	✓	8	0.002	0.006	0.004	✓
Eaton	4	<0.008	<0.008	<0.008	✓	2	120	122	121	✓	4	0.085	0.188	0.132	✓	4	0.002	0.004	0.003	✓
Greenbushes	4	<0.008	0.016	<0.008	✓	4	57	84	70	✓	4	0.085	0.156	0.110	✓	4	0.002	0.014	0.009	✓
Harvey	4	<0.008	0.120	0.044	✓	Refer to Waroona				4	0.040	0.095	0.065	✓	4	<0.002	0.008	0.004	✓	
Hester TWS	4	0.050	0.075	0.064	✓	4	39	51	44	✓	4	0.101	0.480	0.310	(3)	4	<0.002	0.010	0.007	✓
Kirup	4	0.010	0.030	0.019	✓	4	39	51	45	✓	4	0.080	0.172	0.122	✓	4	<0.002	0.004	0.003	✓
Logue Brook	4	<0.008	0.034	0.021	✓	4	22	112	60	✓	4	0.115	0.420	0.274	✓	4	0.008	0.016	0.012	✓
Mandurah	12	<0.008	0.180	0.038	✓	4	31	99	72	✓	12	0.070	1.200	0.215	✓	12	<0.002	0.146	0.018	✓
Manjimup	14	<0.008	0.080	0.032	✓	6	28	45	37	✓	14	0.125	0.550	0.326	(3)	14	0.002	0.048	0.014	✓
Margaret River	8	0.008	0.028	0.016	✓	4	43	46	44	✓	8	0.138	0.600	0.313	(3)	8	0.008	0.024	0.013	✓
Mullalyup	4	0.012	0.028	0.020	✓	Refer to Kirup				4	0.103	0.200	0.148	✓	4	<0.002	0.012	0.006	✓	
Myalup	3	<0.008	0.022	0.015	✓	2	67	388	228	✓	4	0.085	0.136	0.107	✓	4	<0.002	0.038	0.012	✓
Nannup	8	0.022	0.120	0.052	✓	4	23	42	33	✓	8	0.030	0.055	0.041	✓	8	<0.002	0.004	<0.002	✓
North Dandalup	3	0.018	0.055	0.030	✓	Refer to Hills Direct (Perth Metropolitan)				4	0.050	0.240	0.104	✓	4	<0.002	0.004	<0.002	✓	
Northcliffe	4	0.095	0.180	0.124	✓	4	23	28	26	✓	4	0.008	0.460	0.127	✓	4	0.006	0.016	0.011	✓
Park Ridge	8	0.010	0.026	0.017	✓	4	125	164	136	✓	8	0.169	0.320	0.230	✓	8	0.016	0.028	0.019	✓
Pemberton	8	0.016	0.280	0.127	✓	4	37	46	43	✓	8	0.010	0.440	0.125	✓	8	0.004	0.070	0.028	✓
Peppermint Grove	4	<0.008	<0.008	<0.008	✓	2	51	56	54	✓	4	0.055	0.220	0.126	✓	4	<0.002	0.006	0.003	✓
Pinjarra	4	0.012	0.050	0.030	✓	Refer to Hills Direct (Perth Metropolitan)				4	0.050	0.131	0.088	✓	4	<0.002	0.006	0.003	✓	
Preston Beach	8	<0.008	<0.008	<0.008	✓	4	292	310	302	✓	8	0.010	0.018	0.013	✓	8	<0.002	<0.002	<0.002	✓
Quinninup	8	0.120	0.670	0.309	(2)	4	42	53	46	✓	8	0.012	0.600	0.295	✓	8	0.008	0.100	0.052	✓
Walpole	8	0.026	0.590	0.191	✓	4	33	57	47	✓	8	0.008	0.065	0.025	✓	8	0.010	0.050	0.020	✓
Waroona	5	0.030	0.160	0.068	✓	1	36	36	36	✓	5	0.024	0.155	0.079	✓	5	<0.002	0.006	0.004	✓
Yarloop	15	0.022	0.160	0.057	✓	4	16	32	23	✓	16	0.138	0.550	0.265	✓	16	<0.002	0.006	<0.002	✓

(1) Elevated aluminium at Dwellingup is a natural characteristic of the source supplying the locality (2) Acid-soluble aluminium present at Quinninup originates from the addition of alum for water treatment purposes. (3) At Dalyellup, Hester TWS, Manjimup and Margaret River, elevated iron is a natural characteristic of the source supplying these localities.

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Table 16 Aesthetic Variables

South West Locality	pH				TDS				True Colour				Turbidity							
	Samples Taken	Value (pH units)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Value (TCU)			Guideline Met	Samples Taken	Value (NTU)			Guideline Met
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean			Min	Max	Mean	
Allanson	2	6.62	6.87	6.75	✓	Refer to Collie				2	2	3	3	✓	2	0.6	0.7	0.7	✓	
Augusta	16	6.05	7.43	6.78	✓	8	265	886	574	✓	16	<1	<1	<1	✓	16	<0.1	0.4	<0.1	✓
Australind	6	6.17	7.00	6.75	✓	4	392	482	454	✓	6	<1	2	<1	✓	6	0.3	0.5	0.4	✓
Balingup	6	7.43	8.12	7.76	✓	6	274	390	348	✓	6	2	3	2	✓	6	0.3	0.5	0.4	✓
Binningup	5	7.15	8.74	7.77	✓	2	200	1020	610	✓	5	<1	15	6	✓	5	<0.1	0.5	0.2	✓
Boyanup	4	7.47	7.67	7.60	✓	3	372	382	377	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Boyup Brook	4	7.18	7.84	7.35	✓	4	179	287	234	✓	4	2	7	5	✓	4	0.8	3.4	1.6	✓
Bridgetown	12	6.01	6.96	6.67	✓	8	166	209	192	✓	12	1	11	5	✓	12	1.0	8.2	2.9	✓
Brunswick Junction	8	6.57	7.05	6.84	✓	4	181	460	262	✓	8	<1	2	<1	✓	8	0.1	0.9	0.3	✓
Capel	8	6.53	6.81	6.63	✓	4	249	256	252	✓	8	<1	<1	<1	✓	8	0.1	0.2	0.1	✓
Collie	8	6.58	7.12	6.83	✓	4	111	208	165	✓	8	1	3	2	✓	8	0.3	0.8	0.6	✓
Cowaramup	6	6.88	7.27	7.02	✓	2	225	234	230	✓	6	2	4	3	✓	6	0.4	0.9	0.7	✓
Dalyellup	8	6.09	7.69	7.00	✓	4	376	515	457	✓	8	<1	<1	<1	✓	8	0.2	1.8	0.6	✓
Dardanup	7	5.96	6.25	6.09	(2)	4	177	196	184	✓	7	<1	<1	<1	✓	7	<0.1	0.2	<0.1	✓
Darkin	4	8.48	9.61	9.11	(1)	Refer to Collie				4	2	3	3	✓	4	0.3	0.6	0.4	✓	
Donnybrook	5	7.08	8.13	7.63	✓	3	459	604	534	✓	5	<1	<1	<1	✓	5	0.2	2.0	0.7	✓
Dunsborough	7	7.65	8.06	7.94	✓	4	409	514	441	✓	7	<1	<1	<1	✓	7	<0.1	0.3	<0.1	✓
Dwellingup	8	6.21	7.21	6.89	✓	4	144	179	167	✓	8	<1	12	3	✓	8	0.5	3.0	1.3	✓
Eaton	4	6.99	7.52	7.19	✓	2	385	391	388	✓	4	<1	<1	<1	✓	4	0.2	0.4	0.3	✓
Greenbushes	4	7.39	8.35	7.90	✓	4	261	383	321	✓	4	2	3	3	✓	4	0.3	2.8	1.0	✓
Harvey	4	6.59	10.25	8.07	✓	Refer to Waroona				4	1	2	1	✓	4	0.3	1.0	0.6	✓	
Hester TWS	4	7.19	9.53	7.81	✓	4	178	225	202	✓	4	1	6	3	✓	4	0.7	4.2	2.8	✓
Kirup	4	6.59	6.97	6.79	✓	4	265	332	301	✓	4	2	3	3	✓	4	0.4	4.0	1.4	✓
Logue Brook	4	6.01	7.87	6.92	✓	4	122	377	216	✓	4	<1	2	<1	✓	4	0.7	1.2	0.9	✓
Mandurah	12	6.74	8.46	7.76	✓	4	162	318	240	✓	12	1	2	1	✓	12	0.1	20.0	2.4	✓
Manjimup	14	6.47	9.21	6.86	✓	6	151	213	174	✓	14	2	12	7	✓	14	0.5	2.0	1.0	✓
Margaret River	8	6.41	8.11	6.95	✓	4	208	240	224	✓	8	1	6	3	✓	8	0.6	2.0	1.2	✓
Mullalyup	4	6.28	7.23	6.72	✓	Refer to Kirup				4	2	3	3	✓	4	0.5	1.6	0.9	✓	
Myalup	4	7.17	8.80	8.08	✓	2	207	884	546	✓	4	<1	13	4	✓	4	0.3	0.9	0.5	✓
Nannup	8	6.91	7.21	7.09	✓	4	156	239	203	✓	8	1	5	2	✓	8	0.1	0.3	0.2	✓
North Dandalup	4	6.91	9.79	8.29	✓	Refer to Hills Direct (Perth Metropolitan)				4	<1	5	2	✓	4	0.2	1.8	0.8	✓	
Northcliffe	4	4.76	6.97	5.88	(2)	4	98	168	132	✓	4	<1	60	15	✓	4	0.1	4.6	1.3	✓
Park Ridge	8	7.95	8.16	8.01	✓	4	480	714	557	✓	8	2	5	3	✓	8	0.2	0.7	0.4	✓
Pemberton	8	6.56	7.28	6.81	✓	4	191	214	203	✓	8	<1	10	2	✓	8	0.2	1.4	0.6	✓
Peppermint Grove	4	6.67	6.81	6.76	✓	2	267	279	273	✓	4	<1	2	<1	✓	4	<0.1	0.2	<0.1	✓
Pinjarra	4	7.31	9.22	8.19	✓	Refer to Hills Direct (Perth Metropolitan)				4	1	4	2	✓	4	0.3	0.8	0.6	✓	
Preston Beach	8	6.99	7.62	7.24	✓	4	694	718	708	✓	8	1	10	5	✓	8	<0.1	0.3	<0.1	✓
Quinninup	8	6.11	7.57	6.91	✓	4	217	504	369	✓	8	2	23	10	✓	8	0.2	2.0	1.2	✓
Walpole	8	6.52	6.85	6.68	✓	4	313	401	355	✓	8	<1	15	5	✓	8	0.2	1.2	0.5	✓
Waroona	5	7.46	9.60	8.40	✓	1	130	130	130	✓	5	1	3	2	✓	5	0.1	2.0	0.7	✓
Yarloop	16	5.85	7.03	6.21	(2)	4	91	157	118	✓	16	3	13	6	✓	16	0.6	9.0	2.0	✓

(1) Elevated pH is caused by leaching of calcium carbonate from the protective cement lining of the pipes after long water transit times. This characteristic is found in a number of our localities on our large water supply schemes. Experience shows that pH at this level is not objectionable to our customers. (2) Low pH is a characteristic of the source supplying the locality. Experience shows that at this level the pH is not objectionable to our customers.

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Table 17 Health Related Variables

Great Southern	Total Coliforms				Thermotolerant Coliforms				Thermophilic Naegleria			Fluoride			Hydrocarbons		Metals		
	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with Thermophilic Naegleria	Requirement Met	Samples Taken	Concentration (mg/L)			Samples Taken	Guideline Met	Samples Taken	Guideline Met
													Min	Max	Mean				
Albany	144	0	0	✓	144	0	0	✓	72	0	✓	53	0.15	1.00	0.73	4	✓	14	✓
Boddington	48	0	0	✓	48	0	0	✓	24	0	✓	12	0.40	0.90	0.71	1	✓	6	✓
Borden	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	(2)	2	✓	
Bremer Bay	48	0	0	✓	48	0	0	✓	24	0	✓				(1)	1	✓	8	✓
Brookton	48	2	8	✓	48	0	0	✓	24	0	✓	12	0.25	0.80	0.57	1	✓	4	✓
Broomehill	12	0	0	✓	12	0	0	✓	5	0	✓	12	0.50	0.90	0.71	2	✓	1	✓
Bullaring	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	(2)	1	✓	
Cranbrook	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	(2)	6	✓	
Cuballing	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.45	0.90	0.72	(2)	4	✓	
Denmark	72	0	0	✓	72	0	0	✓	18	0	✓				(1)	3	✓	9	✓
Dudin TWS	12	1	1	✓	12	0	0	✓	6	0	✓				(1)	(2)	1	✓	
Dumbleyung	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.40	0.90	0.72	(2)	2	✓	
Frankland	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	(2)	2	✓	
Gnowangerup	48	0	0	✓	48	0	0	✓	23	0	✓	12	0.35	0.85	0.61	2	✓	2	✓
Harrismith TWS	12	2	1	✓	12	0	0	✓	6	0	✓	12	0.35	0.90	0.71	(2)	1	✓	
Highbury	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.45	0.90	0.72	(2)	1	✓	
Hopetoun	46	0	0	✓	46	0	0	✓	24	0	✓				(1)	2	✓	2	✓
Hyden	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	(2)	3	✓	
Jerramungup	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	3	✓	3	✓
Karlgarin	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	(2)	2	✓	
Katanning	57	0	0	✓	57	0	0	✓	24	0	✓	53	0.40	0.90	0.70	(2)	2	✓	
Kendenup	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.45	0.95	0.75	1	✓	1	✓
Kojonup	48	0	0	✓	48	0	0	✓	24	0	✓	12	0.20	0.90	0.70	2	✓	2	✓
Kondinin	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.55	0.85	0.73	(2)	2	✓	
Kukerin	12	1	2	✓	12	0	0	✓	6	0	✓	12	0.20	0.55	0.35	(2)	2	✓	
Kulin	11	0	0	✓	11	0	0	✓	6	0	✓	11	0.60	0.85	0.75	1	✓	1	✓
Lake Grace	47	0	0	✓	47	0	0	✓	24	0	✓	12	0.40	0.85	0.71	(2)	4	✓	
Lake King	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	2	✓	2	✓
Mt Barker	47	0	0	✓	47	0	0	✓	12	0	✓	52	0.35	1.00	0.76	2	✓	2	✓
Munglinup	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	1	✓	2	✓
Muradup	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.60	0.80	0.70	1	✓	1	✓
Narrakup	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.55	0.95	0.78	(2)	1	✓	
Narrogin	60	0	0	✓	60	0	0	✓	30	0	✓	48	0.35	0.90	0.73	(2)	2	✓	
Newdegate	11	0	0	✓	11	0	0	✓	6	0	✓				(1)	2	✓	2	✓
Nyabing	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.15	0.30	0.17	2	✓	2	✓
Ongerup	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	2	✓	2	✓
Pingaring	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.30	0.60	0.44	(2)	2	✓	
Pingelly	48	0	0	✓	48	0	0	✓	24	0	✓	12	0.45	0.90	0.73	(2)	1	✓	
Pingrup	12	0	0	✓	12	0	0	✓	7	0	✓				(1)	2	✓	2	✓
Popanyinning	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.45	0.90	0.73	(2)	1	✓	
Ravensthorpe	11	0	0	✓	11	0	0	✓	5	0	✓				(1)	4	✓	7	✓
Rocky Gully	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	(2)	2	✓	
Tambellup	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.30	0.75	0.48	2	✓	2	✓
Tincurrin TWS	13	1	3	✓	13	0	0	✓	7	2	✓				(1)	(2)	1	✓	
Varley	12	0	0	✓	12	0	0	✓	6	0	✓				(1)	2	✓	2	✓
Wagin	48	0	0	✓	48	0	0	✓	24	0	✓	12	0.45	0.90	0.72	(2)	2	✓	
Wandering	12	0	0	✓	12	0	0	✓	6	0	✓	12	<0.10	0.85	0.51	(2)	3	✓	
Wickepin TWS	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.40	0.90	0.72	(2)	1	✓	
Williams	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.15	0.90	0.71	(2)	1	✓	
Woodanilling	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.50	0.90	0.74	1	✓	1	✓
Yealering	12	0	0	✓	12	0	0	✓	6	0	✓	12	0.40	0.90	0.72	1	✓	1	✓

(1) Non-fluoridated locality. (2) No samples required in this 12 month period.

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Table 18 Health Related Variables

Great Southern	Health Related Variables															
	Locality	Nitrate				Pesticides		Radiological		Trihalomethanes					Other Health Related	
		Concentration (mg/L)	Guideline Met	Samples Taken	Guideline Met	Samples Taken	Guideline Met	Samples Taken	Guideline Met	Concentration (ug/L)	Requirement Met	Samples Taken	Guideline Met			
Min	Max	Mean	Samples Taken	Guideline Met	Samples Taken	Min	Max	Mean	Requirement Met	Samples Taken	Guideline Met					
Albany	10	<0.05	0.2	0.1	✓	13	✓	1	✓	16	53	135	98	✓	(1)	
Boddington	3	<0.05	0.1	<0.05	✓	6	✓		(1)	3	140	263	204	✓	(1)	
Borden	2	0.3	0.4	0.4	✓	4	✓		(1)	2	13	57	35	✓	(1)	
Bremer Bay	2	4.3	4.8	4.6	✓	4	✓		(1)	3	46	139	90	✓	(1)	
Brookton	2	0.1	1.1	0.6	✓	3	✓	2	✓	5	78	361	188	✓	2 ✓	
Broomehill	2	<0.05	<0.05	<0.05	✓	Refer to Narrogin				11	79	152	114	✓	2 ✓	
Bullaring	Refer to Narrogin					4	62	101	83	✓					(1)	
Cranbrook	4	<0.05	0.1	<0.05	✓	12	✓		(1)	4	58	112	86	✓	(1)	
Cuballing	Refer to Narrogin					2	108	206	157	✓					(1)	
Denmark	2	0.1	0.2	0.1	✓	8	✓		(1)	6	78	318	148	✓	1 ✓	
Dudin TWS	Refer to Narrogin					4	74	198	125	✓					(1)	
Dumbleyung	2	0.1	0.2	0.1	✓	4	✓		(1)	4	64	159	124	✓	(1)	
Frankland	2	<0.05	<0.05	<0.05	✓	3	✓		(1)	2	50	115	108	✓	(1)	
Gnowangerup	2	<0.05	<0.05	<0.05	✓	1	✓	2	✓	4	101	175	129	✓	2 ✓	
Harrismith TWS	Refer to Narrogin					4	142	232	194	✓					(1)	
Highbury	Refer to Narrogin					4	64	152	91	✓					(1)	
Hopetoun	2	0.4	0.7	0.5	✓	4	✓		(1)	2	10	28	19	✓	1 ✓	
Hyden	4	0.1	0.2	0.1	✓	4	✓		(1)	4	96	247	170	✓	(1)	
Jerramungup	2	<0.05	0.1	0.1	✓	2	✓	2	✓	2	27	43	35	✓	1 ✓	
Karlgarin	2	<0.05	0.1	<0.05	✓	4	✓		(1)	4	105	179	140	✓	(1)	
Katanning	4	<0.05	<0.05	<0.05	✓		(1)	1	✓	4	90	172	121	✓	1 ✓	
Kendenup	Refer to Mt Barker					6	91	232	197	✓					1 ✓	
Kojonup	3	<0.05	0.1	<0.05	✓	1	✓	1	✓	4	46	135	95	✓	1 ✓	
Kondinin	2	0.1	0.2	0.1	✓	3	✓		(1)	4	120	165	134	✓	(1)	
Kukerin	2	0.1	0.1	0.1	✓	1	✓		(1)	4	62	110	75	✓	(1)	
Kulin	2	<0.05	0.2	0.1	✓	Refer to Mt Barker				3	88	171	133	✓	1 ✓	
Lake Grace	2	0.1	0.1	0.1	✓	3	✓	1	✓	8	137	192	155	✓	(1)	
Lake King	1	1.6	1.6	1.6	✓	1	✓	1	✓	4	131	215	166	✓	1 ✓	
Mt Barker	1	0.1	0.1	0.1	✓	1	✓		(1)	4	69	200	147	✓	1 ✓	
Munglinup	2	<0.05	<0.05	<0.05	✓	1	✓		(1)	4	57	69	62	✓	1 ✓	
Muradup	Refer to Kojonup					4	64	83	75	✓					1 ✓	
Narrakup	2	0.1	0.2	0.1	✓	Refer to Collie (SW Region)				2	110	142	193	✓	(1)	
Narrogin	4	<0.05	0.1	0.1	✓	3	✓		(1)	4	74	147	105	✓	(1)	
Newdegate	3	<0.05	0.2	0.1	✓	1	✓	1	✓	5	22	60	46	✓	1 ✓	
Nyabing	2	0.1	0.2	0.1	✓	1	✓	1	✓	4	55	102	71	✓	1 ✓	
Ongerup	2	0.1	0.2	0.2	✓	10	✓	1	✓	2	56	103	80	✓	1 ✓	
Pingaring	2	0.2	0.3	0.3	✓	1	✓		(1)	4	49	56	54	✓	(1)	
Pingelly	Refer to Narrogin					4	146	272	208	✓					(1)	
Pingrup	2	<0.05	0.3	0.1	✓	1	✓	1	✓	4	31	85	51	✓	1 ✓	
Popanyinning	Refer to Narrogin					1	209	209	209	✓					(1)	
Ravensthorpe	4	<0.05	0.1	<0.05	✓	6	✓	2	✓	4	53	141	92	✓	1 ✓	
Rocky Gully	2	<0.05	0.1	<0.05	✓	1	✓		(1)	2	32	66	66	✓	(1)	
Tambellup	2	<0.05	<0.05	<0.05	✓	1	✓	1	✓	4	71	84	80	✓	1 ✓	
Tincurrin TWS	Refer to Narrogin					4	47	190	102	✓					(1)	
Varley	2	<0.05	0.1	<0.05	✓	4	✓	1	✓	4	32	118	85	✓	1 ✓	
Wagin	2	<0.05	0.3	0.1	✓	4	✓		(1)	12	70	193	125	✓	(1)	
Wandering	2	0.1	0.1	0.1	✓	2	✓		(1)	4	29	243	169	✓	(1)	
Wickepin TWS	Refer to Narrogin					8	92	235	153	✓					(1)	
Williams	Refer to Collie (SW Region)					2	107	129	118	✓					(1)	
Woodanilling	Refer to Narrogin					4	89	306	183	✓					1 ✓	
Yealering	Refer to Narrogin					4	128	196	157	✓					1 ✓	

(1) No samples required in this 12 month period.

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Table 19 Aesthetic Variables

Great Southern	Aesthetic Variables																			
	Aluminium					Hardness					Iron					Manganese				
	Locality	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)		
Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	
Albany	25	<0.008	0.080	0.013	✓	10	42	282	209	✓	26	<0.003	0.380	0.130	✓	26	<0.002	0.004	<0.002	✓
Boddington	7	0.014	0.020	0.017	✓	3	49	54	52	✓	7	0.060	0.120	0.079	✓	7	0.002	0.026	0.013	✓
Borden	5	0.050	0.085	0.066	✓	2	24	30	27	✓	6	0.018	0.045	0.026	✓	6	<0.002	0.004	<0.002	✓
Bremer Bay	6	<0.008	0.010	<0.008	✓	2	179	193	186	✓	6	0.006	0.055	0.021	✓	6	<0.002	<0.002	<0.002	✓
Brookton	4	<0.008	0.032	0.016	✓	2	56	97	77	✓	4	0.085	0.200	0.129	✓	4	0.004	0.006	0.006	✓
Broomehill	6	0.012	0.046	0.022	✓	2	57	73	65	✓	6	0.075	0.280	0.158	✓	6	0.002	0.040	0.011	✓
Bullaring	4	<0.008	0.046	0.020	✓	Refer to Narrogin					4	0.030	0.400	0.173	✓	4	<0.002	0.044	0.016	✓
Cranbrook	8	0.014	0.032	0.021	✓	4	12	14	13	✓	8	0.045	0.176	0.110	✓	8	<0.002	0.008	0.004	✓
Cuballing	2	<0.008	0.016	<0.008	✓	Refer to Narrogin					2	0.102	0.147	0.125	✓	2	0.004	0.006	0.005	✓
Denmark	4	0.070	0.110	0.084	✓	2	62	64	63	✓	4	0.018	0.149	0.057	✓	4	<0.002	0.006	0.003	✓
Dudin TWS	2	0.012	0.016	0.014	✓	Refer to Narrogin					2	0.109	0.128	0.119	✓	2	0.002	0.004	0.003	✓
Dumbleyung	6	0.014	0.026	0.021	✓	2	65	98	82	✓	6	0.045	0.220	0.143	✓	6	<0.002	0.020	0.010	✓
Frankland	6	<0.008	0.018	0.011	✓	2	9	11	10	✓	6	0.055	0.260	0.141	✓	6	<0.002	0.006	<0.002	✓
Gnowangerup	6	0.014	0.028	0.022	✓	2	63	78	71	✓	6	0.080	0.189	0.131	✓	6	0.002	0.006	0.004	✓
Harrismith TWS	4	<0.008	0.046	0.020	✓	Refer to Narrogin					4	0.060	0.340	0.141	✓	4	<0.002	0.036	0.011	✓
Highbury	2	<0.008	0.014	<0.008	✓	Refer to Narrogin					2	0.080	0.142	0.111	✓	2	0.004	0.010	0.007	✓
Hopetoun	6	<0.008	0.390	0.067	✓	2	130	245	188	✓	6	0.006	0.085	0.023	✓	6	0.004	0.012	0.007	✓
Hyden	9	0.020	0.100	0.056	✓	4	14	30	25	✓	9	0.045	1.000	0.274	✓	9	<0.002	0.014	0.006	✓
Jerramungup	6	0.090	0.140	0.110	✓	2	12	14	13	✓	6	0.014	0.085	0.036	✓	6	<0.002	<0.002	<0.002	✓
Karlgarin	6	0.020	0.080	0.050	✓	2	60	83	72	✓	6	0.065	0.260	0.133	✓	6	<0.002	0.004	<0.002	✓
Katanning	8	0.016	0.030	0.021	✓	4	54	71	63	✓	8	0.070	0.280	0.157	✓	8	0.004	0.016	0.010	✓
Kendenup	4	0.010	0.090	0.051	✓	Refer to Mt Barker					4	0.020	0.075	0.036	✓	4	<0.002	<0.002	<0.002	✓
Kojonup	7	0.014	0.032	0.021	✓	3	15	78	51	✓	7	0.065	0.168	0.114	✓	7	0.002	0.014	0.005	✓
Kondinin	6	0.024	0.065	0.037	✓	2	64	77	71	✓	6	0.055	0.145	0.089	✓	6	<0.002	0.008	0.004	✓
Kukerin	6	0.020	0.040	0.028	✓	2	31	44	38	✓	6	0.035	0.137	0.061	✓	6	<0.002	0.006	<0.002	✓
Kulin	5	0.012	0.030	0.018	✓	2	62	64	63	✓	5	0.060	0.360	0.170	✓	5	<0.002	0.016	0.008	✓
Lake Grace	9	0.014	0.044	0.029	✓	2	63	78	71	✓	10	0.018	0.104	0.060	✓	10	<0.002	0.004	<0.002	✓
Lake King	5	0.030	0.070	0.051	✓	1	49	49	49	✓	5	0.012	0.124	0.070	✓	5	<0.002	<0.002	<0.002	✓
Mt Barker	3	<0.008	0.300	0.143	✓	1	49	49	49	✓	3	0.075	0.095	0.082	✓	3	<0.002	0.006	0.003	✓
Munglinup	6	0.014	1.100	0.381	(1)	2	18	20	19	✓	6	0.045	0.075	0.060	✓	6	0.002	0.006	0.005	✓
Muradup	4	0.016	0.020	0.019	✓	Refer to Kojonup					4	0.055	0.106	0.078	✓	4	<0.002	<0.002	<0.002	✓
Narrikup	6	<0.008	<0.008	<0.008	✓	2	232	271	252	✓	6	0.050	0.360	0.200	✓	6	<0.002	0.004	<0.002	✓
Narrogin	8	<0.008	0.020	0.013	✓	4	44	54	48	✓	8	0.060	0.195	0.109	✓	8	0.004	0.012	0.009	✓
Newdegate	6	0.180	0.380	0.275	(1)	3	40	45	43	✓	7	0.035	0.320	0.131	✓	7	<0.002	0.006	<0.002	✓
Nyabing	6	0.020	0.085	0.048	✓	2	17	25	21	✓	6	0.065	0.280	0.115	✓	6	<0.002	0.010	0.005	✓
Ongerup	6	0.220	1.100	0.510	(2)	2	15	20	18	✓	6	0.030	0.112	0.073	✓	6	<0.002	0.018	0.008	✓
Pingaring	6	0.014	0.026	0.019	✓	2	31	51	41	✓	6	0.030	0.065	0.042	✓	6	<0.002	<0.002	<0.002	✓
Pingelly	4	0.010	0.028	0.020	✓	Refer to Narrogin					4	0.085	1.800	0.525	(3)	4	0.002	0.014	0.007	✓
Pingrup	6	0.026	0.075	0.047	✓	2	32	35	34	✓	6	0.022	0.400	0.135	✓	6	<0.002	0.024	0.009	✓
Popanyinning	4	<0.008	0.016	0.012	✓	Refer to Narrogin					4	0.090	0.150	0.112	✓	4	0.004	0.006	0.005	✓
Ravensthorpe	6	0.080	0.200	0.134	✓	4	25	57	39	✓	6	0.050	0.380	0.162	✓	8	<0.002	0.014	0.006	✓
Rocky Gully	4	0.022	0.036	0.031	✓	2	11	11	11	✓	4	0.060	0.095	0.079	✓	4	<0.002	0.002	<0.002	✓
Tambellup	6	0.012	0.028	0.022	✓	2	34	63	49	✓	6	0.065	0.110	0.083	✓	6	0.002	0.004	0.003	✓
Tincurrin TWS	2	0.014	0.032	0.023	✓	Refer to Narrogin					2	0.220	0.420	0.320	(3)	2	0.010	0.022	0.016	✓
Varley	6	0.044	0.530	0.244	(2)	2	16	18	17	✓	6	0.065	0.111	0.088	✓	6	<0.002	0.008	0.003	✓
Wagin	6	<0.008	0.080	0.024	✓	2	16	18	17	✓	6	0.060	0.400	0.144	✓	6	0.004	0.012	0.007	✓
Wandering	6	0.008	0.018	0.014	✓	2	54	57	56	✓	6	0.024	0.171	0.112	✓	6	0.004	0.012	0.007	✓
Wickepin TWS	5	<0.008	0.020	0.009	✓	Refer to Narrogin					5	0.065	0.148	0.095	✓	5	0.004	0.014	0.010	✓
Williams	4	<0.008	0.020	<0.008	✓	Refer to Collie (SW Region)					4	0.055	0.065	0.059	✓	4	0.006	0.040	0.018	✓
Woodanilling	4	0.020	0.036	0.029	✓	Refer to Narrogin					4	0.065	0.240	0.137	✓	4	0.004	0.014	0.011	✓
Yealering	4	<0.008	0.016	<0.008	✓	Refer to Narrogin					4	0.055	0.118	0.081	✓	4	<0.002	0.012	0.005	✓

(1) Acid-soluble aluminium present at Munglinup and Newdegate originates from the addition of alum for water treatment purposes. (2) Elevated aluminium is a natural characteristic of these sources. (3) Elevated iron at Pingelly and Tincurrin is a result of disturbing sediment in the pipes.

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Table 20 Aesthetic Variables

Great Southern	Aesthetic Variables																			
	pH					TDS					True Colour					Turbidity				
	Locality	Samples Taken	Value (pH units)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Value (TCU units)			Guideline Met	Samples Taken	Value (NTU units)		
Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	Min			Max	Mean	
Albany	26	6.75	8.02	7.48	✓	10	377	586	521	✓	26	<1	3	<1	✓	26	<0.1	1.2	0.4	✓
Boddington	7	7.01	7.88	7.40	✓	3	208	218	214	✓	7	1	2	2	✓	7	0.3	1.4	0.6	✓
Borden	6	7.12	7.42	7.29	✓	2	213	246	230	✓	6	1	2	1	✓	6	0.5	0.6	0.5	✓
Bremer Bay	6	7.69	7.81	7.76	✓	2	904	944	924	✓	6	<1	2	<1	✓	6	<0.1	0.2	<0.1	✓
Brookton	4	6.78	8.88	7.84	✓	2	232	462	347	✓	4	1	2	2	✓	4	0.6	0.9	0.8	✓
Broomehill	6	7.09	9.09	7.69	✓	2	227	253	240	✓	6	2	4	3	✓	6	0.4	3.4	1.0	✓
Bullaring	4	9.48	9.74	9.57	(1)	Refer to Narrogin					4	<1	2	2	✓	4	0.2	1.4	0.7	✓
Cranbrook	8	7.25	7.65	7.38	✓	4	63	87	76	✓	8	3	4	4	✓	8	1.6	7.0	3.7	✓
Cuballing	2	7.23	7.60	7.42	✓	Refer to Narrogin					2	2	2	2	✓	2	0.4	0.6	0.5	✓
Denmark	4	5.97	6.22	6.10	(2)	2	401	484	443	✓	4	1	3	2	✓	4	0.1	1.2	0.5	✓
Dudin TWS	2	8.67	8.76	8.72	(1)	Refer to Narrogin					2	2	3	3	✓	2	0.2	0.4	0.3	✓
Dumbleyung	6	8.75	9.46	9.15	(1)	2	239	304	272	✓	6	<1	2	<1	✓	6	0.2	1.0	0.6	✓
Frankland	6	5.94	9.32	7.37	✓	2	47	51	49	✓	6	2	6	4	✓	6	0.7	1.8	1.2	✓
Gnowangerup	6	7.38	8.28	7.82	✓	2	239	258	249	✓	6	2	3	3	✓	6	0.4	1.2	0.6	✓
Harrismith TWS	4	9.07	9.34	9.24	(1)	Refer to Narrogin					4	1	3	2	✓	4	0.2	2.0	0.7	✓
Highbury	2	6.68	7.18	6.93	✓	Refer to Narrogin					2	2	2	2	✓	2	0.5	0.8	0.7	✓
Hopetoun	6	5.93	6.99	6.44	(2)	2	777	850	814	✓	6	<1	3	<1	✓	6	0.4	1.4	0.8	✓
Hyden	9	6.11	7.74	7.01	✓	4	61	108	82	✓	9	<1	7	3	✓	9	0.5	7.0	3.7	✓
Jerramungup	6	6.64	8.48	7.29	✓	2	88	106	97	✓	6	<1	2	<1	✓	6	0.1	0.3	0.2	✓
Karlgarin	6	7.64	8.82	8.24	✓	2	200	276	238	✓	6	<1	2	<1	✓	6	0.8	4.2	2.3	✓
Katanning	8	6.79	7.66	7.23	✓	4	221	250	235	✓	8	2	6	3	✓	8	0.4	1.8	0.9	✓
Kendenup	4	7.60	8.35	7.95	✓	Refer to Mt Barker					4	<1	3	2	✓	4	0.2	0.3	0.3	✓
Kojonup	7	6.98	8.71	7.68	✓	3	94	261	196	✓	7	2	3	2	✓	7	0.3	4.8	1.0	✓
Kondinin	6	8.06	9.34	8.65	(1)	2	236	264	250	✓	6	<1	1	<1	✓	6	0.5	3.0	1.5	✓
Kukerin	6	7.05	7.79	7.29	✓	2	107	155	131	✓	6	1	2	2	✓	6	0.3	2.8	1.4	✓
Kulin	5	9.31	9.50	9.37	(1)	2	216	227	222	✓	5	2	2	2	✓	5	0.2	1.6	0.6	✓
Lake Grace	10	8.94	9.53	9.19	(1)	2	232	258	245	✓	10	<1	2	<1	✓	10	0.1	0.3	0.2	✓
Lake King	5	7.27	7.50	7.35	✓	1	206	206	206	✓	5	1	2	1	✓	5	0.5	2.8	1.3	✓
Mt Barker	3	7.29	7.78	7.58	✓	1	280	280	280	✓	3	<1	9	4	✓	3	0.3	0.9	0.6	✓
Munglinup	6	6.41	7.43	7.00	✓	2	84	92	88	✓	6	<1	<1	<1	✓	6	1.6	2.0	1.8	✓
Muradup	4	7.53	7.93	7.74	✓	Refer to Kojonup					4	1	2	2	✓	4	0.2	0.4	0.3	✓
Narrakup	6	7.52	7.90	7.65	✓	2	542	585	564	✓	6	<1	2	<1	✓	6	0.2	1.6	0.7	✓
Narrogin	8	6.63	7.33	6.92	✓	4	195	223	209	✓	8	1	3	2	✓	8	0.5	1.4	0.9	✓
Newdegate	7	7.56	8.83	7.99	✓	3	169	195	186	✓	7	<1	<1	<1	✓	7	0.7	8.2	3.2	✓
Nyabing	6	6.93	8.69	7.51	✓	2	89	119	104	✓	6	1	2	2	✓	6	2.8	4.6	3.8	✓
Ongerup	6	6.65	6.97	6.80	✓	2	103	129	116	✓	6	<1	4	2	✓	6	0.6	2.6	1.9	✓
Pingaring	6	7.25	8.20	7.51	✓	2	118	180	149	✓	6	<1	1	<1	✓	6	0.2	0.4	0.3	✓
Pingelly	4	7.86	8.97	8.37	✓	Refer to Narrogin					4	2	3	2	✓	4	0.2	0.9	0.5	✓
Pingrup	6	7.37	7.89	7.49	✓	2	105	129	117	✓	6	<1	4	<1	✓	6	0.5	3.0	2.0	✓
Popanyinning	4	7.54	7.99	7.78	✓	Refer to Narrogin					4	2	3	2	✓	4	0.3	1.0	0.7	✓
Ravensthorpe	8	7.25	8.21	7.70	✓	4	108	298	198	✓	6	<1	2	1	✓	6	0.5	5.2	2.7	✓
Rocky Gully	4	6.51	9.06	7.51	✓	2	67	82	75	✓	4	1	2	2	✓	4	0.6	1.4	1.0	✓
Tambellup	6	6.84	7.78	7.32	✓	2	123	235	179	✓	6	1	3	2	✓	6	0.3	1.8	0.8	✓
Tincurrin TWS	2	7.97	9.17	8.57	(1)	Refer to Narrogin					2	<1	2	<1	✓	2	0.9	1.2	1.1	✓
Varley	6	6.43	7.00	6.59	✓	2	73	81	77	✓	6	<1	2	2	✓	6	1.0	4.6	3.4	✓
Wagin	6	5.88	7.24	6.82	✓	2	64	78	71	✓	6	1	9	4	✓	6	0.5	6.8	2.0	✓
Wandering	6	6.49	8.04	7.53	✓	2	214	221	218	✓	6	2	2	2	✓	6	0.3	1.6	0.6	✓
Wickepin TWS	5	7.15	7.88	7.59	✓	Refer to Narrogin					5	1	3	2	✓	5	0.3	1.2	0.7	✓
Williams	4	6.78	7.09	6.94	✓	Refer to Collie (SW Region)					4	1	3	2	✓	4	0.5	1.4	0.8	✓
Woodanilling	4	7.12	8.18	7.60	✓	Refer to Narrogin					4	2	4	3	✓	4	0.3	1.2	0.7	✓
Yealering	4	9.17	9.51	9.33	(1)	Refer to Narrogin					4	1	2	2	✓	4	0.3	0.7	0.4	✓

(1) Elevated pH is caused by leaching of calcium carbonate from the protective cement lining of the pipes after long water transit times. This characteristic is found in a number of our localities on our large water supply schemes. Experience shows that pH at this level is not objectionable to our customers. (2) Low pH is a characteristic of the source supplying the locality. Experience shows that at this level the pH is not objectionable to our customers.

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Table 21 Health Related Variables

North West	Total Coliforms				Thermotolerant Coliforms				Thermophilic Naegleria			Fluoride			Hydrocarbons		Metals		
	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with > 0 cfu/100mL	Max cfu/100mL	Requirement Met	Samples Taken	Samples with Thermophilic Naegleria	Requirement Met	Concentration (mg/L)			Samples Taken	Guideline Met	Samples Taken	Guideline Met	
												Min	Max	Mean					
Argyle & Ord	13	0	0	✓	13	0	0	✓	13	0	✓			(1)	2	✓	2	✓	
Broome	78	1	26	✓	78	1	2	✓	78	0	✓	53	0.25	0.75	0.63	2	✓	6	✓
Burrup LNG	13	0	0	✓	13	0	0	✓	13	0	✓	13	0.55	0.60	0.59	1	✓	1	✓
Burrup Supply	13	0	0	✓	13	0	0	✓	13	0	✓	13	0.55	0.60	0.58	1	✓	1	✓
Camballin	12	0	0	✓	12	0	0	✓	12	0	✓				(1)	3	✓	6	✓
Cape Lambert TWS	13	0	0	✓	13	0	0	✓	13	0	✓	13	0.55	0.60	0.58	1	✓	1	✓
Derby	52	0	0	✓	52	0	0	✓	52	0	✓	64	0.40	0.65	0.57	2	✓	2	✓
Fitzroy Crossing	12	0	0	✓	12	0	0	✓	12	0	✓				(1)	1	✓	2	✓
Halls Creek	52	0	0	✓	52	0	0	✓	52	0	✓				(1)	2	✓	7	✓
Hedland	79	0	0	✓	79	0	0	✓	79	0	✓	51	0.40	0.55	0.48	2	✓	11	✓
Karratha	80	0	0	✓	80	0	0	✓	80	0	✓	53	0.25	0.70	0.58	3	✓	3	✓
Kununurra	52	0	0	✓	52	0	0	✓	52	0	✓				(1)	2	✓	2	✓
Marble Bar	12	0	0	✓	12	0	0	✓	12	0	✓				(1)	2	✓	9	✓
Newman	65	0	0	✓	65	0	0	✓	65	0	✓	1	0.60	0.60	0.60	2	✓	2	✓
Nullagine	12	0	0	✓	12	0	0	✓	12	0	✓				(1)	3	✓	14	✓
Onslow TWS	52	0	0	✓	52	0	0	✓	52	0	✓				(1)		(2)	8	✓
Point Samson	13	0	0	✓	13	0	0	✓	13	0	✓	13	0.55	0.60	0.59	1	✓	1	✓
Roebourne	53	0	0	✓	53	0	0	✓	53	0	✓	13	0.55	0.60	0.58	1	✓	1	✓
Wickham	53	0	0	✓	53	0	0	✓	53	0	✓	13	0.55	0.75	0.60	1	✓	4	✓
Wyndham	53	0	0	✓	53	0	0	✓	52	0	✓				(1)		(2)	3	✓

(1) Non-fluoridated locality. (2) No samples required in this 12 month period.

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Table 22 Health Related Variables

North West	Nitrate				Pesticides		Radiological		Trihalomethanes				Other Health Related			
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Guideline Met	Samples Taken	Guideline Met	Concentration (ug/L)			Requirement Met	Samples Taken	Guideline Met	
		Min	Max	Mean						Min	Max	Mean				
Argyle & Ord	4	<0.05	0.1	0.1	✓	5	✓	1	✓	4	<4	93	62	✓	1	✓
Broome	4	3.5	3.9	3.8	✓	2	✓	(1)		2	40	71	56	✓	2	✓
Burrup LNG	4	1.2	1.4	1.3	✓	Refer to Karratha		(1)		2	5	8	7	✓	1	✓
Burrup Supply	4	1.2	1.4	1.3	✓		(1)	(1)		2	4	7	6	✓	1	✓
Camballin	2	<0.05	<0.05	<0.05	✓	2	✓	2	✓	2	3	8	6	✓		(1)
Cape Lambert TWS	4	1.2	1.5	1.3	✓		(1)	(1)		2	4	10	7	✓	1	✓
Derby	4	<0.05	0.1	<0.05	✓	1	✓		(1)	2	14	19	17	✓	2	✓
Fitzroy Crossing	1	0.7	0.7	0.7	✓	4	✓		(1)	2	2	2	2	✓		(1)
Halls Creek	8	0.4	1.7	1.0	✓	2	✓	2	✓	2	<4	<4	<4	✓		(1)
Hedland	8	0.7	1.0	0.9	✓	2	✓		(1)	4	5	8	6	✓	2	✓
Karratha	9	1.2	1.3	1.2	✓	2	✓	2	✓	2	5	35	20	✓	2	✓
Kununurra	2	<0.05	<0.05	<0.05	✓	4	✓	1	✓	2	23	30	27	✓	2	✓
Marble Bar	4	1.7	1.8	1.7	✓	1	✓		(1)	2	11	24	18	✓		(1)
Newman	3	0.6	0.7	0.6	✓	1	✓		(1)	2	60	68	64	✓	1	✓
Nullagine	4	0.5	1.2	0.9	✓	3	✓	2	✓	2	8	18	13	✓		(1)
Onslow TWS	2	0.2	0.3	0.3	✓	1	✓		(1)	4	6	18	13	✓		(1)
Point Samson	4	1.2	1.4	1.3	✓		(1)	(1)	(1)	2	5	10	8	✓	1	✓
Roebourne	4	1.2	1.4	1.3	✓		(1)	(1)	(1)	2	5	7	6	✓	1	✓
Wickham	4	1.2	1.4	1.3	✓		(1)	(1)	(1)	2	22	25	24	✓	1	✓
Wyndham	2	0.1	0.1	0.1	✓	1	✓		(1)	8	79	209	142	✓		(1)

(1) No samples required in this 12 month period.

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Table 23 Aesthetic Variables

North West Locality	Aluminium				Hardness				Iron				Manganese							
	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean			Min	Max	Mean	
Argyle & Ord	4	0.010	0.022	0.014	✓	4	81	101	93	✓	4	0.026	0.153	0.072	✓	4	0.002	0.008	0.005	✓
Broome	10	<0.008	<0.008	<0.008	✓	4	68	74	71	✓	12	0.008	0.187	0.044	✓	12	<0.002	0.002	<0.002	✓
Burrup LNG	4	<0.008	<0.008	<0.008	✓	4	415	450	433	✓	4	<0.003	<0.003	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Burrup Supply	4	<0.008	0.010	<0.008	✓	4	400	446	428	✓	4	<0.003	0.012	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Camballin	4	<0.008	<0.008	<0.008	✓	2	42	42	42	✓	4	0.024	0.060	0.041	✓	4	<0.002	0.004	<0.002	✓
Cape Lambert TWS	4	<0.008	<0.008	<0.008	✓	4	399	452	430	✓	4	0.006	0.035	0.018	✓	4	<0.002	<0.002	<0.002	✓
Derby	8	<0.008	0.010	<0.008	✓	4	5	13	8	✓	8	0.153	0.900	0.435	(1)	8	0.004	0.034	0.015	✓
Fitzroy Crossing	3	<0.008	<0.008	<0.008	✓	1	152	152	152	✓	3	<0.003	0.008	<0.003	✓	3	<0.002	<0.002	<0.002	✓
Halls Creek	10	<0.008	<0.008	<0.008	✓	8	135	327	242	✓	10	<0.003	0.700	0.129	✓	10	<0.002	0.008	<0.002	✓
Hedland	10	<0.008	0.010	<0.008	✓	8	151	233	180	✓	12	<0.003	0.010	<0.003	✓	12	<0.002	<0.002	<0.002	✓
Karratha	11	<0.008	<0.008	<0.008	✓	9	409	494	459	✓	11	<0.003	0.035	0.007	✓	11	<0.002	<0.002	<0.002	✓
Kununurra	6	<0.008	<0.008	<0.008	✓	2	164	167	166	✓	6	<0.003	0.018	0.005	✓	6	0.004	0.014	0.008	✓
Marble Bar	4	<0.008	<0.008	<0.008	✓	4	429	511	483	✓	4	<0.003	0.004	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Newman	5	<0.008	0.010	<0.008	✓	3	286	292	289	✓	5	<0.003	0.004	<0.003	✓	5	<0.002	<0.002	<0.002	✓
Nullagine	3	<0.008	0.010	<0.008	✓	4	185	254	207	✓	4	0.004	0.006	0.005	✓	4	<0.002	0.004	<0.002	✓
Onslow TWS	4	<0.008	<0.008	<0.008	✓	2	182	225	204	✓	4	<0.003	0.016	0.006	✓	4	<0.002	<0.002	<0.002	✓
Point Samson	4	<0.008	<0.008	<0.008	✓	4	416	448	431	✓	4	<0.003	0.012	<0.003	✓	4	<0.002	<0.002	<0.002	✓
Roebourne	5	<0.008	<0.008	<0.008	✓	4	397	449	427	✓	6	<0.003	0.075	0.019	✓	6	<0.002	<0.002	<0.002	✓
Wickham	6	<0.008	<0.008	<0.008	✓	4	436	463	446	✓	6	<0.003	0.016	0.008	✓	6	<0.002	<0.002	<0.002	✓
Wyndham	10	<0.008	0.016	0.011	✓	2	7	8	8	✓	10	0.060	1.200	0.230	✓	10	<0.002	0.016	0.004	✓

(1) Iron is a natural characteristic of the source supplying this locality.

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Table 24 Aesthetic Variables

North West Locality	pH				TDS				True Colour				Turbidity							
	Samples Taken	Value (pH units)			Guideline Met	Samples Taken	Concentration (mg/L)			Guideline Met	Samples Taken	Value (TCU)			Guideline Met	Samples Taken	Value (NTU)			Guideline Met
		Min	Max	Mean			Min	Max	Mean			Min	Max	Mean			Min	Max	Mean	
Argyle & Ord	4	7.55	7.95	7.68	✓	4	203	257	235	✓	4	<1	1	<1	✓	4	0.6	3.6	1.5	✓
Broome	10	6.45	7.05	6.65	✓	4	341	384	363	✓	10	<1	<1	<1	✓	10	<0.1	0.4	<0.1	✓
Burrup LNG	4	7.29	7.46	7.37	✓	4	930	991	961	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Burrup Supply	4	7.29	7.37	7.32	✓	4	896	992	951	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Camballin	4	6.82	7.00	6.92	✓	2	228	233	231	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Cape Lambert TWS	4	7.21	7.31	7.26	✓	4	894	990	947	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Derby	8	7.47	8.30	8.01	✓	4	419	491	469	✓	8	<1	2	<1	✓	8	0.2	3.0	0.7	✓
Fitzroy Crossing	3	7.26	7.38	7.31	✓	1	329	329	329	✓	3	<1	1	<1	✓	3	<0.1	0.2	<0.1	✓
Halls Creek	10	7.04	7.38	7.19	✓	8	551	1040	770	✓	10	<1	<1	<1	✓	10	<0.1	8.2	1.0	✓
Hedland	12	7.51	7.67	7.60	✓	8	455	990	677	✓	12	<1	<1	<1	✓	12	<0.1	<0.1	<0.1	✓
Karratha	11	7.10	7.25	7.18	✓	9	899	1080	1013	(3)	11	<1	<1	<1	✓	11	<0.1	1.2	<0.1	✓
Kununurra	6	7.43	7.57	7.52	✓	2	407	415	411	✓	6	<1	<1	<1	✓	6	0.1	0.3	0.2	✓
Marble Bar	4	7.16	7.42	7.30	✓	4	1300	1380	1345	(3)	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Newman	5	7.91	8.08	8.00	✓	3	607	667	636	✓	5	<1	2	<1	✓	5	<0.1	<0.1	<0.1	✓
Nullagine	4	7.01	7.55	7.28	✓	4	503	710	567	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Onslow TWS	4	7.44	7.85	7.68	✓	2	403	453	428	✓	4	<1	<1	<1	✓	4	<0.1	0.2	<0.1	✓
Point Samson	4	7.21	7.33	7.27	✓	4	937	987	963	✓	4	<1	<1	<1	✓	4	<0.1	<0.1	<0.1	✓
Roebourne	6	7.43	7.49	7.46	✓	4	897	1000	952	✓	6	<1	<1	<1	✓	6	<0.1	<0.1	<0.1	✓
Wickham	6	7.22	7.45	7.32	✓	4	973	1020	993	✓	6	<1	<1	<1	✓	6	<0.1	<0.1	<0.1	✓
Wyndham	10	5.92	6.90	6.44	(2)	2	31	38	35	✓	10	1	7	3	✓	10	0.6	3.2	1.1	✓

(1) Iron is a natural characteristic of the source supplying this locality. (2) Moolalabra Dam supplying this locality has a low pH attributed to the low hardness and poor buffering of the water. (3) Elevated salinity is a natural characteristic of these sources.

Appendix C – List of all sampling parameters

This appendix lists all constituents for which the Water Corporation routinely samples. Additional information is available on request by phoning 13 13 75.

Microbiological

Naegleria tolerant to 42°C and above
Thermotolerant Coliforms
Total Coliforms

Physical Characteristics

Alkalinity
Conductivity
Filterable Organic Carbon
Hardness (Ca, Mg)
pH
Total dissolved solids (calculated)
True colour
Turbidity

Inorganic Chemicals

Aluminium (acid-soluble)
Ammonia – in chloraminated systems
Antimony
Arsenic
Barium
Beryllium
Boron
Bromide
Cadmium
Chloride
Chromium (as Cr(VI))
Copper
Cyanide
Fluoride
Iodide
Iron
Lead
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Nitrate / Nitrite
Potassium
Selenium
Silica
Silver
Sodium
Sulphate
Uranium
Zinc

Organic Compounds

1,1,1-Trichloroethane
Acrylamide – only if polyelectrolytes in use
BETX (Benzene, Ethylbenzene, Toluene, Xylene)
Chlorobenzene
Dichlorobenzene
1,2-dichlorobenzene (1,2-DCB)
1,3-dichlorobenzene (1,3-DCB)
1,4-dichlorobenzene (1,4-DCB)
Dichloroethanes
1,2-dichloroethane
1,1-dichloroethane
Dichloroethenes
1,1-dichloroethene (1,1-DCE)
1,2-dichloroethene (1,2-DCE)
Dichloromethane
Disinfection By-products
Epichlorohydrin – only if resins in use
Ethylenediamine tetraacetic (EDTA)
Hexachlorobutadiene
Nitrilotriacetic acid (NTA)
Organotins
dialkyltins
tributyltin oxide
Plasticisers
di(2-ethylhexyl) phthalate (DEHP)
di(2-ethylhexyl) adipate (DEHA)
Polycyclic aromatic hydrocarbons
Styrene (vinylbenzene)
Tetrachloroethene
Trichlorobenzenes (total)
Trichloroethylene (TCE)
Vinyl chloride

Pesticides

2,4,5-T
2,4-D
Aldrin
Amitraz
Atrazine
BHCs (including Lindane)
Bromophos Ethyl
Chlordane
Chlorpyrifos
DDD
DDE
DDT
Diazinon
Dicamba
Dichlofop Methyl
Dieldrin
Dimethoate
Diuron
Endosulphan I
Endosulphan II
Endosulphan Sulphate
Ethion
Fenamiphos
Fenitrothion
Fluometuron
HCB
Heptachlor
Heptachlor Epoxide
Malathion
MCPA
Molinate
Oxychlordane
Parathion Ethyl
Parathion Methyl
Prometryn
Propazine
Simazine
Terbutryn
Triclopyr
Trifluralin (dinitroaniline compound)

Radiological

Radium 226 & 228