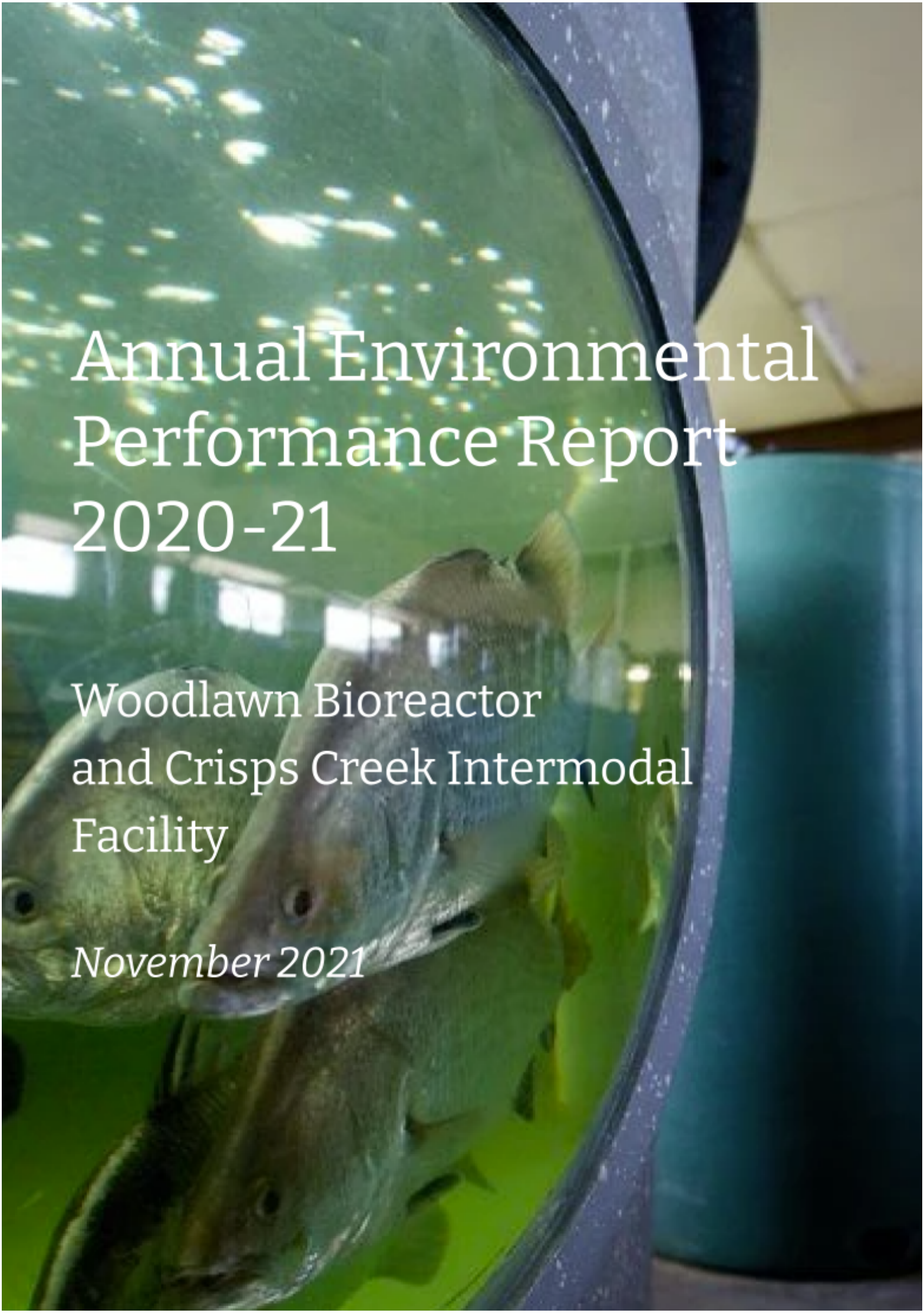

Annual Environmental Performance Report 2020-21

Woodlawn Bioreactor and Crisps Creek Intermodal Facility

November 2021

Quality Information

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0	Draft for internal review	• Woodlawn Bioreactor Site Management • NSW SHEQ Compliance Team	October 2021
1	Final	• NSW Environment Protection Authority	November 2021

Contents

Introduction

This Annual Environmental Performance Report (Report) has been prepared in accordance with condition R1.8 of Environment Protection Licence (EPL) 11436 for the Woodlawn Bioreactor (Bioreactor), as well as Environment Protection Licence (EPL) 11455 for the Crisps Creek Intermodal Facility (IMF), issued and regulated by the NSW Environment Protection Authority (EPA).

In accordance with relevant legislative requirements and industry best practice, the environmental performance of the Bioreactor and the IMF is managed to stringent conditions, the reporting of which forms the basis of this Report. This Report covers the period of 6 September 2020 to 5 September 2021.

Background

The Bioreactor and Crisps Creek Intermodal Facility (IMF) form part of the Woodlawn Eco-Precinct (the Eco-Precinct) which is owned and operated by Veolia Australia and New Zealand (Veolia) and located approximately 250 kilometres (km) south west of Sydney in the NSW Southern Tablelands. A site location plan is provided in **Appendix 1**. The Eco-Precinct, which covers an area of 6000 hectares, comprises of the 'Pylara' and 'Woodlawn' agricultural properties. The Bioreactor is where waste landfilling and landfill gas extraction occurs in the void of a remnant open cut mine, approximately 33 million cubic metres (m^3) in capacity.

The Bioreactor has been operating since September 2004, with the collection of landfill gas from landfill waste to extract methane for energy generation commencing in 2008. This occurs at the adjacent Woodlawn Bio Energy Power Station (the Power Station). Waste to the Bioreactor from Sydney is transported in shipping containers via rail and unloaded onto road trucks at the IMF which is located approximately 8 km away in the township of Tarago. Local waste from neighboring councils and businesses is transported to the Bioreactor via road.

In October 2018, Veolia commissioned the Leachate Treatment Plant (LTP) designed and constructed to facilitate improved environmental and operational performance by allowing Veolia to extract and treat greater volumes of leachate minimising and reducing the generation of odour, enabling more efficient gas extraction, and maximizing the waste to energy benefits of the Bioreactor.

Legislative Requirements

The main legislative instrument governing the environmental performance and activities undertaken at the Bioreactor and the IMF, pertaining to this Report, is the *Protection of the Environment Operations Act 1997* (POEO Act) regulated by the EPA, as well as its associated regulations.

The EPL for each site has been issued under Section 55 of the POEO Act. Conditions of the EPLs stipulate the environmental and operational parameters that need to be addressed by Veolia, in the management strategies adopted for both the sites, to maintain compliance.

This Report is split into a section for each EPL and contains these management strategies.

Part 1 EPL 11436 Woodlawn Bioreactor

1.1 Bioreactor Operations

In accordance with EPL 11436, the Bioreactor is permitted to accept material classified as General Solid Waste (Putrescible) as described in the *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014) for the scheduled activity 'Waste disposal by application to land'. The other ancillary activity permitted on the EPL is 'Electricity generating works' for the generation of energy from the extraction of landfill gas.

In addition to the waste management and energy generation activities, the site EPL mandates the administrative, operating and reporting conditions for the Bioreactor, as described in Table 2.1 below. A licence boundary plan is provided in **Appendix 2**.

1.2 Bioreactor Licence Conditions

EPL 11436 details the operating conditions and environmental monitoring requirements for the Bioreactor as noted in Table 2.1.

Table 1.2 **Bioreactor EPL 11436 Licence Conditions**

Condition	Compliance with Condition
1. Administrative conditions	Noted
2. Discharges to air and water and application to land	**P1. Location of monitoring/discharge points and areas** These monitoring points have been documented in a monitoring location plan (**Appendix 3**) and a program is in place for sampling as required.
3. Limit conditions	**L1. Pollution of Waters** The Bioreactor is deemed a zero discharge site, as all surface and stormwater that comes into contact with waste or leachate is captured, stored and treated onsite. Non-contaminated water is managed through diversion drains and bunds. No water was discharged during this reporting period.
	L2. Concentration Limits Air concentration limits are noted.
	L3. Waste

	All waste received at the Bioreactor during this reporting period was in accordance with the waste types permitted in the EPL. Waste generated onsite was deposited in the Bioreactor. The amount of maximum annual landfill input rates for regional putrescible waste permitted at the licenced premises was exceeded during the reporting period. This is explained further in **Section 1.7** of this report.
	L4. Noise Limits No noise complaints were received during this reporting period. The noise limit criteria for the Bioreactor is 35 dB(A) LAeq (15 minute) at the most affected residential receiver. Noise monitoring will be undertaken by Veolia on the receipt of any such complaints.
	L5. Hours of Operation All operational activities at the Bioreactor, including haulage of waste from the IMF were undertaken between 6:00 am and 10:00 pm, Monday to Saturday during this reporting period as permitted.
	L6. Potentially Offensive Odour An annual independent odour audit (IOA) is used to assess the effectiveness of odour control measures and to identify improvements to existing odour management practices at the site. The IOA for the Bioreactor was undertaken by The Odour Unit in 2021. Veolia will continue to implement recommended actions from the odour audit in combination with improving current odour control measures identified onsite.
4. Operating conditions	**O1. Activities Carried out in a Competent Manner** All licensed activities undertaken at the Bioreactor in this reporting period were carried out in a competent manner and under a high standard of environmental management for which Veolia is certified under *ISO 14001:2015 Environmental Management Systems*.
	O2. Maintenance of Plant and Equipment The maintenance and operation of all plant and equipment on the premises associated with the licensed activities was undertaken in a proper and efficient condition as required by qualified technicians. Details of all major plant and equipment at the site are stored in a computerised maintenance management system in order to schedule and complete the required maintenance. Veolia operators hold the appropriate qualifications and licenses to operate plant and equipment used as part of Bioreactor operations.
	O3. Dust All operations and activities were carried out at the Bioreactor in a manner to minimise dust at the boundary of the premises. These included all access roads from the IMF to the Bioreactor and the haul road used for ancillary operations being sealed, the use of water trucks for dust suppression as required and

	monthly sampling to monitor for the presence and quantity of depositional dust.
	O4. Emergency Response The Emergency Response Plan (ERP) for the Eco-Precinct, incorporates the Pollution Incident Response Management Plan (PIRMP) in accordance with s153A of the POEO Act. The ERP/PIRMP is maintained electronically on Veolia's Business Management System, an online platform for storing Veolia policies, procedures, plans and working documents. Hard copies of the ERP/PIRMP are available at various locations on site for ease of use. The ERP/PIRMP contains procedures for minimising the risk of and managing incidents such as fires, spills, explosions etc. at the Bioreactor, as well providing guidance on the notification protocols to relevant authorities in the event of a pollution incident. The PIRMP was tested during the reporting period.
	O5. Processes and Management The processes implemented onsite to manage water quality in accordance with the EPL are documented in the *Landfill Environmental Management Plan* (LEMP), prepared by Veolia. The LEMP (MAN-13298 WL - Bioreactor Landfill Environmental Management Plan) provides guidance on the management of surface and stormwater systems such as drainage and pumping networks to divert clean water from any water that has come in contact with waste or leachate. Clean surface and stormwater collected from within the void is pumped to Evaporation Dam 3 South (ED3S) for evaporation. An overview of the current Stormwater Management System is provided in **Section 3.3** of this Report. Water that has come into contact with waste and/or leachate is pumped to the onsite Leachate Treatment Plant for treatment and transferred for storage in the coffer dam in Evaporation Dam (ED1) for evaporation and potential use as process water for Heron Resources, should they recommence mining operations. The existing leachate aeration dam is used as a contingency. Mechanical evaporators may be used to assist evaporation and are controlled by wind direction sensors to prevent the drifting of sprayed liquids from the premises.
	O6. Waste Management Veolia has comprehensively re-designed the landfill tipping profile and its gas collection infrastructure to maximise gas collection and minimise the impacts of higher leachate levels in the void. This included investing in new collection infrastructure across the void. Veolia continues to extract and treat leachate from the void at an average of 2.02 litres per second (L/s), totalling 62482 m^3 over the reporting using the current system.

	Gas collection remains steady at an average of 3709.19 cubic metres per hour (m^3/h) of landfill gas flow this reporting period. The Leachate treatment system continued to be maintained and operated to optimise the Bioreactor conditions for treatment of leachate, other wastewaters and stormwater entering the void. Excess leachate was extracted, treated and transferred for storage in ED3 lagoons 1, 2, 3, 4 & 5 (ED3N-1, ED3N-2, ED3N-3 & ED3N-4, ED3SS). Following a prolonged period with minimal rainfall and favourable conditions for evaporation, the contents of ED3N-1 was pumped to other dams in the ED3N network. ED3N-1 was cleaned and prepared as a mixing reservoir for various site waters. The aim was for Heron to use this mix of site waters for mineral processing. The use of site waters by Heron will assist with Veolia's site water balance. This plan has been impacted by Heron going into care and maintenance. ED3N-1 remains empty. The construction of the Leachate Treatment Plant (LTP) was completed and commissioned in September 2018. Current average throughput was 2.96L/s or 256m3/day during the reporting period. The long term management of the ED3N dams will be to remove the stored liquid by 31 December 2022. Leachate from waste via Veolia's Sydney transfer facilities continued to be the only liquid imported into the void during this reporting period and was processed through the leachate treatment system as approved by the EPA. Virgin Excavated Natural Material (VENM) was continuously sourced from onsite and offsite locations for use as cover material during the reporting period. All waste accepted within the Bioreactor in this reporting period was screened prior to final disposal to ensure only waste conforming to EPL 11436 was received. Veolia will undertake final capping of the Bioreactor when required and in accordance with the EPL. Veolia operates the Bioreactor to maximise the production of landfill gas for generation of renewable energy at the Power Station, where 7 generators have been installed and commissioned, with 2 auxiliary flares as back up treatment of landfill gas emissions captured. The generators and flares satisfy the design, installation and operational requirements within the EPL. The landfill gas extraction and utilisation infrastructure in the Bioreactor has been designed to meet the conditions of the landfill including settlement. Veolia has continued to construct temporary access roads to minimise waste delivery vehicles coming in contact with and tracking waste to external surfaces. Dedicated site vehicles that only operate within the void and other operational areas were utilised. Any vehicles exiting the facility are required to use the wheel wash facility to prevent the tracking of materials. In addition to tracking of materials, a monthly site inspection checklist is used to ensure practical measures are in place at the site to prevent materials leaving the premises.

	A variation of licence was issued in June 2021 permitting the application of biofiltration media to fissure zones on those parts of the landfill covered with intermediate cover, and the use of MBT MWOO as an ADC. In accordance with Condition **O6.31** an Odour Management Plan including MWOO is being developed and will be incorporated into the Woodlawn Air Quality and Greenhouse Gases Management Plan.
5. Monitoring and recording conditions	Noted, all compliance monitoring was carried out in this reporting period in accordance with EPL requirements. The results of which are detailed in **Section 1.7**. There were non-compliances with condition M2 during this reporting period. The site telephone complaints line was maintained and operated during this reporting period for receiving complaints from members of the public and is available to the public via signage placed at the entry of the site.
6. Reporting conditions	Noted and addressed in this Report and the annual return documents, where relevant. Notifications to the EPA were undertaken in a timely fashion. There were non-compliances with condition **R4.2** during this reporting period, in which Veolia plans to rectify by way of licence variation in consultation with the EPA in the next reporting period.
7. General conditions	A copy of the EPL is displayed at the Woodlawn reception.
8. Pollution Studies and Reduction Programs	**U1. Long-term Leachate Treatment Solution** The Leachate Treatment Plant was commissioned in the 2018-19 reporting period and has implemented the following processes: - Throughput management to steadily increase leachate treatment to achieve EPA target of 346 m3/day (4litres/sec) ; - Permeate quality management of the final product going into the coffer dam; - Foam management via chemical and mechanical mechanisms; - Temperature control via monitoring through SCADA & in-line monitoring systems; and - Monitoring weather conditions All monthly progress reports on the LTP commissioning and optimisation were submitted to the EPA in this reporting period. Veolia will install and commission an additional membrane filtration train to the membrane bioreactor (MBR) of the Leachate Treatment Plant by 1 July 2022. A Leachate Assessment Report prepared by Earth2Water Pty Ltd in accordance with the requirements of Pollution Reduction Program (PRP) **U1.5** of Environment Protection Licence (EPL) 11436 for the Woodlawn Landfill was submitted for the EPA review. A Leachate management Action Plan developed by Veolia based on the recommendations of the report.

	U2. Investigation and Impact Assessment of Hydrogen Sulfide Gas Emissions Veolia has engaged Epic Consulting to undertake the Hydrogen Sulfide Investigation and Impact Assessment. Due to delays relating to COVID-19, an extension was granted by the EPA and the final report will be submitted before 1 December 2021.
9. Special Conditions	The financial assurance (FA) is adjusted each financial year in accordance with condition **E1**. The FA calculations were undertaken according to conditions **E1.4** and **E1.9** and submitted to the EPA for approval, prior to Veolia submitting the adjusted bank guarantee to the EPA by the EPL anniversary date.

1.3 Community Engagement

1.3.1 Community Liaison

Community consultation occurs through meetings attended by local community representatives, committee members/executives from the Tarago & District Progress Association Inc. (TADPAI) and local councillors from Goulburn Mulwaree and Queanbeyan-Palerang Regional Councils. Veolia continues to attend such meetings and engage proactively with the community regarding activities related to the site.

In order to proactively engage in effective odour management, Veolia participates in regular community liaisons to encourage and gather feedback from the local residents regarding the odour performance at the Bioreactor.

The Veolia Community Liaison Committee (VCLC) operates for the Woodlawn Bioreactor which consists of an independent chair, representatives from Goulburn Mulwaree Council and Queanbeyan Palerang Council, and community members. The committee meets up to four times per year.

1.3.2 Complaints

Veolia operates a 24-hr telephone complaints line that enables the receipt of complaints from members of the public, as required under the EPL. Other complaints that were received off site during this reporting period were logged by the EPA.

Upon receipt of an odour complaint, Veolia records the details of the complaint into the Eco-Precinct complaints register as follows:

- Date and time of complaint
- Method by which the complaint was made
- Personal details of the complainant if available

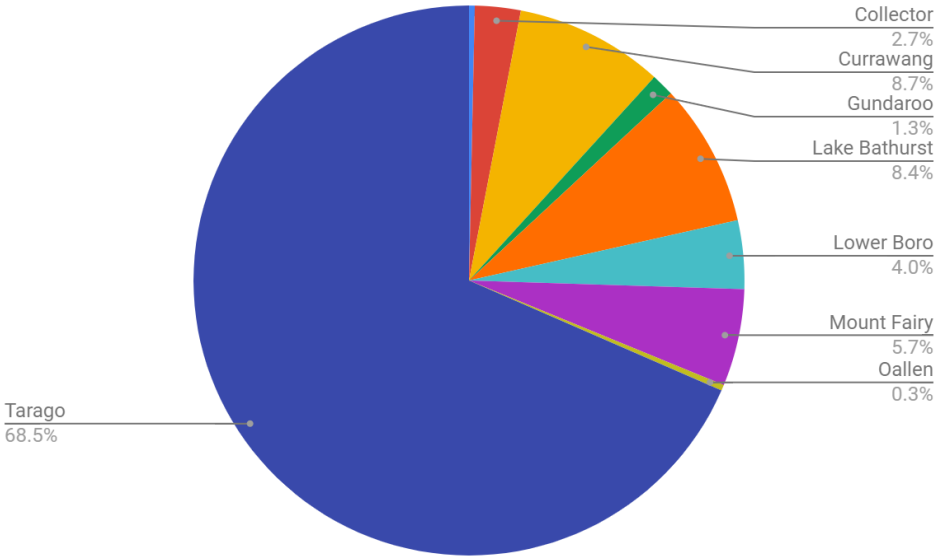
- Nature of the complaint
- Action taken by Veolia is relation to the complaint ie. investigation
- If no action was required, the reason why no action was undertaken

After investigating the odour complaint and implementing any remedial action, a report is submitted to the NSW EPA as per condition R4.2 of the EPL, and made publicly available on the Veolia website.

There was a notable increase in odour complaints over the reporting period, with Veolia recording a total of 302 complaints relating to odour which is significantly higher than the previous reporting year (20). Complaints received in the 2020-21 reporting period are detailed in **Table 6.1** (refer **Appendix 6**) and noted in **Section 1.8** of this report.

The majority of odour complaints were reported from the Tarago area as demonstrated in the graph below (refer **Figure 1.3.2).**

Figure 1.3.2 **Woodlawn Eco-Precinct Odour Complaint Locations**



1.3.2 Odour Management

Veolia is committed to managing the site odour potential through specific and targeted projects that address improvements to gas capture, leachate extraction, treatment, storage and evaporation. Balancing these competing requirements is required to ensure the site's odour potential is minimised.

The processes and procedures implemented at the Bioreactor have been developed to minimise the odour potential of the site as a whole. Production of H_2S in landfill gas spiked during the reporting period with gas capture identified as the major contributor to potential odour emissions.

In the last 18 months Woodlawn has experienced twice the annual average rainfall which has brought challenges within the Bioreactor process that has on occasions resulted in an increase in odour

intensity and frequency. While improvements have been made, the site has been forced to reconsider contingency for abnormal weather events.

Veolia's odour management strategy includes but is not limited to:

- Regular surface gas monitoring (monthly)
- Actions resulting from identified fugitive emission hot spots
  - Application of additional cover material
  - Installation of additional LFG extraction wells
  - Application of additional biofilter at the rock-waste interface
  - Application of biofilter material to identified cracks in the landfill cover
- Investigation of the current odour emissions by third party
- Investigation of odour emission from the batter of the waste tip
- Performance assessments of the biofilter and expansion of the gas extraction systems
- Internal odour source identification procedures

The site has successfully completed numerous projects over time to improve gas capture as part of the odour management strategy on site.

1.4 Bioreactor Environmental Monitoring Requirements

Veolia is required to monitor environmental performance of the Bioreactor underEPL 11436. **Table 1.4** details the EPL ID, sampling location, frequency and the type of monitoring undertaken at each licensed point. A monitoring location plan is included in **Appendix 3**.

***Table 1.4* Bioreactor Licensed Monitoring Points**

EPA ID	Sampling Location	Frequency	Type of Monitoring
1	GMBH1	Quarterly	Subsurface Gas
2	GMBH2		
4	GMBH4		
6	Landfill Surface	Monthly	Surface Gas
7	Landfill Gas Flare	Annual / Continuous	Air Discharge
8	Landfill Gas Engine Exhaust Point	Annual	
5	Gas Extraction Booster	Monthly/Annual	Landfill Gas Input
9	Meteorological Station	Continuous	Meteorological
10	DG28 – Pylara	Monthly	Particulates – Deposited Matter
11	DG22		
12	DG34		
13	Site 115 – Allianoyonyige Creek	Quarterly	Surface Water
14	Spring 2		

15	Site 105 – Crisps Creek		
16	WM200		
17	WM201		
18	ED3SS		
19	WM203 – ED3N		
22	Pond 5		
54	WM202 - ED3S		
59	ED1		
23	Leachate Pond	Annual	Leachate
24	Leachate Recirculation System		
25	MB1	Quarterly / Annual	Groundwater
26	MB2		
27	MB3		
28	MB4		
30	MB6		
31	MB7		
33	MB10		
41	ED3B	Quarterly / Annual	Groundwater
42	WM1		
45	WM5		
46	WM6		
48	P38A & P38B	Quarterly	Standing Water Level
49	P200A		
50	P200B		
51	P58A & P58B		
52	P59A & P59B		
53	P100A & P100B		
55	MW8S	Quarterly / Annual	Groundwater
56	MW8D		
57	MW9S		
58	MW10S (Dry well) (GW10S)		
60	MB28		
66	MB33		
67	MB34		
68	MB35		
61	Effluent from LTP	Weekly	Discharge
62	ED1 Cofferdam (LTP)	Monthly	Surface Water
63	SP2-MW1	Quarterly	Groundwater
64	MW-FRC1		
65	MB10S		

1.5 Bioreactor Monitoring Results

All monitoring data collected at the monitoring points identified in **Table 1.4** during this reporting period has been tabulated and provided in **Section 1.5** or in **Appendix 4**.

Graphs of data collected have been developed to assist in the assessment of trends and depict any variability within the monitoring results are presented in **Section 1.5** or in **Appendix 5**.

Any non-compliances relating to Condition M2.1 of the EPL is noted in **Section 1.8** of this report.

1.5.1 Bioreactor Landfill Gas Monitoring Results

Gas monitoring is a critical component of the Bioreactor's landfill and subsurface gas monitoring regime. Portable gas monitors (PGM's) and analysers such as the GEM5000 and TDL Landfill Gas Analyser are used to take spot readings, showing landfill conditions moment-to-moment as well as fulfill quarterly surface and subsurface gas monitoring as required by the EPL.

***Table 1.5.1* Bioreactor Landfill Gas Monitoring Results**

<table>
<tr><th>Parameter</th><th>Results/Discussion</th></tr>
<tr><td>Subsurface Gas</td><td>Monitoring of 3 subsurface gas monitoring bores (GMB) was undertaken on a quarterly basis as per EPL requirements and is summarised in Table 1.5.1.1 below:
Table 1.5.1.1: Subsurface Gas Monitoring Result
<table>
<tr><th rowspan="2">Gas Monitoring Bore ID</th><th colspan="4">Purged Methane Reading (%)</th></tr>
<tr><th>16/11/20</th><th>3/2/21</th><th>1/7/21</th><th>27/8/21</th></tr>
<tr><td>GMBH1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>GMBH2</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>GMBH4</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
The results show that the gas collection network is effectively capturing and controlling landfill gas within the landfill void. Engineered impermeable barriers and the natural subsurface of the void wall also minimises the potential movement of landfill gas from the Bioreactor, allowing for maximum extraction through the gas collection system.
The monitoring data for each of the subsurface gas monitoring bores is provided in Tables 1.1 to 1.3 (refer Appendix 4).</td></tr>
<tr><td>Landfill Gas Extraction Booster</td><td>The data reported for the landfill gas extraction booster at the Power Station is consistent to the historical average as summarised in Table 1.5.1.2 below:
Table 1.5.1.2: Landfill Gas Extraction Booster Monitoring Results Summary
<table>
<tr><th>Parameter</th><th>Historical Average</th><th>2020/2021 Result</th></tr>
</table></td></tr>
</table>

Temperature (°C)	2.7	3
Volumetric Flow (m³/s)	0.67	0.75
Carbon Dioxide (%)	38.8	36.3

The detailed data for each of the parameters required under the EPL for the gas extraction booster is provided in **Tables 2.1** and **2.2** (refer **Appendix 4**).

Surface Gas

Surface gas monitoring was completed on a quarterly basis as per EPL requirements, which are summarised in **Table 1.5.1.3** below. The detailed tabulated data is available in **Tables 3.1** to **3.9** (refer **Appendix 4**).

Table 1.5.1.3: Surface Gas Monitoring Results Summary

Parameter (ppm)	Minimum	Average	Maximum
Methane	2	71.97	2000
Hydrogen Sulfide	0.00	0.0083	1.20

Methane was detected in varying amounts over the waste surface with a slight decrease in overall average of 71.97ppm (0.007%) during this reporting period, compared to 0.008% last reporting period.

Identified through surface gas monitoring, areas where higher methane levels were recorded had additional cover material added to maintain the average methane emissions below the threshold concentration in surface gas emission testing of 500 parts per million (0.05%), as per the *Environmental Guidelines for Solid Waste Landfills* (EPA, 2016).

Application of cover material in areas of the void demonstrating settlement cracking, commissioning and rebalancing of gas extraction wells and installing additional gas collection infrastructure were methods used to reduce surface gas emissions.

Surface gas emission monitoring was increased from a quarterly to monthly frequency with the addition of hydrogen sulfide monitoring during the reporting period and implemented in Q4 of the reporting period.

During this reporting period mulch bio-cover was also implemented around wells, which has assisted in mitigating odour and reducing surface gas emissions as well as an approved Alternative Daily Cover (ADC).

Landfill Gas Flare

The landfill gas flares are manufactured to a residence time of 0.3 seconds with a destruction efficiency of 98% for methane and non methanogenic organic compounds to meet the requirements of the EPL.

Monitoring was continuously performed during this reporting period, an average of which is summarised in **Table 1.5.1.4** below.

Table 1.5.1.4: Landfill Gas Flare Monitoring Results

Parameter	Units	Result
Temperature	°C	1000
Residence Time	Seconds	>0.3

Landfill Gas Engine Exhaust Point(s)	Monitoring of a landfill gas engine exhaust point was completed during the reporting period. The results are consistent with the previous monitoring period and presented in **Tables 4.1** and **4.2** (refer **Appendix 4**). Concentration limits for each of the following pollutants are stipulated in the EPL, all of which were below the threshold for the exhaust point test within this reporting period and consistent with previously reported levels. • Nitrogen Oxides; • Hydrogen Sulphide; • Volatile Organic Compounds • Sulphuric Acid Mist; and • Sulphur Trioxide *Table 1.5.1.5: Landfill Gas Engine Exhaust Point Monitoring* **Concentration (mg/m³)** / **Maximum** / **Result** Hydrogen Sulphide / 5 / <0.7 Sulfuric acid mist and sulfur trioxide (as SO3) / 100 / 4.5 Nitrogen Oxides / 450 / 440

1.5.2 Bioreactor Dust Monitoring Results

Air quality monitoring was carried out as required to determine whether activities conducted at the site impacted ambient air quality. All operations were carried out in a manner that would minimise emissions of dust from the premises.

Dust suppression control measures employed during the reporting period included but was not limited to:

- A water cart is used on access roads to suppress and/or clear dust, as required
- The wheel wash ensures that trucks travelling from the Bioreactor to the intermodal facility minimise the transport of particulate matter into the surrounds
- Truck speed and movements on-site are minimised as much as practicable, with speed limits no greater than 40km/h
- All trucks entering and leaving the premises carrying loads must be covered at all times, except during loading and unloading

Sampling and analysis of dust deposition was carried out in accordance with Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method as specified in the Woodlawn Bioreactor's Project Approval.

The criteria for deposited dust at the Woodlawn Bioreactor is assessed as insoluble solids and provided in **Table 1.5.2.1**.

Table 1.5.2.1 **Bioreactor Depositional Dust Long Term Criteria**

Pollutant	Averaging Period	Maximum Increase	Maximum Total Level
[c]Deposited Dust	Annual	[b]2 g/m²/month	[a]4 g/m²/month

Criteria Notes:

[a]Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and

[d]Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the Director-General in consultation with OEH.

There are currently three dust deposition gauges associated with the Woodlawn operation. DG22 on the eastern side of the void, DG34 behind the core shed, and DG28 located at Pylara. These are sampled each month as shown in **Table 1.5.2.2**.

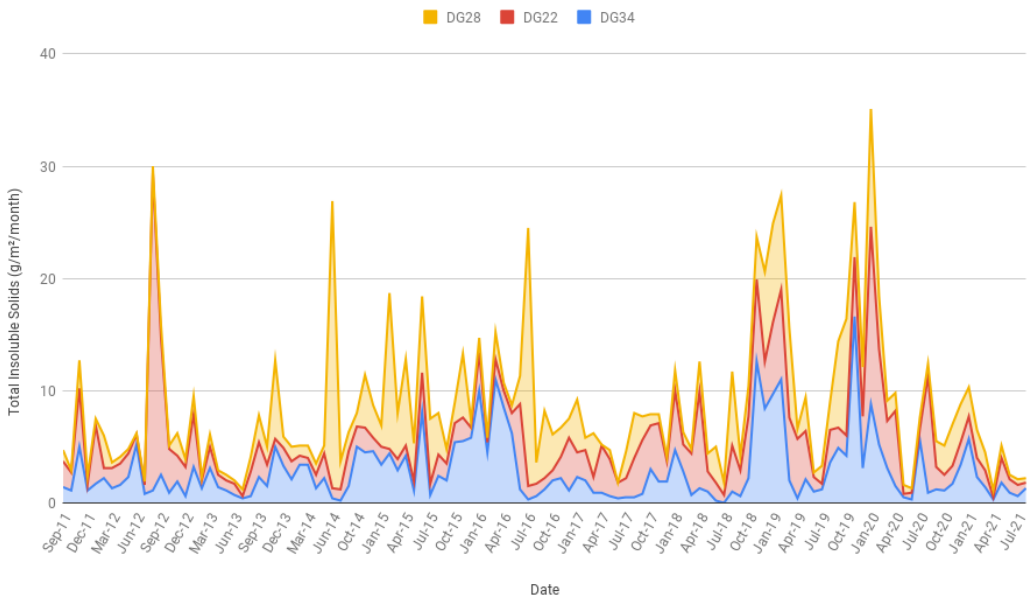
Table 1.5.2.2 **Bioreactor Dust Monitoring Results**

<table>
<tr><th>Parameter</th><th>Results/Discussion</th></tr>
<tr><td>Particulates/ Dust Monitoring</td><td>The results of total insoluble solids found within the depositional dust samples are summarised for each of the monitoring locations in Table 1.5.2.1 below, with the detailed results tabulated in Table 5.1 (refer Appendix 4).

Table 1.5.2.1: Dust Monitoring Results
<table><tr><th rowspan="2">Dust Gauge</th><th colspan="3">Summary Total Insoluble Solids (g/m²/month)</th></tr><tr><th>Minimum</th><th>Average</th><th>Maximum</th></tr><tr><td>DG22</td><td>0.2</td><td>1.4</td><td>2.2</td></tr><tr><td>DG34</td><td>0.3</td><td>1.8</td><td>5.7</td></tr><tr><td>DG28</td><td>0.4</td><td>1.8</td><td>3.7</td></tr></table>
The maximum dust level recorded in this reporting period was 5.7 g/m2/month at DG34 (July 2021) which is located on the West side of the Bioreactor. Due to the location of DG34 and a predominantly westerly wind in the month of July the dust is indicative of a regional dust source.

All monitoring points remained within the long term criteria for deposited dust during the reporting period.</td></tr>
</table>

Figure 1.5.2.2 **Bioreactor Dust Monitoring Results**



1.5.3 Bioreactor Surface Water Monitoring Results

A surface water monitoring program is established to detect potential pollution of offsite surface water by leachate or sediment-laden stormwater from the landfill. Monitoring points are located upstream and downstream of the site to identify any impacts the Woodlawn operations may be having on surface waters and equally, eliminate impacts to surface waters that are not a result of the landfill operation.

There are 11 surface water monitoring sites in total as shown in **Table 1.4.** The sites consist of four creeks and seven dam locations.

The findings from water quality monitoring of surface water locations required under the EPL is summarised in **Table 1.5.3** below with detailed data provided in **Tables 6.1 - 6.11** (refer **Appendix 4**). Key quality indicators selected to identify likely impacts from the Bioreactor include:

- pH,
- Electrical conductivity (EC),
- Ammonia (NH_3),
- Total organic carbon (TOC),
- Potassium (K)
- Sulphate (SO_4), and
- Zinc (Zn).

These are depicted in the trend graphs **(Figures 1.5.3.1 – 1.5.3.11)** provided in **Appendix 5.**

Table 1.5.3 **Bioreactor Surface Water Monitoring Results**

Parameter	Results/Discussion
Site 115 – Allianoyonyiga Creek	Site 115 is situated downstream of the evaporation dams. All four quarterly monitoring samples were undertaken in this monitoring period. Based on the results provided in **Table 6.1** (refer **Appendix 4**), the pollutant concentration trends from previous monitoring periods are generally consistent. • Mean pH at 7.98 for this location indicates slightly alkaline water; • EC at 2155 µS/cm, indicating fresh to brackish water; • NH_3 at less than 0.1mg/L and TOC at mean of 17 mg/L concentrations recorded in this monitoring period remain consistent with historical monitoring results; • Mineral and heavy metal concentrations are of fairly low magnitude at 8.4 mg/L for K and 0.12 mg/L for Zn, indicating no contaminated runoff is impacting surface water at this monitoring location. While the indicator trends for this location indicate some variability over time, this is not uncommon when sampling intermittent streams.
Spring 2	Spring 2 is located upstream of the Bioreactor and adjacent to Crisps Creek. The site therefore provides background water quality information to site operations. The spring naturally overflows to Crisps Creek during rainfall events. 4 out of 4 quarterly monitoring events required under the EPL were undertaken in this monitoring period, and have been documented in the Annual Return. Water quality trend in Spring 2, based on the results provided in **Table 6.2** (refer **Appendix 4**), is consistent with water quality from historical monitoring records. • pH is consistent with previous years (average 6.4) and reflective of the overall range of 6.06 - 7.43 for this location; • EC (average 1039 µS/cm) for this reporting period is higher than previous;. • SO_4 (average 333 mg/L) shows an identical trend to conductivity, again indicating a direct effect on EC; • K (average 13.5 mg/L) and Zn (average 4.3 mg/L) concentrations continue to show slow decline from overall averages with some variability likely due to dilution following wet weather periods and concentration during drier periods; • NH_3 (average 0.5 mg/L) and TOC (average 24 mg/L) concentrations recorded in this monitoring period are consistent with historical monitoring results. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
Site 105 – Crisps Creek	Site 105 is located downstream of the Bioreactor and tailings dams. All quarterly monitoring requirements were undertaken in this monitoring period. Water quality trends in Site 105, based on the results provided in **Table 6.3** (refer **Appendix 4**) are consistent with previous monitoring results. • pH (7.4) is within the overall range of 7.06 - 7.96 for this location, indicating relatively neutral water; • EC (1188 µS/cm) is consistent with historical results, reflecting brackish water;

	• TOC (22 mg/L) and NH_3 (0.1 mg/L) were consistent with historical trends; • Zn and K remain consistent averaging 0.23 mg/L and 6.9 mg/L respectively, consistent with historical results. Site 105's water quality fluctuates in response to rainfall and can often contain higher salt content particularly during low flow or following extended dry conditions. During the reporting period Crisps Creek has consistently had water flow due to the above average rainfall experienced across the region.
WM200 - Raw Water Dam	The Raw Water Dam is located to the west of the dolerite stockpile and collects uncontaminated water. Quarterly monitoring events were undertaken in accordance with EPL conditions. Based on the results provided in **Table 6.4** (refer **Appendix 4**), the results for WM200 remain generally consistent with the previous reporting periods. • pH (average 7.4) indicates slightly alkaline water; • EC (average 962 µS/cm) is slightly lower but overall consistent with historical results; • SO_4 level (average 92.4 mg/L) is higher than previous reporting period; • Zn level was higher at an average of 1.1 mg/L than previous reporting period; • TOC was an average of 7 mg/L in this reporting period which is consistent with historical results. This could be reflective of the presence of organic matter from riparian zone vegetation surrounding the dam; • NH_3 at an average of 0.15 mg/L is consistent with historical results. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
WM201 – Entrance Road Culvert	The Entrance Road Culvert collects surface water runoff from the Woodlawn Bioreactor administration office and workshop areas. 4 of 4 monitoring quarters were sampled during the 2020-21 reporting period. Water quality trends for WM2011, based on the results provided in **Table 6.5** (refer **Appendix 4**). • pH (6.6) is within the overall range of 5.53 – 8.56 for this location, indicating relatively neutral water; • EC (301 µS/cm) is consistent with historical results, reflecting brackish water; • TOC (8.5 mg/L) remains consistent with previous reporting periods; • NH_3 (0.2 mg/L) concentration are consistent with historical trends; • K (average 12.7 mg/L) is consistent with historical levels. Veolia will continue monitoring this location in the next reporting period for any runoff impacts.
ED3SS – Lagoon 5	Evaporation Dam 3 South-South (ED3SS) is a storage point to manage treated leachate by evaporation. Quarterly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.6** (refer **Appendix 4**), for ED3SS, the following can be confirmed: • pH (average 8.5) appears to be fairly consistent with the existing treated leachate quality;

	• EC average (24100 µS/cm) indicates a slight increase from previous reporting periods; • SO_4 averages (1893 mg/L) appears to be fairly consistent with the existing treated leachate quality; • Zn levels (average 20.2 mg/L) higher than previous monitoring periods; • NH_3 concentrations (average 388 mg/L) remained stable over the course of the reporting period; • TOC (average 3945 mg/L) continues to trend upwards from previous reporting periods. The progressively increasing trend in EC and TDS evident in monitoring results is directly associated with the increase in concentration of salts as the water component on leachate evaporates from this dam.
WM203 – Evaporation Dam 3 North	Evaporation Dam 3 North (ED3N) is a storage point to manage treated leachate by evaporation. Quarterly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.7** (refer **Appendix 4**), for WM203, the following can be confirmed: • pH (average 8.6) appears to be generally consistent with previous reporting periods; • EC average (36600 µS/cm) indicates a slight increase from previous reporting periods; • SO_4 averages (5360 mg/L) is consistent with previous reporting periods; • Zn levels (average 76.7 mg/L) is also consistent with historical levels; • NH_3 concentrations (average 85.8 mg/L) showing a steady decrease from previous reporting periods; • TOC average (3340 mg/L) has decreased from the previous reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
Pond 5	Pond 5 is situated on a bench within the landfill void and acts as a transfer point to capture stormwater from the walls of the landfill void to Evaporation Dam 3 South. All quarterly monitoring events required under the EPL were undertaken in this monitoring period, the results of which are tabulated in **Table 6.8** (refer **Appendix 4**). These water quality results are consistent with previous reporting periods. • pH average of 4.3 confirms acidic nature of water that comes in contact with the void walls and is lower than previous results; • EC (average 2002 µS/cm) is generally consistent lower than previous results; • SO_4 trends downwards (average 1227 mg/L) from the previous reporting period; • K average of 9.5 mg/L is slightly down on previous results; • Zn (average 145.9 mg/L) is generally consistent with previous results; • NH_3 (average 4.4 mg/L) and TOC (average 10 mg/L) both mirror a similar trend which appears quite variable over historical monitoring results. These results and trends are deemed representative of the stormwater quality captured from the walls of the void.

WM202 – ED3S	Evaporation Dam 3 South is a storage point to manage stormwater from the void by evaporation. Quarterly monitoring events were undertaken in accordance with EPL conditions. Water quality results indicated a similar trend to previously reported data as seen **in Table 6.9** (refer **Appendix 4**). • pH levels indicate an acidic, yet stable trending result with the average pH of 3.6 appearing to be generally consistent with previous reporting periods; • Zn at an average of 378 mg/L is consistent with previous reporting periods; • SO_4 (average 4380 mg/L) is lower than previous reporting periods; • EC (average 6115 µS/cm) is indicating a downward trend. Both SO_4 and EC concentrations reflect the signature for Acid Mine Drainage (AMD) contaminated waters from remnant mining operations stored in Evaporation Dam 3 South; • NH_3 concentrations (average 57.2 mg/L) is also lower than previous reporting periods. The majority of the analytes tested at this location during this monitoring period indicates a downward trend in concentrations in comparison to previous reporting periods.
ED1 – Evaporation Dam 1	Evaporation Dam 1 (ED1) is a storage point to manage runoff stormwater from its external catchment including dolerite stockpile area. Quarterly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.10** (refer **Appendix 4**), for ED1, the following can be confirmed: • pH (average 2.7) which is consistent with previous reporting periods; • EC (average 20160 µS/cm) is slightly lower than previous reporting periods; • Zn levels (average 3041 mg/L) is consistent with the previous reporting period; • NH_3 concentrations (average 15.9 mg/L) showed lower than usual results over the reporting period; • TOC averages 14.75 mg/L remains consistent with previous reporting periods. Similar to ED3S, ED1 demonstrated a steady decline in concentrations in the majority of the analytes tested at this location during this monitoring period in comparison to previous reporting period, which is reflective of the increased surface water inputs resulting from the rainfall since Feb 2020.
ED1 Coffer Dam	Evaporation Dam 1 (ED1) coffer dam is a storage point to manage treated leachate from the Leachate Treatment Plant. Monthly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.11** (refer **Appendix 4**), for ED1 coffer dam, the following can be confirmed: • pH (average 8.75) is lower than previous reporting period; • EC (average 26083 µS/cm), BOD (average 7.42 mg/L) and COD (2909 mg/L) results are lower than previous reporting period results; • NH_3 concentrations (average 10 mg/L) remained stable over the reporting period;

	• Chloride averages (4378 mg/L) remained stable however declining over the reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

1.5.4 Bioreactor Leachate Monitoring Results

Leachate quality monitoring is undertaken annually at 2 monitoring locations in the Bioreactor as required by the EPL. Effluent quality from the Leachate Treatment Plant is also monitored and sampled.

The findings from this reporting period are summarised in **Table 1.5.4** below with the detailed data provided in **Tables 7.1** and **7.2** (refer **Appendix 4**). The key quality indicators selected to characterize the leachate and identify any migration into groundwater or surface water monitoring locations include:

- pH,
- Electrical Conductivity (EC),
- Sulphate (SO_4),
- Lead (Pb),
- Zinc (Zn),
- Ammonia ($NH_{3)}$, and
- Total Organic Carbon (TOC).

These are also depicted in the subsequent trend graphs **Figures 1.5.4.1** and **1.5.4.2** (refer **Appendix 5).**

Table 1.5.4 Bioreactor Leachate Monitoring Results

Parameter	Results/Discussion
Leachate Dam	The leachate dam is located at the northwest rim of the landfill void where leachate collected and extracted from the void is treated by aeration to oxidise organic compounds. An annual monitoring round was completed during this reporting period as per the requirements of the EPL. Based on the results provided in **Table 7.1** (refer **Appendix 4**), the characteristics of the leachate are: • pH (8.71) and EC (27100µS/cm) is consistent with the previous reporting period; • SO_4 one of the dominant anions, (473 mg/L) is consistent with previous reporting readings; • Pb (0.798 mg/L) and Zn (2.96mg/L) is consistent with the previous reporting period; • NH_3 (2550 mg/L) is consistent with previous reporting; • TOC (5740 mg/L) is consistent with previous reporting. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

Leachate Recirculation System	An annual round was completed during this reporting period in accordance with the EPL, the results of which are detailed in **Table 7.2** (refer **Appendix 4**). Based on these results, the leachate collected directly from the recirculation system displays similar characteristics to the leachate pond, with some exceptions as summarised below: • pH (8.28) is generally consistent with previous reporting period; • EC (25700µS/cm) is consistent with the previous reporting period and is generally consistent with the overall annual average for this location; • SO_4 (382 mg/L) is higher than previous reporting period; • Both Pb and Zinc are consistent with the previous reporting period, 0.098 mg/L and 3.32 mg/L respectively; • TOC (4520 mg/L) is consistent with historical monitoring results. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
Effluent from LTP	The effluent from the Leachate Treatment Plant is located at the ultrafiltration membrane shed at the Leachate treatment Plant. Water quality is tested on the agreed 7 day assessment and provided to the NSW EPA on a monthly basis as part of the Commissioning process. Based on the results provided in **Table 8.1** (refer **Appendix 4**), the water quality at this location can be described as: • pH (average 8.03) consistent with throughout reporting period and meets proposed Targets; • EC (average 17076 µS/cm) remains stable, consistent with throughout the reporting period; • NH_3 (average 9.3 mg/L) is well below proposed Targets; • BOD (3 mg/L) is well below proposed targets; No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

1.5.5 Bioreactor Groundwater Monitoring Results

Groundwater quality monitoring at 22 locations was undertaken in this reporting period as required by the EPL, comprising 1 annual and 3 quarterly rounds of monitoring for 19 of the 22 locations. The results of which are summarised in **Table 1.5.5** below.

The groundwater monitoring well network allows for an assessment of potential impacts from the waste operations at the Bioreactor, evaporation dams and tailing dams. The key quality indicators selected to detect any pollutants in groundwater samples are the same as those deemed characteristic for leachate and are as follows:

- pH
- Electrical Conductivity (EC),
- Sulphate (SO_4),
- Lead (Pb),
- Zinc (Zn),

- Ammonia ($NH_{3)}$, and
- Total Organic Carbon (TOC).
- Copper (Cu)

These are depicted in the trend graphs **(Figures 1.5.5.1 to 1.5.5.21)** provided in **Appendix 5**.

Table 1.5.5 **Bioreactor Groundwater Monitoring Results**

Parameter	Results/Discussion
MB1	MB1 is located down gradient of the landfill void. Based on the results provided in **Table 9.1** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 775.6 m RL) was slightly higher than previous reporting periods due to recent rainfall events; • pH (average 7.6) neutral – to slightly alkaline consistent with previous reporting period; • EC (average 1550 µS/cm) is lower than but generally consistent with previous readings representing fresh water; • SO_4 (average 257 mg/L) is generally consistent with previous periods; • Pb and Zn (0.0008 mg/L and 0.192 mg/L respectively) are generally consistent with previous periods; • NH_3 (average 0.2) is consistent with previous reporting periods; • TOC (7 mg/L) is consistent with the previous reporting period and historical trends. The concentration is indicative of natural conditions. Veolia will continue to monitor this parameter in the future to ensure water quality at this location is preserved. All trends at this location indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.
MB2	MB2 is located upstream of Evaporation Dam 2. Based on the results provided in **Table 9.2** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 779.4 m RL) was consistent with long term average since 2004; • pH (average 7.2) neutral, consistent with previous reporting period; • EC (average 6308 µS/cm) and SO_4 (average 4400 mg/L) are generally consistent with previous periods; • Pb (0.0002 mg/L) indicates a stable trend consistent with the previous reporting period; • Zn (0.052 mg/L) is generally consistent with previous reporting periods; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (5 mg/L) shows a slight increase with previous reporting periods.

	All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.
MB3	MB3 is located upstream of the Bioreactor and mine site. Based on the results provided in **Table 9.3** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 790.7 m RL) was consistent with long term average since 2004; • pH (average 7.1) near neutral is consistent with previous reporting period; • EC (average 1795 µS/cm) is consistent with previous readings representing fresh water; • SO_4 (average 30.1 mg/L) is stable; • Pb (0.0004 mg/L) and Zn (0.015 mg/L) are stable and consistent with previous periods; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (1 mg/L) result is consistent with historical results. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved. All trends indicate fairly stable concentration and provide an indication of background groundwater concentrations.
MB4	MB4 is located to the east of the landfill void and downstream of the Bioreactor. Based on the results provided in **Table 9.4** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 773.94 m RL) was consistent with long term average since 2004; • pH (average 6.1) slightly acidic, consistent with previous reporting period; • EC (average 1707 µS/cm) represents fresh water salinity and is consistent with previous period. This trend is reflected in SO_4 (average 157 mg/L) results for this period; • Pb (0.0035 mg/L) remains stable while Zn (0.915 mg/L) is seen to fluctuate which appears consistent with historical cyclic trends; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (1 mg/L) result is consistent with historical results. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved. All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities.
MB6	MB6 is located to the west of the landfill void and downstream of Evaporation Dam 3 and upstream of the Bioreactor. Based on the results provided in **Table 9.5** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 773.6 m RL) was consistent with historical results; • pH (average 6.2) slightly acidic consistent with previous reporting period;

	• EC (average 1955 µS/cm) represents brackish water and the trend is mirrored by SO_4 (average 254 mg/L) consistent with previous periods; • Pb (0.004 mg/L) and Zn (4.4 mg/L) is consistent with previous periods; • TOC (2.0 mg/L) and NH_3 average of 0.1 mg/L is consistent with previous monitoring periods. This bore was not sampled in Quarter 1 and 4 of the reporting period due to being dry. Due to the tendency of MB6 to be dry, the long term reliability of this bore for monitoring is uncertain. It will continue to be monitored and samples obtained when possible.
MB7	MB7 is located upstream of Evaporation Dam 3. Based on the results provided in **Table 9.6** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 787.3 m RL) was consistent with long term average since 2004; • pH (average 7.5) neutral is consistent with the previous reporting period; • EC (average 8372 µS/cm) and SO_4 (average 147.3 mg/L) follow a similar stable trend to previous reporting periods ; • Pb (0.0003 mg/L) is consistent throughout the reporting period whilst Zn (0.227 mg/L) shows a fluctuating trend consistent with historical cycles; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (13 mg/L) is fairly consistent with the previous reporting period. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved. All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities.
MB10	MB10 is located adjacent to Evaporation Dam 1. Based on the results provided in **Table 9.7** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 781.6m RL) was consistent with previous monitoring periods; • pH (average 7.3) neutral is consistent with previous reporting periods; • EC (average 7640 µS/cm) is of brackish quality generally consistent with previous readings; • SO_4 (average 3780 mg/L) mirrors EC and is generally consistent with previous periods; • Pb (0.0005 mg/L) is stable while Zn (0.028 mg/L) and is generally consistent with previous reporting periods; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (3 mg/L) appears consistent with the previous reporting period. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved.

	All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities.
ED3B	ED3B is located downstream of Evaporation Dam 3. Based on the results provided in **Table 9.8** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 784.1 mRL) was consistent with previous monitoring periods; • pH (average 7.4) is neutral – slightly alkaline and consistent with previous reporting period; • EC (average 7575 µS/cm) indicating brackish water and SO_4 (average 1082 mg/L) follow similar trends consistent with previous periods; • Pb (0.0024 mg/L) remains stable while Zn (0.356mg/L) is lower than previous monitoring periods; • NH_3 (0.1 mg/L) is at non detection rates; • TOC (27 mg/L) is higher than previous reporting periods. All trends indicate fairly stable concentrations at this location with no evidence of contamination from mining or Bioreactor activities.
WM1	WM1 is located northeast of the landfill void. Based on the results provided in **Table 9.9** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 748.1m RL) is consistent with previous monitoring periods; • pH (average 8) neutral – to slightly alkaline consistent with previous reporting period; • EC (average 2404 µS/cm) represents slightly brackish water, and slightly lower than previous historical records; • SO_4 (average 1513 mg/L) is similar in trend to EC and demonstrating a long term upward trend; • Both Pb (0.0022 mg/L) and Zn (0.281mg/L) remain consistent with previous reporting periods; • NH_3 (average 0.3 mg/L) is close to, or within, non-detection rates; • TOC (7 mg/L) is consistent with previous monitoring period reflective of natural conditions; All trends indicate fairly stable concentrations at this location with no evidence of contamination from mining or Bioreactor activities.
WM5	WM5 is located to the west of the void near Evaporation Dam 3 South. Based on the results provided in **Table 9.10** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 785.7mRL) is consistent with long term averages; • pH (average 7.48) neutral is consistent with the previous period; • EC (average 4146 µS/cm) is representative of saline water and consistent with the previous reporting period; • SO_4 (average 71.1 mg/L) is lower than previous monitoring periods;

	• Pb average 0.0002 mg/L) and Zn (0.006mg/L) can be seen to be fluctuating which appears consistent with historical cyclic trends; • NH_3 (average 0.1 mg/L) is close to non-detection rates; • TOC (12 mg/L) is consistent with previous monitoring periods reflecting natural conditions. No significant variations or anomalies were recorded for any analyte tested in this location during this monitoring period from the data available.
WM6	WM6 is located to the west of the void adjacent to Evaporation Dam 3 North. Based on the results provided in **Table 9.11** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 786.6m RL) is consistent with the previous reporting period; • pH (average 6.98) is slightly acidic, but stable and consistent with previous reporting period; • EC (average 12081 µS/cm) represents brackish to slightly saline water, consistent with previous reporting period; • SO_4 (average 284 mg/L) mirrors EC's stable trend; • Pb (0.0178 mg/L) and Zn (0.303 mg/L) are both similar to the previous reporting period and generally consistent with historical fluctuations; • NH_3 (average 0.1mg/L) is close to, or within, non-detection rates; • TOC (15 mg/L) is consistent with previous monitoring periods reflecting natural conditions. All trends are relatively consistent and there is no indication of contamination from mining or Bioreactor activities.
MW8S	MW8S is located on the northern side of ED3N. Only 3 of the 4 quarterly monitoring samples were obtained due to the bore being dry during Quarter 2 of the reporting period. Based on the results provided in **Table 9.12** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 783.98 m RL) is consistent with previous reporting periods; • pH (average 6.84) shows consistency with previous reporting periods; • EC (average 7045 µS/cm) shows a significant decrease from previous reporting period results; • SO_4 (average 2553 mg/L) continues to show a slight decrease but is generally consistent with previous periods; • NH_3 (average 0.1 mg/L) is close to, or within, non-detection rates; • Pb (0.0014mg/L) and Zn (12.1mg/L) are both similar to the previous reporting period and generally consistent with historical fluctuations. All trends indicate fairly stable concentrations with no evidence of contamination from mining or Bioreactor activities.
MW8D	MW8D is located adjacent to MW8S. Based on the results provided in **Table 9.13** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 783.88m RL) was consistent with long term average since 2004;

	• pH (average 7.36) slightly acidic to neutral consistent with previous reporting period; • EC (average 3488 µS/cm) represents brackish water showing a downward trend; • SO_4 (average 1502 mg/L) mirrors EC consistent with previous periods; • Pb (0.0004 mg/L) and Zn (7.28 mg/L) are both consistent with previous periods; • NH_3 (0.1 mg/L) is at non detection rates; • TOC (5 mg/L) is consistent with previous monitoring periods reflecting natural conditions. All trends indicate fairly stable concentrations with no evidence of contamination from mining or Bioreactor activities.
MW9S	MW9S is located on the northwest side of ED3N.Based on the results provided in **Table 9.14** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 786.61m RL) was consistent with previous reporting period; • pH (average 7.02) consistent with previous reporting period; • EC (average 9212 µS/cm) remains stable, consistent with previous reporting period for brackish water; • SO_4 (average 4217 mg/L) is consistent with previous periods; • Pb (0.0033 mg/L) and Zn (0.207 mg/L) were both generally consistent with historical results; • NH_3 (0.1mg/L) is at non detection rates; • TOC (4 mg/L) reflecting natural conditions is consistent with historical results. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MW10S	MW10S is located on the northeast side of ED3. No sampling of MW10S could be undertaken during the reporting period as this well was continually dry. This has been a consistent observation since the well was commissioned in 2007. No data is available to produce tables or graphs for this monitoring point.
MB28	MB28 is located downstream of ED1. Based on the results provided in **Table 9.16** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 779.9m RL) was consistent throughout this reporting period; • pH (average 7.2) is neutral; • EC (average 8275 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 882.3 mg/L) is consistent; • Pb (0.0004 mg/L) and Zn (1.03mg/L) were both generally consistent in this reporting period; • NH_3 (0.1 mg/L) is at non detection rates; • TOC (7 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

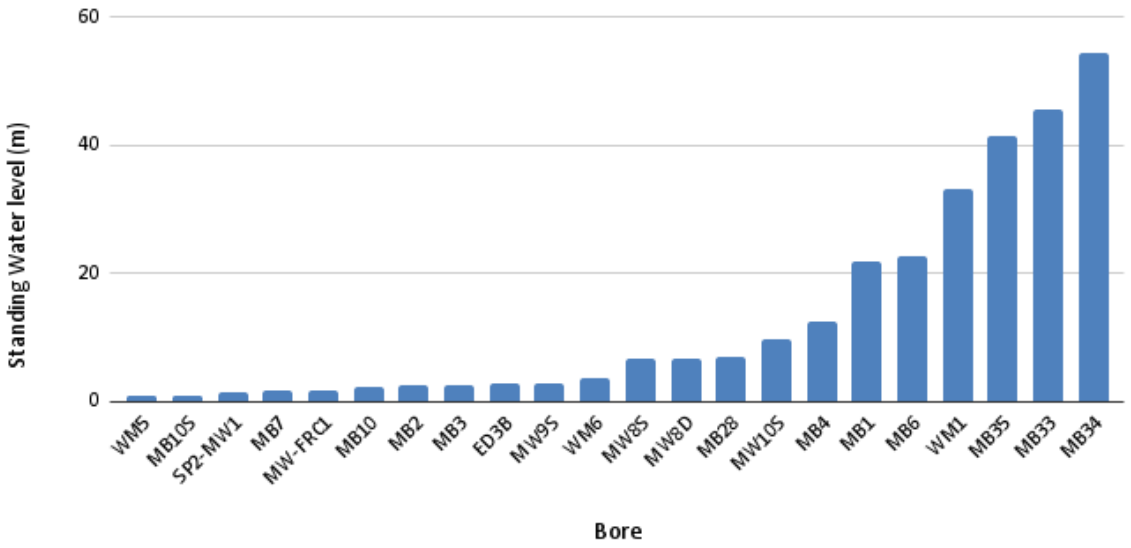
MB33	MB33 is a 75m deep groundwater monitoring bore to replace a waste covered well (WM4) in the Void. Based on the results provided in **Table 9.17** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 751.48m RL) was consistent throughout this reporting period; • pH (average 7.94) showing consistent alkalinity; • EC (average 1626 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 345 mg/L) is consistent with previous periods; • Pb (0.0002 mg/L) and Zn (0.04 mg/L) were both generally consistent in this reporting period; • NH_3 (0.93 mg/L) is close to, or within, non-detection rates; • TOC (6 mg/L) reflecting natural conditions is consistent throughout this reporting period. Veolia engaged Earth2Water Pty Ltd to carry out a flushing of this bore prior to the first quarterly sampling of the 2020-21 reporting period.
MB34	MB34 is a deep groundwater monitoring bore installed as part of a groundwater monitoring network review in the vicinity of the landfill void, and added to the EPL by way of variation in June 2021. Based on the results provided in **Table 9.21** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 761.12m RL) was consistent throughout this reporting period; • pH (average 8.19) showing consistent alkalinity; • EC (average 1455 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 233 mg/L) is consistent with previous periods; • Pb (0.0002 mg/L) and Zn (2.07 mg/L) was anaylsed for the first time during the reporting period, setting the benchmark for future annual testing trends; • NH_3 (0.23 mg/L) is close to, or within, non-detection rates; • TOC (8 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MB35	MB35 is a deep groundwater monitoring bore installed as part of a groundwater monitoring network review in the vicinity of the landfill void, and added to the EPL by way of variation in June 2021. Based on the results provided in **Table 9.22** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 770.09m RL) was consistent throughout this reporting period; • pH (average 6.99) showing consistent alkalinity; • EC (average 9800 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 10700 mg/L) is consistent with previous periods; • Pb (0.0002 mg/L) and Zn (515 mg/L) was anaylsed for the first time during the reporting period, setting the benchmark for future annual testing trends; • NH_3 (4.03 mg/L) is close to non-detection rates; trend will continue to be monitored for increases in the next sampling round.

	• TOC (110 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
SP2-MW1	SP2-MW1 is located adjacent to Spring 2. This shallow bore was installed as part of the ED1 and ED2 seepage management scheme. Based on the results provided in **Table 9.18** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 778.05m); • pH (average 7.25) being neutral, was consistent throughout the reporting period; • EC (average 2178 µS/cm) remains stable, consistent with for fresh to brackish water; • SO_4 (average 266 mg/L) is consistent with the previous reporting period; • Pb (average 0.0002 mg/L) and Zn (average 0.19 mg/L) were both generally consistent in this reporting period; • TOC (4 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MW-FRC1	MW-FRC1 is located adjacent to the farm road culvert. This shallow bore was installed as part of the ED1 and ED2 seepage management scheme. Based on the results provided in **Table 9.19** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 779.28m); • pH (average 6.88) consistent throughout this reporting period; • EC (average 5111 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 557 mg/L) is consistent with the previous reporting period; • Pb (average 0.0002 mg/L) and Zn (average 0.756mg/L) were both generally consistent and reflected low to non-detectable; • TOC (4 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MB10S	MB10S is located adjacent to MB10 at the toe end of ED1. This shallow bore was installed as part of the ED1 and ED2 seepage management scheme. Based on the results provided in **Table 9.20** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 781.65m); • pH (average 6.84) consistent throughout this reporting period; • EC (average 1529 µS/cm) remains stable for fresh to brackish water; • SO_4 (average 606 mg/L) is consistent with the previous reporting period;

	• Pb (average 0.0002 mg/L) and Zn (average 3.04 mg/L) were both generally consistent and reflected low to non-detectable; • TOC (7 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

Detailed monitoring data is provided in Tables **9.1** – **9.22** (refer **Appendix 4**). There was a consistent notable increase in standing water levels (SWL) averages during the reporting period due to the recent and prolonged rain period.

Figure 1.5.5 **Bioreactor Groundwater Bore Standing Water Levels**



1.5.6 Bioreactor Piezometers Level Monitoring Results

Measurements for groundwater standing water levels (SWL) in the vicinity of the Bioreactor were undertaken at 6 out of 6 piezometers around the landfill void in accordance with the EPL and have been documented in the Annual Return. The primary purpose is to monitor the groundwater hydraulics in the Void. Each location consists of a shallow (reference A) and deep (reference B) piezometer.

The findings of the monitoring are summarised in **Table 1.5.6** below and detailed quarterly levels are provided in **Tables 10.1 – 10.5** (refer **Appendix 4**)

Table 1.5.6 **Bioreactor Piezometers Level Monitoring Results**

Parameter	Results/Discussion

P38A & P38B	P38 is located east of the void. Standing water levels are presented in **Table 10.1** (refer **Appendix 4**). • SWL in P38A (shallow aquifer) indicated a stable standing water level ranging from 775.62m RL to 776.85m RL during this reporting period. • SWL in P38B (deep) ranged from 771.40m RL to 772.38m RL in this reporting period, consistent with previous reporting periods.
P200A & P200B	P200 is located east of the void. Standing water levels are presented in **Table 10.2** (refer **Appendix 4**). • SWL in P200A (shallow) showed a range of 755.83m RL to 768.84m RL and is stable. • SWL in P200B (deep) showed a range of 760.72m RL to 769.3 m RL and is stable.
P58A & P58B	P58 is located west of the void. Standing water levels are presented in **Table 10.3** (refer **Appendix 4**). • SWL in P58A (shallow) showed a range of 764.15m RL to 764.19m RL and is stable. • SWL in P58B (deep) is similar to the previous reporting period, fluctuating between 744.15m RL and 748.64m RL.
P59A & P59B	P59 is located west of the void and to the south of P58. Standing water levels are presented in **Table 10.4** (refer **Appendix 4**). • SWL in P59A (shallow) ranged from 786.14m RL to 788.59m RL in this reporting period, consistent with previous reporting period. • SWL in P59B (deep) ranged between 773.8 m RL and 788.32m RL, consistent with previous reporting period.
P100A & P100B	P100 is located northeast of the void. Standing water levels are presented in **Table 10.5** (refer **Appendix 4**). • SWL in P100A (shallow) is consistent with the previous reporting period measuring 735.30m RL in quarter one. It was found to be Dry for the remainder of the monitoring period (Quarters 2 to 4). • P100B (deep) averaged between 701.66m RL and 722.69m RL which indicates water above the base level of 698.29 m RL which has been recorded in previous periods. As historical monitoring results indicated potential silting had occurred, P100B was developed by flushing by Earth2Water Pty Ltd during the reporting period.

1.5.7 Bioreactor Evaporation Dam Volume Monitoring Results

The Evaporation Dam 3 (ED3) system comprises extracted (and treated) leachate from the landfill void and captured stormwater. The water volume has to be maintained in all Evaporation Dam 3 (Lagoon systems) below the freeboard level at all times.

Water levels are surveyed monthly as detailed in **Table 1.5.7**, which shows the dam levels and required freeboard requirements. Additional monitoring is conducted for other dams managed by Veolia.

Table 1.5.7 **Bioreactor Evaporation Dam Volume Monitoring Results (RLs AHD)**

	ED3 SOUTH		ED3 NORTH				ED1
	ED3S	ED3S-S	ED3N-1	ED3N-2	ED3N-3	ED3N-4	Coffer Dam
Date	RL	RL	RL	RL	RL	RL	RL
29/09/2020	790.85	792.25	Empty	790.52	790.39	790.47	788.09
27/10/2020	790.89	792.16	Empty	790.75	790.57	790.36	788.18
27/11/2020	790.31	792.16	Empty	790.81	790.61	790.37	788.38
18/12/2020	790.27	792.11	Empty	790.88	790.45	790.24	788.35
28/01/2021	790.24	792.19	Empty	790.52	790.69	790.05	788.37
01/03/2021	790.35	792.42	Empty	789.62	790.86	790.14	788.45
31/03/2021	791.03	792.67	Empty	789.86	790.94	790.42	788.74
29/04/2021	790.94	792.82	Empty	789.44	790.94	790.51	788.75
31/05/2021	791.03	793.12	Empty	789.76	789.98	790.69	788.95
28/06/2021	791.19	793.18	Empty	789.80	790.09	790.85	789.11
29/07/2021	791.21	793.21	Empty	789.46	790.31	790.96	789.29
30/08/2021	791.24	793.19	Empty	789.82	790.46	790.96	789.47
Minimum	*790.24*	*792.11*	*0.00*	*789.44*	*789.98*	*790.05*	*788.09*
Mean	*790.80*	*792.62*	*0.00*	*790.10*	*790.52*	*790.50*	*788.68*
Maximum	*791.24*	*793.21*	*0.00*	*790.88*	*790.94*	*790.96*	*789.47*
Max Freeboard levels	**791.5**	**793.6**	**791.2**	**791.2**	**791.2**	**791.2**	**789.92**

1.5.8 Bioreactor Meteorological Monitoring Results

Monitoring meteorological data during this reporting period provided an understanding of the ambient air (such as dust and odour) and rainfall conditions at the Bioreactor, which was utilised to manage environmental performance, as well as investigate potential impact to nearby sensitive receivers.

An onsite automated meteorological monitoring station was operated during the reporting period to monitor weather conditions representative of the site. Meteorological data recorded includes (but is not limited to):

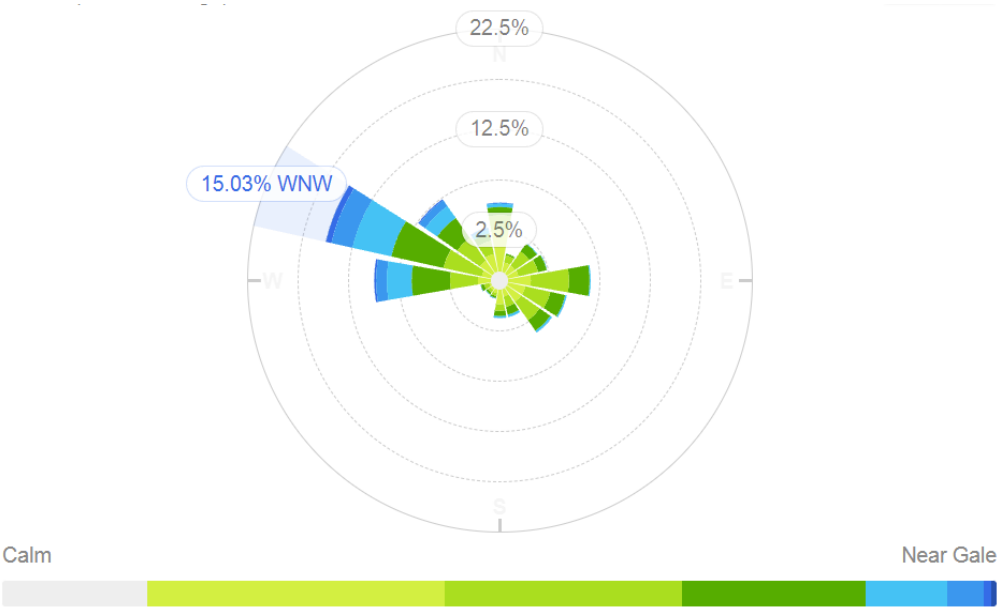
- Wind speed at 10m;
- Wind direction at 10m;
- Temperature at 2m;
- Temperature at 10m;
- Rainfall;
- Solar radiation; and
- Sigma theta at 10m

Wind speed, direction and sigma theta (which are used to calibrate turbulence) are logged at 60-minute intervals, the data from which is used to respond to odour and noise complaints, on receipt. Over the 5 year period, the winds prevailed predominantly from the West North West in the general direction of the Tarago Village.

Meteorological data is logged in 60 minute and 24 hour intervals and can be made available for the 2020/2021 reporting period upon request. Servicing and calibration of the meteorological station is carried out quarterly by Hydrometric Consulting Services.

Figure 1.5.8 below indicates average wind speed and direction during the reporting periods.

Figure 1.5.8 Average Wind Speed (km/h) and Direction



Source: https://www.willyweather.com.au/

The wind rose above depicts the average wind speed and direction recorded at 10m above ground level from September 2020 to August 2021. Average wind speeds over the reporting period ranged from 0km/h to 45.7km/h with strong prevailing winds typically from the West North West (WNW) directly toward Tarago and surrounding areas.

A review of the correlation between reported odour complaints and meteorological data such as wind speed, wind direction, temperature at the time and location of the alleged emission of odour are consistent with this modelling.

According to the Woodlawn Weather Station, total rainfall over the reporting period was 983.5mm, which was well above the previous 2019/20 period (704mm). The total number of rain days recorded during the reporting period (131) was also higher than the previous period (92 days).

Weather statistics for the reporting period are shown in **Table 1.5.8**. The meteorological data for the reporting period is detailed in **Table 11.1** (refer **Appendix 4**).

***Table 1.5.8* Rainfall Statistics by Month (mm)**

Month	Days of Rain	Rainfall (mm)	Daily Average (mm)	Daily Maximum (mm)
September 2020	9	35	1.2	12.5
October 2020	15	117.5	3.8	30
November 2020	5	95	3.2	42
December 2020	14	63	2	20.5
January 2021	10	84	2.7	21
February 2021	15	72	2.6	31.5
March 2021	12	238	7.7	59.5
April 2021	3	3.5	0.1	2
May 2021	12	82	2.6	23
June 2021	12	84	2.8	21
July 2021	14	48	1.5	9
August 2021	10	61.5	2	28.5
Yearly Totals	**131**	**983.5**	**2.7**	**59.5**

1.6 Pollution Studies and Reduction Programs

1.6.1 Long Term Leachate Treatment Solution

In accordance with the requirements of Pollution Reduction Program (PRP) EPL Condition **U1.5**, Earth2Water Pty Ltd (E2W) were commissioned to undertake an assessment of leachate extraction from the Bioreactor aimed to better understand the leachate assessment and potential backlog of extraction rates.

The assessment report and recommendations have been reviewed and a Leachate Management Action Plan has been submitted to the EPA for review.

1.6.2 Investigation and Impact Assessment of Hydrogen Sulfide Gas Emissions

Epic Environmental has been engaged to undertake an independent Hydrogen Sulfide Investigation and Impact Assessment in accordance with Pollution Reduction Program (PRP) Condition **U2** of the EPL.

Ongoing COVID-19 impacts have caused a delay in the fieldwork component of the study resulting in an extension of the to due date for the final report to 1st December 2021.

1.7 Waste Input Volumes

In July 2019, the DPIE approved an increase in regional waste delivered to the Woodlawn Bioreactor from 90,000 tonnes per annum (tpa) to 125,000 tpa pursuant to Condition 6, Schedule 3 of MP 10_0012.

The Bioreactor EPL condition L3.3 provides the maximum annual landfill input rates as broken down in **Table 1.7**.

***Table 1.7* Maximum annual landfill input rates**

Putrescible waste received by rail from Sydney	Received as residual waste from Woodlawn AWT	Putrescible regional waste received by road
900,000 TPA	100,000 TPA	90,000 TPA

The data provided by SAP is used to track and monitor the amount of incoming waste in accordance with the limits of the Bioreactor EPL. **Table 1.8** indicates that the Woodlawn Bioreactor has remained within the annual waste limit stipulated within the Bioreactor PA of 1.13Mtpa.

Waste received at the Bioreactor during the reporting period is provided in Table **1.8** and itemised into categories set out in Condition L3.3 of EPL 11436 (**Table 1.7**).

***Table 1.8* Incoming waste tonnage during 2020/2021 reporting period**

Putrescible waste received by rail from Sydney	Received as residual waste from Woodlawn AWT	Regional waste received by road *Including putrescible and non-putrescible waste
568,502.730	71,185.180	138,127.976

In March 2020, Condition 7A, Schedule 3 of SSD 10_0012 permitted the acceptance of up to 200,000m3 of bushfire impacted waste material from regional areas of NSW between March 2020 and 30 September 2020, which was subsequently extended until 31 March 2021. During the reporting period, the Bioreactor received 1,919.320t of bushfire impacted material.

The exceedance of regional waste inputs is noted in **Section 1.8** of this report.

1.8 Non-Compliance with EPL 11436

Condition	Non-Compliance	Further Details	Corrective Action
M2.1	Monitoring did not meet the sampling frequency requirements during the reporting period.	3 groundwater locations (Points 30, 55 and 58) did not allow sampling to be undertaken, as the bores were insufficiently recharged. 2 groundwater locations (Points 67 and 68) did not meet the quarterly sampling requirement as they were added to the licence in June 2021. H2S monitoring at 1 air discharge location (Monitoring Point 7) was not undertaken due to time taken to assess risk and develop appropriate sampling methods with an external contractor, who were not able to access the Premises due to COVID restrictions.	For the 3 groundwater monitoring points not able to be sampled from, the volume of water able to be extracted is dependent on recharge of bores. For the 2 new groundwater bores added to the licence, these will be sampled in the new reporting period. Monitoring for H2S will be completed in the new reporting period now that COVID restrictions have eased and the appropriate sampling methods have been developed
L6.1	Emission of potentially offensive odour impacting on the community.	302 Odour complaints were received and investigated during the reporting period.	Veolia is implementing improvements to landfill gas capture, leachate extraction, treatment, storage and evaporation.
M8.1	The licensee must maintain a log of the run-times of all mechanical evaporators used at the premises.	A mechanical evaporator log was not maintained for 6 months of this reporting period.	An automated continuous logging system is now in place.
R4.2	Within 24 hours of receipt of an odour complaint, the Licensee must provide the EPA with a written report.	Odour complaint reports were not provided to the EPA within the required 24-hour timeframe.	Veolia consulted with EPA and implemented processes to manage odour complaint investigations and reporting timeframes for future events.

U1.2	The membrane bioreactor (MBR) leachate treatment plant component of the long term leachate management solution must be capable of continuously treating at least 4L/s of leachate.	Whilst the LTP has been designed to continuously treat at least 4 L/s of leachate, this minimum rate was not able to be achieved in this reporting period.	Veolia intends to install an additional ultrafiltration train, with a target for completion by July 2022, to contribute to achieving the LTP throughput target. EPA has confirmed the required implementation target by way of a licence condition.

Part 2 EPL 11455 Crisps Creek Intermodal Facility

2.1 Crisps Creek IMF Operations

Veolia operates the Crisps Creek Intermodal Facility (IMF), which is comprised of a rail siding, container storage hardstand and mobile infrastructure located adjacent to the regional Bombala railway line network (approximately 1 km south of Tarago train station and 8 km from the Bioreactor), to enable transfer of containerised waste received by rail from Sydney onto road trucks and subsequently to the Bioreactor for disposal.

2.2 Crisps Creek IMF Licence Conditions

The IMF is operated under EPL 11455 which details the operating conditions and environmental monitoring requirements as noted in **Table 2.2**.

***Table 2.2* IMF Licence Conditions**

Condition	Compliance with Condition
1. Administrative conditions	Noted
2. Discharges to air and water and application to land	**P1. Location of monitoring/discharge points and areas** These monitoring points have been documented in a monitoring location plan (**Appendix 3**) and a program is in place for sampling as required.
3. Limit conditions	**L1. Pollution of Waters** All clean surface and storm water collected at the IMF was diverted to the onsite retention system for storage, as part of the first flush stormwater management system, in this reporting period. Following rainfall events, surface water monitoring was undertaken to assess the water quality prior to discharge.
	L2. Waste All waste received at the IMF during this reporting period was in accordance with the waste types permitted in the EPL, received via rail from the Clyde and Banksmeadow Transfer Terminals in Sydney. There were 3 incidents during the reporting year where permission was sought and granted by the EPA for the overnight storage of waste laden containers due to locomotive issues.

	L3. Noise Limits No noise complaints were received during this reporting period indicating that noise from operational activities at the IMF was likely maintained within the 35 dB(A) LAeq (15 minute) criteria at the most affected residential receiver. Similarly, it can be inferred that noise from freight trains did not exceed 45 dB(A) LAeq (15 minute and 50 dB(A) LAeq (15 minute before and after 7:00 am respectively. Noise monitoring will be undertaken by Veolia on the receipt of any such complaints.
	L4. Hours of Operation All operational activities at the IMF including haulage of waste to the Bioreactor and MBT facility were undertaken between 6:00 am and 10:00 pm, Monday to Saturday during this reporting period as permitted under the DA.
	L5. Potentially Offensive Odour No odour complaints were received for the IMF during this reporting period.
4. Operating conditions	**O1. Activities Carried out in a Competent Manner** All licenced activities undertaken at the IMF in this reporting period were carried out in a competent manner and under a high standard of environmental management for which Veolia is certified under ISO 14001.
	O2. Maintenance of Plant and Equipment The maintenance and operation of all plant and equipment on the premises associated with the licenced activities was undertaken in a proper and efficient condition as required by qualified technicians. All major plant and equipment at the site is stored in a computerised maintenance management system in order to schedule and complete the required maintenance. All Veolia operators hold the appropriate qualifications and licenses to operate plant and equipment used as part of IMF operations.
	O3. Dust Control All operations and activities were carried out at the IMF in a manner to minimise dust at the boundary of the premises. These included operating on a hardstand site with fully paved access roads to the site. All haulage of waste to the Bioreactor and MBT facility occurred within enclosed containers. Monitoring for the presence and quantity of depositional dust is undertaken monthly to verify the performance.
	O4. Emergency Response All Veolia operators are trained in handling emergency situations, which include fire fighting in accordance with the Woodlawn Eco-Precinct ERP (MAN-6297 WL - Eco-Precinct Emergency Response Plan).

	Fire extinguishers and a 20,000 litre water tank were maintained onsite during this reporting period to enable effective fire fighting capabilities. In addition, Crisps Creek and Mulwaree River are located adjacent to the IMF, which are approved and readily available water sources for fire fighting. The Tarago Fire Brigade is also located approximately 4 km from the IMF,which enables fast mobilisation to the site.
	O5. Waste Management As all waste container unloading and movements occurred within enclosed containers on a hardstand site, tracking of waste from the IMF did not occur during this reporting period. No opening of containers was required to be undertaken at the IMF during this reporting period. One non-compliance relating to Condition **O5.2** of the EPL occurred during the reporting year. This is noted in **Section 2.5** of this report.
	O6. Other operating conditions The first flush stormwater management system was operated effectively in this reporting period in accordance with the EPL requirements to capture all the clean storm and surface water from the paved and sealed areas of the IMF. No sewage was removed from the IMF in this reporting period. Uncontaminated stormwater is permitted under the EPL to be utilised in vegetated areas of the IMF, as required.
5. Monitoring and recording conditions	Noted, all compliance monitoring was carried out in this reporting period in accordance with EPL requirements, the results of which are detailed in Section 5.
6. Reporting conditions	Noted and addressed in this Report and the annual return documents, where relevant. Notifications to the EPA were undertaken in a timely fashion.
7. General conditions	Noted.

2.2.1 Odour Management

Maintaining the waste in sealed and enclosed containers while at the Crisps Creek IMF, significantly mitigates the risk of the release of odour emissions from the transfer of waste. waste. Carbon filters, located at the vents of the containers, are effective at reducing odour emissions and are inspected as part of the container maintenance management system.

Containers are inspected at all key areas of Veolia's operations, including:

- During tipping at the Bioreactor;
- During unloading and loading at the Intermodal Facility; and
- During unloading, loading, storage or compacting at the Sydney Transfer Terminals.

Odour mitigation measures at the IMF are also assessed as part of the Annual Independent Odour

Audit (IOA).

2.3 Crisps Creek IMF Environmental Monitoring Requirements

Veolia is required to monitor environmental performance of the IMF. The current environmental monitoring regime at the IMF is considered sufficient to detect potential impacts to surface water and ambient air from the site operations. The monitoring regime is detailed in the EPL and is summarised in the below.

Table 2.3 details the EPA ID, Veolia monitoring point identification, frequency and the type of monitoring undertaken at each licensed point. A monitoring location plan is included in **Appendix 3**.

***Table 2.3* IMF Licensed Monitoring Points**

EPA ID	Veolia ID	Frequency	Type of Monitoring
1	Site 110 - Upstream	Quarterly	Surface Water
2	Site 150 - Downstream		
3	IMF First Flush		
4	DG18 IMF	Monthly / Continuous	Dust / Particulates

Veolia also undertakes additional surface water quality monitoring at Site 130 (located upstream of Crisps Creek Intermodal in Mulwaree River) to provide additional background quality information.

2.4 Crisps Creek IMF Monitoring Results

2.4.1 IMF Surface Water Monitoring Results

Upstream and downstream monitoring is undertaken at nearby surface water bodies to identify any degradation of water quality caused by landfilling operations.

Surface water quality monitoring at 3 monitoring locations was undertaken as required by the EPL, the findings of which are summarised in **Table 2.4.1**. Detailed quality results are provided in **Tables 12.1** to **12.3** (refer **Appendix 4**). The key quality indicators selected to identify any contamination in the receiving surface waters from site operations include:

- pH,
- Electrical Conductivity (EC),
- Sulphate (SO_4),
- Zinc (Zn),
- Ammonia (NH_3), and
- Total Organic Carbon (TOC).

These are depicted in trend graphs **(Figures 2.4.1.1 to 2.4.1.3)** provided in **Appendix 5**.

Table 2.4.1 **IMF Surface Water Monitoring Results**

Parameter	Results/Discussion
Site 110 Upstream	Site 110 is located upstream of the IMF in Crisps Creek. It is approximately 8 km downstream of the Bioreactor. Four out of four quarterly monitoring requirements were fulfilled this reporting period. Results provided in **Table 12.1** (refer **Appendix 4**) indicate the following trends: • pH is close to neutral (average 7.72, consistent with previous reporting periods; • EC (average 954 µS/cm) is consistent with the historical data and representative of fresh water salinity; • SO_4 (average 70.18mg/L) is consistent with previous reporting periods; • Fe (average 0.32 mg/L) is consistent with previous reporting periods, whilst Zinc indicates a fluctuating trend (average 0.13mg/L), consistent with historical cyclic results; • NH_3 (average 0.1 mg/L) is consistent with previous reporting periods and continues to be at non-detection levels. • TOC (average 15 mg/L) shows a slight increase than the previous reporting period and is generally reflective of natural organic matter in streams. While the indicator trends for this location indicate some variability over time, this is not uncommon when sampling intermittent streams. Veolia will continue to endeavour to obtain samples when flow occurs during a rainfall event for low flow surface water points.
Site 150 – Mulwaree River	Site 150 is located 2 km downstream of the IMF on the Mulwaree River, which is also downstream of a railway bridge and Braidwood Road. Four out of four quarterly monitoring requirements were fulfilled this reporting period. Results provided in **Table 12.2** (refer **Appendix 4**) indicate the following trends: • pH (average 7.61) is consistent with the previous reporting period; • EC (average 675 µS/cm) shows a fluctuating trend and is generally consistent with previous periods and fresh water salinity; • SO_4 (average 35 mg/L) reflecting EC trend, is generally consistent with previous reporting periods; • Fe and Zn, average 0.52 mg/L and 0..31mg/L respectively indicate consistency with fluctuating cycles in previous reporting periods. • NH_3 (0.1mg/L) continued to be not detected during this reporting period. • TOC (average 15 mg/L), is generally consistent with previous reporting periods; These results are consistent with the trends for Site 110. Veolia will continue to endeavour to obtain samples when flow occurs during a rainfall event for low flow surface water points.

First Flush Stormwater Outlet	The IMF First Flush is located at the surface water outlet point of the site, prior to runoff into Crisps Creek. Results provided in **Table 12.3** (refer **Appendix 4**) indicate the following trends: • pH (average 7.22) is close to neutral, consistent with the previous reporting period; • EC (average 160 µS/cm) shows a slight downward trend but is generally consistent with the previous period and representative of fresh water salinity; • SO_4 (average 8 mg/L) is also slightly lower but generally consistent with previous reporting period; • Fe and Zn, average 0.84 mg/L and 0.103 mg/L are generally consistent with the previous period but reflective of fluctuating cycles. • NH_3 an average of (0.1 mg/L) is also is consistent with previous reporting period; • TOC (average 7 mg/L) which is consistent with previous reporting periods. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

2.4.2 IMF Dust Monitoring Results

Air quality monitoring was carried out as required to determine whether activities conducted at the site impacted ambient air quality. All operations were carried out in a manner that would minimise emissions of dust from the premises.

Dust monitoring is undertaken monthly at 1 location at the IMF in accordance with the EPL. A summary of this reporting period is provided in **Table 2.4.2** and detailed in **Table 13.1** (refer **Appendix 4**).

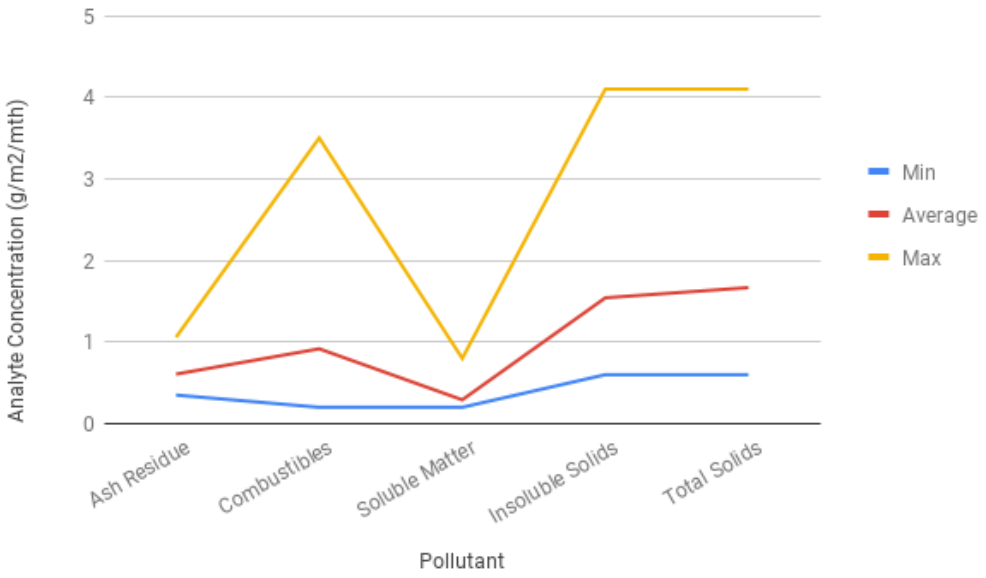
***Table 2.4.2* Dust Monitoring Results**

Dust Gauge	Summary Total Insoluble Solids (g/m²/month)		
	Minimum	Average	Maximum
DG18	0.6	1.54	4.1

The results at DG18 indicate an average level of total insoluble solid matter is 1.5 g/m^2/month, which is consistent with historical trends as seen in the subsequent graph in **Figure 2.4.2.1.**

The handling of waste and associated operational activities at the IMF are undertaken in a manner to ensure minimal emissions of dust. This includes no opening of containerised waste on unloading, and operating on a hardstand which aids in the mitigation of dust emissions due to the sealed surface..

***Figure 2.4.2.1* Crisps Creek IMF Depositional Dust Levels**



2.5 Non-Compliance with EPL 11455

Condition	Non-Compliance	Further Details	
O5.2	During a routine site inspection, EPA officers observed liquid leaking from the bottom of the door seal of the container.	A broken locating pin was found during the course of the investigation which allowed the container door to move during transit causing damage to the container seal. The container door was repaired.	Veolia immediately removed the relevant container from service and the cause of the leak was investigated. Processes have been implemented to mitigate against a similar incident occurring in the future.

Part 3 Environmental Performance

3.1 Independent Audit Findings

Three (3) independent audits were carried in accordance with the requirements of the Development Consent (MP 10_0012) during the reporting period. The findings relevant to the EPL conditions are included in this report for the information of the EPA.

3.1.1 Independent Leachate and Water Management System Audit

The annual Independent Leachate and Water Management System (LWMS) Audit was undertaken at the Woodlawn Bioreactor during this reporting period. A number of mandatory recommendations were developed as a result and discussed in **Table 3.4.1.**

Table 3.4.1 **2021 Independent LWMS Audit Findings and Corrective Actions**

Item	Observation	Implemented/Proposed Action
1.	Actual inflows were higher in many of the dams (including ED3N2, ED3N3, ED3N4, ED3SS and ED1) due to the additional transfer of water / leachate around the site as a result of significant rainfall during the audit period.	Taking into consideration the high rainfall and low evaporation, Veolia will develop a contingency plan and apply for extension of the date for emptying ED3N and ED1 in consultation with the EPA, Water NSW and the Department.
2.	The assessment of water / leachate stored in the dams indicates that Veolia could have potential issues emptying the dams in accordance with their objectives. Clarification of whether the dams will be emptied in accordance with the objectives will be provided upon finalisation of the updated site water balance (in progress at the time of the audit).	Veolia will develop a contingency plan and apply for extension of the date for emptying ED3N and ED1, in consultation with the EPA, Water NSW and the Department. Veolia will also continue to work on the improvement of the evaporation system for all the dams for volume reduction.

3.	Information contained within the monthly LTP reports indicate that the majority of the effluent water quality parameter targets (detailed in the site Leachate Management Plan) have been achieved. Ammonia and BOD are the key odour parameters and these are generally undetectable. However, there have been regular exceedances of COD with some isolated exceedances of Total Phosphorus, Nitrates and pH. This primarily occurred due to the ongoing optimisation of the LTP system including the fluctuation in feed leachate quality.	The ED1 coffer dam, where the LTP discharges treated effluent, is assessed as part of the annual odour audit. The 2020 IOA reported the effluent from the LTP to be of a quality that contributes negligible levels of odour. Veolia will engage a third party to assess the odour potential of the effluent with higher (than the current target) COD concentration, re-assess and set more realistic effluent quality targets in consultation with the EPA, Water NSW and the Planning Secretary prior to the next Audit.
4.	The LTP started discharging treated effluent into the ED1 CofferDam on 26th April 2019. Information contained within the monthly LTP reports indicates that during the annual audit period the average throughput has been 3.3 L/s. This throughput rate is less than the 4 L/s predicted in the Water Balance.	Veolia is investing in an additional ultrafiltration train to increase the throughput of the LTP and continues to utilise suitably qualified experts to improve and optimise its operation. Veolia has provided a schedule to the NSW EPA regarding the process improvements and timeframes. This is now formalised within the Sites Environmental Protection Licence.

3.1.2 Independent Odour Audit

The annual Independent Odour Audit was undertaken at the Woodlawn Bioreactor during this reporting period. A number of mandatory recommendations were developed as a result and discussed in **Table 3.4.2.**

***Table 3.4.2* 2021 Independent Odour Audit Findings and Corrective Actions**

Item	Observation	Implemented/Proposed Action
1.	Veolia should continue to manage fugitive landfill gas pathways from the surface using the existing toolkit such as biocover material and should enhance and accelerate its improvement to landfill gas capture from the Bioreactor as reasonably practicable. This continuation is apparent in the WIP 2020, which outlines a comprehensive plan that is being implemented to increase gas capture.	Continuous improvement on odour management includes; Installation of biocover material to identified areas of fugitive gas emissions to minimise odour. Develop the Odour Management Plan in line with licence conditions by the end of 2021. Monthly surface gas monitoring for methane and hydrogen sulphide.

2.	Continue to adequately maintain and manage the upgraded LMS to ensure it is operating in an optimum state and meeting the leachate quality monitoring targets as outlined in the Leachate Treatment Operation Manual and recommended by Veolia Water and continue the implementations planned in the WIP 2020.	Continuous improvement on leachate management includes: Optimizing leachate extraction and transfer infrastructure to provide more options and contingency for leachate management. Request contingency storage for contaminated stormwaters. Install additional UF train at the LTP to optimise the throughput of the plant with expected completion by July 2022. Review strategies and storage capacity for leachate. Continuous improvement of evaporation systems. Continued regular monitoring of the water quality in LTD, ED3S-S, and ED3N from an odour perspective.

3.1.3 Independent Environmental Audit

The 3-yearly Independent Environmental Audit was undertaken at the Woodlawn Bioreactor during this reporting period. A number of mandatory recommendations in relation to the EPL were developed as a result and discussed in **Table 3.4.3.**

***Table 3.4.3* 2021 Independent Environmental Audit Findings and Corrective Actions**

Item	Observation	Implemented/Proposed Action
1.	The Total VOCs measured at the LFG Inlet (Point 5) and the Engine 1 Exhaust Stack (EPA Point 8) were 56 g/min and 1.8 g/min, respectively, resulting in a calculated destruction efficiency of 96.8% for Engine 1, which is less than the required minimum destruction efficiency of 98%.	Veolia and the third party consultant is now using a secondary approved test method that has eliminated the margin of error, and provides a more accurate and reliable destruction efficiency calculation, confirming that the required minimum destruction efficiency of 98% is being achieved.
2.	The progress report on the Alternative Daily Cover (ADC) trial was not provided to the EPA within the required 90-day timeframe.	No action was required as the alternative daily cover trial progress report was issued.
3.	The mechanical evaporator log was not maintained up to late 2020 / early 2021 before a continuous monitoring system was implemented.	No action was required as a continuous monitoring system of the mechanical evaporators has been implemented.

4.	Three odour complaint reports were not provided to the EPA within the required 24-hour timeframe.	Veolia has implemented processes and endeavour to avoid delays in odour complaint investigations in future. Veolia will seek to vary its licence to extend reporting requirements with the NSW EPA.
5.	Whilst the LTP has been designed to continuously treat at least 4 L/s of leachate and therefore, should be capable of doing so, the LTP has yet to achieve the minimum rate.	The LTP is currently treating an average of 3.88L/s and achieving a maximum of 4.22L/s. Operations are now looking to stabilise the plant at this treatment rate as the process is pushed to 4 L/s. Veolia is also installing an additional UF Train with a target for completion in July 2022.

Part 4 Conclusion

Based on the results of environmental monitoring undertaken at both the Bioreactor and IMF sites over the 2020-21 reporting period, the overall performance of the Woodlawn Eco-Precinct can be considered to be well managed, with a few compliance matters to be addressed .

4.1 Proposed Improvements

In efforts to advance the Woodlawn Eco-Precinct's overall performance, Veolia is looking at a number of improvements to address the following parameters, primarily at the Bioreactor:.

- Stormwater interception
- Leachate management
- Gas extraction management
- Leachate treatment
- Liquid storage
- Evaporation

In line with Veolia's commitment to operational excellence through continuous improvement, recently implemented improvements and future opportunities are outlined below.

During this reporting period, Veolia implemented the recommendations for environmental and operational improvements identified in the 2019-20 Annual Performance Report as discussed in **Table 4.1.1**.

***Table 4.1.1* 2020/2021 Improvement Recommendation**

Item.	Improvement	Implemented Action
1.	Engage suitably qualified persons to conduct a review of the Groundwater Monitoring Network in the vicinity of the Void	A comprehensive review and report carried out by Earth 2 Water (E2W) was received in April 2020 and based on the recommendations, 2 new deep groundwater monitoring bores were installed post COVID restrictions.
2.	Act on the recommendations of the Groundwater Monitoring Network review by installing two deep wells to replace previously decommissioned wells within the void (WM-3 & WM-7).	The installation of two new wells was completed in November 2020 in conjunction with E2W and Terratest. These have since been added to EPL 11436 by way of licence variation.
3.	Increase the landfill gas extraction infrastructure including the installation of an additional blower and flares.	Blower 5, Flare 3 and 2nd Gas Main have been installed and commissioned. Progressive addition of new extraction wells as the surface area within the Bioreactor increases. This is in line with the WIP 2020 and beyond, Showing

		additional wells on the approximate 20m x 20m grid pattern.
4.	Install and optimise additional infrastructure for dam evaporation.	Further improvements to evaporative systems on ED3N and ED1 Coffer Dam have been installed.
5.	Develop and implement trigger values & control measures for monitoring points located within the vicinity of ED1 as identified in the Groundwater Management Strategies for ED-1.	A 6-monthly monitoring regime for the groundwater monitoring bores has been implemented with relevant triggers based on laboratory analysis results.
6.	Implement a Dams Safety Management System including the development of a Dams Safety Emergency Plan (DSEP) in order to meet new regulatory requirements.	In consultation with Heron Resources a "Woodlawn" DSEP has been developed and implemented as part of the site's overall Dams Safety Management System.

Improvements proposed for the next reporting period at the Bioreactor and the IMF are as follows in **Table 4.1.2**.

***Table 4.1.2* 2021/2022 Improvement Recommendations**

Item	Improvement	Proposed Action
1.	Install and optimise additional infrastructure for dam evaporation.	Install evaporation system on ED3S.
2.	Improve stormwater management efficiencies for periods of high rainfall.	Develop a contingency plan to manage periods of high rainfall.
3.	Develop and implement throughput contingency for the Leachate Treatment Plant.	Install additional UF train at the LTP to optimise the throughput of the plant with expected completion by July 2022.
4.	Develop and implement an Odour Management Plan that includes the use of MWOO as alternate daily cover.	Incorporate the Odour Management Plan into the Woodlawn Air Quality and Greenhouse Gases Management Plan in line with licence conditions.
5.	Increase the landfill gas extraction infrastructure.	Install additional manifold to the waste surface in the south west corner to improve gas extraction within the void.
6.	Effectively manage contingency storage for contaminated stormwaters within the void.	Develop transfer of contaminated stormwater procedure in consultation with the EPA.
7.	Implement a robust container maintenance programme ensuring prevention of emission of offensive odour and leakage from containers during transport and handling activities.	Develop and implement an improved container inspections and monitoring program aimed at ensuring containers are managed and maintained efficiently.

Reference and Related Documents

Document Name
Earth2Water (2021) Leachate Assessment at Woodlawn Bioreactor, 3 August 2021
Ramboll Australia Pty Ltd (2021) Independent Environmental Audit, May 2021
The Odour Unit (2021) Woodlawn Bioreactor Expansion Project Independent Odour Audit #9, August 2021
SLR Consulting (2021) Independent Audit Leachate and Water Management System, May 2021
EPA (2014) Waste Classification Guidelines: Part 1 Classifying Waste, November 2014
EPA (2016) Environmental Guidelines: Solid Waste Landfills Second Edition, 2016, April 2016
Veolia (2020) Annual Environmental Performance Report – Woodlawn Bioreactor and Crisps Creek Intermodal Facility, November 2020
Veolia (2018) MAN-13298 WL - Bioreactor Landfill Environmental Management Plan (LEMP), 30 August 2018
Veolia (2020) MAN-6297 WL - Eco-Precinct Emergency Response Plan (ERP), 26 June 2020

Appendices

Appendix 1 Site Location Map

Appendix 2 EPL Boundary Map

Appendix 3 EPL Monitoring Point Maps

Appendix 4 Tabulated Monitoring Results

Appendix 5 Monitoring Trend Graphs

Appendix 6 Odour Complaints Register