





Busselton Water

1 Fairbairn Road Busselton WA 6280

PO Box 57 Busselton WA 6280

Phone: 61 (8) 9781 0500 Fax: 61 (8) 9754 1075

admin@busseltonwater.wa.gov.au

busseltonwater.wa.gov.au





Contents

Message from the CEO	4
Our commitment	5
Drinking Water Quality Policy	5
Drinking Water Quality Management Framework	5
Our licence area	6
System analysis and management	7
Our water source	7
Understanding water quality	8
Water treatment	9
Our water treatment plants	10
Distribution network	11
Multi barrier approach	11
Incident responses	11
Development, training and innovation	12
Our customers	12
Review	13
Microbiological and disinfection health results	13
Chemical health results	13
Radiological health results	13
Non-health (aesthetic) results	13
Water quality results	14



I am pleased to present the 2015-16 Water Quality Report on behalf of Busselton Water.

Our commitment to achieving 100 per cent compliance, with health related and non-health related water quality criteria in the Australian Drinking Water Guidelines (ADWG) is firmly established and is ensured through our Memorandum of Understanding (MoU) with the Department of Health.

Busselton Water continued to achieve exceptional water quality results in 2015-16 as detailed in this report and summarised in the following table:

and performance against the Memorandum of Understanding, this report also describes the processes Busselton Water uses to collect, treat and distribute drinking water to our customers. It also provides some insight into the customer's perception in relation to the quality of their supplied water.

In addition to presenting water quality results

I wish to thank everyone who has made a contribution to these excellent results, particularly staff and representatives from Department of Health, GHD and Rockwater.

2015-16 WATER QUALITY RESULTS AT A GLANCE									
Health related characteristics	% compliance with MoU								
Escherichia coli	100								
Naegleria	100								
Chemical	100								
Pesticides	100								
Radiological	100								
Chlorine disinfection	100								
Non-health parameters	% compliance with MoU								
Aesthetic	100								

Chris Elliott
Chief Executive Officer

OUR COMMITMENT

We are committed to achieving 100 per cent compliance, with health related and non-health related water quality criteria in the ADWG.

To enable us to achieve this, we will:

- systematically monitor and report water quality performance;
- be prepared for incidents including regular testing of our response plans;
- fulfil all the requirements of our Operating Licence and MoU with the Department of Health; and
- implement the Drinking Water Quality Management Plan.

Drinking Water Quality Policy

Busselton Water is committed to achieving compliance with water quality criteria in the ADWG.

In pursuit of our commitments, we will:

- systematically monitor and report water quality performance:
- be prepared for incidents including regular testing of our response plans; and
- fulfil all the requirements of our Operating Licence and MoU with the Department of Health.

Drinking Water Quality Management Framework

Busselton Water's Drinking Water Quality Management System is based on the ADWG Framework for Management of Drinking Water Quality, endorsed by the National Health and Medical Research Council. The Framework provides benchmark water quality guidelines and values for the design of a structured and systematic approach to drinking water quality management, ensuring a safe and reliable water supply.

There are 12 elements within the Framework which are considered best practice. These elements are divided into four sections:

- 1. Commitment to drinking water quality management.
- 2. System analysis and management.
- 3. Supporting requirements.
- 4. Review.

Busselton Water will regularly assess its progress against implementation of the 12 elements of the ADWG Framework¹.

The Operating Licence issued by the Economic Regulation Authority (ERA), recognises our MoU with the Department of Health. The MoU describes the Department of Health Requirements for Compliance with the microbiological, health, chemical and radiological criteria.

As well as quarterly meetings, Busselton Water provides the Department of Health with quarterly water quality reports, detailing how the organisation has performed against the agreed requirements as specified in the MoU.

Busselton Water recognises and supports the ongoing work of the Advisory Committee for the Purity of Water².

Busselton Water provides raw water information to the Department of Water to ensure the long-term sustainability of the water supply for the Busselton region.

A copy of the MoU can be found on the **Busselton** Water website³.

- 1 The "Australian Drinking Water Guidelines" published by the National Health and Medical Research Council, Australia's peak health research body, provides an authoritative reference on what defines safe, good quality drinking water; how it can be achieved; and how it can be assured. It is available for download from www.nhmrc.gov.au/guidelines/publications.
- 2 Since 1925, the Advisory Committee for the Purity of Water has been monitoring the quality of Western Australian drinking water and recommending improvements in monitoring and management protocols to both the Minister for Health and Minister for Water. The Committee is composed of experts from private and public sectors, and government regulatory and advisory agencies and is chaired by the Executive Director. Public Health. http://ww2.health.wa.gov.au/Articles/A_E/Drinking-water-advisory
- http://www.busseltonwater.wa.gov.au/Portals/0/Water%20quality/4%20PUBLIC%20 $BusseltonWater_MOU_DoH_ASignatures_inserted_PublishedVersion\%20 dated\%20 20\%20 April\%2015.pdf?timestamp=1432879546727$

OUR COMMITMENT

Our licence area

Busselton Water has been a successful water service provider for more than 100 years currently supplying drinking water to more than 32,000 people within the City of Busselton as well as bulk water to the Water Corporation in Dunsborough. It is now seeking new opportunities in water services and surface drainage services under the provisions of the *Water Services Act 2012*.

In high seasons – weekends, holidays and Christmas times – Busselton Water supplies a bigger population of approximately 65,000 people.

Busselton Water expanded its Operating Licence area from 81,200ha to 688,700ha in August 2014. The greater Operating Licence area was granted by the ERA to facilitate Busselton Water's desire to grow and expand its water services operations and to diversify in to the management of surface water drainage within the Geographe Catchment area. The official map of the expanded Operating Licence area can be viewed on the ERA's website³:

The Operating Licence area is illustrated in the plan shown right.



³ https://www.erawa.com.au/cproot/12840/2/Operating%20area%20map%20-%20WL3%20-%20Busselton%20Water.PDF

Our water source

Busselton Water sources the bulk of its raw water from the deep, confined, Yarragadee aquifer. There is some minor draw from the base of the shallower Leederville aguifer which extends from about 10 to 275 metres in depth, below this the Yarragadee aquifer extends to over 800 metres in depth.

Busselton Water extracts raw water under licences (GWLs 110850 and 110851) issued by the Department of Water from the Yarragadee and Leederville aquifers. There are eight production bores that pump raw water to the treatment plants for filtration and disinfection before it is stored in tanks and reticulated to customers. The bores are located at Plant 1 Kent Street, Plant 2 Queen Elizabeth Avenue, Plant 3 Hobson Street, and Plant 5 Queen Elizabeth Avenue.



Source Protection

Busselton Water in conjunction with the Department of Water developed the Busselton Water Reserves Drinking Water Source Protection Plan (Report WRP 139) released by the Department of Water in August 2013. It defines the boundaries of Busselton Water's Water Reserve and assigns a Priority 1 area to them. The confined nature of this drinking water source means that it is not at risk of contamination from overlying land uses. The reserves were proclaimed in March 2014 to ensure their locations are under legislative protection.



Busselton Water is also bound by the Department of Water's Groundwater Licence Operating Strategy (GLOS) issued March 2014 that stipulates the annual extraction entitlement limits, licence conditions and requirements with which Busselton Water must comply. Busselton Water's consultant hydrogeologists (Rockwater Pty Ltd) reviews this document (along with the implementation of the borefield construction and maintenance plan), monitoring and reporting requirements to ensure future operational strategies are sustainable in the long term.

Financial Year	Extraction (gigalitres)
2008-09	4.49
2009-10	4.23
2010-11	4.30
2011-12	4.30
2012-13	4.59
2013-14	5.05
2014-15	5.18
2015-16	5.38

Understanding water quality

Turbidity	Turbidity is the cloudy appearance of water caused by the presence of suspended matter.	The ADWG specify an aesthetic guideline of 5 NTU. If disinfection is required, the turbidity of less than 1 NTU is desirable at the point of disinfection.
Colour	Colour in water originates mainly from natural drainage through soil and vegetation in a catchment.	The ADWG value for colour is based on the colour that is noticeable in a glass. This is generally accepted as 15 HU.
Iron	Iron occurs naturally in water as a result of contact with soil or rock in the catchment. Iron in the water does not present a health hazard.	The ADWG recommend that based on aesthetic consideration, the concentration of Iron should not exceed 0.3 mg/L.
Manganese	Manganese in water can come from contact with soil or rock in the catchment. Manganese is not considered a health concern unless the concentration exceeds 0.5mg/L.	The ADWG recommend that based on aesthetic considerations, the levels of Manganese should not exceed 0.1mg/L.
Total dissolved solids	Total dissolved solids (TDS) consist of inorganic (natural) salts and small amounts of organic matter dissolved in water. Total dissolved solids comprise sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silicon, organic matter, fluoride, iron, manganese, nitrate and phosphate.	Treated water quality containing TDS levels of below 500mg/L is classified as good.
Microbiological pathogens and disinfection	Thermophilic Naegleria refers to a group of amoeba which includes Naegleria fowleri, the organism that causes the waterborne disease primary amoebic meningoencephalitis. Naegleria fowleri is an environmental pathogen which naturally lives in fresh warm water. The most common and widespread health risk associated with drinking water is contamination by microorganisms. Organisms associated with the gut of humans and mammals cause the usual waterborne diseases. Tests are undertaken for Escherichia coli (E.coli).	The Western Australian Department of Health has notification protocols in place regarding <i>Naegleria</i> . The ADWG state that thermotolerant coliforms/ <i>E.coli</i> should not be present in a minimum 100mL sample.
Radiological	There are natural levels of radiation within the environment, and groundwater sources such as that sourced from the Yarragadee aquifer can have higher background levels than that of surface water systems.	Testing is undertaken for gross alpha and gross beta radioactivity, where levels of Radium 226 and Radium 228 can be determined.
		The ADWG (2004) recommend that levels should not exceed 0.5Bq/L.
рН	pH is a measure of how acidic/basic water is. The range goes from 0-14, with 7 being neutral. pH is the measure of free hydrogen ion concentrations in the water.	The suggested aesthetic pH target from the ADWG is 6.5 to 8.5.

 $NTU-Nephelometric \ turbidity \ units; \ HU-Hazen \ Units; \ mg/L-milligrams \ per \ litre; \ Bq/L-Becquerel \ per \ litre$

Water treatment

Busselton Water uses a three-step process to treat the raw water from the deep groundwater aquifers to produce safe drinking water to its customers. Chlorine is used as a disinfectant because it is effective against a broad spectrum of pathogens, it provides residual protection against microbial growth in the distribution system, and it is reliable. Busselton Water uses chlorine that is approved for use in drinking water and sourced from an accredited supplier.

Pre-treatment and aeration

Raw water is dosed with a small amount of chlorine and then aerated via spray aerators. This oxidises naturally occurring iron and manganese, turning it from its soluble form into small solids.



Filtration

The pre-chlorinated and aerated water is then filtered through sand filters to remove the iron, manganese, turbidity and other impurities. The filtered water is then collected in a clear well.



Disinfection

A further dose of chlorine is then added to water pumped from the clear well to maintain the disinfection level required to preserve microbiological safety, before it is stored in tanks and pumped into the distribution system.

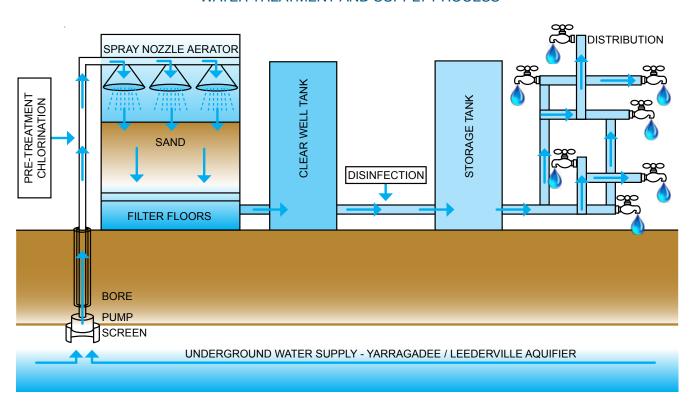


Our water treatment plants

Busselton Water has three treatment plants:

- Plant 1 Kent Street, Busselton;
- Plant 2 Queen Elizabeth Avenue, Busselton; and
- Plant 3 Hobson Street, East Busselton.

WATER TREATMENT AND SUPPLY PROCESS



Distribution network

Busselton Water's distribution network delivers drinking water within the City of Busselton, including bulk water to the Water Corporation in Dunsborough. The network operates as one large, interconnected system. The materials used in the reticulation network have been approved either under Australian Standard AS/NZS 4020:2005 (testing of procedures for use in contact with drinking water) or as scheduled in our MoU with the Department of Health.

Strict protocols have been established by Busselton Water in conjunction with the Department of Health to assure the safe integrity of the distributed water and the safe handling of chlorine at the treatment plants.

The distribution network has the following components:

Estimated population	32,186
Total number of connections	12,875
Total length of pipes	320km
Number of storage tanks	5
Chlorine residual target	0.5mg/L
Number of distribution water quality zones	1

Multi barrier approach

Preventing contamination and minimising potential hazards is an essential part of providing our customers with safe drinking water. The ADWG (2004) state that a multi barrier approach is the most effective way to ensure the safety of drinking water.

Busselton Water's barriers include:

- protection of groundwater;
- treatment:
- chlorine disinfection; and
- backflow prevention.

Busselton Water maintains and operates these multiple barriers, ensuring they are robust and that high quality water is delivered to its customers.



Incident responses

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, extreme weather conditions or unforeseen events. Busselton Water has incident response plans to manage such events, with the minimum possible impact on water quality.

In the event of a water quality incident, Busselton Water activates its Water Quality Incident Response Plan, which is a comprehensive plan to manage water quality incidents and links to the binding protocols of the MoU between Busselton Water and the Department of Health.

In order to maintain our preparedness to deal with any water quality incidents and as part of our compliance with the MoU with the Department of Health, one mock event simulating a failure of our systems was held in June 2016. It tested the effectiveness of staff and Busselton Water's Business Continuity and Emergency Response Plans for the delivery of safe water and the effective continuity of supply during a significant water quality incident.

Development, training and innovation

Busselton Water utilises training in accordance with the National Water Industry Training package. Our operational staff who work in water quality are progressing towards a Certificate III in Water Industry Operations.

Busselton Water has launched best practice 70/20/10 development approach. This approach allocates more time to experimental learning and delivers better employee development and business outcomes. It consists of 70 per cent experimental learning, 20 per cent mentorship of employee learning and development plan; and 10 per cent approved class based training.

Staff regularly attend relevant training courses and/or conferences.

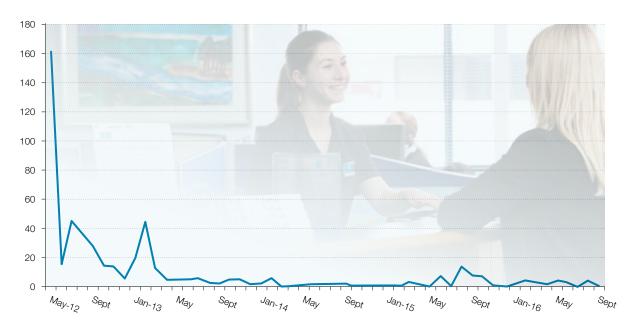
More recently, Busselton Water has innovated in the backflow detection system for residential customers with radio frequency meters.

Our customers

We strive to deliver excellence in customer service and continue to improve our existing levels of customer satisfaction. Busselton Water holds Customer Advisory Group meetings twice per year.

As shown in the following graph, water quality complaints have reduced significantly - with results showing a 98 per cent reduction in water quality complaints since 2012. Water quality complaints are addressed with a visit to the customer's premises to determine the nature and cause of the compaint and explain how it will be resolved.

WATER QUALITY COMPLAINTS - MAY 2012 TO DATE



RFVIFW

Busselton Water monitors water quality by taking weekly water samples.

Microbiological and disinfection health results

Busselton Water collected 364 samples from the reticulation system during the reporting period and 100 per cent of these were compliant with no detections of either Escherichia coli or Thermophilic Naegleria. A further 1361 samples were taken for chlorine levels.

Chemical health results

There is a large number of chemical parameters that have health-related guideline values in the ADWG (2004). The next section of this report gives more detail on the individual parameters. Busselton Water achieved 100 per cent compliance with all the healthrelated requirements set out in the ADWG (2004) for chemical parameters.

Radiological health results

Groundwater radiological testing is carried out in accordance with parameters and frequencies based on the ADWG (2004) and in consultation with the Department of Health.

Graduates radiological testing is only required periodically. Radium 228 and Radium 226 are tested annually in April and results from these samples were 100 per cent compliant.

Non-health (aesthetic) results

There is a large number of parameters with aesthetic guideline value in the ADWG parameters. Results of the individual parameters are outlined in the following section of this report.



WATER QUALITY RESULTS

In the period 1 July 2015 to 30 June 2016 there were no reportable water quality events requiring notification to the Department of Health and there were 40 customer complaints received concerning either taste and odour or discolouration.

CHEMICAL HEALTH - 1 JULY 2015 TO 30 JUNE 2016

			CHEN	IICAL HEA	LTH - 201	5-16				
CHARACTERISTIC mg/L	ADWG LIMIT LI	Lab Limit of Reporting		imber of amples	Total no.	Maximum value		Number of non-compliance with ADWG limit		Compliance %
IIIg/L	(Health)	(LOR)	Raw water	Distribution water	dioti ibation)		Distribution water	Raw water	Distribution water	distribution water
Antimony	0.003	0.001	0	2	2	-	ND	-	0	100%
Arsenic	0.007	0.001	10	0	10	ND	-	0	-	
Barium	0.7	0.001	10	0	10	0.41	-	0	-	
Boron	4	0.05	10	0	10	0.31	-	0	-	
Bromodichloromethane	0.25*	0.5	0	2	2	-	ND	-	0	100%
Bromoform	0.25*	0.5	0	2	2	-	0.0035	-	0	100%
Cadmium	0.002	0.0001	0	2	2	-	ND	-	0	100%
Chlorine (Total)	5		0	726	726	-	1.27	-	0	100%
Chloroform	0.25*	0.5	0	2	2	-	ND	-	0	100%
Chromium	0.05	0.002	0	2	2	-	ND	-	0	100%
Copper	2	0.005	0	56	56	-	0.018	-	0	100%
Dibromochloromethane	0.25*	0.5	0	2	2	-	0.001	-	0	100%
Fluoride	1.5	0.1	52	84	136	0.7	0.7	0	0	100%
Lead	0.01	0.001	0	2	2	-	ND	-	0	100%
Manganese (Soluble)	0.5	0.005	44	42	86	0.094	ND	0	0	100%
Manganese (Total)	0.5	0.005	82	84	166	0.25	0.009	0	0	100%
Mercury	0.001	0.00005	10	0	10	ND	-	0	-	
Molybdenum	0.05	0.001	10	0	10	ND	-	0	-	
Nickel	0.02	0.001	10	1	11	0.002	ND	0	0	100%
Nitrate	50	0.05	26	0	26	0.07	-	0	-	
Nitrite	3	0.005	26	0	26	0.015	-	0	-	
Selenium	0.01	0.002	10	0	10	ND	-	0	-	
Total Trihalomethanes	0.25	0.0005	0	28	28	-	0.006	-	0	100%
Uranium	0.02	0.001	10	0	10	ND	-	0	-	
TOTAL			310	1037	1347					

Note 1: *The concentration of trihalomethanes, either individually or in total, in drinking water should not exceed 0.25 mg/L

ADWG = Australian Drinking Water Guidelines

Bq/L = Becquerel per litre CFU = colony forming units

CFO = Colonly forming units

HU = Hazen Units

mg/L = milligrams per litre

NA = Not Applicable

ND = Not Detected

NTU = Nephelometric Turbidity Units

Note 2: Busselton Water does not add fluoride to the water. The naturally occurring fluoride levels vary from bore to bore. The maximum value shown is not indicative of the level throughout the Busselton water supply. Fluoride levels in the drinking water vary with location and time and can be between 0.03 and 0.7 mg/L.

Busselton Water collected 1361 free chlorine and total chlorine samples in the distribution network during 2015-16. The minimum, average and maximum levels were as follows:

ТҮРЕ	Minimum mg/L	Average mg/L	Maximum mg/L
Distributed Chlorine (free)	0.33	0.65	1.00
Distributed Chlorine (total)	0.42	0.67	1.27

When chlorine is added to water it reacts with chemical components and biological lifeforms. The presence of a free chlorine residual in the distribution system provides evidence of initial disinfection and protection against recontamination from backflow, pipeline breaks or other causes.

MICROBIOLOGICAL SAMPLES - 1 JULY 2015 TO 30 JUNE 2016

CHADACTEDICTIC	LIMIT	LIMIT	LINIT	LIMIT	LINUT	LIMIT	LINIT	LINIT	LINIT	LINUT	LINUT	LINUT	LINIT	LINUT	LINUT	LINIT	LINIT	LINIT	LIMIT	LINIT	LINIT	LINUT	ADWG	Number c	of samples	Total no. of	Maximu	m value	Numb non-con with AD	npliance	Compliance %
CHARACTERISTIC	UNIT		Treated water (non- assessable)	Treated Distribution (treate water (non-assessable) (assessable)	samples (treated + distribution)	Treated water (non- assessable)	Distribution water (assessable)	Treated water (non- assessable)	Distribution water (assessable)	distribution water																					
Escherichia coli	CFU/ 100mL	0	251	364	615	0	0	0	0	100%																					
Thermophilic Naegleria	org/ 250mL	ND	251	364	615	ND	ND	0	0	100%																					
Naegleria fowleri	org/ 250mL	ND	0	0	0	-	-	0	0	100%																					

RADIOLOGICAL SAMPLES - 1 JULY 2015 TO 30 JUNE 2016

CHARACTERISTIC	UNIT	ADWG (Health)	Non-compliance (Health)	Number of samples	% Compliance (Health)	Maximum value
Radium 226	Bq/L	0.5	0	13	100%	0.352
Radium 228	Bq/L	0.5	0	13	100%	0.281

ADWG = Australian Drinking Water Guidelines

Bq/L = Becquerel per litre CFU = colony forming units HU = Hazen Units mg/L = milligrams per litre NA = Not Applicable

ND = Not Detected NTU = Nephelometric Turbidity Units

WATER QUALITY RESULTS

CHEMICAL NON-HEALTH (AESTHETIC) - 1 JULY 2015 TO 30 JUNE 2016

			CI	HEMIC	AL AESTH	IETIC – 201	15-16				
CHARACTERISTIC	UNIT	ADWG LIMIT	Lab Limit of	Number of samples		Total no. of samples (raw +	Maximum value		Number of non-compliance with ADWG limit		Compliance %
		(Non- health)	Reporting (LOR)	Raw water	Distribution water	distribution)	Raw water	Distribution water	Raw water	Distribution water	distribution water
Alkalinity (Bicarbonate)		-	5	16	2	18	200	170	-	-	
Alkalinity (Carbonate)		-	5	16	2	18	<1	ND	-	-	
Alkalinity (Hydroxide)		-	5	16	2	18	<5	ND	-	-	
Alkalinity (Total)		-	5	16	2	18	180	140	-	-	
Aluminium (Soluble)		0.2	0.02	16	2	18	ND	ND	0	0	100%
Aluminium (Total)		0.2	0.02	16	2	18	ND	ND	0	0	100%
Ammonia	mg/L	0.5	0.005	0	57	57	-	ND	-	0	100%
Calcium		-	0.2	8	2	10	24	19	-	-	
Chloride	mg/L	250	1	26	0	26	120	-	0	-	
Colour True	HU	15 HU	1	82	84	166	23	ND	12	0	100%
Colour App	HU	15 HU	1	60	35	95	270	3	33	0	100%
Electrical Conductivity		-	2 us/cm	30	28	58	740	740	-	-	
Filterable Reactive Phosphorus		-	0.005	16	0	16	0.013	-	-	-	
Filterable Reactive Phosphorus as PO4		-	0.01	16	0	16	0.04	-	-	-	
Hardness	mg/L	200	5	60	57	117	130	130	0	0	100%
Hydrogen Sulphide	mg/L	0.05	0.05	0	2	2	-	ND	-	0	100%
Iron (Soluble)	mg/L	0.3	0.005	82	84	166	14	0.009	70	0	100%
Iron (Total)	mg/L	0.3	0.005	82	84	166	14	0.039	71	0	100%
Magnesium		-	0.1	21	2	23	16	13	-	-	
рН	рН	pH 6.5- 8.5		82	726	808	7.8	8.6	5	2	99.7%
Salinity (as Total Dissolved Solids)	mg/L	500		82	0	82	420	-	0	-	
Silica		80	10	16	0	16	17	-	0	-	
Sodium	mg/L	180	0.05	26	0	26	110	-	-	-	
Sulphate	mg/L	250	0.5	26	0	26	18	-	0	-	
Total Hardness by Calculation		200	1	16	2	18	130	100	0	0	100%
Turbidity	NTU	5 NTU		66	570	636	2.64	1	0	0	100%
Zinc	mg/L	3	0.005	0	2	2	-	ND	-	0	100%
TOTAL			1.300	893	1747	2640					120,0

ADWG = Australian Drinking Water Guidelines Bq/L = Becquerel per litre CFU = colony forming units HU = Hazen Units mg/L = milligrams per litre NA = Not Applicable ND = Not Detected NTU = Nephelometric Turbidity Units

Note 1: pH, Turbidity and Chlorine Total are Busselton Water in-house tests. All others are accredited test results.





Busselton Water

1 Fairbairn Road Busselton WA 6280

PO Box 57 Busselton WA 6280

Phone: 61 (8) 9781 0500 Fax: 61 (8) 9754 1075

admin@busseltonwater.wa.gov.au

busseltonwater.wa.gov.au