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For the

Rottnest Island Authority

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

April – June 2018

Submission Date: 23th July 2018

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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 660,000 visits are typically made to the island on a yearly basis, with a low season minimum of 24,200 visitors/month (August) and a high season maximum of 118,784 visitors/month (January 2018).

The number of beds on the 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 the 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 typically produce less than 15% of the island's water, but has not been in use since February 2017. The freshwater bores are only utilised as a supplementary contingency water supply to the saline production bores.

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 quality and purity of the chlorine gas used for disinfection is ensured by only engaging approved product suppliers for the island.

Regular maintenance of the chlorine dosing unit is undertaken by a qualified third party at the frequencies mandated by the manufacturer. In addition to this, the quality and performance of disinfection occurring within the drinking water supply is regularly monitored by qualified Hydraulic

Technicians. This ensures that the drinking water produced on Rottnest Island meets the standard requirements agreed between the RIA and the Department of Health (DoH)'s Memorandum of Understanding (MOU) 2003, in line with the Australian Drinking Water Guideline Values.

The water demand on Rottnest is highly seasonal, and the monthly consumption can range from approximately 6,000kL in July to 25,000kL in January. The combined storage capacity of the drinking water infrastructure on site is 14,000kL, which is able to maintain approximately 28 days of water storage.

The island's bitumen catchment runoff collection system, which previously supplied the drinking water to storage tanks, was decommissioned from the drinking water supply chain in 2007. The runoff from the bitumen catchment however continued to supplement irrigation of the Golf Course until mid-2017 and is now fully decommissioned.

Remote locations outside the main settlement, such as the outer island ablutions, Wadjemup lighthouse and the Research House, 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

A comprehensive sampling schedule is in place and the distribution sampling points are RI2/001, R12/002, R12/003, R12/004, R12/005, R12/006, R12/007 and R12/008. Monitoring of Tank 4 and Tank 7 has been added to the sampling regime in recent years and continues to be monitored weekly.

Potable water sampling is carried out in accordance with the Australian Drinking Water Guidelines and is scheduled as per the Rottnest Island Drinking Water Quality Management Plan (DWQMP). At times, opportunities for further monitoring is required based on risk assessment, new information, post-incident or as per specialist recommendations. As such, additional testing parameters were suggested by the DoH in November 2017 which identified the presence of bromate in the distribution system. Initial levels returned were found to be well above the Health levels found in the Australian drinking guidelines (ADWG). The findings resulted in the formation of a specialist working group who implemented a series of proposed corrective actions to address and mitigate this issue. More information is supplied in section 8.

Testing of the island's drinking fountains was also suggested as an ongoing requirement against defined parameters in the ADWG, which have now been added to the monthly sampling regime.

2. Performance Summary

Water Quality Meeting the *Australia Drinking Water Guidelines v.3.4* (2017) (ADWG) April - June 2018			
	[1]No. of Analyses Completed	No. of Analyses Within Guidelines	No. of Non-conformances to Guidelines
Microbial			
Bacterial (*E.coli*)	62	62	0
Thermotolerant Coliforms	62	62	0
Amoeba (Thermophilic *Naegleria)*	24	24	0
Chemical & Physical			
Health	226	226	0
Aesthetic	386	339	47
Radiological			
Gross Alpha		Next Schedule March 2019	
Gross Beta		Next Schedule March 2019	

[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 April - June 2018 reporting period, there was no reported exceedances of Microbial Health against the ADWG in the potable water distribution system.

3.1. Microbial – Compliance Summary

Rottnest Island Distribution System April - June 2018				
Microbial Characteristic	**MoU Compliance Criteria**	**No. of Analyses**	**No. of Analyses Complying with MoU**	**% Compliance**
Bacterial				
E.coli	Non Detect	62	62	100%
Thermotolerant Coliforms	Non-Detect	62	62	100%
Amoeba				
Thermophilic *Naegleria*	Non Detect	24	24	100%

3.2. Microbial – Exception Notifications

Microbial Water Quality Exceptions April - June 2018						
Population Served	**Date**	**Microbial Characteristic**	**MoU Alert Level**	**Remedial Action**	**DoH Notified**	**Close Out Date**
	NTR					

3.3. Microbial Incident Specific Information

There were no reported exceedances of Microbial Health in the potable water distribution system over the period, however the island successfully manage an E.coli detection in Tank 4 in June 2018.

On 19th June 2018 the weekly NATA monitoring samples for Tank 4 returned a positive results for E.coli and Thermotolerant Coliforms, both at levels of 24 cfu/100ml.

The investigation identified a failure in the primary chlorination treatment process between tank 7 and 4 which was promptly rectified by the hydraulics team. Additional sampling was undertaken on 22nd June with results returning levels of 7 cfu/100ml, followed by a non-detect of microbial parameters on the 26th June 2018.

Tank 4 is an intermediary holding tank for potable water between tank 7 and tank 5. The disinfection system between Tank 4 and Tank 5 remained in good working order and was found to be effective in preventing microbial contamination to Tank 5. All sample locations within the distribution system remained within the ADWG.

Both transfer/chlorination stations are scheduled for full replacement in July/ August 2018.

Tank 7 continues to have regular E.coli and Thermotolerant Coliform exceedances, mainly reported following heavy rainfall events.

4. Chemical: Health Related Performance

During the April - June 2018 reporting period, there were no reported exceedances of Chemical Health parameters in the potable water distribution system.

4.1. Chemical: Health Related - Compliance Summary

Rottnest Island Distribution System April - June 2018					
Health Characteristic	**ADWG Guideline (mg/L)**	**No. of Analyses**	**No. of Analyses Complying with ADWG**	**% Compliance with ADWG**	**Max Value of Analysis (mg/L)**
Antimony (Sb)	0.003	4	4	100%	<0.001
Bromate	0.02	103	103	100%	0.02
Cadmium (Cd)	0.002	4	4	100%	<0.001
Chlorine (Cl_2) *(in house testing)*	5	53	53	100%	1.10
Copper (Cu)	1	4	4	100%	0.016
Fluoride (F)	1.5	1	1	100%	<0.1
Lead (Pb)	0.01	4	4	100%	<0.001
Manganese (Mn)	0.5	24	24	100%	<0.005
Nickel (Ni)	0.02	4	4	100%	<0.001
Nitrate (NO_3) (Nitrate as nitrate)	50 mg-$N0_3$/L	4	4	100%	<0.05
Nitrite (NO_2)	3 mg-$N0_2$/L	10	10	100%	<0.5
Trihalomethanes (THMs)	0.25	10	10	100%	0.013

[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 Characteristic	MoU Alert Level	Remedial Action	DoH Notified	Close Out Date
		NTR		

Chemical: Health Related Incident Specific Information

The parameters for Bromate have now been included in the Chemical Health section and will be a permanent addition to the Drinking Water monitoring schedule moving forward.

5. Chemical: Aesthetic Performance

5.1. Chemical: Aesthetic – Compliance Summary

Rottnest Island Distribution System April - June 2018					
Aesthetic Characteristic	**ADWG Guideline (mg/L unless stated)**	**No. of Analyses**	**No. of Analyses Complying with ADWG**	**% Compliance with ADWG**	**Max Value of Analysis (mg/L)**
Aluminium (Al)	0.2	3	3	100%	<0.01
Ammonia (NH_3)	0.5	7	7	100%	0.008
Chloride (Cl)	250	41	41	100%	260
Chlorine (Cl_2) *(in house testing)*	0.6	61	23	38%	1.65
Colour	15 (HU)	7	7	100%	<5
Copper (Cu)	1	4	4	100%	0.016
Hardness ($CaCO_3$)	200	1	1	100%	11
Iron (Fe)	0.3	27	25	93%	1.6
Manganese (Mn)	0.1	28	28	100%	<0.005
pH	6.5 – 8.5	90	83	92%	9.5
Sodium (Na)	180	104	104	100%	140
Sulphate	250	1	1	100%	3
Sulphide (H_2S)	0.05	0	0	NR	NR
TDS	600	2	2	100%	390
Turbidity	5 (NTU)	7	7	100%	0.5
Zinc (Zn)	3	4	4	100%	0.042

[2] As screened against respective guideline – health / aesthetic. Results from Tank 4, Tank 7 and Drinking fountains are excluded from this table.
NR = Not recorded

5.2. Chemical: Aesthetic - Incident Specific Information

There were 47 instances where analytical results exceeded the aesthetic guidelines for chemical and physical properties, these are summarised below:

Iron: There were two recorded exceedances of iron in the distribution system over the quarter. As iron has a taste threshold of approximately 0.3 mg/L in water; this may cause taste and odour problems.

The first instance was reported on April 3rd 2018 at R12/005 in Longreach at 1.6mg/L. The cause was associated to a line purge conducted by the hydraulics team in the previous week, as part of the bromate remediation plan. No further exceedance were recorded and there has been no history of high iron concentration in this location previous to this event.

The second exceedance was recorded on the 15th May 2018 at R12/008 at the Nursery. The line was flushed and no further exceedance were recorded in the quarter.

pH: During the quarter, there was 7 instances of pH reported outside the ADWG range (6.5 to 8.5).

One recorded instance of low pH (6.41) was recorded at R12/001 (Tank 5) during a field monitoring round on the 4th May. Subsequent pH analysis of Tank 5 returned all results within ADWG parameters.

The second instance was recorded at R12/007 (Geordie Bay) at a high pH level of 8.52. This sample was also taken during a field monitoring round.

Five other instances were recorded at R12/002 between the 13th April and the 11th May 2018, with high pH ranging between 8.56 to 9.5. The samples were recorded by both internal field monitoring and NATA lab results.

A higher pH can be due to longer retention times in the water main, and can also be a characteristic of distribution systems that are constructed partly of concrete tanks and cement-mortar lined pipes; typical of the Rottnest Island distribution system. The ADWG indicates that pipes constructed of these materials can significantly increase pH, and a higher pH value may be tolerated, provided monitoring indicates no deterioration in microbial quality.

- **Chlorine:** During this quarter, 38 out of 61 recorded samples were reported with chlorine values above the ADWG' Aesthetic limit of 0.6mg/L. These results were found across all distribution sampling points over the 3 month period.

  Whilst some monitoring locations reported analytic concentrations outside of the guideline values for aesthetic water quality, it is important to note that these results remain well below the Health limit of 5mg/L, with a maximum value of 1.65mg/L reported at Bathurst on 26th June 2018.

6. Radiological Performance

No radiological samples were required during the reporting period. The next round of radiological samples are due in March 2019 and will be reported during the appropriate reporting cycle.

6.1. Radiological – Compliance Summary

Rottnest Island Distribution System April - June 2018				
Radiological Characteristic	**MoU Compliance Criteria**	**No. of Analyses**	**No. of Analyses Complying with MoU**	**% Compliance**
Gross Alpha	< 0.5 Bq/L	NR	NR	NR
Gross Beta	< 0.5 Bq/L	NR	NR	NR

NR = Not recorded

7. Planned Sample Summary

7.1. Planned Sample – Compliance Summary

Planned Samples [1] April - June 2018								
Microbial			Chemical[2]			Radiological		
Planned	Taken	% Taken	Planned	Taken[3]	% Taken	Planned	Taken	% Taken
86	86	100%	257	610	237%	NR	NR	NR

NR = Not recorded
[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] Planned chemical sampling did not include bromate monitoring requirements.
[4] Results from Tank 4, Tank 7 and Drinking fountains are excluded from this table.

7.2. Planned Sample - Exception Notifications

Planned Sample Exceptions April - June 2018			
Sampling Point	Date Due	Characteristic	Reason for Missing Sample
No Exceptions			

8. Comments

Bromate management

The Bromate working group is continuing to implement the bromate action plan drafted in January 2018

Bromate levels in the distribution system continue to be within the ADWG parameters. The flushing regime initiated in January continues to ensure a consistent flow of drinking water at the dead legs, reducing holding time during low occupancy period on the island. Weekly monitoring of bromate over the quarter provides the team with the visibility to review the effectiveness of individual actions taken to reduce and eliminate bromate from the distribution system.

Drinking Fountain Monitoring Initiative

Rottnest Island commenced the Drinking fountain monitoring initiative in December 2018 following a recommendation from the Department of Health. Early results obtained from the sampling program supported the island's drinking fountain replacement project, which includes the replacement of all current drinking fountains, and the addition of new amenities around the settlement. Completion of the project is expected by late 2018.

Rottnest Island Drinking Fountain April - June 2018					
Health Characteristic	**ADWG Guideline (mg/L)**	**No. of Analyses**	**No. of Analyses Complying with ADWG**	**% Compliance with ADWG**	**Max Value of Analysis (mg/L)**
Antimony (Sb)	0.003	42	42	100%	<0.001
Bromate	0.02	30	27	90%	0.048
Cadmium (Cd)	0.002	37	37	100%	<0.0004
Copper (Cu)	2	46	45	98%	2.40
Lead (Pb)	0.01	48	46	96%	0.018
Manganese (Mn)	0.5	4	4	100%	<0.005
Nickel (Ni)	0.02	44	43	98%	0.20
Aesthetic Characteristic	ADWG Guideline (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Chloride (Cl)	250	12	12	100%	180
Iron (Fe)	0.3	4	4	100%	0.04
Sodium (Na)	180	22	22	100%	110
Sulphate	250	12	12	100%	3
TDS	600	27	27	100%	390
Zinc (Zn)	3	42	42	100%	0.4

The drinking fountain results have been excluded from the distribution system (Tables 3.1, 4.1 and 5.1), as isolated events at these location are not indicative of the distribution system on a whole.

Several isolated instances were identified during the quarter as follows:

- Three bromate exceedances were recorded on the 18th April from the drinking fountains located at the Visitor Centre (on the first flush sample at 0.043mg/L) and on both samples taken at the Beach Shelter (0.048mg/L and 0.03mg/L respectively). The Visitor Centre drinking fountain is now being regularly flushed by use of a tap timer. The Beach Shelter drinking fountain was later decommissioned as part of the Drinking fountain replacement project.

  No further bromate exceedances have been reported on any drinking fountain since the tap timers were installed in early April 2018.

- Whilst conducting ongoing investigative sampling of the water delivery line to the Geordie Bay drinking fountain, a copper exceedance was reported on 12th April. Investigation identified that the sample was taken at a tap fitted with a brass fitting. The brass fitting was replaced and follow up samples were returned within the ADWG parameters.

- During the commissioning of the new Geordie Bay drinking fountain, a lead exceedance was reported on the first flush sample at 0.018mg/L on May 15th 2018. A follow up sample was taken on May 22nd with exceedance on the first flush of 0.017mg/L. The fountain's water delivery line was excluded as the source of lead contamination. The drinking fountain's filter was identified as another potential source of contamination from the commissioning process. The filter was replaced by the hydraulics team and follow up samples were all returned within ADWG parameters.

- The temporary water tap at the Kingston Barracks bus stop returned an exceedance for Nickel on the first flush sample at 0.2mg/L. The tap was isolated during the investigation and follow up samples on May 22nd were within the ADWG parameters. The drinking water tap was decommissioned shortly after pending the installation of the new Kingston Barracks drinking fountain.

Event investigation

On the 10th May 2018, the Department of Health (DoH) forwarded to RIA a photograph of a discoloured liquid (rust coloured), within a plastic container labelled "Tap water from back kitchen". The photograph was sent from an undisclosed person. The hydraulics team immediately isolated the suspected tap and commenced an investigation into this issue. The team collected an initial sample from the tap for both microbial and chemical analysis, which was reported as within ADWG parameters at the time. It was later found that the rust coloured water happened only on occasion, and only upon turning on the water after a period of being unused. The water then cleared within a few seconds. It was found that this particular tap was fed from an old galvanised section of pipework. The recommended solution was to remove the old pipework and resupply from other source.

Other

The Annual Drinking Water Test Exercise was successfully conducted on Thursday 21st June 2018. The test exercise consisted of two incidents taking place over a peak summer weekend period. The recommendations of the exercise are currently being reviewed and details shall be outlined in the Annual Drinking Water Report issued in November 2018. The participants of the test exercise handled the scenario in a professional manner, following the appropriate guidelines set out in the Programmed emergency protocols.

The RIA anticipates that the Rottnest Island Drinking Water Quality Management Plan, along with the Memorandum of Understanding with the Department of Health to be approved and re-endorsed during the third quarter of 2018.