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For the

Rottnest Island Authority

Quarterly Drinking Water Report to the Department of Health by the Rottnest Island Authority

January – March 2019

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1. Water Provider Information

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1.1. System Information

1.1.1. Consumers

The water demand on Rottnest Island is related to tenancy and is highly seasonal, being low in winter and high in summer. Historical data indicates that over 770,000 visits are typically made to Rottnest Island on a yearly basis, with 122,781 total visitor numbers recorded for January 2019, 98,439 in February 2019 and 88,073 in March 2019.

The number of beds on Rottnest Island for guests is approximately 2,150, with the average length of stay being 3.5 nights. In addition to this, there are approximately 250 permanent residents on Rottnest Island, which also fluctuates in accordance with high and low seasons.

1.1.2. Distribution System & Water Supply

The Rottnest Island distribution system is relatively small, consisting of approximately 22km of mains. Water is sourced from 15 freshwater bores located in the Wadjemup bore field and 6 saline (seawater) bores located in the Longreach bore field.

The freshwater bores make up approximately 15% of the water source for Rottnest Island and have not been used for potable water consumption since before and have ceased using the water for irrigation on the golf course since February 2017. The freshwater bores are utilised only as a supplementary contingency water supply for the golf course irrigation.

Water abstracted from the saline bores feed into the desalination plant, where reverse osmosis occurs. The desalinated water is then disinfected through a dual chlorination system, which ensures the provision of safe drinking water to Rottnest Island customers.

The water demand on Rottnest Island is highly seasonal, and the monthly consumption can range from approximately 14,000kL in July to 22,000kL in the January months.

The combined storage capacity of the drinking water infrastructure on Rottnest Island is 14,000kL, this volume provides approximately 22 days of water storage in peak periods.

Remote locations outside the main settlement, such as the outer island ablutions, the Research House (2 Stables Road), Wadjemup lighthouse and surrounding area are supplied with water via a tanker. The supplied water in these areas is deemed not suitable for drinking and warning signs are posted accordingly.

Image 1 Example of Public Signage

1.1.3. Sampling Schedule & Procedure

Potable water sampling is carried out in accordance with the Australian Drinking Water Guidelines and is scheduled in accordance with the Rottnest Island Drinking Water Quality Management Plan dated April 2017.

To respond to emerging trends, and to further ensure the safety of the drinking water quality, opportunities for further monitoring or adjustment of the schedule has occurred. Additional or adjusting testing parameters can be in response to a risk assessment, new information or industry best practice and guidance, post-incident or to adhere to specialist recommendations such as the Department of Health or Water Corporation.

There are eight sampling locations across the potable water distribution network and since 2017, a comprehensive sampling monitoring schedule of Tank 4 and Tank 7 has been added to the sampling regime and continues to be monitored weekly. The data associated with Tank 4 and 7 do not form part of the statistical data provided for analysis in this quarterly report.

Further additional sample locations associated with the Island's drinking fountains has been included in the schedule for specified parameters to meet the requirements set out in the Australian Drinking Water Guidelines. These sample locations and criteria form part of the monthly schedule.

In November 2017, the sampling regime was updated to test for other minerals and metals and the additional testing parameters identified the presence of Bromate in the potable water distribution system. Initial levels were found to be above the Australian Drinking Water Guidelines. Since testing identified the presence of Bromate, an action plan has been implemented to monitor the results.

The initial findings resulted in the formation of a specialist working group that implemented a series of proposed corrective actions to address and mitigate this issue. As a result of the findings and implemented controls the monitoring for Bromate has now been added to the regular monitoring schedule of Rottnest Island's distribution sample points and continues to be reviewed by the working group.

2. Performance Summary

Water Quality Meeting the *Australia Drinking Water Guidelines v.3.5* 2018 January - March 2019			
	[1]No. of Analyses Completed	No. of Analyses Within Guidelines	No. of Non-conformances to Guidelines
Microbial			
Bacterial (*E.coli*)	61	61	0
Thermotolerant Coliforms	61	61	0
Thermophilic Amoebae	26	26	0
Amoeba (Thermophilic *Naegleria)*	26	26	0
Chemical & Physical			
Health	280	273	7
Aesthetic	337	271	66
Radiological			
Gross Alpha	Sample taken March 2019 results due in May 2019 (refer to Section 6)		
Gross Beta	Sample taken March 2019 results due in May 2019 (refer to Section 6)		

[1] As screened against respective guideline – health / aesthetic. Results from Tank 4, Tank 7 and Drinking fountains are excluded from this table.

3. Microbial Performance

During the January – March 2019 reporting period, there were no reported exceedances of Microbial Health against the Australian Drinking Water Guidelines in the potable water distribution system.

3.1. Microbial – Compliance Summary

Rottnest Island Distribution System January – March 2019				
Microbial Characteristic	**Memorandum of Understanding Compliance Criteria**	**No. of Analyses**	**No. of Analyses Complying with Memorandum of Understanding**	**% Compliance**
Bacterial				
E.coli	Non Detect	61	61	100%
Thermotolerant Coliforms	Non-Detect	61	61	100%
Amoeba				
Thermophilic Amoebae	Non Detect	26	26	100%
Thermophilic *Naegleria*	Non Detect	26	26	100%

3.2. Microbial – Exception Notifications

Microbial Water Quality Exceptions January - March 2019						
Population Served	**Date**	**Microbial Characteristic**	**Memorandum of Understanding Alert Level**	**Remedial Action**	**Department of Health Notified**	**Close Out Date**
			Nothing to report			

3.3. Microbial Incident Specific Information

There were no reported exceedances for Microbial Health in the potable water distribution system over the period.

4. Chemical: Health Related Performance

During the January to March 2019 reporting period, there were seven samples returned with exceedances of Chemical Health parameters in the potable water distribution system. Details are outlined in section 4.3.

4.1. Chemical: Health Related - Compliance Summary

Rottnest Island Distribution System January - March 2019					
Health Characteristic	**Australian Drinking Water Guidelines (mg/L)**	**No. of Analyses**	**No. of Analyses Complying with Australian Drinking Water Guidelines**	**% Compliance with Australian Drinking Water Guidelines**	**Max Value of Analysis (mg/L)**
Antimony (Sb)	0.003	11	11	100%	0.001
Bromate	0.02	104	97	93%	0.035
Cadmium (Cd)	0.002	11	11	100%	<0.0001
Chlorine Total (Cl) *(in house testing Total Residual)*	5	66	66	100%	1.16
Copper (Cu)	2	11	11	100%	0.021
Fluoride (F)	1.5	1	1	100%	<0.1
Lead (Pb)	0.01	11	11	100%	<0.001
Manganese (Mn)	0.5	29	29	100%	<0.005
Nickel (Ni)	0.02	11	11	100%	<0.001
Nitrate (NO_3) (Nitrate as nitrate)	50 mg-$N0_3$/L	3	3	100%	<0.5
Nitrite (NO_2)	3 mg-$N0_2$/L	11	11	100%	<0.5
Trihalomethanes (THMs)	0.25	11	11	100%	0.011

[2] As screened against respective guideline – health / aesthetic. Results from Tank 4, Tank 7 and Drinking fountains are excluded from this table.

4.2. Chemical: Health Related - Exception Notifications

Chemical: Health Related Water Quality Exceptions January – March 2019						
Population Served	**Date**	**Chemical Characteristic**	**Memorandum of Understanding Alert Level**	**Remedial Action**	**Department of Health Notified**	**Close Out Date**
	March 2019	Bromate	Level 2	Bromate Action Plan	Yes	On going

*Based on RIA total daily visitors for the period includes Ferry (excluding Island workers) Boats and Planes

4.3. Chemical: Health Related Incident Specific Information

During the quarter, there were seven exceedances of routine monitoring parameters set in the Memorandum of Understanding (MOU) between the RIA and DoH for Rottnest Island:

1. Sample Date 05 March 2019 – Distribution Points:
    a. R12/003 (Central Thompsons) reported a reading of 0.022 mg/L;
    b. R12/005 (South Thompson) reported a reading of 0.035 mg/L;
    c. R12/006 (Kingstown Barracks) reading of 0.032; and
    d. R12/007 (Geordie Bay) a reading of 0.023 mg/L.
2. Sample Date 12 March 2019 – Distribution Points:
    a. R12/006 (Kingstown Barracks) a reading of 0.024 mg/L; and
    b. R12/007 (Geordie Bay) a reading of 0.031 mg/L.
3. Sample Date 20 March 2019 – Distribution Points:
    a. R12/007 (Geordie Bay) a reading of 0.027 mg/L.

Initial exceedances were responded to by performing a quality assurance review on the 12th March 2019 of the laboratory testing and conducting reanalysis that confirmed the exceedances were consistent. Subsequent sampling included quality assurance testing with two laboratories and sampling methods reviewed. Subsequently the Bromate Action Plan was reviewed and the flushing regime reinstated which resulted in no further exceedances above the Australian Drinking Water Guidelines.

5. Chemical: Aesthetic Performance

5.1. Chemical: Aesthetic – Compliance Summary

During the January - March 2019 reporting period, there were 66 sample exceedances of Chemical Aesthetic parameters in the potable water distribution system, details are outlined in section 5.2.

Rottnest Island Distribution System January - March 2019					
Aesthetic Characteristic	**Australian Drinking Water Guidelines (mg/L unless stated)**	**No. of Analyses**	**No. of Analyses Complying with Australian Drinking Water Guidelines**	**% Compliance with Australian Drinking Water Guidelines**	**Max Value of Analysis (mg/L)**
Aluminium (Al)	0.2	3	3	100%	<0.05
Ammonia (NH_3)	0.5	11	11	100%	<0.01
Chloride (Cl^-)	250	8	8	100%	250
Chlorine Free Residual (Cl) *(in house testing)*	0.6	72	7	10%	1.06
Colour	15 (HU)	6	6	100%	<5
Copper (Cu)	>1	11	11	100%	0.021
Hardness ($CaCO_3$)	200	1	1	100%	17
Iron (Fe)	0.3	29	28	97%	0.48
Manganese (Mn)	0.1	29	29	100%	<0.005
pH	6.5 – 8.5	27	27	100%	8.4
Sodium (Na)	180	104	104	100%	180
Sulphate	250	8	8	100%	4
Sulphide (H_2S)	0.05	3	3	100%	<0.01
TDS	600	8	8	100%	450
Turbidity	5 (NTU)	6	6	100%	0.3
Zinc (Zn)	3	11	11	100%	0.032

[2] As screened against respective guideline – health / aesthetic. Results from Tank 4, Tank 7, investigative samples and Drinking fountains are excluded from this table.

5.2. Chemical: Aesthetic - Incident Specific Information

There were two instances where analytical results exceeded the aesthetic guidelines for chemical and physical properties, these are summarised below:

Iron: There was one recorded exceedance of iron in the distribution system in the reporting period. The exceedance was recorded at location R12/008 on the 1st February 2019 with a reading of 0.48mg/L. Where Iron has a taste threshold of approximately 0.3 mg/L in water which may cause unfavourable taste and odour to be present, however there were no customer complaints during the period.

Chlorine (free): During the quarter, 65 out of 72 recorded samples were reported with chlorine values above the Australian Drinking Water Guidelines Aesthetic limit of 0.6mg/L.

The Australian Drinking Water Guidelines state that chlorine has an aesthetic odour threshold of 0.6mg/L, however the reported concentrations exceeding this threshold do not pose any health risks, as values are below the specific health guideline value of 5.0mg/L.

The results for exceeding the Aesthetic limit were found across multiple distribution sampling points over the three month period, however no results were returned close to the Health limit with the maximum value of 1.06mg/L reported at R12-001 and R12/008 on 26th February 2019.

Whilst impacts to aesthetic quality of drinking water may occur due to greater concentrations of chlorine, it is important to note that adequate disinfection is paramount for the provision of safe drinking water.

No complaints were recorded during the January to March period with regards to chlorine related aesthetic.

6. Radiological Performance

Eight radiological samples were tested during the reporting period, however results are expected to be received in May 2019 and will be reported in the next quarterly report.

6.1. Radiological – Compliance Summary

Rottnest Island Distribution System January - March 2019				
Radiological Characteristic	**Memorandum of Understanding Compliance Criteria**	**No. of Analyses**	**No. of Analyses Complying with Memorandum of Understanding**	**% Compliance**
Gross Alpha	< 0.5 Bq/L	8	Waiting on Results	Not required
Gross Beta	< 0.5 Bq/L	8	Waiting on Results	Not required

7. Planned Sample Summary

7.1. Planned Sample – Compliance Summary

Planned Samples [1] January - March 2019								
Microbial			Chemical			Radiological		
Planned[1]	Taken[2]	% Taken	Planned[1]	Taken[2,3]	% Taken	Planned	Taken	% Taken
82	87	106%	489	577	118%	8	8	100

[1] A planned sample is defined as being included in the Sampling Schedule for this period.
[2] Physical number of samples taken for this period.
[3] Results from Tank 4, Tank 7, and Drinking fountains are excluded from this table.

Note: the addition of aesthetic and health samples equates to 617 and a percentage of 126% however actual sampled is 577 due to duplicates tests of same sample for aesthetic and health purposes therefore percentage is 118%.

7.2. Planned Sample - Exception Notifications

Planned Sample Exceptions January - March 2019			
Sampling Point	Date Due	Characteristic	Reason for Missing Sample

8. Customer Complaints

There were no complaints received for the January to March 2019 reporting period.

9. Comments

Bromate management

Context

Bromate testing is usually required in disinfection systems that utilises ultra violet technologies, however this process is not undertaken in the production of drinking water on Rottnest Island.

During the development of the risk assessments and Drinking Water Quality Management Plan, the requirement for routine Bromate analysis was not identified. It is believed that Bromate may be introduced to a drinking water system through its disinfection methodology, such as chemical compounds found in disinfectants (hypochlorites), or may be formed as a result of physical parameters

such as heat, aeration and stagnation where source water is high in Bromide. Bromide may react under suitable conditions to form Bromate.

Current Status

The Bromate working group continues to implement the Bromate Action Plan. The flushing regime initiated in January 2018 has been reinstated as part of the corrective action for the recent exceedances, with monitoring of the frequency and volume required balanced with potable water production and consumption volumes.

Drinking Fountain Monitoring Initiative

The Rottnest Island Authority commenced a drinking fountain monitoring initiative in December 2017 following a recommendation from the Department of Health.

Results obtained from the sampling program implemented supported the island's drinking fountain replacement project, which included the replacement of all existing drinking fountains and the addition of new amenities around the settlement. The final drinking fountain installation was completed in October 2018.

The drinking fountain monitoring program and sampling results are reported separately to the distribution system or network that are represented in Tables 3.1, 4.1 and 5.1. The drinking fountain results are represented in the below table for the specified period.

Rottnest Island Drinking Fountain January – March 2019					
Health Characteristic	**Australian Drinking Water Guidelines (mg/L)**	**No. of Analyses**	**No. of Analyses Complying with Australian Drinking Water Guidelines**	**% Compliance with Australian Drinking Water Guidelines**	**Max Value of Analysis (mg/L)**
Antimony (Sb)	0.003	69	69	100%	<0.005
Cadmium (Cd)	0.002	69	69	100%	0.0003
Copper (Cu)	2	69	69	100%	0.160
Lead (Pb)	0.01	69	67	97%	0.043
Nickel (Ni)	0.02	69	69	100%	0.006
Aesthetic Characteristic	**ADWG Guideline (mg/L)**	**No. of Analyses**	**No. of Analyses Complying with ADWG**	**% Compliance with ADWG**	**Max Value of Analysis (mg/L)**
Copper (Cu)	1	69	69	100%	0.160
Zinc (Zn)	3	69	69	100%	0.190

The sample results indicated isolated instances of exceedances were identified during the quarter:

- Two Lead exceedances were recorded – at the Mall and Army Jetty Drinking Fountain locations on 17th January 2019.

  Results at the Army Jetty drinking fountain sample point returned a reading of 0.021mg/L on the 1st Flush.

  Results at the pre Mall drinking fountain sample point returned a reading of 0.043mg/L on the 1st Flush

All 2nd flush samples at both drinking fountain locations returned readings within the Australian Drinking Water Guidelines.

All new drinking fountains with Lead detects were removed from service and a Lead Mitigation Plan was implemented to determine the root cause of these exceedances.

Faulty internal components, which were identified as the lead source, were subsequently replaced, recommissioned and tested by 26th February 2019.

All sample readings post replacement project have returned results within the Australian Drinking Water Guidelines.