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Facility Management

Programmed Facility Management

for the

Rottnest Island Authority

Annual Drinking Water Report

Rottnest Island Authority

July 2021 – June 2022





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Foreword

The Rottnest Island Authority (RIA) is committed to providing high quality drinking water that meets the Australian Drinking Water Guidelines (ADWG), other regulatory requirements and consumer expectations in a sustainable way.

This Annual Report describes Rottnest Island's drinking water quality performance for the 2021 to 2022 reporting period. The RIA is committed to being transparent on its performance by providing the public with accurate and representative information in this report. The report aims to demonstrate to island customers and visitors, the ongoing commitment to the sustainable production and supply of high-quality drinking water on Rottnest Island.

Further details on RIA's commitment to Drinking Water Quality can be reviewed under [Rottnest Island Drinking Water Quality Policy](#) on the Rottnest Island website.

Programmed Facility Management (PFM) continues to operate the major facilities and delivers other services on behalf of the RIA. Management of the water network is a component of the utilities services performed by PFM, which includes the production, distribution, and monitoring of drinking water.

The 2021-2022 Annual Water Quality Report confirms that the RIA and PFM have remained consistent with previous years' performance in the management of the Drinking Water supply on Rottnest Island.

Acronyms

| | | |
|-----------------------|--|---|
| ADWG | Australian Drinking Water Guidelines | The Australian Drinking Water Guidelines provides a framework for management of drinking water supply. |
| Bq/L | Becquerels per litre | Becquerels per litre is the unit of activity of radioactivity per unit volume |
| DWQMP | Drinking Water Quality Management Plan | The Drinking Water Quality Management Plan describes how the production, distribution and monitoring of drinking water is managed on Rottnest Island. |
| HU | Hazen Unit | A Hazen unit is a measurement of colour. |
| km | Kilometre | A kilometre is a unit of length in the metric system, equal to one thousand metres. |
| mg/L | Milligrams per litre | Milligrams per litre is the mass of a chemical per unit volume of water. |
| mg-NO ₂ /L | Milligrams of nitrite | Milligrams per litre is the mass of nitrite per unit volume. |
| mg-NO ₃ /L | Milligrams of nitrate | Milligrams per litre is the mass of nitrate per unit volume. |
| ML | Megalitre | A megalitre is a unit of volume in the metric system, equal to one million litres. |
| MoU | Memorandum of Understanding | The memorandum of understanding is an agreement between the RIA and WA Health and demonstrates the agreed commitments to drinking water quality. |
| NTU | Nephelometric Turbidity Unit | A nephelometric turbidity unit is a measurement of turbidity. |
| PFAS | Per- and polyfluoroalkyl substances | A group of over 4,000 synthetic chemicals that are used for a variety of household and industrial purposes. |
| PFM | Programmed Facility Management | Programmed Facility Management (ABN 23001382010) is contracted to manage drinking water supply on Rottnest Island. |
| RIA | Rottnest Island Authority | Rottnest Island Authority is a statutory body who manage Rottnest Island. |
| TDS | Total Dissolved Solids | Total Dissolved Solids is a measurement of inorganic salts and organic matter dissolved in water. |
| WA Health | Department of Health | The Department of Health oversee compliance of Western Australia's health system. |
| µg/L | Micrograms per litre | Micrograms per litre is a unit of volume in the metric system. One microgram is equal to one millionth of a gram. |

1. Introduction

Rottnest Island is located 19 km west of Fremantle, Western Australia, and is 11 km long and 4.5 km at its widest point. The total land area measures approximately 1,900 hectares and is managed by the RIA. The island is a Class A Reserve and a popular destination for local, interstate and international visitors. Due to the COVID-19 Pandemic, visitation to the island has been reduced from previous reporting periods.

Water production facilities include saline groundwater bores, desalination plant, drinking water storage tanks, and distribution system. The distribution and supply to customers is via a reticulated network. PFM is contracted by the RIA to manage the production, distribution and monitoring of the drinking water supply to customers, Rottnest Island residents, and visitors.

The primary source of drinking water on Rottnest Island processed through the desalination plant is the six saline production bores located within the Longreach Borefield. Historically Wadjemup Borefield has been used for the supply of drinking water, however, this ceased in 2017.

1.1. Drinking Water Quality Management

The DWQRMP is the principal framework document used by RIA and PFM to implement the effective management of the drinking water distribution system on Rottnest Island. The DWQRMP forms part of the Memorandum of Understanding (MoU) between the RIA and the Department of Health (WA Health) and is supported by the drinking water binding protocols. The Drinking Water Quality Risk Management Plan Framework also includes the Drinking Water Incident Response Protocols and other statutory documentation required to ensure compliance with the ADWG.

A copy of the 2019 [Memorandum of Understanding](#) is available to view on the RIA website.

The ADWG are published and updated by the National Health and Medical Research Council, Australia's peak health research body on Australian Drinking Water. The ADWG are the national standard for Australian Drinking Water; requiring a risk management framework to be established for the effective management of drinking water supplies in Australia.

The ADWG can be downloaded from: <https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines>

A key aspect of the ADWG is a risk management approach. This approach is aimed at ensuring the ADWG are achieved from the water source, to points of consumption. This ensures, and requires, that there is a monitoring program established with appropriate sampling points throughout the distribution system, whilst providing a robust tool for identifying preventative and corrective actions for the improvement of water quality.

The ADWG recognise the significance of a preventative, multi-barrier approach for the protection of public health in drinking water supplies and have incorporated a framework for management of drinking water quality. The framework presented in the ADWG includes twelve elements considered good practice in the systematic management of drinking water supplies.

A DWQRMP has been developed for Rottnest Island, utilising the elements within the Australian Drinking Water Guidelines – Framework for the Management of Drinking Water Quality.

The DWQRMP is an important requirement of the MoU, and has included a detailed risk assessment for each element of the system including:

- Longreach (saline) Borefield;
- Desalination Plant;
- Storage Tanks;

- Treatment System (Chlorination);
- Pumping System;
- Distribution and Reticulation system;
- Water sampling and monitoring points.


To ensure that the production, monitoring, supply and management of Rottnest Island's drinking water supply continues to remain of high quality, the DWQRMP is reviewed at set frequencies.

Where changes are made to the DWQRMP, these undergo a detailed review by relevant stakeholders and the changes will be presented within subsequent Quarterly and Annual Drinking Water Reports.

1.2. Memorandum of Understanding

In April 2012 the MoU between WA Health and RIA commenced. This commitment to the MoU by both parties ensures a strong cooperative relationship for the management of drinking water and the protection of public health. The MoU was updated and re-signed by the RIA and WA Health in December 2019 which extends for a period of five years. The 2019 [MoU](#) is available to view on the RIA website.

Another important component of the MOU is the requirement for the Licensee (RIA) to notify WA Health of the provision of other forms of water supply. That is, the supply of water not intended for drinking purposes. The specific items pertaining to management of this commitment as described within the MoU, and how these items are complied with on Rottnest Island, are detailed within the table below. Primarily, provision of non-drinking water on Rottnest Island occurs for the toilet facilities at the western end of Rottnest Island.

| Memorandum of Understanding and the provision of non-drinking Water on Rottnest Island | |
|---|--|
| MOU | RIA Provision |
| Ensure advice is given to customers and their tenants or visitors that this water supply is not to be used for drinking or food preparation. | Where water provided is unsuitable for drinking/food preparation, public signage has been installed. Example provided below.  |
| Annual requirement by way of written reminders of water quality. Inspections to ensure affected taps are labelled with "non-drinking water". | Water quality is reported annually and quarterly. Points have been labelled where the water provided is unsuitable for drinking. |
| If the Licensee provides non-drinking water to public open space areas, accessible to general public or via standpipes, then adequate signage advising "not suitable for drinking" is required. | Where non-drinking water is used in public open spaces, and areas accessible to the general public, appropriate signage has been installed clearly stating non-drinking water is in use. |



2. Water Provider Information

| Contact Details | | | |
|--|--|------------|----------------|
| Name of Company | Rottnest Island Authority | | |
| Company Address | 1st Floor E – Shed, Victoria Quay, Fremantle WA 6160 | | |
| Company Phone | Ph (08) 9432 9300 | Fax | (08) 9432 9301 |
| Company Website | www.rottnestisland.com | | |
| Company Email | enquiries@rottnestisland.com | | |
| Executive Director | Jason Banks | | |
| Director Environment Heritage and Parks | Arvid Hogstrom | | |
| Manager Environment and Compliance | Rebecca Gabbitus | | |
| Island Operations Manager (PFM) | Dan Hunt | | |

2.1. System Information

2.1.1. Consumers

Water demand is highly seasonal and directly related to tenancy and visitation to Rottnest Island. Typically, consumption is low in winter and high in summer.

The number of beds on the island for visitors totals 2,150, with the average length of stay being 3.5 nights. In addition, there are approximately 150 permanent residents on the island, however this value fluctuates with seasonal staffing demands.

In a typical year Rottnest Island experiences an average low season minimum between June-August and an average high season maximum between December – February. During this reporting period approximately 424,168 visitors arrived at the Island, an increase from last year's number of 411,325 but a decrease from 455,031 visitors during the 2019-20 reporting period.

The peak visitation period for this reporting year was December 2021 to January 2022 with approximately 57,546 and 72, 536 visitors, respectively.

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 150 permanent residents on Rottnest Island, which also fluctuates in accordance with high and low seasons.

2.1.2. Distribution System & Water Supply

The drinking water quality parameters are regularly monitored by the PFM Environment, Quality and Compliance Officer and hydraulic technicians to ensure that drinking water produced on Rottnest Island meets the requirements of the ADWG and WA Health. A graphical representation of the drinking water distribution system is provided in **Figure 1**.

During the reporting period, 447,568 kilolitres of saline groundwater was abstracted from the Longreach Borefield. (Ground Water Licence GWL177495(2) – Department of Water 2015-2025) for desalination purposes. No water abstracted from the Wadjemup Borefield was used to supplement the drinking water system.

The water demand on Rottnest Island is highly seasonal, with monthly consumption ranging from approximately 12,000 kilolitres in July (low season) to 22,000 kilolitres in December (peak season). The combined storage capacity of the drinking water infrastructure is approximately 14.5 ML, which provides around 22 days of drinking water storage at full capacity.

2.1.3. Sampling Schedule & Procedure

The DWQRMP details a comprehensive sampling schedule developed by a specialist consultant based on a risk management strategy and adopted by the RIA and PFM. The schedule includes eight nominated sampling points throughout the distribution system. The nominated sample points allow for fair representation of the water supply on Rottnest Island.

The sampling locations are shown in **Figure 1** and **Figure 2**.

Sampling and in-house monitoring procedures are carried out in accordance with best industry practice and executed by qualified hydraulics technicians. Nominated samples in the sampling schedule are analysed by a NATA accredited laboratory in accordance with the requirements of WA Health.

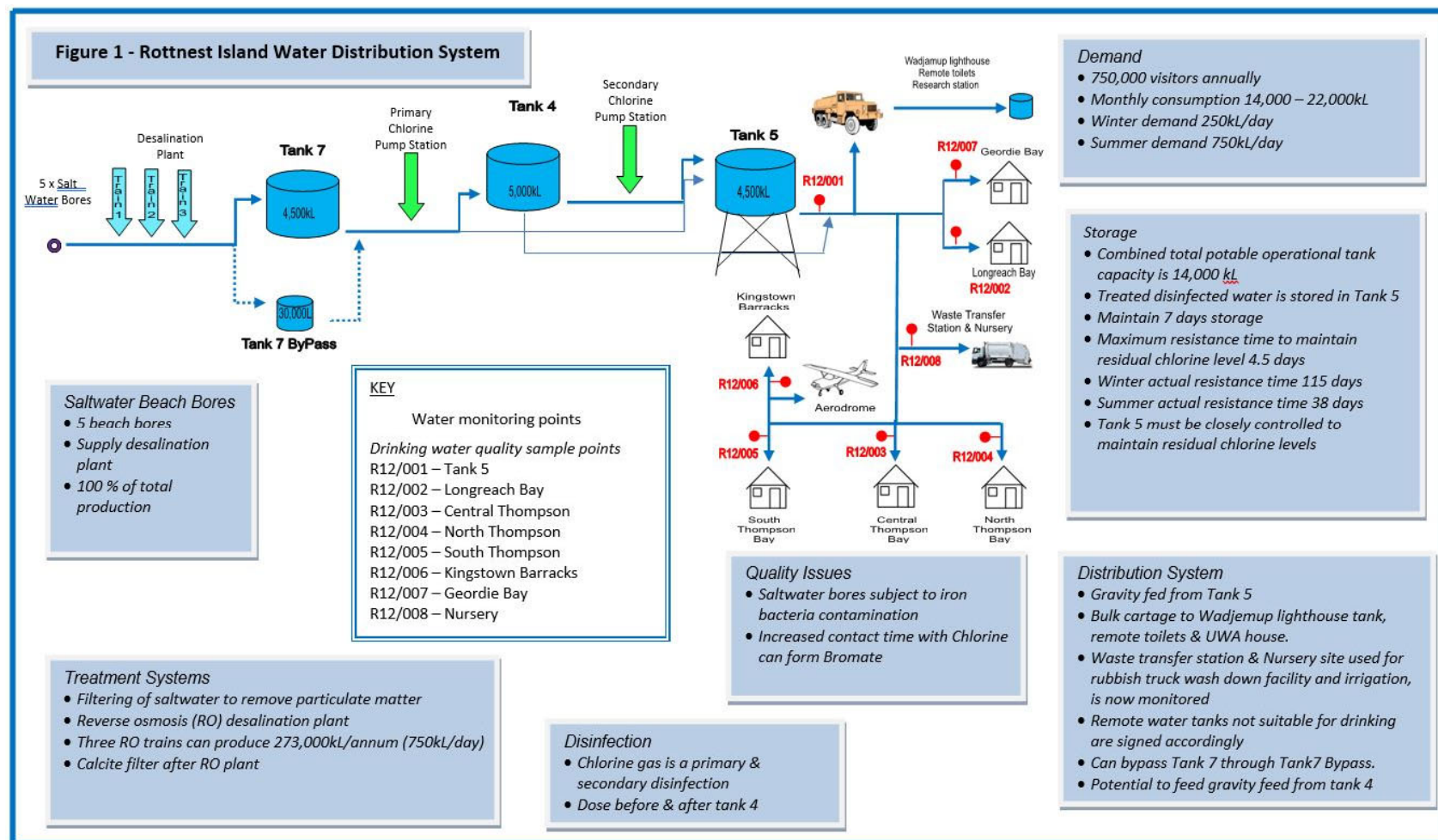


Figure 1: Rottnest Island Water Distribution System



Figure 2: Map of the Sampling Locations

2.1.4. Public Drinking Water Supply Source Protection Measures

The [Rottnest Island Management Plan 2020-24](#), Drinking Water Source Protection Plan, and Groundwater Licence Operating Strategy reflect this commitment and contain the strategies, procedures and processes to meet this objective. With regards to the Drinking Water Source Protection Plan, the RIA are undertaking the following activities within the Longreach Borefield to manage and protect the source area for public drinking water supply:

- Recognition of the P3 Public Drinking Water Source Area (PDWSA) and risk assessment of allowable uses in the Drinking Water Quality Risk Management Plan.
- Monitoring of the raw (source) water at the Longreach Borefield for chemical parameters in accordance with the ADWG.
- Confirming that all production bores have been constructed in accordance with regulatory standards for bore installations.
- Defining a 300m wellhead protection zone around each production bore.
- Management of the P3 source protection area in accordance with regulatory requirements.

In addition, the RIA will undertake a one-off sampling event at the Longreach Borefield in 2023 for microbiological parameters as recommended in the Drinking Water Source Protection Plan. The monitoring will be undertaken in accordance with the ADWG.

In relation to compliance with the provisions of the Groundwater Licence Operating Strategy, the RIA is managing groundwater abstraction from the public drinking water supply through collection and analysis of data including groundwater abstraction, groundwater chemistry and levels. In the 2021 to 2022 reporting period, a total of 447,568 kilolitres of groundwater was abstracted from the Longreach Borefield.

3. Microbial Performance

The results in Section 3.1 summarise the outcome of microbial characteristics monitored during the 2021-2022 period. 100% compliance was reported at the eight nominated sampling points in 2021-2022 maintaining the compliance rate set in 2020-2021.

3.1. Microbial Compliance Summary

| Rottnest Island Distribution System 2021–22 | | | | |
|--|---|-----------------|--|--------------|
| Microbial Characteristic | Memorandum of Understanding Compliance Criteria | No. of Analyses | No. of Analyses Complying with Memorandum of Understanding | % Compliance |
| Bacterial | | | | |
| <i>E. coli</i> | Non Detect | 231 | 231 | 100% |
| Amoeba | | | | |
| Thermophilic <i>Naegleria</i> | Non Detect | 108 | 108 | 100% |

3.2. Microbial Incident Specific Information

There were no recorded microbial non-conformances for *E. coli*, thermotolerant coliforms or thermophilic *Naegleria* at the eight nominated sample points during the 2021-2022 reporting period.

4. Chemical: Health Related Performance

The results in Section 4.1 summarise the outcome of health characteristics monitored during the 2021-2022 reporting period.

The health characteristics monitored within the eight nominated sampling points recorded 99% overall compliance with the ADWG. The reported exceedances were related to the presence of bromate in the drinking water system.

Specific details are described in the below section 4.2 Health Related Incident Specific Information.

4.1. Chemical: Health Related Compliance Summary

| Rottnest Island Distribution System 2021-22 | | | | | |
|---|---------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Health Characteristic | ADWG Compliance Criteria (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) |
| Antimony (Sb) | 0.003 | 94 | 94 | 100% | < 0.001 |
| Bromate (BrO ₃ ⁻) | 0.02 | 411 | 409 | 99% | 0.021 |
| Cadmium (Cd) | 0.002 | 15 | 15 | 100% | < 0.002 |
| Chlorine Total (Cl) | 5 | 177 | 177 | 100% | 1.37 |
| Copper (Cu) | 2 | 13 | 13 | 100% | 0.02 |
| Fluoride (F) | 1.5 | 112 | 112 | 100% | < 0.1 |
| Lead (Pb) | 0.01 | 13 | 13 | 100% | 0.001 |
| Manganese (Mn) | 0.5 | 7 | 7 | 100% | < 0.005 |
| Nickel (Ni) | 0.02 | 13 | 13 | 100% | < 0.001 |
| Nitrate (NO ₃) | 50 mg-NO ₃ /L | 13 | 13 | 100% | < 0.01 |
| Nitrite (NO ₂) | 3 mg-NO ₂ /L | 44 | 44 | 100% | 0.04 |
| ¹ Trihalomethanes (THM) | 0.25 | 48 | 48 | 100% | 0.097 |

¹ Trihalomethanes can be present in drinking water as a by-product of chlorination or chloramination. Chlorine is the only source of disinfection currently used on Rottnest.

4.2. Chemical: Health Related Incident Specific Information

The health characteristics sampled during the 2021-2022 reporting period returned results in line with those taken during the 2020-2021 period in that bromate was the only detected exceedance. There were two exceedances of bromate in the current reporting period compared with five exceedances in the previous reporting period. The first exceedance event reported a bromate concentration of 0.021 mg/L on 3 May 2022, and the second also reported a concentration of 0.021 mg/L on 10 May 2022. Both samples were taken from sample point R12-005 (South Thompson).

Both bromate results were verified with the laboratory on 22 May which returned concentrations of 0.021 mg/L for the 3 May sample, and 0.020 mg/L for the 10 May sample. Following laboratory verification, a remedial flushing plan was initiated in accordance with the Island's Bromate Remediation Plan (PFM, 2018). The flush point at South Thompson was flushed for 24 hours on 11 May, and flushing then occurred weekly until bromate results were below the ADWG limit of 0.020 mg/L for two consecutive samples. Samples taken at R12-005 on 14 May reported a bromate concentration of 0.016 mg/L.

All critical control points were then checked and confirmed to be working (pH, chlorine, and turbidity sensors).

4.2.1. Bromate management

Bromate testing was added to the agreed sampling schedule in the 2017-2018 reporting period. This followed a request from WA Health to participate in a voluntary monitoring program for bromate. RIA and PFM continue to manage bromate formation through proactive and reactive management:

Proactive

- Close monitoring of tank levels, water retention times and their relationship with bromate formation. The holding time in pipes is believed to be a contributing factor in the production of bromate in the drinking water system.
- Avoidance of excessive chlorination and oxidation of bromide to bromate by optimising chlorine levels in the storage tanks before distribution in the water network.
- Regular maintenance and replacement of membranes, which improves the quality of the permeate, in turn lowering bromide levels.

Reactive

Flushing regime – Flushing of the distribution system when the bromate levels are reported approximately 25% below the limit set out in the ADWG.

4.3. Pesticides

As part of RIA's commitment to providing a sustainable environment, pesticide usage is minimised and applied in a controlled manner on Rottne Island. Pesticide testing was undertaken in February 2021 at R12/001 in line with WA Health 'Pesticides Monitoring Exclusion Policy' (2018) and from the MOU between RIA and WA Health. All pesticide test results in February 2021 complied with the health-related guideline values set out in the ADWG. These results are shown in last year's annual report.

According to the *Pesticides Monitoring Exclusion Policy' (2018)* if the presence of pesticides is unlikely, very infrequent monitoring or no monitoring at all is required. Therefore, there was no pesticide analysis completed during this reporting period.

4.4. PFAS testing

Following the Drinking Water Quarterly Meeting held on 5 June 2019, WA Health recommended a one-off sampling for per- and poly-fluoroalkyl substances (PFAS) to take place at two locations along the drinking water distribution line. From this point onwards, PFAS has been tested on an annual basis. Samples for this reporting period were taken in May 2022.

The results are presented in the below table.

| Rottnest Island Distribution System 2021-2022 | | | | | |
|---|---------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Health Characteristic | ADWG compliance criteria (ug/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (ug/L) |
| Sum of Perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS) | 0.07 | 2 | 2 | 100% | < 0.01 |
| Perfluorooctanoic acid PFOA | 0.56 | 2 | 2 | 100% | < 0.01 |

PFAS are manufactured chemicals that do not occur naturally in the environment. PFAS chemicals include perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS) amongst a large group of other compounds. PFAS are persistent in the environment, show the potential for bioaccumulation and biomagnification, and are toxic in animal studies (potential developmental, reproductive and systemic toxicity). They have been used in a wide range of consumer products including surface treatments such as non-stick cookware, and notably in aqueous film forming foam used to extinguish fires.

5. Chemical: Aesthetic Related Performance

5.1. Chemical: Aesthetic Compliance Summary

The following table summarises the outcomes for specific aesthetic related characteristics during the 2021-2022 reporting period.

| Rottneest Island Distribution System 2021-22 | | | | | |
|--|---------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Aesthetic Characteristic | ADWG compliance criteria (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) |
| Aluminium (Al) | 0.2 | 13 | 13 | 100% | 0.01 |
| Ammonia (NH ₃) | 0.5 | 48 | 48 | 100% | 0.04 |
| Chloride (Cl ⁻) | 250 | 6 | 6 | 100% | 170 |
| Chlorine (Cl ₂) Free Residual | 0.6 | 177 | 15 | 8% | 1.20 |
| Colour (True Colour) | 15 (HU) | 26 | 24 | 92% | 20 (HU) |
| Hardness (CaCO ₃) | 200 | 4 | 4 | 100% | 25 |
| Iron (Fe) | 0.3 | 102 | 94 | 92% | 0.60 |
| pH | 6.5 - 8.5 | 116 | 112 | 97% | 8.23 |
| Sodium (Na) | 180 | 411 | 414 | 100% | 120 |
| Sulphate (SO ₄ ²⁻) | 250 | 4 | 4 | 100% | 4.5 |
| Hydrogen Sulfide (H ₂ S) | 0.05 | 13 | 11 | 85% | 0.08 |
| TDS | 600 | 4 | 4 | 100% | 340 |
| Turbidity | 5 (NTU) | 26 | 26 | 100% | 2.7 (NTU) |
| Zinc (Zn) | 3 | 14 | 14 | 100% | 0.062 |

5.2. Chemical: Aesthetic Incident Specific Information

Whilst exceedances of aesthetic guidelines can affect consumer experience, it is important to note that exceedances to aesthetic guidelines refer only to palatability to consumers, including appearance, taste and odour.

There were several instances where analytical results exceeded the aesthetic guidelines for chemical and physical properties as follows:

- **Free Chlorine:** 162 out of 177 samples reported chlorine concentrations above the ADWG aesthetic value of 0.6 mg/L, with the highest concentration reported at 1.20 mg/L in August 2021. The ADWG states that chlorine has an aesthetic odour threshold of 0.6 mg/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 mg/L. 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. In the interest of maintaining microbiological safety across the entire drinking water distribution system, the RIA intends to continue operating the distribution system using higher levels of chlorine that may exceed the ADWG aesthetic values to maintain disinfection. No complaints were recorded during the year with regards to odour.
- **Colour:** 2 out of 26 samples recorded colour above the ADWG aesthetic value of 15 HU, the first was in July 2021 with a value of 18 HU and the second during October 2021 with a value of 18 HU. According to the ADWG a True Colour of up to 25 would probably be accepted by most people provided the turbidity was low. It is noted that turbidity was 100% compliant with the ADWG limit.
- **Iron:** 8 of the 102 samples recorded iron concentrations above the ADWG aesthetic value of 0.3 mg/L, with the highest concentration reported at 0.60 mg/L in December 2021. The cause of the iron exceedances is likely to be related to rusted pipework. Iron has a taste threshold of 0.3 mg/L in water, and becomes objectionable above 3 mg/L.
- **pH:** 4 of 116 laboratory samples reported pH values outside the ADWG aesthetic pH range of 6.5 to 8.5. The exceedances for the 2021-2022 period included:
 - pH of 6.1 on 14 December 2021. In-situ field test reported a result of 7.41.
 - pH of 6.4 on 8 March 2022. In-situ field test reported a result of 6.55.
 - pH of 6.4 on 3 May 2022. In-situ field test reported a result of 7.29
 - pH of 6.3 on 31 May 2022. In-situ field test reported a result of 7.62 and subsequent laboratory analysis reported a pH within the ADWG limit at 6.8.

All in-situ field tests reported pH values within the ADWG limit range of 6.5 to 8.5.

To manage reactive upper and lower limit pH values, flushing occurred on 15 December and 9 March at the Tank 5 sample point. Flushing also occurred on 17 May at Geordie Bay flush point as instructed by the RIA. Given that the field pH were within limits, it is considered that the low pH was due to changes in temperature between the time of sampling and analysis at the laboratory.

- **Hydrogen Sulfide:** There were two exceedance events that occurred on 25 May 2022 and the concentrations for both events were 0.06 mg/L. This was an isolated event as there was no other detect the whole reporting period. The cause is unknown although subsequent re-analysis of these two samples by the laboratory reported results below the ADWG criteria indicating that the initial exceedance may have been a laboratory error.

6. Special Interest Performance

6.1. Compliance Summary for Drinking Fountains

The following tables summarise the outcomes for the Drinking Water Quality Monitoring Program completed at the Rottnest Island drinking fountains. This program monitors health and aesthetic related characteristics during the 2021-2022 reporting period.

| Health - Rottnest Island Drinking Fountain Network 2021–22 | | | | | |
|--|---------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Health Characteristic | ADWG compliance criteria (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) |
| Antimony (Sb) | 0.003 | 186 | 186 | 100% | < 0.003 |
| Cadmium (Cd) | 0.002 | 186 | 186 | 100% | 0.0002 |
| Lead (Pb) | 0.01 | 186 | 186 | 100% | 0.01 |
| Nickel (Ni) | 0.02 | 186 | 186 | 100% | 0.007 |

| Aesthetic - Rottnest Island Drinking Fountain Network 2021–22 | | | | | |
|---|---------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Aesthetic Characteristic | ADWG compliance criteria (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) |
| Copper (Cu) | 1 | 186 | 186 | 100% | 0.29 |
| Zinc (Zn) | 3 | 186 | 186 | 100% | 0.72 |

There were no health or aesthetic exceedance events during the 2021-2022 reporting period.



7. Radiological Performance

Radiological sampling for gross alpha and gross beta is required annually. Testing occurred in October 2021 at the eight designated distribution sampling locations. There were no exceedances identified for Gross Alpha and Gross Beta.

| Rottnest Island Distribution System 2021-2022 | | | | | |
|---|------------------------------|-----------------|---|------------------------|------------------------------|
| Radiological Characteristic | ADWG screening values (Bq/L) | No. of Analyses | No. of Analyses Complying with ADWG screening value | % Compliance with ADWG | Max Value of Analysis (Bq/L) |
| Gross Alpha | 0.5 | 8 | 8 | 100% | 0.035 |
| Gross Beta | 0.5 | 8 | 8 | 100% | 0.076 |

8. Customer Service & Notifiable Incidents

8.1. Customer Service Charter

The RIA Customer Service Charter sets out the principal terms and conditions upon which the RIA intends to provide water services to its customers, in accordance with the license issued by the Economic Regulation Authority under the *Water Services Act 2012*.

The charter informs the customers of Rottnest Island of their rights in accordance with the provisions of the license, including service interruptions, levels of service, and complaint procedures.

A copy of the operating license is available on request from the RIA or from the Economic Regulation Authority.

8.2. Notifiable Incidents

During the 2021-2022 reporting period there were two health exceedance results reportable to WA Health concerning the drinking water distribution system. These results related to two health exceedances for bromate. It is noted that a total of 411 water samples were analysed in total.

A number of other exceedances identified during the 2021-2022 reporting period were reported to WA Health including:

- Four total coliform detections associated with non-disinfected water in Tank 7 on 28 September 2021, 16 November 2021, 14 December 2021 and 21 December 2021.
- Eight iron exceedances.
- One hydrogen sulfide exceedance.
- Four pH exceedances.

8.2.1. Water Outage (May 2022)

During mid-May 2022 there was one incident which caused the cessation of the drinking water supply on the entire island in response to an unplanned water outage caused by an unintentional introduction of an air lock into the drinking water distribution network.

On 12 May, the PFM Plumbing Team commenced two separate planned upgrade tasks related to the pipeline linking Tank 5 with Geordie Bay, and the pipeline linking Tank 5 to the Digby Drive Pumping Station (DDPS). The tasks proceeded as planned until early on the morning of Friday 13 May whereby resumption of normal water flow to the DDPS was not observed. Gravity flow did not automatically re-establish as anticipated which was being prevented by an unknown impediment in the pipeline. The physical cause of the drinking water outage to services downstream of the DDPS was a series of airlocks at three relative high points in the water main between Tank 5 and the DDPS. Due to three peaks and troughs in the pipeline, air had become trapped in the peaks once supply was shut off. When the supply valve at Tank 5 was opened again the water pressure within the pipe was not sufficient to push the air out. This resulted in an immediate unplanned water outage across all services downstream of the DDPS.

The outage was resolved by actively applying suction to the DDPS water main using an electrically powered pumpset. This resulted in the airlocks being sucked down and vented through outlets downstream of the pumps and allowed the resumption of water flow through the pipeline.

Water samples were taken to test the quality of the water once drinking water supply was reinstated. All samples were free of any exceedance and the water was deemed safe to consume.



8.2.2. Improvements

There were four total coliform detects in Tank 7 in the 2021-2022 reporting period. Tank 7 is being managed under the *2020 Interim Microbial Exceedance Management Plan for Tank 7* (accepted by WA Health). The total coliform detects in Tank 7 did not adversely affect safety of the drinking water supplied on the island.

The requirement for Tank 7 to be included within the drinking water supply system is being investigated as part of the water infrastructure upgrades that are planned across 2022-2025.

9. Comments

Ten Commandments for Safe Drinking Water

The Ten Commandments for Safe Drinking Water stand behind all internal drinking water operations on Rottnest Island. To remind all workers of the RIA's commitment to public health and safety relating to drinking water, the Ten Commandments for Safe Drinking Water have been installed in all pump stations and operational areas of the desalination plant (**Figure 3** and **Figure 4**). The Ten Commandments are shown in **Figure 5**.



Figure 3 and Figure 4: Ten Commandments for Safe Drinking Water at the Rottnest Island Desalination Plant.

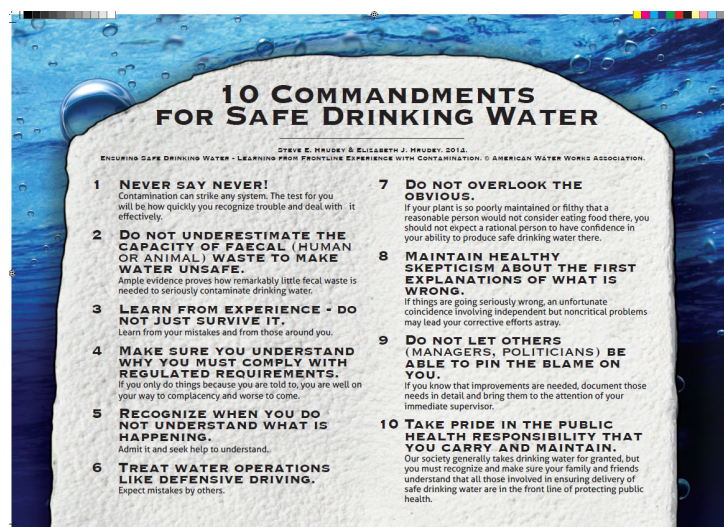


Figure 5: The Ten Commandments for Safe Drinking Water (Hrudehy SE & Hrudehy EJ, 2014)

Mock Incident Scenario



The Rottnest Island Mock Incident Scenario occurred on 15 June 2022 and was based around the recommissioning of refurbished units at South Thompson. Laboratory results reported concentrations of lead and iron in exceedance of ADWG limits and after some investigation it was determined that the cause was non-compliant plumbing fittings that had been installed during the refurbishment. The scenario highlighted gaps in the notification process within the response protocols. The response protocols have been updated to include relevant RIA staff and the flowcharts have been updated to include steps for notification.

There was also perceived to be a lack of understanding of the *Rottnest Island Water Services Flushing Plan (2020)* which will be addressed through staff training.

In addition, the scenario highlighted the need for better familiarisation with the Incident Response Protocols.

A follow up review meeting is planned between the RIA and PFM to assess whether the identified areas for improvement have been addressed.



10. References

Hrudey S E, Hrudey E J, *Ten Commandments For Safe Drinking Water* Canadian Water Network 2020, and American Water and Wastewater Association, 2014

Neale O, *Bromate Remediation Plan*, Programmed Facility Management 2018.

11. Acknowledgements

The RIA acknowledges the work of PFM in managing Drinking Water Quality at Rottnest Island, and the assistance of WA Health throughout the year.

The RIA recognises and supports the ongoing work of the Advisory Committee for the Purity of Water².

12. Enquiries

To request further information, or to seek clarification on information provided within this Rottnest Island Annual Drinking Water Report, please contact the RIA Administration by phone at (08) 9432 9300 (8:30 am to 5:00 pm, Monday to Friday). Alternatively, enquiries may also be sent by e-mail to rotnnest.compliance@dbca.wa.gov.au.

² More information on the Advisory Committee for the Purity of Water can be found at: http://ww2.health.wa.gov.au/Articles/A_E/Advisory-Committee-for-the-Purity-of-Water



13. Appendices

Appendix A Annual Data Summary

| | | July-September 2021 | | | | October-December 2021 | | | | January-March 2022 | | | | April-June 2022 | | | | 2021-22 Summary | | | |
|--------------------------------|---|---------------------|-------------------------------------|------------------------|------------------------------|-----------------------|-------------------------------------|------------------------|------------------------------|--------------------|-------------------------------------|------------------------|------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Health Characteristic | Australian Drinking Water Guidelines (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) |
| Antimony | 0.003 | 30 | 30 | 100% | <0.003 | 24 | 24 | 100% | <0.005 | 24 | 24 | 100% | <0.003 | 16 | 16 | 100% | <0.003 | 94 | 94 | 100% | 0 |
| Bromate | 0.02 | 101 | 101 | 100% | 0.0192 | 102 | 102 | 100% | 0.01 | 104 | 104 | 100% | 0.014 | 104 | 102 | 98% | 0.021 | 411 | 409 | 100% | 0.021 |
| Cadmium | 0.002 | 7 | 7 | 100% | <0.0002 | 0 | 0 | - | NA | 8 | 8 | 100% | <0.0002 | 0 | 0 | - | NA | 15 | 15 | 100% | 0 |
| Chlorine (Total Residual) | 5 | 44 | 44 | 100% | 1.22 | 42 | 42 | 100% | 1.1 | 46 | 45 | 100% | 1.19 | 45 | 45 | 100% | 1.37 | 177 | 176 | 100% | 1.37 |
| Copper | 2 | 3 | 3 | 100% | 0.009 | 3 | 3 | 100% | 0.001 | 3 | 3 | 100% | 0.01 | 4 | 4 | 100% | 0.008 | 13 | 13 | 100% | 0.01 |
| Fluoride | 1.5 | 24 | 24 | 100% | <0.1 | 32 | 32 | 100% | <0.1 | 32 | 32 | 100% | <0.1 | 24 | 24 | 100% | <0.5 | 112 | 112 | 100% | 0 |
| Lead | 0.01 | 3 | 3 | 100% | <0.001 | 3 | 3 | 100% | 0.001 | 3 | 3 | 100% | 0.001 | 4 | 4 | 100% | 0.002 | 13 | 13 | 100% | 0.002 |
| Manganese | 0.5 | 7 | 7 | 100% | <0.005 | 0 | 0 | - | NA | 0 | 0 | - | NA | 0 | 0 | - | NA | 7 | 7 | 100% | 0 |
| Nickel | 0.02 | 3 | 3 | 100% | <0.001 | 3 | 3 | 100% | <0.001 | 3 | 3 | 100% | <0.001 | 4 | 4 | 100% | <0.001 | 13 | 13 | 100% | 0 |
| Nitrate (as NO ₃ -) | 50 | 3 | 3 | 100% | <0.02 | 3 | 3 | 100% | <0.02 | 3 | 3 | 100% | <0.02 | 4 | 4 | 100% | <0.02 | 13 | 13 | 100% | 0 |
| Nitrite (as NO ₂ -) | 3 | 10 | 10 | 100% | <0.02 | 12 | 12 | 100% | <0.02 | 12 | 12 | 100% | 0.04 | 10 | 10 | 100% | <0.02 | 44 | 44 | 100% | 0.04 |
| Total THM | 0.25 | 10 | 10 | 100% | 0.015 | 14 | 14 | 100% | 0.015 | 14 | 14 | 100% | 0.097 | 10 | 10 | 100% | 0.01 | 48 | 48 | 100% | 0.097 |

| | | July-September 2021 | | | | October-December 2021 | | | | January-March 2022 | | | | April-June 2022 | | | | 2020-22 Summary | | | |
|--------------------------|---|---------------------|-------------------------------------|------------------------|------------------------------|-----------------------|-------------------------------------|------------------------|------------------------------|--------------------|-------------------------------------|------------------------|------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Aesthetic Characteristic | Australian Drinking Water Guidelines (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) |
| Aluminium | 0.2 | 3 | 3 | 100% | <0.05 | 3 | 3 | 100% | <0.05 | 3 | 3 | 100% | 0.01 | 2 | 2 | 100% | <0.05 | 11 | 11 | 100% | 0.01 |
| Ammonia | 0.5 | 10 | 10 | 100% | 0.01 | 14 | 14 | 100% | 0.04 | 14 | 14 | 100% | 0.03 | 101 | 10 | 10% | 0.03 | 139 | 48 | 35% | 0.04 |
| Chloride | 250 | 1 | 1 | 100% | 120 | 2 | 2 | 100% | <5 | 2 | 2 | 100% | 160 | 1 | 1 | 100% | 170 | 6 | 6 | 100% | 170 |
| Chlorine (Free Residual) | 0.6 | 44 | 1 | 2% | 1.06 | 42 | 0 | 0% | 1.06 | 46 | 6 | 13% | 1.09 | 45 | 8 | 18% | 1.15 | 177 | 15 | 8% | 1.15 |
| True Colour | 15HU | 6 | 5 | 83% | 20 | 6 | 5 | 83% | 18 | 7 | 7 | 100% | 8.6 | 7 | 7 | 100% | <5 | 26 | 24 | 92% | 20 |
| Hardness | 200 | 1 | 1 | 100% | 25 | 1 | 1 | 100% | 13 | 1 | 1 | 100% | 10 | 1 | 1 | 100% | 11 | 4 | 4 | 100% | 25 |
| Iron | 0.3 | 30 | 25 | 83% | 0.42 | 24 | 22 | 92% | 0.6 | 24 | 23 | 96% | 0.32 | 24 | 24 | 100% | 0.23 | 102 | 94 | 92% | 0.6 |
| pH | 6.5-8.5 | 27 | 27 | 100% | 7.6 | 31 | 31 | 100% | 7.3 | 27 | 26 | 96% | 7.3 | 31 | 29 | 94% | 7.8 | 116 | 113 | 97% | 7.8 |
| Sodium | 180 | 101 | 101 | 100% | 88 | 102 | 102 | 100% | 99 | 104 | 104 | 100% | 120 | 104 | 104 | 100% | 110 | 411 | 411 | 100% | 120 |
| Sulphate | 250 | 1 | 1 | 100% | <5 | 0 | 0 | NA | NA | 2 | 2 | 100% | 4.5 | 1 | 1 | 100% | 3 | 4 | 4 | 100% | 4.5 |
| Sulphide | 0.05 | 3 | 3 | 100% | <0.05 | 3 | 3 | 100% | <0.05 | 3 | 3 | 100% | <0.05 | 4 | 2 | 50% | 0.08 | 13 | 11 | 85% | 0.08 |
| TDS | 600 | 1 | 1 | 100% | 190 | 0 | 0 | NA | NA | 2 | 2 | 100% | 340 | 1 | 1 | 100% | 320 | 4 | 4 | 100% | 340 |
| Turbidity | 5NTU | 6 | 6 | 100% | 2.7 | 6 | 6 | 100% | <5 | 7 | 7 | 100% | 0.7 | 7 | 7 | 100% | 0.8 | 26 | 26 | 100% | 2.7 |
| Zinc | 3 | 3 | 3 | 100% | 0.036 | 3 | 3 | 100% | 0.029 | 3 | 3 | 100% | 0.049 | 4 | 4 | 100% | 0.062 | 13 | 13 | 100% | 0.062 |



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| | | July-September 2021 | | | October-December 2021 | | | January-March 2022 | | | April-June 2022 | | | 2021-22 Summary | | |
|--------------------------|---|---------------------|-------------------------------------|------------------------|-----------------------|-------------------------------------|------------------------|--------------------|-------------------------------------|------------------------|-----------------|-------------------------------------|------------------------|-----------------|-------------------------------------|------------------------|
| Microbial Characteristic | Memorandum of Understanding Compliance Criteria | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG |
| Bacterial | | | | | | | | | | | | | | | | |
| <i>E.coli</i> | Non Detect | 57 | 57 | 100% | 57 | 57 | 100% | 59 | 59 | 100% | 58 | 58 | 100% | 231 | 231 | 100% |
| Amoeba | | | | | | | | | | | | | | | | |
| Thermophilic | Non Detect | 27 | 27 | 100% | 28 | 28 | 100% | 29 | 29 | 100% | 24 | 24 | 100% | 108 | 108 | 100% |
| <i>Naegleria</i> | | | | | | | | | | | | | | | | |

| | | July-September 2021 | | | | October-December 2021 | | | | January-March 2022 | | | | April-June 2022 | | | | 2020-21 Summary | | | |
|----------------------------|---|---------------------|-------------------------------------|------------------------|------------------------------|-----------------------|-------------------------------------|------------------------|------------------------------|--------------------|-------------------------------------|------------------------|------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|-----------------|-------------------------------------|------------------------|------------------------------|
| Drinking Fountain Analytes | Australian Drinking Water Guidelines (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) | No. of Analyses | No. of Analyses Complying with ADWG | % Compliance with ADWG | Max Value of Analysis (mg/L) |
| Health Characteristics | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.003 | 30 | 30 | 100% | <0.005 | 44 | 44 | 100% | <0.003 | 48 | 48 | 100% | <0.003 | 64 | 64 | 100% | <0.003 | 186 | 186 | 100% | <0.005 |
| Cadmium | 0.002 | 30 | 30 | 100% | <0.0002 | 44 | 44 | 100% | <0.0002 | 48 | 48 | 100% | <0.0002 | 64 | 64 | 100% | <0.0002 | 166 | 186 | 112% | <0.0002 |
| Lead | 0.01 | 30 | 30 | 100% | 0.001 | 44 | 44 | 100% | 0.002 | 48 | 48 | 100% | 0.002 | 64 | 64 | 100% | 0.002 | 166 | 186 | 112% | 0.002 |
| Nickel | 0.02 | 30 | 30 | 100% | 0.034 | 44 | 44 | 100% | 0.002 | 48 | 48 | 100% | 0.002 | 64 | 64 | 100% | <0.001 | 166 | 186 | 112% | 0.034 |
| Aesthetic Characteristics | | | | | | | | | | | | | | | | | | | | | |
| Copper | 1 | 30 | 30 | 100% | <0.001 | 44 | 44 | 100% | 0.003 | 48 | 48 | 100% | <0.001 | 64 | 64 | 100% | 0.003 | 166 | 186 | 112% | 0.003 |
| Zinc | 3 | 30 | 30 | 100% | 0.45 | 44 | 44 | 100% | 0.28 | 48 | 48 | 100% | 0.37 | 64 | 64 | 100% | 0.17 | 166 | 186 | 112% | 0.45 |

Appendix B ADWG Sample Point Graph Summaries (Health)

The following graphs provide a summary of all data collected over the monitoring period for each health related parameter. There were either none or very few detects for the following analytes during the reporting period, therefore there are no graphs for the following analytes:

- Antimony;
- Cadmium;
- Fluoride (Rottnest Island's drinking water is not fluoridated);
- Lead, there were only two detects of 0.001 mg/L in November 2021;
- Manganese;
- Nickel; and
- Nitrite, there were three detects in January 2022.

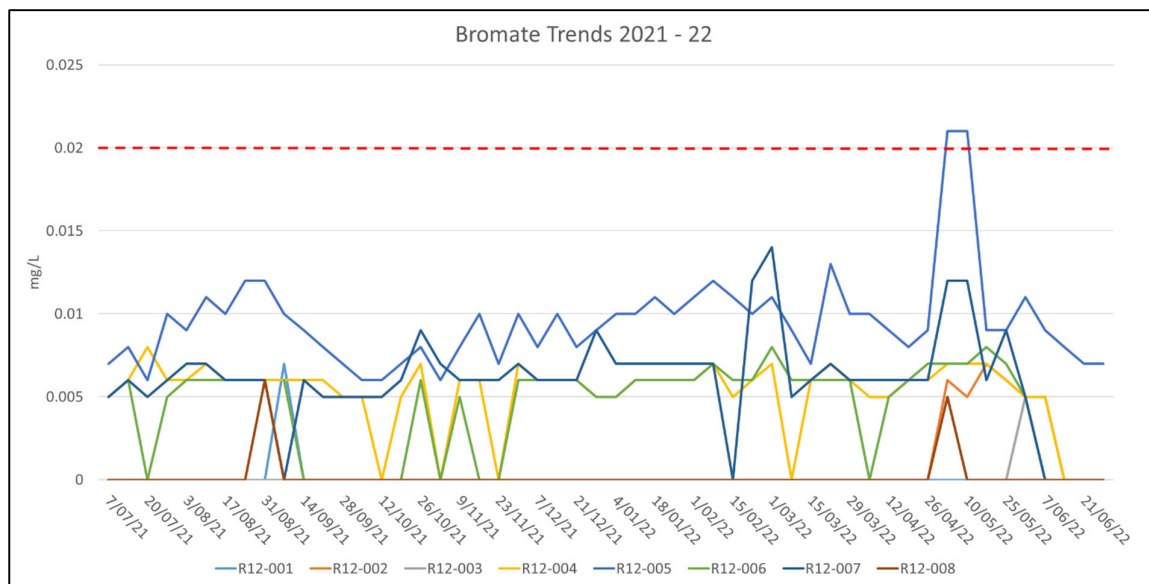


Figure B.1: Bromate trends during the 2021 – 22 monitoring period (ADWG limit 0.02 mg/L).

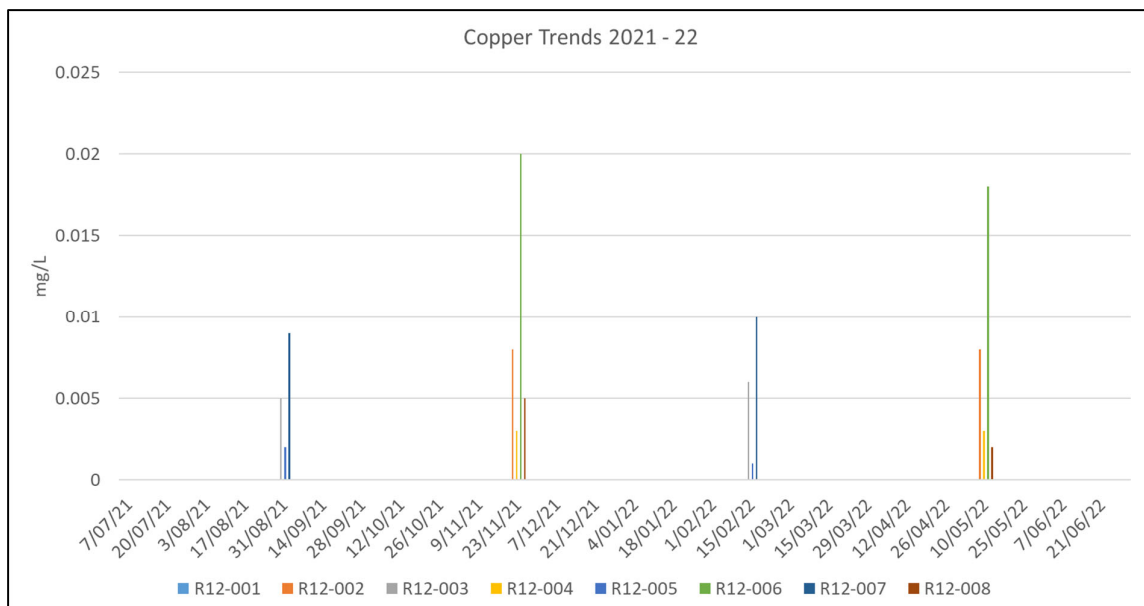


Figure B.2: Copper trends during the 2021 – 22 monitoring period (ADWG limit 2 mg/L)

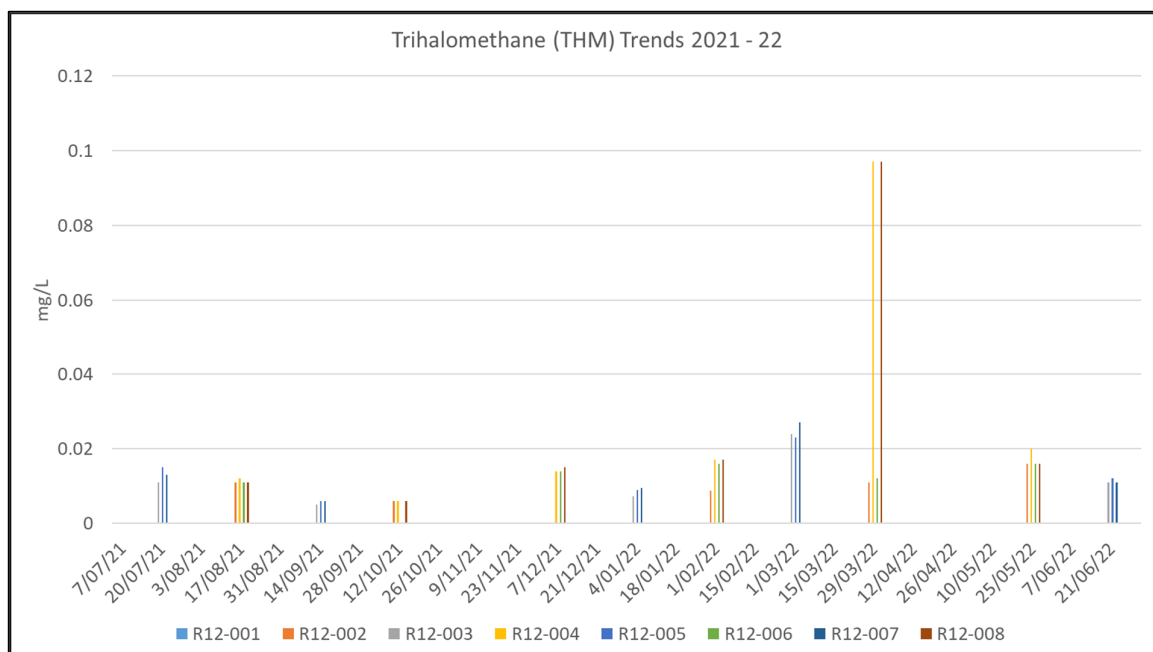


Figure B.3: THM trends during the 2021 – 22 monitoring period (ADWG limit 0.25 mg/L).

Appendix C - ADWG Sample Point Graph Summaries (Aesthetic)

The following graphs provide a summary of all data collected over the monitoring period for each aesthetic related parameter. There were either no detects or very few for the following during the

- Aluminum, there was only one detect in March 2022 of 0.01 mg/L;
- Chloride, there were four detects in September 2021, January, March and May 2022;
- Colour, there were four detects of colour, July 2021, two in January and one in March 2022;
- Hardness, there were four analyses done during the period;
- Sulphate, there was only four analyses done during the period;
- Hydrogen Sulfide, there were two detects in May 2022; and
- TDS, there were four analyses done during the period.

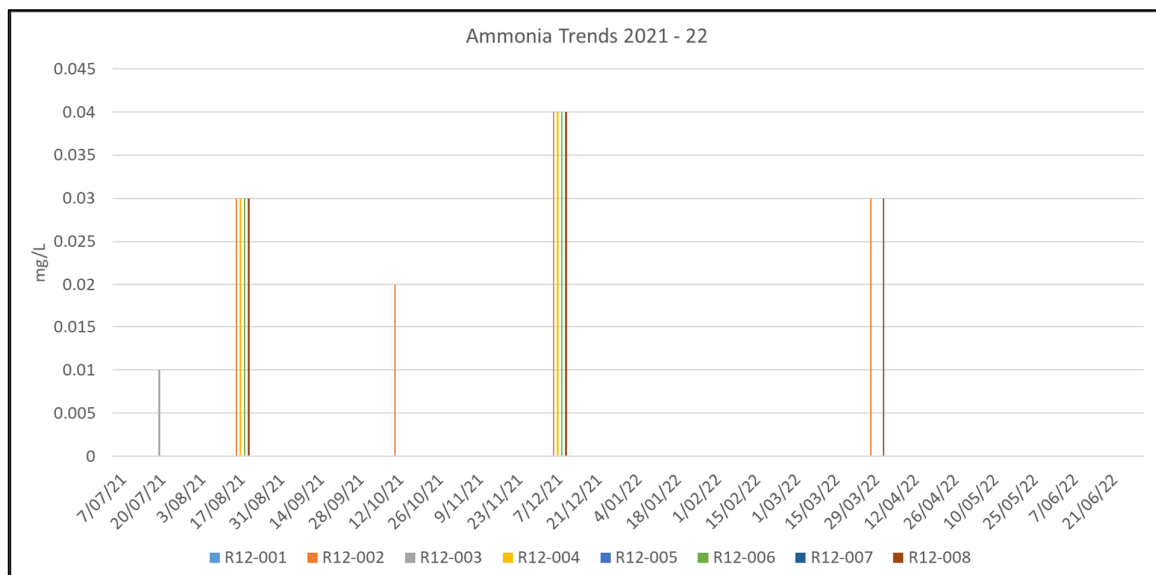


Figure C.1: Ammonia trends during the 2021 – 22 monitoring period, (ADWG limit 0.5 mg/L).

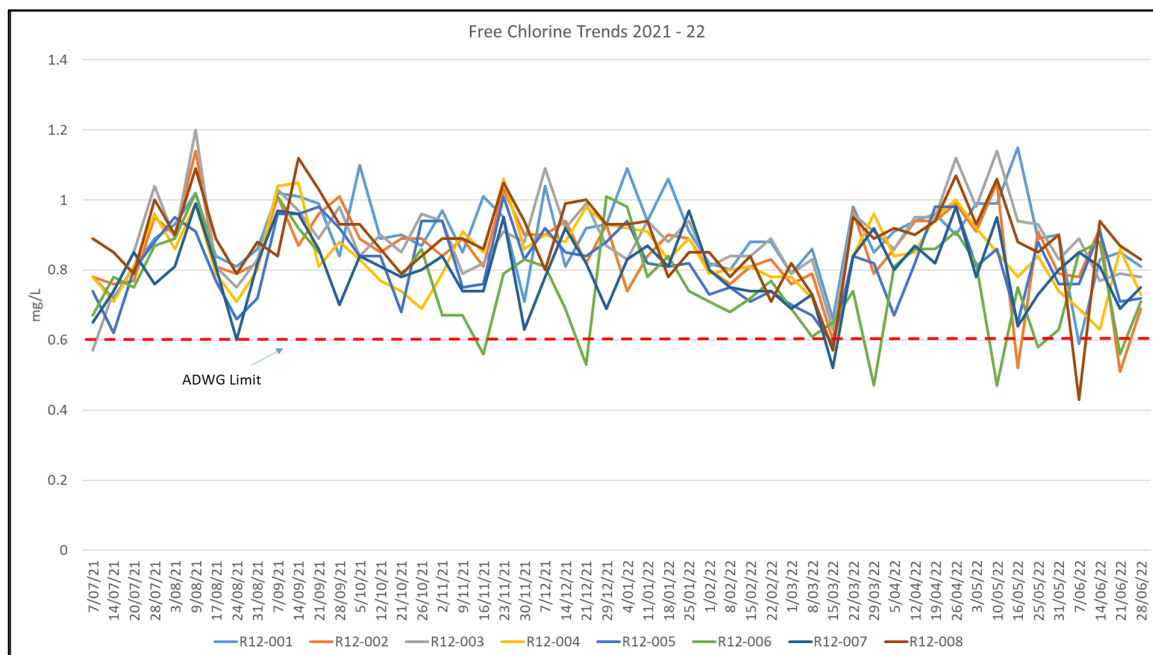


Figure C.2: Free chlorine trends during the 2021 – 22 monitoring period

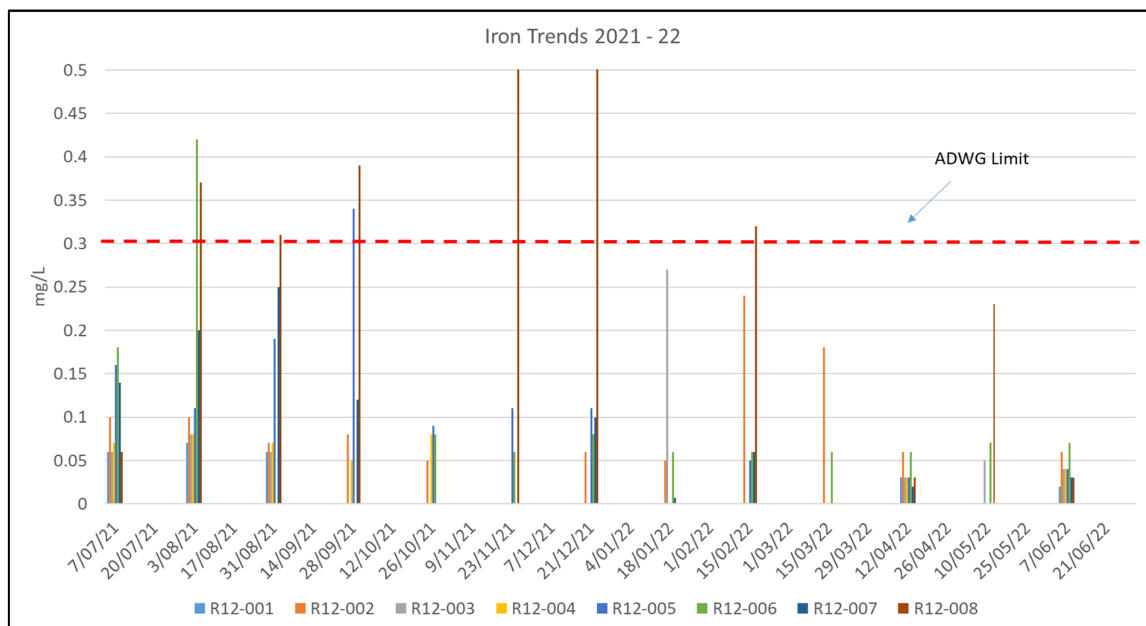


Figure C.3: Iron trends during the 2021 – 22 monitoring period.

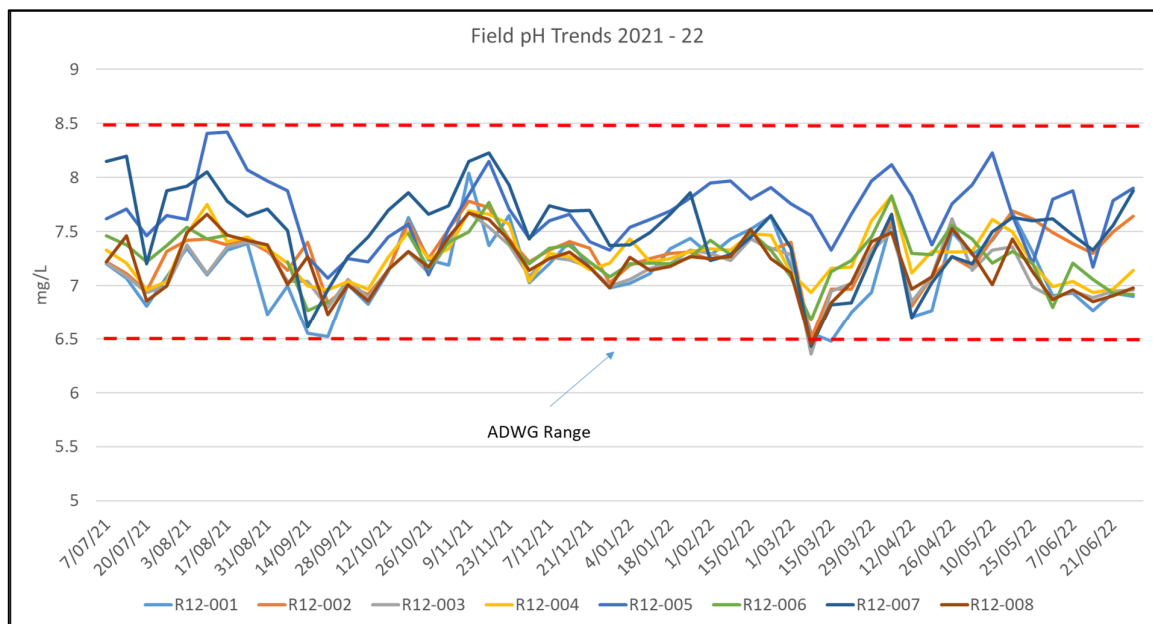


Figure C.4: pH trends during the 2021 – 22 monitoring period

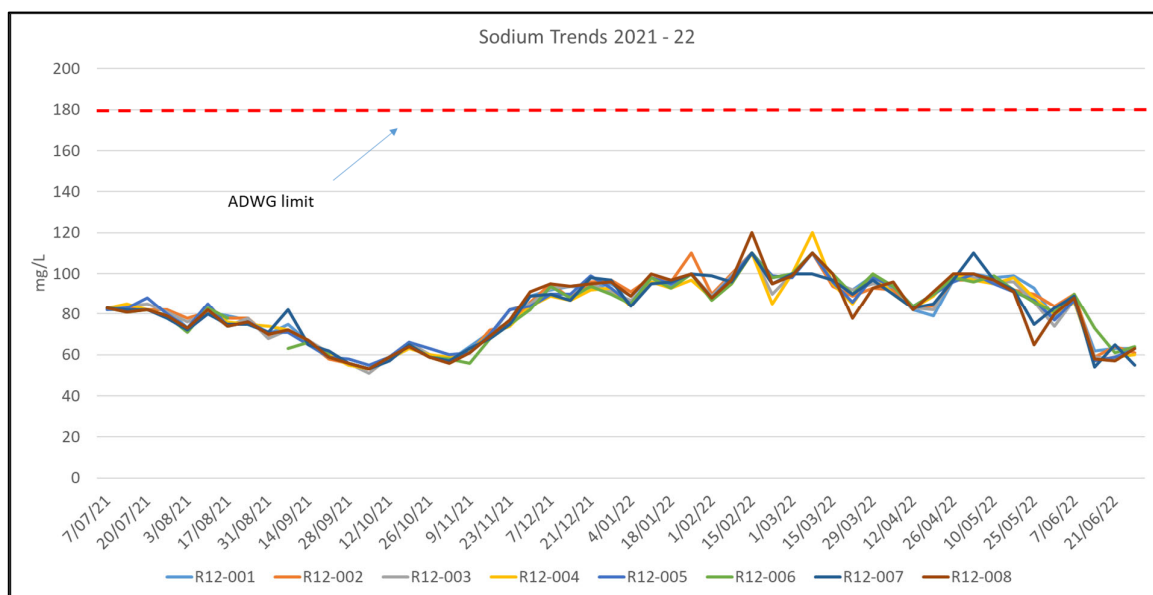


Figure C.5: Sodium trends during the 2021 – 22 monitoring period.

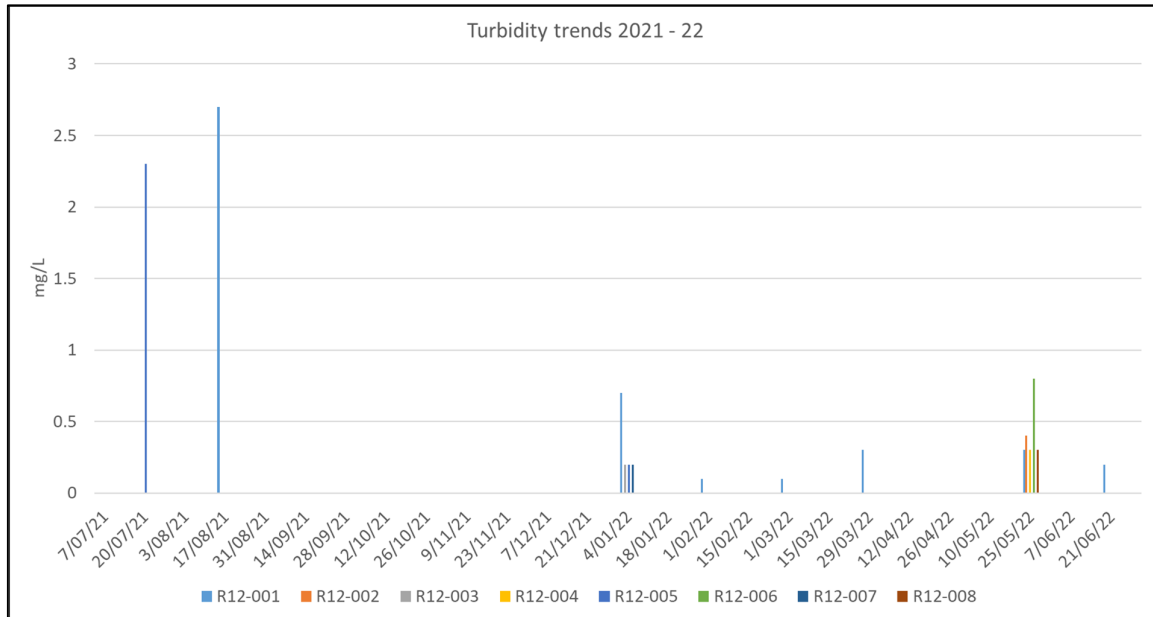


Figure C.6: Turbidity trends during the 2021 – 22 monitoring period (ADWG limit 5 NTU).

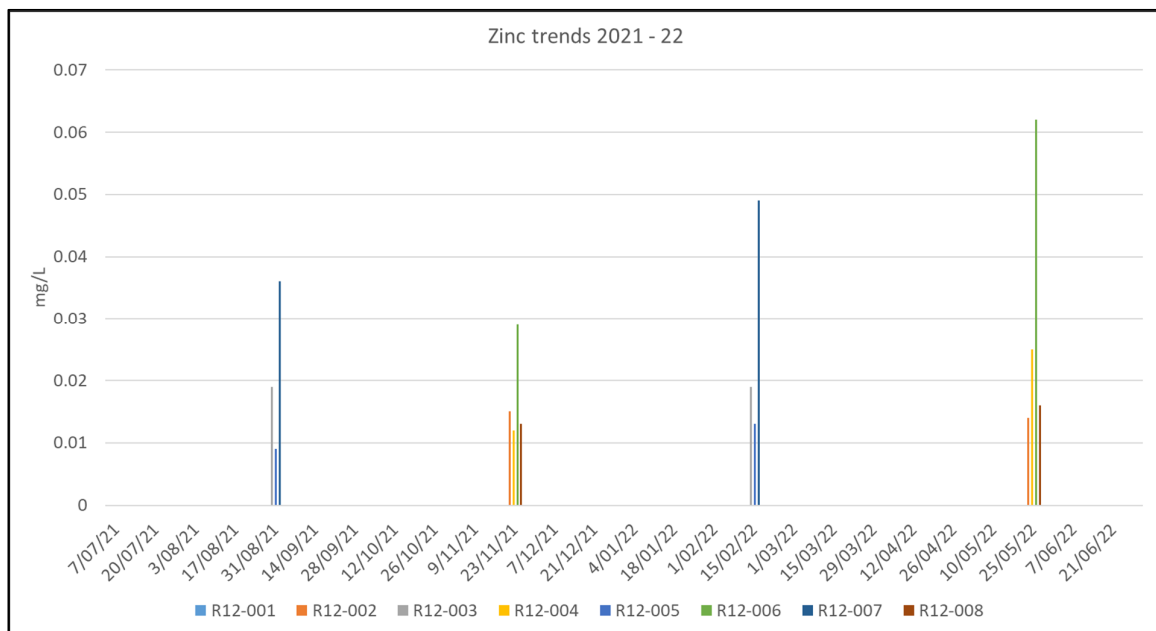


Figure C.7: Zinc trends during the 2021 – 22 monitoring period (ADWG limit 3 mg/L).