Annual Environmental Management Report

For
Woodlawn Waste Expansion Project
And
Woodlawn Alternative Waste Technology Project

December 2018

QUALITY INFORMATION

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0	Draft for internal review	• Woodlawn site management • Veolia NSW SHEQ	29 November 2018
1	Final	• NSW Department of Planning and Environment	10 December 2018

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DEFINITIONS/ABBREVIATIONS

AEMR	Annual Environmental Management Report
BMS	Business Management System
BTT	Banksmeadow Transfer Terminal
CTT	Clyde Transfer Terminal
DPE	NSW Department of Planning and Environment
EMP	Environmental Management Plan (IMF)
EIS	Environmental Impact Statement
EP&A	*Environmental Planning and Assessment Act 1979* (and Regulations)
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
IEA	Independent Environmental Audit
IMF	Crisps Creek Intermodal Facility
LEMP	Landfill Environment Management Plan
LMP	Leachate Management Plan
MBT	Woodlawn Mechanical Biological Facility
MWOO	Mixed Waste Organic Output
NMP	Noise Management Plan
OEMP	Operational Environmental Management Plan (MBT)
PA	Project Approval
POEO	*Protection of the Environment Operations Act 1997* (and Regulations)
SWMP	Soil Water and Management Plan
TADPAI	Tarago and District Progress Association Inc.
TPA	Tonnes per annum
Veolia	Veolia Australia and New Zealand
WHS	Work Health and Safety Act 2011 (and Regulation)

EXECUTIVE SUMMARY

This Annual Environmental Management Report (AEMR) has been prepared in accordance with the Woodlawn Waste Expansion Project under Project Approval (PA) 10_0012 and the Alternative Waste Technology Project under PA 06_0239, as well as relevant legislative requirements and industry best practices .

On instruction from the Department of Planning and Environment (DPE), the requirements under each PA as per Schedule 7, Condition 5 of PA 10_0012 and Schedule 4, Condition 5 of PA 06_0239 have been combined in this AEMR and comprise collectively the 2017 - 2018 reporting period (9 September 2017 to 8 September 2018) respectively for the Woodlawn Bioreactor (the Bioreactor) and Crisps Creek Intermodal Facility (IMF) and the Woodlawn Mechanical Biological Treatment Facility (MBT).

This AEMR details the environmental performance of Bioreactor, IMF and MBT for the reporting period as a summary of environmental monitoring conducted in keeping with the PAs, as well as corrective actions resulting from any non-compliances identified and/or other findings from regulatory inspections, external and internal audit programs.

Section 1
Introduction

INTRODUCTION

1.1. Site Overview

Veolia Australian and New Zealand (Veolia) own and operate the Woodlawn Eco Precinct (the Eco Precinct), which is located approximately 40 km south of Goulburn and 50 km north of Canberra and comprises of the Woodlawn Bioreactor (the Bioreactor), Crisps Creek Intermodal Facility (IMF) and the Woodlawn Mechanical Biological Treatment Facility (MBT) as depicted in **Figure 1.1 and Appendix 1**.

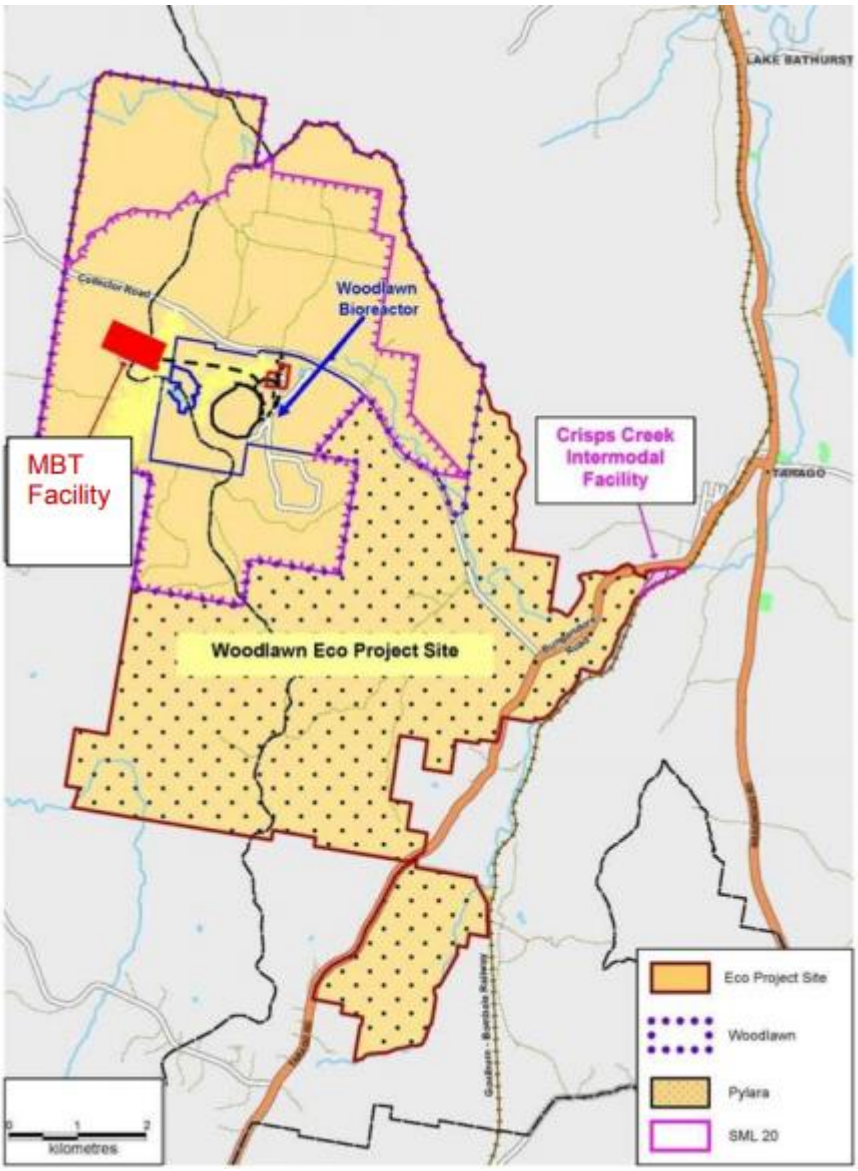


Figure 1.1 The Woodlawn Eco Precinct

1.1.1 Woodlawn Bioreactor and Crisps Creek Intermodal Facility

The Bioreactor, where waste landfilling and landfill gas extraction occurs in the void of a remnant open cut mine, approximately 33 million cubic metres (m3) in capacity. Originally

approved to accept a maximum of 500,000 tonnes per annum (tpa) of putrescible waste, the Bioreactor, is now approved to accept a maximum throughput of 1.13 million tpa.

The Bioreactor has been operating since September 2004, with the collection of landfill gas from landfilled 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, also owned and operated by Veolia and located approximately 8 km away in the township of Tarago. Local waste from neighboring councils and businesses is transported via road.

In addition to the above operations, the DPE has also granted approval (December 2017) to modify the Bioreactor's PA for construction and operation of a leachate treatment plant (LTP) to process leachate was approved on. Construction of the LTP commenced following the approval and it is anticipated that the LTP will be operational to full capacity by March 2019. The LTP will facilitate better environmental and operational performance by allowing Veolia to extract and treat greater volumes of leachate from the Bioreactor and minimise and reduce the generation of odour, and enable more efficient gas extraction maximizing the waste to energy benefits of the Bioreactor.

Woodlawn Mechanical Biological Treatment FacilityThe MBT PA was granted in November 2007 and has been designed to process municipal solid waste (MSW) received from a collective of Sydney based councils to extract recyclable materials and produce MWOO from the organic fraction. The MWOO is produced with the intent to rehabilitate the former mine site on which the Bioreactor is situated.

The MBT facility currently comprises six building/processing areas (waste reception, area BRS drums, refining building, buffer storage area, fermentation hall and maturation storage areas. Changes to site layout, technology and operating hours were approved by the DPE as a modification to the PA in 2014.

Permitted to accept 240,000 tpa of mixed waste and 40,000 tpa of garden waste from Sydney, the first stage of the MBT commenced commissioning in March 2017 and operation in July 2017 processing up to 144,000 tpa of mixed waste.

1.2 Legislative Requirements

The main legislative instruments governing the environmental performance and activities undertaken at the Terminal include the *Environmental Planning and Assessment Act 1979* (the EP&A Act) regulated by the DPE, and the *Protection of the Environment Operations Act 1997* (POEO Act) regulated by the EPA, as well as their respective associated regulations.

In addition to the PAs, Environment Protection Licences (EPLs) issued by the EPA, under the POEO Act, regulate the operational activities conducted at the Bioreactor,

IMF and MBT. Monitoring activities undertaken at both facilities are reflected in the EPLs consistent with the consent requirements

An Environmental Management Plan has been prepared to reflect the requirements of the PAs for the operation of the Bioreactor (LEMP), IMF (EMP) and MBT (OEMP) respectively.

These 3 document concentrate on key environmental issues identified in the environmental assessment undertaken for these 3 facilities and set out the criteria for managing and monitoring environmental parameters such as water quality, waste, traffic, air quality, greenhouse gas, noise, landscape and vegetation and emergency response.

The above requirements stipulate the performance standards that need to be met to maintain compliance at the 3 sites, and those relevant to the preparation of this AEMR are provided in **Table 1.2.1** and **Table 1.2.2** and further discussed in Section 2.

Table 0.2.1: Bioreactor and IMF conditions relevant for the preparation of this AEMR

Relevant Condition	Requirement
SCHEDULE 7 – ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING	
Annual Environment Management Review	
5	One (1) year after the commencement of expanded operations, and annually thereafter, the Proponent shall prepare an Annual Environmental Management Report (AEMR) to review the environmental performance of the project to the satisfaction of the Director-General. This review must: a) describe the operations that were carried out in the past year; analyse the monitoring results and complaints records of the Project over the past year, which includes a comparison of these results against the • relevant statutory requirements, limits or performance measures/criteria; • monitoring results of previous years; and • relevant predictions in the EA; c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance; d) identify any trends in the monitoring data over the life of the Project; and e) describe what measure will be implemented over the next year to improve the environmental performance of the Project.

Table 0.2.2: MBT conditions relevant for the preparation of this AEMR

Relevant Condition	Requirement
SCHEDULE 4 – REPORTING	
Annual Reporting	
5	Every year from the date of this approval, unless the Director-General agrees otherwise, the Proponent shall submit an AEMR to the Director-General and relevant agencies. The AEMR shall: a) identify the standards and performance measures that apply to the development; b) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years; c) include a summary of the monitoring results for the development during the past year; d) include an analysis of these monitoring results against the relevant: • Impact assessment criteria; • Monitoring results from previous years; and • Predictions in the EIS; e) identify any trends in the monitoring results over the life of the development; f) identify any non-compliance during the previous year; and g) describe what actions were, or are being taken to ensure compliance.

Table 1.2.3 summaries the list of environmental approvals in place for the Bioreactor, IMF and MBT:

Table 0.2.3: Environmental Approvals

Description	Permit Number
Conditions of Development Consent: The Woodlawn Waste Management Facility (issued by DPE)	31-02-99
Project Approval: *Woodlawn Waste Expansion Project* (issued by DPE)	10_0012
Bioreactor Environment Protection Licence (issued by EPA)	11436
Special (Crown & Private Lands) Lease 20 (SML 20) (issued by Department of Primary Industries)	SML 20
Water Access Licence: Willeroo Borefield (issued by Water NSW)	40WA411642
IMF Environment Protection Licence (issued by EPA)	11455
MBT Environment Protection Licence (issued by EPA)	20476
Project Approval: *Woodlawn Alternative Waste Technology Project* (issued by DPE)	PA 06_0239

1.3 Responsibilities

- Environmental monitoring for the Bioreactor and IMF was undertaken and/or supervised by Ark Du (Landfill Engineer) and Harneet Puarr (Woodlawn Environmental Officer)
- Environmental monitoring for the MBT was undertaken and/or supervised by Christian Chang (MBT Process Engineer).
- Analyses of collected samples were performed at Australian Laboratory Services Pty Ltd (ALS), which is a NATA accredited laboratory.
- The Odour Unit Pty Ltd (TOU) was appointed in January 2018 to conduct odour audits for the Bioreactor and IMF.
- An Independent Environmental Audit (IEA) for the Bioreactor/IMF was conducted by Ramboll Environ Australia Pty Ltd in the previous reporting period, the findings of which and corrective actions implemented in this reporting period are presented in this AEMR.
- The audit team associated with the Bioreactor IEA included Victoria Sedwick (Lead Auditor), David Ford (Auditor) and Ronan Kellaghan (Reviewed). The audit team was approved by the DPE.
- An independent noise audit was conducted by SLR Consulting Australia Pty Ltd (SLR) in October 2017 for MBT. The audit team associated with this noise assessment included Mark Blake and John Sleeman. The audit team was approved by the DPE.

Section 2

Environmental Assessment Criteria

SECTION 2 ENVIRONMENTAL ASSESSMENT CRITERIA

Based on the risk predictions in the environmental assessments undertaken for the 3 facilities, the implemented controls measures described in the EMPs became the assessment criteria to determine the environmental performance of the respective operations. These are summaries in **Table 2** and results of monitoring measures in this reporting period are described in subsequent sections of this AEMR.

Table 2: Assessment Criteria

Issue	Environmental Risk	Likelihood of Occurrence	Control Measure	AEMR Section Reference
Air quality (dust and odour)	Emission of air pollutants and odour above the EPA guidelines.	Low level of risk due to the large buffer distance between the Bioreactor and sensitive receptors.	Monthly Dust monitoring Annual Independent Odour Audits	Section 3.2
Greenhouse gas emissions and energy use	Excessive energy consumption and related GHG emissions compared to similar facilities.	Known consequences with significant offset through generation of electricity from methane produced at the site.	Extraction & monitoring of the gas for green energy generation , reporting under National Greenhouse and Energy Scheme	Section 3.3
Surface Water	Contamination of surface water.	Possible without control measures, but unlikely due to existing approved Surface Water Management Scheme.	Ongoing Surface and Ground water monitoring, Leachate monitoring	Section 3.4
Groundwater	Contamination of ground water.	Possible without control measures, however unlikely due to the use of leachate barrier systems and existing Groundwater Management Scheme.	Ongoing Surface and Ground water monitoring, Leachate monitoring	

Issue	Environmental Risk	Likelihood of Occurrence	Control Measure	AEMR Section Reference
Noise	Increased noise impacts above the EPA guidelines. Impacts on local residents.	Rare due to the large buffer distance between the Bioreactor sensitive receivers.	In the event a noise compliant is received , Noise monitoring is carried out at the site	Section 3.5
Pest, disease and agriculture related impacts	Introduction of pests and the spreading of disease as a result of the proposed expansion.	Possible without control measures, however unlikely due to existing approved, operational management measures.	Routine Site Inspections	Section 3.7
Traffic and transport	Significant impacts on local Tarago community, impacting levels of service and traffic flow.	The risk is rare due to the relatively low level of truck movements.	Limit the transfer of waste within approved operational hours	Sections 3.5 and 3.6
Socio economic	Negative impact on existing social conditions and on economic vitality of the Tarago district.	Rare as the Project will generate additional employment demand, while amenity impacts are low.	Veolia has well established mechanisms in place for addressing community concerns for engaging with the community to assist in the management of issues raised	N/A
Hazard and risk	Increased risk to human health and the environment from expansion, especially from dangerous materials and gases.	Rare as hazardous substances may not received at the Bioreactor and IMF.	All know hazards are understood and managed by Veolia with any incidents dealt with as part of the Fire and Emergency Response Plan	N/A

SECTION 3 ENVIRONMENTAL MONITORING

3.1 Monitoring Requirements

This section presents the monitoring undertaken at the Bioreactor, IMF and MBT throughout the reporting period, in accordance with the requirements of the PAs, as detailed in the respective EMPs.

An Environmental Monitoring Program (EMP) has prepared to guide monitoring requirements, which enable the continuous measuring and assessment of suitability, adequacy and effectiveness of on-site environmental management measures. These requirements are summarised in **Table 3.1.1**, **Table 3.1.2** and **Table 3.1.3** and discussed in subsections below.

A monitoring location plan is included in **Appendix 3**.

Table 3.1.1: **Bioreactor Monitoring Requirements**

Consent Reference	Type of Monitoring	Frequency	Commentary
Schedule 4, Condition 3	Site Inspection	Daily	Ongoing basis
Schedule 4, Condition 7	Odour Audit	Annually	Condition satisfied , odour audit conducted 02/02/17
Schedule 4, Condition 11	Dust Monitoring	Monthly	Ongoing basis
Schedule 4,Condition 12/ Air Quality and Greenhouse management Plan	Odour – Site inspections	Daily or as required	Ongoing basis
Schedule 4,Condition 17/ Soil and Water management Plan/EPL	Surface water monitoring Groundwater monitoring	Quarterly/ Annually	Ongoing basis
Schedule 4, Condition 18/ Leachate Management Plan	Leachate pond monitoring and Leachate recirculation monitoring	Annually	Ongoing basis
Schedule 4, Condition 19/ Noise Management Plan	Noise Monitoring	As required	Not triggered
Schedule 4, Condition 22	Meteorological monitoring	Continuous	Ongoing basis
Schedule 4, Condition 23/ Landscaping and Vegetation Management	Site Inspections	Weekly housekeeping	Ongoing basis

Consent Reference	Type of Monitoring	Frequency	Commentary
Plan			
Schedule 4 Condition 24/ Pest ,Vermin & Noxious Weed Management	Site Inspections	Weekly housekeeping	Ongoing basis

Table 3.1.2: Crisps Creek IMF Monitoring Requirements

Consent Reference	Type of Monitoring	Frequency	Commentary
Schedule 5, Condition 5	Litter control	Daily	Ongoing basis
Schedule 5 Condition 6/ Pest ,Vermin & Noxious Weed Management	Site Inspections	Weekly housekeeping	Ongoing basis
Schedule 5, Condition 9	Odour Audit	Annually	Condition satisfied , odour audit conducted January 2018
Schedule 5, Condition 15	Noise Monitoring	As required	Not triggered

Table 3.1.3: MBT Monitoring Requirements

Condition Reference	Type of Monitoring	Frequency	Commentary
Schedule 3, Condition 29 EPL Condition M4	Meteorological monitoring	Continuous	Ongoing basis
Schedule 3, Condition 23 & 24 EPL Condition M2.2	Depositional Dust Monitoring	Monthly	Ongoing basis
Schedule 3, Condition 25 & 26 EPL Condition L4	Operational noise monitoring	As required	Condition satisfied, monitoring conducted: 2 – 3 October 2017
Schedule 3, Condition 20 EPL Condition M2.3	Surface Water Monitoring	Quarterly	Ongoing basis

EPL Condition L2.4	Discharge Monitoring	Daily during any discharge	Ongoing basis
Schedule 3, Condition 20 EPL Condition M2.3	Groundwater Quality Monitoring	Quarterly	Ongoing basis
Schedule 3, Condition 20 EPL Condition M2.3	Leachate Monitoring	Six monthly	Ongoing basis
EPL Condition O5.3	Leachate Level	Weekly or as required	Ongoing basis
Schedule 3, Condition 6 EPL Condition L3.1	Waste volume monitoring	Daily	Ongoing basis
Schedule 3, Condition 9	Site Inspection and Housekeeping	Weekly	Ongoing basis
Schedule 3, Condition 10	Pest and Vermin Checks	Every two months	Ongoing basis

3.2 Air Quality

Air quality monitoring, pertaining to odour and dust emissions, was undertaken in accordance with the Consent to determine whether activities conducted at the Bioreactor, Crisps Creek IMF and MBT affected ambient air quality.

3.2.1 Bioreactor Air Quality Monitoring Results

3.2.1.1 Meteorology

Veolia operates an onsite meteorological station to continuously monitor climatic data listed in the EPL. 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

Meteorological data is logged in 15 minute and 24 hour intervals and can be made available for the 2017/2018 reporting period upon request. Servicing and calibration of the meteorological station is carried out quarterly by Hydrometric Consulting Services (calibration reports can be provided upon request)

3.2.1.2 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.

Table 3.2.1: Bioreactor Air Quality Monitoring Results

<table>
<tr><th>Parameter</th><th>Results/Discussion</th></tr>
<tr><td>Particulates/Dust Monitoring</td><td>Monitoring of 3 depositional dust gauges (DG) was completed on a monthly basis as required under the EPL, the results of which are generally consistent with previously reporting periods as depicted in Figure 3.2.1

The results of total insoluble solids found within the depositional dust samples are summarised for each of the monitoring locations in Table 3.2.1 below, with the detailed results tabulated in Tables 4.1 - 4.3 (refer Appendix 3).

Table 3.2.1.1: 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>Maximum</th><th>Average</th></tr>
<tr><td>DG22</td><td>0.7</td><td>8.6</td><td>3.66</td></tr>
<tr><td>DG34</td><td>0.2</td><td>4.7</td><td>1.75</td></tr>
<tr><td>DG28</td><td>0.4</td><td>6.6</td><td>1.90</td></tr>
</table>

The maximum dust level recorded in this reporting period was 8.6 g/m2/month at DG22 in April 2018 which is located on the East side of the Bioreactor. Given that for the corresponding month there were no similar levels recorded at the dust gauges located within the proximity of the landfill void, it can be inferred that this dust emission was not as a result of the Bioreactor activities and can be treated as an outlier. Veolia infer that this result is due to Heron Resources' construction activities directly next to DG22.
Overall dust suppression is generally consistent with previous years and a measure of the dust control measures that the site has in place.</td></tr>
<tr><td>Odour Monitoring</td><td>41 odour complaints were received at the premises during this reporting period.

An annual independent odour audit is used to assess the effectiveness of odour control measures and to identify improvements to existing odour management practices at the site. The odour audit report indicated Veolia has implemented all recommendations from the previous odour audit.

Veolia will continue to implement recommended actions from the odour audit in combination with improving current odour control measures identified by Veolia.</td></tr>
</table>

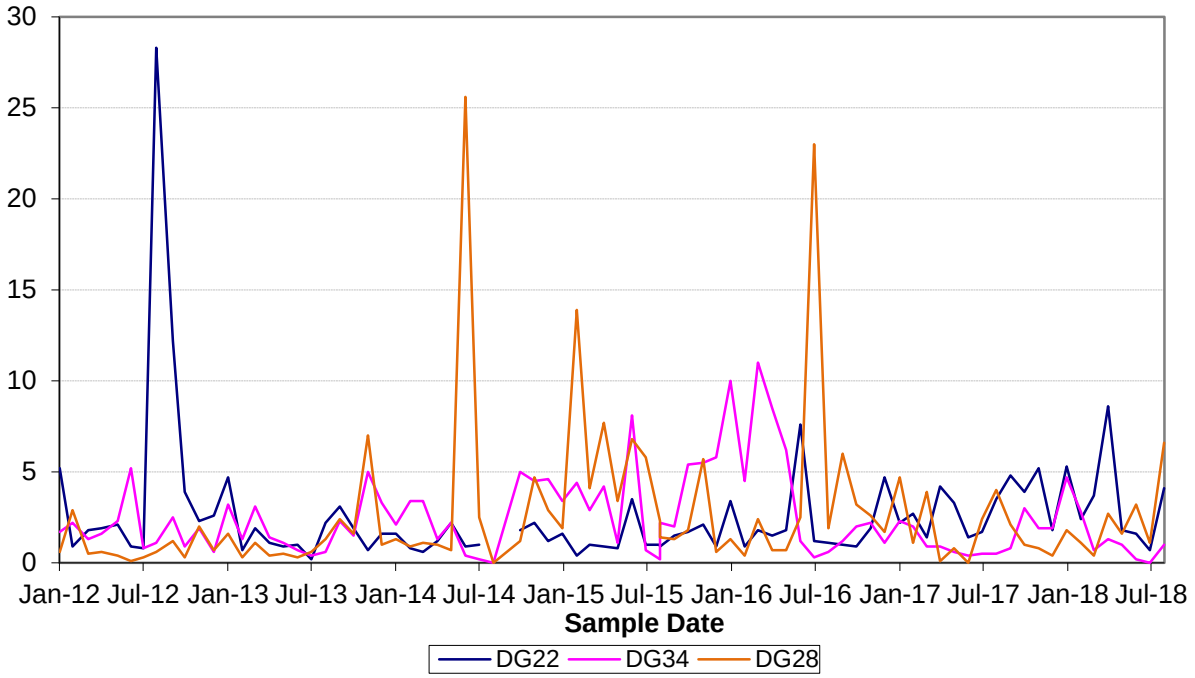


Figure 3.2.1: Bioreactor Depositional Dust Levels (g/m^2/month)

***** Data before 2011 has been removed to allow for better interpretation of performance for recent reporting periods.

3.2.1.3 PM10/TSP monitoring results

Results taken in 2016/2017 show that there were no exceedance both on and offsite. The maximum PM10 level was 21.7µg/m^3 onsite, which was under the limit. (Note: Monitoring for the month November started 11/11/2016)

Note: Heron Resources, as part of their construction activities, have begun PM10/TSP monitoring at the Pylara monitoring site and started on the 17 October 2017.

3.2.2 IMF Air Quality Monitoring Results

3.2.2.1 Dust

Dust monitoring is undertaken monthly at one location at the IMF in accordance with the EPL. A summary of this reporting period is provided in Table 3.2.2 and detailed in Table 10 (refer Appendix 3).

The results at DG18 indicate an average level of total insoluble solid matter is 0.75 g/m2/month, which is generally consistent with overall historical trends as seen in the subsequent graph, Figure 3.2.2. 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 hardstand site.

Table 3.2.2: Dust Monitoring Results

Dust Gauge	Summary Total Insoluble Solids (g/m2/month)		
	Minimum	**Maximum**	**Average**
DG18	0.4	1.4	0.75

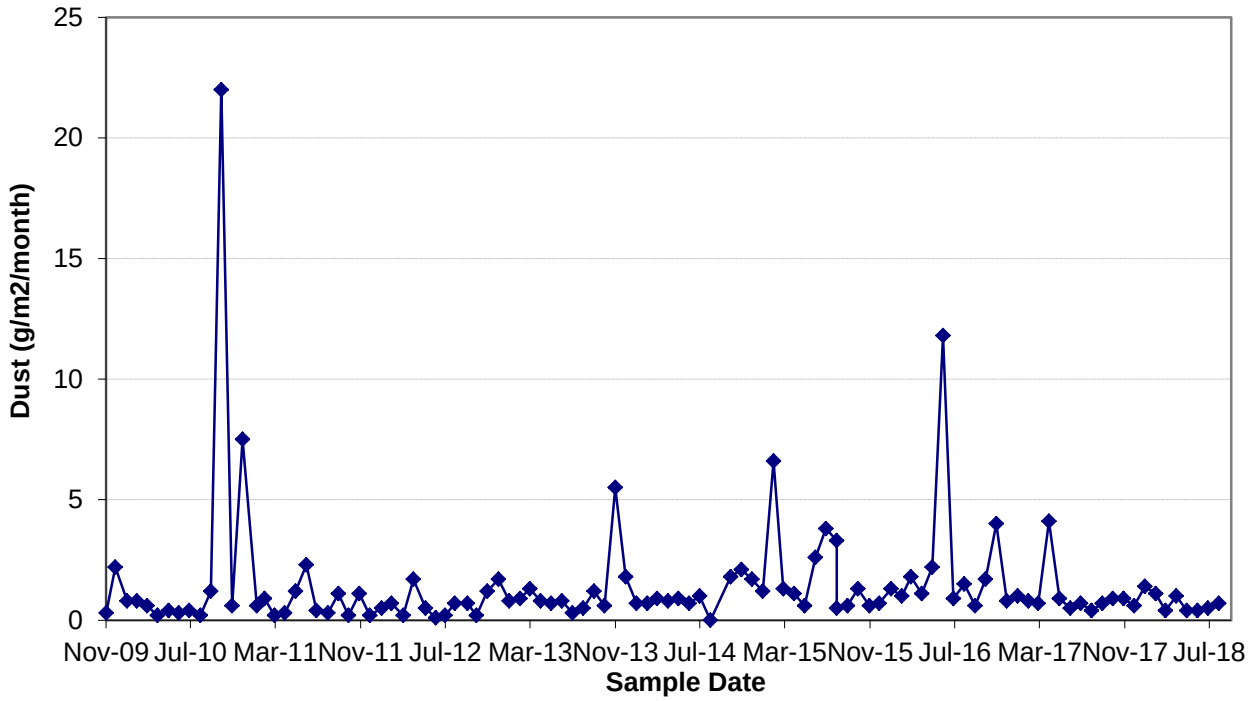


Figure 3.2.2: IMF Depositional Dust Levels – DG18

3.2.2.2 Odour

An annual independent odour audit is used to assess the effectiveness of odour control measures and to identify improvements to existing odour management practices at the site. The odour audit report indicated Veolia has implemented all recommendations from the previous odour audit and is further discussed in Section 6 of this AEMR.

Veolia will continue to implement recommended actions from the odour audit in combination with improving current odour control measures identified by Veolia.

No odour complaints were received for the IMF during this reporting period.

3.2.3 MBT Air Quality Monitoring Results

3.2.3.1 Dust

Dust monitoring is undertaken monthly at the MBT facility in accordance with the EPL. A summary of this reporting period is provided in Table 3.2.3 and detailed in Table 4 & 11 (refer Appendix 3).

Table 3.2.3: MBT Air Quality Monitoring Results

<table>
<tr><th>Parameter</th><th>Results/Discussion</th></tr>
<tr><td>Particulates/Dust Monitoring</td><td>Monitoring of 3 depositional dust gauges (DG) was completed on a monthly basis as required under the EPL, the results of which are generally consistent with previously reporting periods as depicted in Figure 3.2.1 & 3.2.3.

MBT shares 2 depositional dust gauges with the Bioreactor, which include Pylara (DG28) and West Void (DG 34), which are summarised in section 3.2.1. In addition, there is a dust gauge (DG 33) close to the MBT facility. A summary of this reporting period at the dust gauge is provided in Table 3.2.3.1 and detailed in Table 11 (refer Appendix 3)

Table 3.2.3.1: 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>Maximum</th><th>Average</th></tr><tr><td>DG 33 (Point 7)</td><td>0.2</td><td>2.4</td><td>0.84</td></tr></table>
The average level of total insoluble solid matter is 0.84 g/m2.month, which is generally consistent with overall historical trends as seen in the Figure 3.3. The maximum dust level recorded in this reporting period was 2.4 g/m2/month at DG 33. The maximum dust level observed is related to the dry weather condition during this period. In addition, the maximum dust observed at the area is lower than background dust level in other monitoring points.</td></tr>
<tr><td>Odour Monitoring</td><td>The air quality impact assessment (AIA) prepared by SLR, predicted that MBT Facility operations would comply with relevant air quality goals and are not expected to generate offensive or nuisance odours at nearby sensitive receivers.

The adopted odour criterion of 6 OU was predicted to be achieve at all receptors with the exception of the TriAusMin (now Heron) administration building, which was predicted to experience a 99th percentile odour concentration of 8.5 OU. This concentration was predicted to be dominated by the existing source of the Bioreactor, rather than the operation of the Facility, which was predicted to result in a 99th percentile concentration of 1.7 OU when modelled alone.

Table 3.2.3.2 - Odour Emission Performance Criteria
<table><tr><th>Parameter</th><th>Performance Measure</th><th>Standards</th><th>Statutory Requirement</th></tr><tr><td>Odour Emissions</td><td>6 OU</td><td>German Standard VDI</td><td>OEMP</td></tr></table></td></tr>
</table>

				3940 'Determination of Odorants in Ambient Air by Field Inspections'	

The management of odour emissions from each of the proposed processing stages is maintained by the use of biofilters. Biofilters are pollution control mechanisms which use living material to biologically degrade and filter pollutants which may cause odours. These pollutants are absorbed into the biofilter material whereby it is broken down by microorganisms. Two biofilter odour control systems (OCS) are located adjacent to the processing areas at the Site. The two biofilter system are maintained regularly to ensure the odour control system is working with the best performance.

No odour complaints were received in this reporting period.

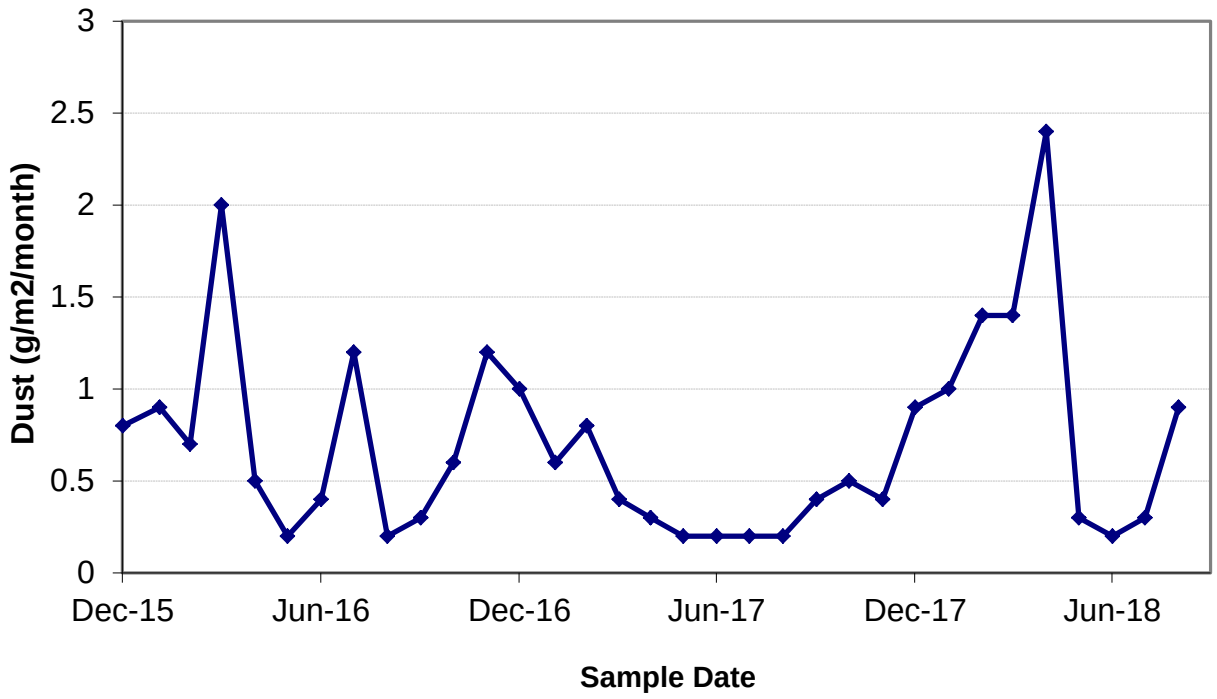


Figure 3.2.3 – MBT Depositional Dust Levels – DG33

3.3 Bioreactor Landfill Gas Monitoring results

Veolia operate 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 Consent and EPL.

The landfill gas extraction and utilisation infrastructure in the Bioreactor has been designed to meet the conditions of the landfill including settlement.

The findings from Landfill gas monitoring required under the Consent and EPL is summarised in **Table 3.3** below

Table 3.3: 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 3.3.1 below:

Table 3.3.1: Subsurface Gas Monitoring Result
<table><tr><th rowspan="2">Gas Monitoring Bore ID</th><th colspan="4">Purged Methane Reading (%)</th></tr><tr><th>29/11/2017</th><th>23/03/2018</th><th>9/07/2018</th><th>16/08/2018</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.</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 since 2016 as summarised in Table 3.3.2 below:

Table 3.3.2: Landfill Gas Extraction Booster Monitoring Results Summary
<table><tr><th>Parameter</th><th>Historical Average</th><th>2017/2018 Result</th></tr><tr><td>Temperature (° C)</td><td>2.7</td><td>5</td></tr><tr><td>Volumetric Flow (m3/hr)</td><td>2157</td><td>3400</td></tr><tr><td>Methane (%)</td><td>53.4</td><td>51</td></tr></table>
The detailed data for each of the parameters required under the EPL for the gas extraction booster is provided in Table 1 (refer Appendix 3).</td></tr>
<tr><td>Surface Gas</td><td>Surface gas monitoring was completed on a quarterly basis as per EPL requirements, which are summarised in Table 3.3.3 below. The detailed tabulated data is available in Table 2 (refer Appendix 3).

Table 3.3.3: Surface Gas Monitoring Results Summary
<table><tr><th>Parameter</th><th>Minimum</th><th>Maximum</th><th>Average</th></tr><tr><td>Methane (%)</td><td>0.0001</td><td>0.08</td><td>0.009</td></tr></table>
Methane was detected in varying amounts over the waste surface with a</td></tr>
</table>

<table>
<tr><td></td><td>decreasing overall average of 0.009% during this reporting period compared to 0.010% last reporting period.
The emission threshold concentration for methane detected in surface gas emission testing is 500 parts per million (0.05%), as recommended in (Environmental Guidelines for Solid Waste Landfills, Second Edition 2016).
Surface gas monitoring enables site operational personnel to investigate and apply corrective actions where any high concentrations of methane has been detected to maintain the effectiveness of the landfill cap and prevent migration of landfill gas through preferential pathways to the surface.
This can include 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. During this reporting period vegetation mulch bio-cover was implemented around wells which have assisted in mitigating odour and reducing surface gas emissions.</td></tr>
<tr><td>Landfill Gas Flare</td><td>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 3.3.4 below.

Table 3.3.4: Landfill Gas Flare Monitoring Results
<table><tr><th>Parameter</th><th>Units</th><th>Result</th></tr><tr><td>Temperature</td><td>°C</td><td>1057</td></tr><tr><td>Residence Time</td><td>Seconds</td><td>< 0.3</td></tr></table></td></tr>
<tr><td>Landfill Gas Engine Exhaust Point(s)</td><td>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 3.1 to 3.5 (refer Appendix 3).

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, as demonstrated in Figures 3.3.1 – 3.3.3.
Nitrogen Oxides;
Hydrogen Sulphide;
Sulphuric Acid Mist; and
Sulphur Trioxide.</td></tr>
</table>

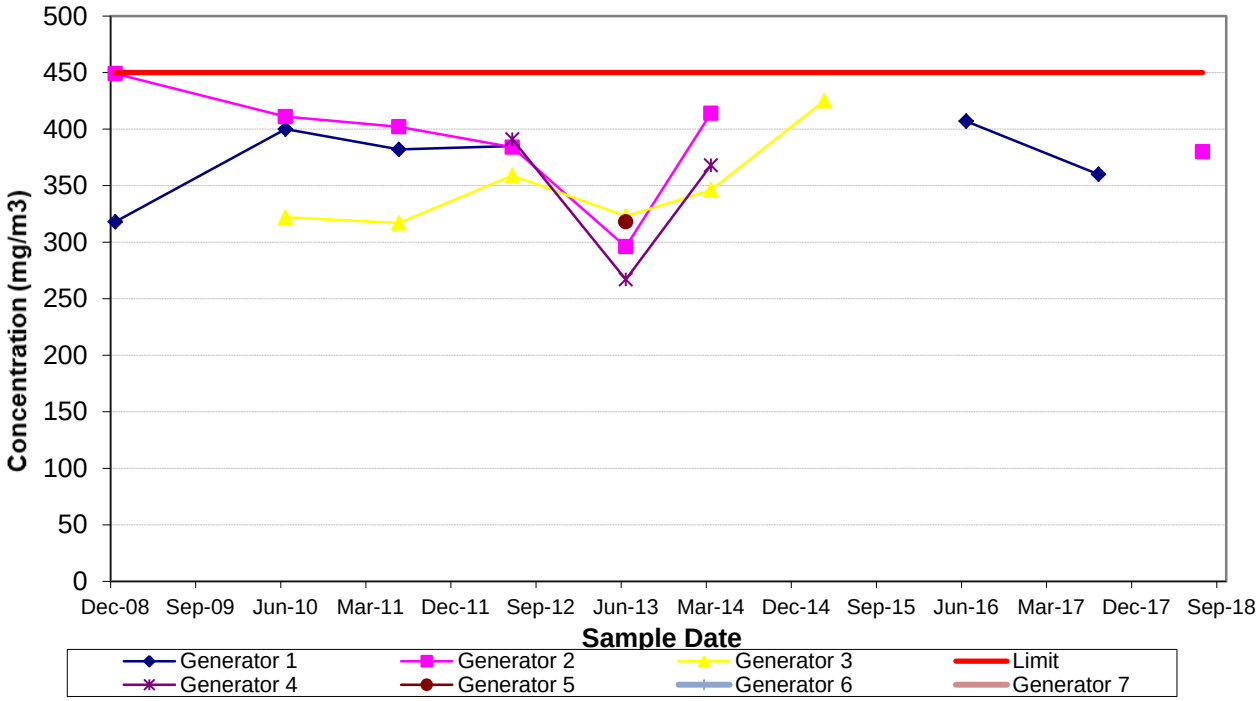


Figure 3.3.1 – Landfill Gas Engine Exhaust Point – Nitrogen Oxide Flow (mg/m^3)

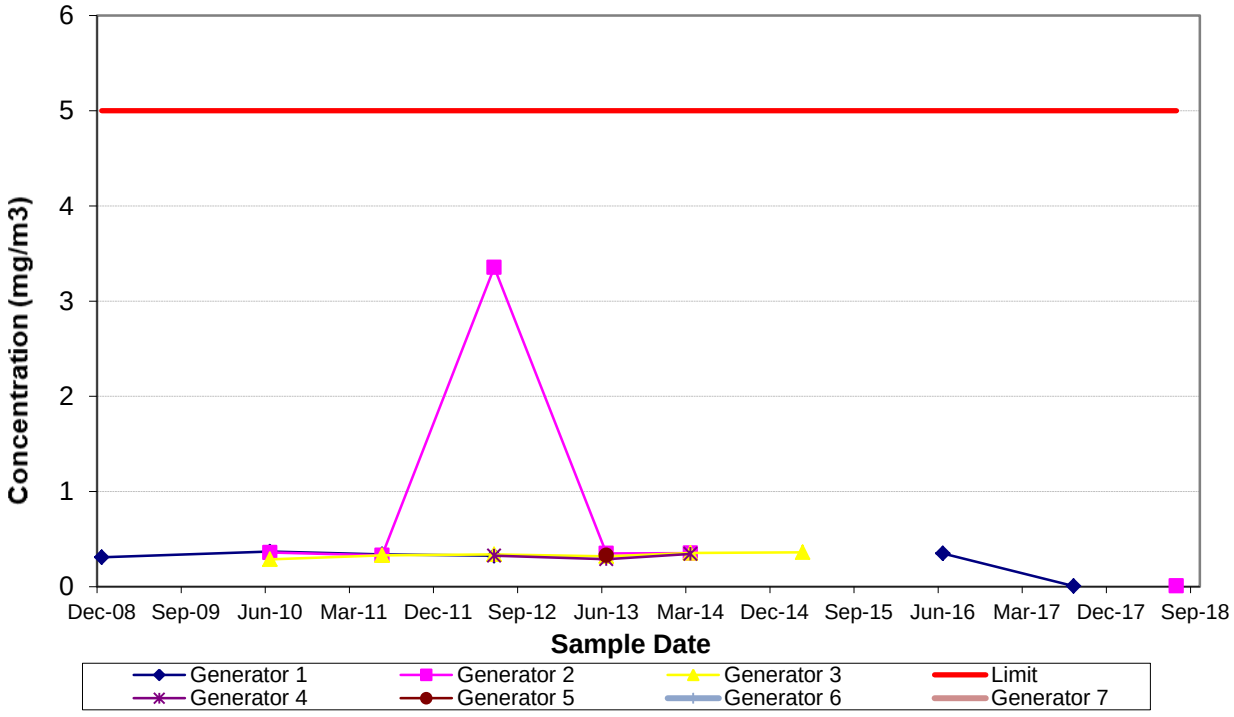


Figure 3.3.2 – Landfill Gas Engine Exhaust Point – Hydrogen Sulphide (mg/m^3)

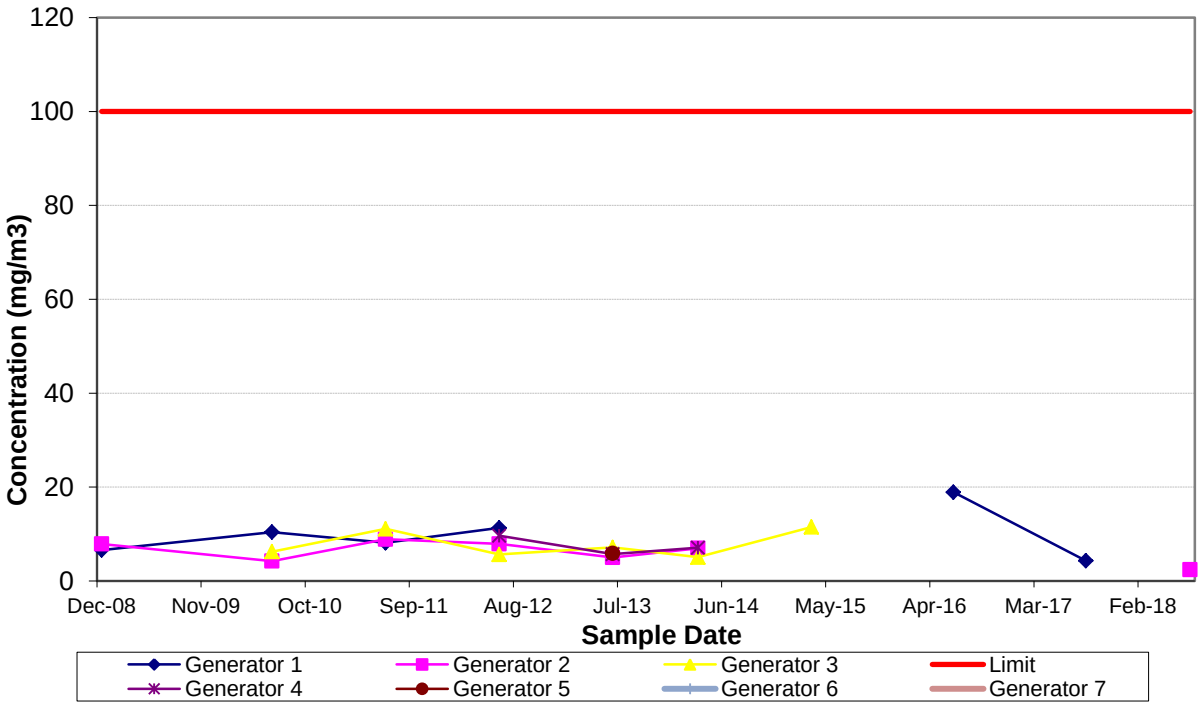


Figure 3.3.3 – Landfill Gas Engine Exhaust Point – Sulphuric Acid Mist and Sulphur Trioxide (mg/m3)

3.4 Water Monitoring

3.4.1 Bioreactor Surface Water Monitoring

The processes and management of water quality is documented and implemented on site in accordance with the EPL and the Landfill Environmental Management Plan (LEMP) for the Bioreactor. The LEMP 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.

Water contaminated by waste or leachate is collected and treated in the Leachate Treatment System before being transferred to Evaporation Dam 3 North (ED3N) for evaporation. 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.

The wash bay, used for cleaning of containers and equipment associated with Bioreactor operations, collects sediment in a drainage sump. This sump is periodically drained and the resultant waste deposited in the Bioreactor.

The findings from water quality monitoring of surface water locations required under the Consent and EPL is summarised in Table 3.4.1 below with detailed data provided in Tables 5.1 - 5.10 (refer Appendix 3). Key quality indicators selected to identify likely impacts from the Bioreactor include:

- pH,
- Electrical conductivity (EC),
- Ammonia (NH3),
- Total organic carbon (TOC),
- Iron (Fe),
- Sulphate (SO4), and
- Zinc (Zn).

These are depicted in the trend graphs (Figures 3.4.1.1 – 3.4.1.10) provided in Appendix 4.

*It should be noted that for some monitoring locations, surface water monitoring results are only available to April 2018 as there was insufficient rain following this period to cause water flow. Hence samples were unable to be obtained for the purpose of conducting surface water monitoring.

*For Quarter 4 2018, monitoring was undertaken slightly earlier for 2 reasons - samples are collected in conjunction with the Heron Resources Environmental Officer for safety reasons and the schedule followed was consistent with the previous reporting period.

Table 3.4.1: Bioreactor Surface Water Monitoring Results

Parameter	Results/Discussion
Site 115 – Allianoyonyige Creek	Site 115 is situated downstream of the evaporation dams. 1 out of 4 quarterly monitoring events required under the EPL was undertaken in this monitoring period, due to insufficient flow, and have been documented in the Annual Return. Based on the results provided in **Table 5.1** (refer **Appendix 3**), the pollutant concentration trends from previous monitoring periods are generally consistent. • Mean pH at 7.74 for this location indicates slightly alkaline water. • EC at 1080 µS/cm, indicating fresh to brackish water. • NH3 at <0.1mg/L and TOC at mean of 19 mg/L concentrations recorded in this monitoring period remain consistent with historical monitoring results • Heavy metal concentrations are of low magnitude for this reporting period – less than 0.0012 mg/L for Pb and less than 0.07mg/L for Zn, indicating no contaminated runoff is impacting surface water at this monitoring location.

Parameter	Results/Discussion
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 5.2** (refer **Appendix 3**), is consistent with water quality from historical monitoring records. • pH is consistent with previous years (average 7.2) and reflective of the overall range of 3.5 – 8.5 for this location; • EC (average 522 µS/cm) for this reporting period is indicative of fresh water. • SO_4 (average 171 mg/L) shows an identical trend to conductivity, again indicating a direct effect on EC. • Pb (average 0.01mg/L) and Zn (average 4.50mg/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 0.25mg/L) and TOC (average 17mg/L) concentrations recorded in this monitoring period were consistent with historical monitoring results.
Site 105 – Crisps Creek	Site 105 is located downstream of the Bioreactor and tailings dams. 2 out of 4 quarterly monitoring events required under the EPL were undertaken in this monitoring period, due to insufficient flow, and have been documented in the Annual Return. Water quality trends in Site 105, based on the results provided in **Table 5.3** (refer **Appendix 3**) are consistent with previous monitoring results. • pH (average 7.6) is within the overall range of 5.4 – 8.6 for this location, indicating relatively neutral water; • EC (average 1665 µS/cm) is consistent with historical results, reflecting brackish water. • TOC (average 20 mg/L) and NH_3 (average 0.1 mg/L) were consistent with historical trends. • Zn and Pb remain consistent and average 0.33 mg/L and 0.01 mg/L respectively consistent with historical results.
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 5.4** (refer **Appendix 3**), the

Parameter	Results/Discussion
	results for WM200 remain generally consistent with the previous reporting periods. • pH (average 8.15) indicates slightly alkaline water; • EC (average 1655 µS/cm) is consistent with historical results; • SO_4 level (average 202 mg/L) is lower than previous reporting period; • Zn and Fe levels were lower at averages of 3.1 mg/L and 0.13mg/L respectively 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 0.45 mg/L is at quite low levels at this location.
WM201 – Entrance Road Culvert	The Entrance Road Culvert collects surface water runoff from the Woodlawn Bioreactor administration office and workshop areas. 4 out of 4 quarterly monitoring events required under the EPL were undertaken in this monitoring period, due to insufficient flow, and have been documented in the Annual Return, the results of which are provided in **Table 5.5** (refer **Appendix 3**). • pH is consistent (average 7.32) with previous reporting periods and remains within the overall range of 4.5 – 8.2 for this location; • EC at 387 µS/cm is reflective of fresh water and is consistent with previous reporting periods. EC variability can be caused by dilution during rainfall events. • Pb, Zn and Fe average 2.52 mg/L, 9.2 mg/L and 49.8 mg/L respectively, results in quarter 4 were high and treated as an anomaly as a subsequent sample was tested and resulted with usual readings. Veolia will continue to monitoring this location in the next reporting period for any likely contaminant run off impacts.
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 5.9** (refer **Appendix 3**). • pH levels indicate an acidic, yet stable trending result with the average pH of 3.17 appears to be generally consistent with previous reporting periods; • Fe (average 61.65 mg/L) is consistent with previous reporting periods;

Parameter	Results/Discussion
	• Zn at an average of 788.75 mg/L is consistent with previous reporting periods; • SO_4 (average 8870 mg/L) is consistent with previous reporting periods • EC (average 10082.5 µS/cm) remains within the overall average. 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 138 mg/L) which is consistent with previous reporting periods.
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 5.7** (refer **Appendix 3**), for WM203, the following can be confirmed: • pH (average 8.23) appears to be generally consistent with previous reporting periods. • EC average (31275 µS/cm) appears to be fairly consistent with previous reporting periods; • SO_4 averages (5698.5 mg/L) is lower than previous monitoring periods • Fe levels (average 39 mg/L) are slightly higher than previous years whilst Zn levels (average 149.82) reflect a downward trend. • NH_3 concentrations (average 747 mg/L) remained stable over the course of the reporting period (592 – 885 mg/L). TOC is trending upward (average 1820 mg/L) from the previous reporting period.
Pond 3	Pond 3 is situated on a bench within the landfill void at a relative level (RL) of 740 m above sea level. Pond 3 acts as a transfer point to capture stormwater from the walls of the landfill void to Evaporation Dam 3 South. 3 out of 4 quarterly monitoring events required under the EPL were undertaken in this monitoring period, due to insufficient flow, and have been documented in the Annual Return, the results of which are tabulated in **Table 5.8** (refer **Appendix 3**). Pond 3 was decommissioned at the end of the reporting period. These water quality results are consistent with previous reporting periods. • pH average of 3.8 confirms acidic nature of water that comes in contact with the void walls and is generally consistent with previous results • EC (average 2765.7 µS/cm) is generally consistent with previous results; • SO_4 trends (average 1832 mg/L) is generally consistent with previous results

Parameter	Results/Discussion
	• Pb average of 7.7 mg/L is generally consistent with previous results • Zn (average 206 mg/L) is generally consistent with previous results; • NH_3 (average 37 mg/L) and TOC (average 45 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.
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 5.10** (refer **Appendix 3**), for ED1, the following can be confirmed: • pH (average 3.1) which is consistent with previous reporting periods • EC average 20125 µS/cm which is consistent with previous reporting periods • SO_4 (averages 21825 mg/L) and Fe levels (average 99 mg/L) is greater than previous reporting period • Zn levels (average 2967.5 mg/L) is greater than previous reporting period • NH_3 concentrations (average 15.5 mg/L) remained stable over the course of the reporting period. • TOC averages 6 mg/L remains consistent with previous reporting periods Fe and Zn levels were noted significantly higher in quarter 4 this reporting period as Heron Resources were pumping into ED1 from the tailings dam at that time as part of the overall management of water across the site. Water will be progressively evaporated.
ED3SS – Lagoon 5	Evaporation Dam 3 South-South (ED3SS) is a new 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 5.6** (refer **Appendix 3**), for ED3SS, the following can be confirmed: • pH (average 8.4) appears to be fairly consistent with the existing treated leachate quality • EC average 24200 µS/cm appears to be generally consistent with the existing treated leachate quality • SO_4 averages (675.75 mg/L) is lower than previous monitoring periods • Fe levels (average 29.92mg/L) Zn levels (average 8.5mg/L) are lower than previous monitoring periods • NH_3 concentrations (average 962.5 mg/L) remained stable over the course of the reporting period

Parameter	Results/Discussion
	• TOC (average 2420 mg/L) appears to be fairly consistent with the existing treated leachate quality

3.4.2 IMF Surface Water Monitoring Results

Surface water quality monitoring at three monitoring locations was undertaken as required by the EPL, the findings of which are summarised in Table 3.4.2. Detailed quality results are provided in Tables 9.1 to 9.4 (refer Appendix 3). The key quality indicators selected to identify any contamination in the receiving surface waters from site operations include:

- pH,
- Electrical Conductivity (EC),
- Sulphate (SO4),
- Iron (Fe),
- Zinc (Zn),
- Ammonia (NH3), and
- Total Organic Carbon (TOC).

These are depicted in trend graphs Figures 3.4.2.1 to 3.4.2.4 (refer Appendix 4).

Table 3.4.2: 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. Results provided in Table **9.1** (refer **Appendix 3**) indicate the following trends: • pH is close to neutral (average 7.50), consistent with previous reporting periods; • EC (average 881.50 µS/cm) is consistent with the previous period and representative of fresh water salinity; • SO4 (average 113.55 mg/L) is consistent with previous reporting periods; • Fe (average 0.28 mg/L) is consistent with previous reporting periods, whilst Zinc indicates a fluctuating trend (average 0.13mg/L), consistent with historical cyclic results; • NH3 (average 0.1 mg/L) is consistent with previous reporting periods and continues to be at non-detection levels. • TOC (average 13 mg/L) is slightly higher 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.
Site 130 - Upstream	Site 130 is located upstream of the IMF in the Mulwaree River. Results provided in Table **9.2** (refer **Appendix 3**) indicate the following trends: • pH is close to neutral (average 7.58), slightly lower than the

Parameter	Results/Discussion
	previous reporting period; • EC (average 401 µS/cm) is consistent with the previous reporting period and representative of fresh water salinity; • SO_4 (average 16.30 mg/L) is lower but generally consistent with previous reporting period; • Fe and Zn, average 0.72 mg/L and 0.02 mg/L respectively indicate consistency with fluctuating cycles in previous reporting periods; • NH_3 (<0.1 mg/L) continued to be un-detectable during this reporting period. • TOC (average 13.50 mg/L) is consistent with previous reporting periods.
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. Results provided in **Table 9.3** (refer **Appendix 3**) indicate the following trends: • pH (average 7.64) is slightly alkaline, consistent with the previous reporting period; • EC (average 680 µS/cm) shows a fluctuating trend and is generally consistent with previous periods and fresh water salinity; • SO_4 (average 45.35 mg/L) reflecting EC trend, is generally consistent with previous reporting period; • Fe and Zn, average 0.40 mg/L and 0.08 mg/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 14 mg/L), is generally consistent with previous reporting periods; These results are consistent with the trends for Site 110.
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 9.4** (refer **Appendix 3**) indicate the following trends: • pH (average 7.33) is close to neutral, consistent with the previous reporting period; • EC (average 124.17 µS/cm) shows a slight downward trend but is generally consistent with the previous period and representative of fresh water salinity; • SO_4 (average 9.93 mg/L) is also slightly lower, reflecting EC trend, but generally consistent with previous reporting period; • Fe and Zn, average 0.83 mg/L and 0.07mg/L are generally

Parameter	Results/Discussion
	consistent with the previous period but reflective of fluctuating cycles. • NH_3 (< 0.1mg/L) continued to be not detected during this reporting period. • TOC (average 6 mg/L) which is lower than previous reporting periods.

3.4.3 MBT Surface Water Monitoring Results

Quarterly surface water monitoring is carried out to monitor any potential surface water impacts of the project on the surrounding area.

Baseline data for surface water has been obtained from historical water quality monitoring undertaken for monitoring location Site 115 - Allianoyonyiga Creek.

For results of the surface water monitoring point Site 115, refer to section 3.4.1.

3.4.4 MBT Discharge Monitoring Results

Surface water discharge monitoring is conducted at the MBT facility to determine whether surface water flowing offsite could be contaminated as a result of operational activities. The results of discharge monitoring are assessed against discharge limits stipulated within the Consent and EPL 20476, which are described in Table 3.4.4.

Table 3.4.4 - Discharge Parameters and Performance Measures

Parameter	Performance Measure	Standards	Statutory Requirements
pH	6.5 – 8.5	Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales	EPL Condition L2.4
Total Suspended Solids (TSS)	50 mg/L		

Condition 19 of the Consent states the stormwater retention pond must capture and store all stormwater runoff generated at the premises during a 24-hour duration 1-in-100-year Average Recurrence Interval (ARI) rainfall event. Following the commencement of operations the Facility must ensure it maintains a closed water management system, which ensures no discharge to the downstream environment.

Since start of the reporting period, no discharge events were recorded at Site 140. This is indicating compliance with this condition. This is due to low rainfall during this reporting period.

3.4.5 Bioreactor Leachate Monitoring Results

Leachate quality monitoring is undertaken annually at two monitoring locations in the Bioreactor as required by the EP. The findings from this reporting period are summarised in Table 3.4.5 below with the detailed data provided in Tables 6.1 and 6.2 (refer Appendix 3). 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 (SO4),
- Lead (Pb),
- Zinc (Zn),
- Ammonia (NH3), and
- Total Organic Carbon (TOC).

These are depicted in the subsequent trend graphs **Figures 3.4.5.1** and **3.4.5.2**.

Table 3.4.5: 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 6.1** (refer **Appendix 3**), the characteristics of the leachate are: • pH (8.26) is indicative of a slightly decreasing alkaline state from the previous reporting period result of 8.74 • EC (23,500 µS/cm) is consistent with the previous reporting period; • SO4, one of the dominant anions, (354 mg/L) is consistent with previous reporting readings; • Pb (0.175 mg/L) and Zn (3.45 mg/L)) is consistent with the previous reporting period • NH3 (284 mg/L) is lower compared to previous reporting readings; • TOC (2790 mg/L) is consistent with previous reporting
Leachate Recirculation System	The leachate recirculation system is located within the landfill void, comprised of a network of drainage sumps, pipes, pumps and wells that are used to collect and extract leachate from the waste mass. An annual round was completed during this reporting period in accordance with the EPL, the results of which are detailed in the **Table 6.2** (refer **Appendix 3**). Based on these results, the leachate collected directly from the recirculation system displays similar characteristics to the leachate

Parameter	Results/Discussion
	pond, with some exceptions as summarised below: • pH (8.2) is generally consistent with previous reporting period; • EC (40,300 µS/cm) is consistent with the previous reporting period and is generally consistent with the overall annual average for this location; • SO_4 (255 mg/L) is consistent with previous reporting period; • Both Pb and Zinc are consistent with previous reporting period, 0.326 mg/L and 2.4 mg/L respectively. • TOC (7380 mg/L) is consistent with historical monitoring results.

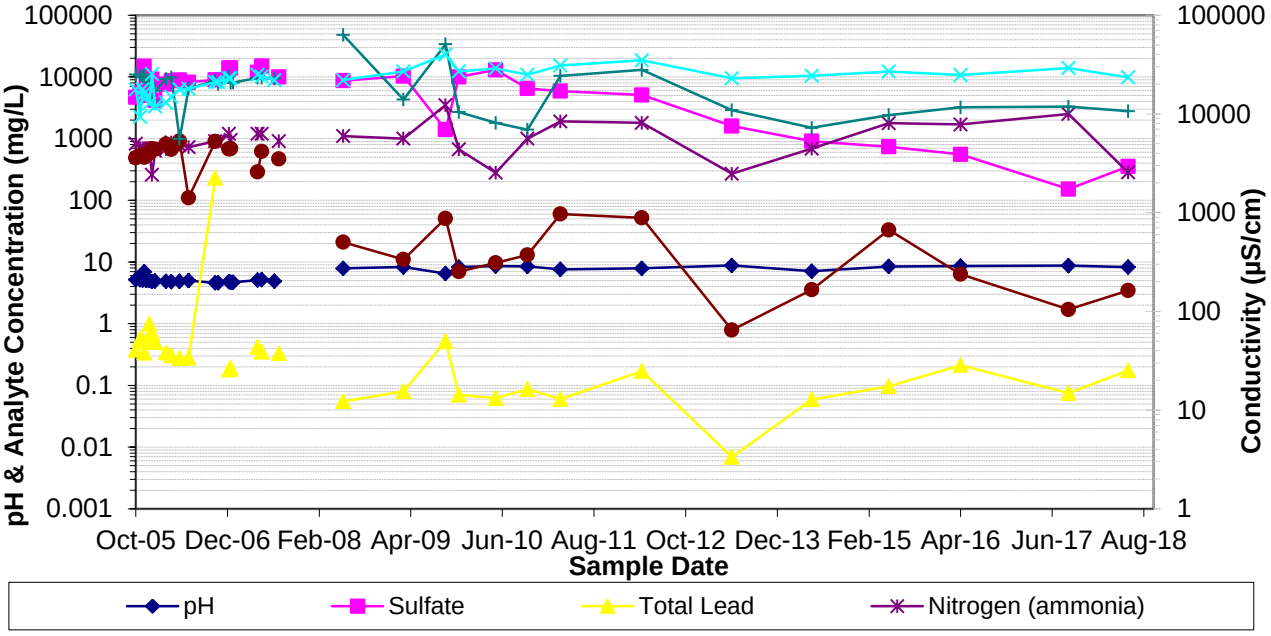


Figure 3.4.5.1 – Leachate Trends – Leachate Dam

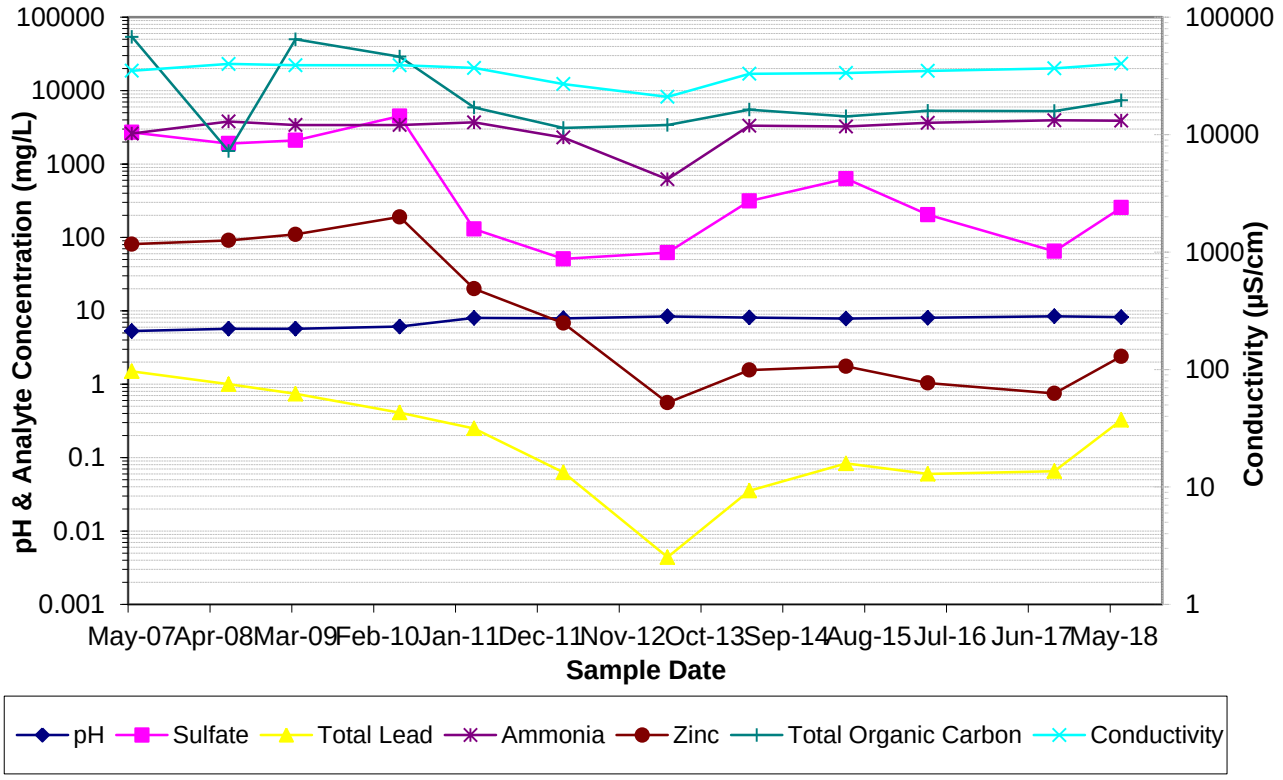


Figure 3.4.5.2 – Leachate Trends – Leachate Recirculation System

3.4.6 MBT Leachate Monitoring Results

Leachate quality monitoring is undertaken half-yearly at the MBT leachate aeration dam as required by the EPL. The findings from this reporting period are summarised in Table 3.4.6 below with the detailed data provided in Tables 6.3 (refer Appendix 3). Same key quality indicators are used as per section 3.4.5 and are depicted in **Figures 3.4.6.**

In addition to chemical testing, the level of the water in the leachate aeration pond is also monitored on a weekly basis and after every rainfall event to ensure the freeboard is not exceeded as per Condition O5.3 of the EPL.

Table 3.4.6: MBT Leachate Monitoring Results

Parameter	Results/Discussion

Parameter	Results/Discussion
MBT Leachate Aeration Dam	The leachate aeration dam is located at the northern side of the MBT facility where leachate collected from the facility is treated by aeration to oxidise organic compounds in leachate. Based on the results provided in **Table 6.3** (refer **Appendix 3**), the characteristics of the leachate are: • pH average (7.44) is showing a decreasing alkaline state from the previous reporting period result of 8.12. • EC average (13,800 µS/cm) has increased from the previous reporting period (1,200 µS/cm) due to increased organic load. • SO_4 average (154 mg/L) is lower than the previous reading (299 mg/L); • Pb average (0.0013 mg/L) and Zn (0.141 mg/L) is consistent with the previous reporting period. • NH_3 average (570 mg/L) is higher compare to previous reporting reading (3.5 mg/L); • TOC average (4100 mg/L) is higher compare to previous reporting reading (23 mg/L). The first round leachate sample was taken in May 2017 and was at the start of commissioning. The aeration dam was mostly accumulated by storm water. There is leachate collected and stored at the leachate pond during this reporting period, which resulted higher concentration in organic compounds and ammonia.

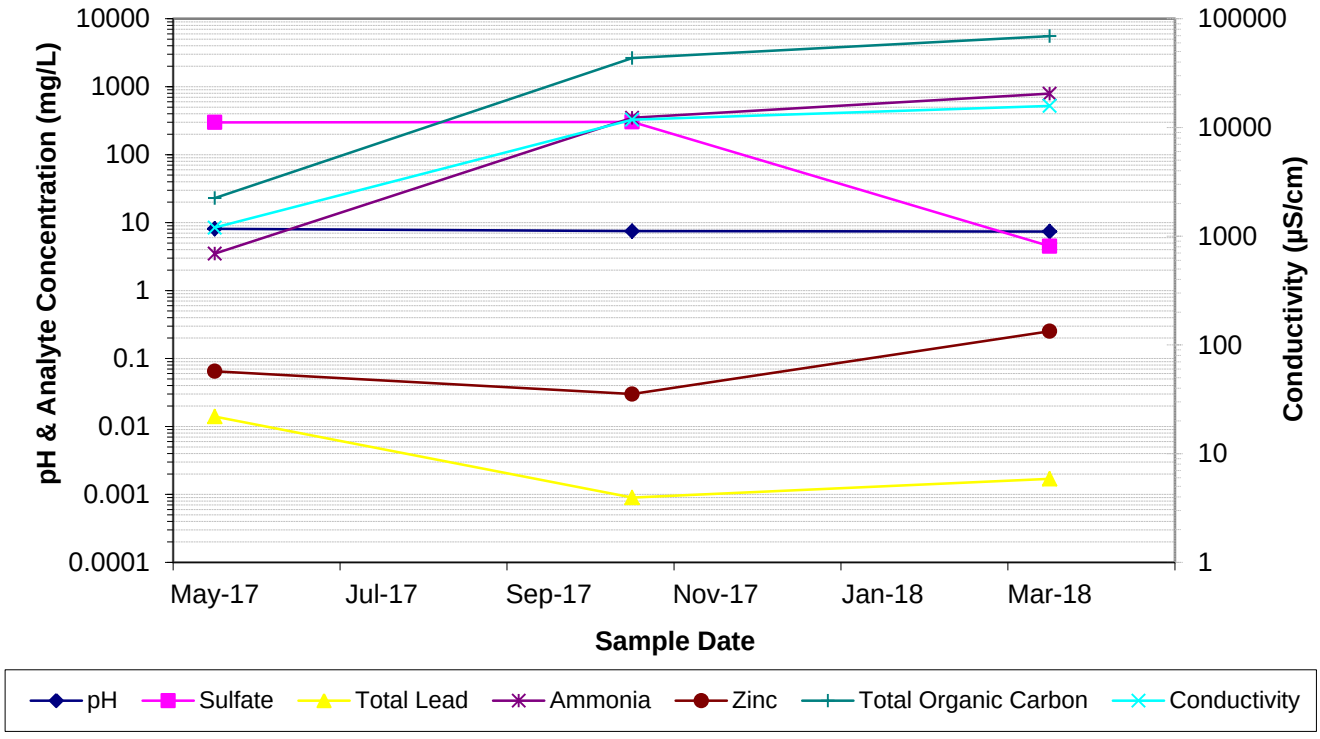


Figure 3.4.6 - Leachate Trends - MBT Leachate Pond

3.4.7 Bioreactor Groundwater Monitoring Results

Groundwater quality monitoring at 15 locations was undertaken in this reporting period as required by the EPL, comprising of one annual and three quarterly rounds of monitoring, the results of which are summarised in **Table 3.4.7** below. Detailed data is provided in Tables **7.1 – 7.14** (refer **Appendix 3**).

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 (SO4),
- Lead (Pb),
- Zinc (Zn),
- Ammonia (NH3), and
- Total Organic Carbon (TOC).

These are depicted in the trend graphs Figures **3.4.7.1 to 3.4.7.14** (refer **Appendix 4**). In addition to water quality monitoring, standing water levels (SWL) of the wells are also measured in metres relative to sea level (m RL) and are depicted in the subsequent graphs Figures **3.4.7A, 3.4.7B** and **3.4.7C**.

*It should be noted that the sampling frequency for some groundwater analytes are annual instead of quarterly, consistent with the requirements of the relevant EPL (refer section 3.4.8.

Table 3.4.7: Bioreactor Groundwater Monitoring Results

Parameter	Results/Discussion
MB1	MB1 is located down gradient of the landfill void. Based on the results provided in **Table 7.1** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 777.4 m RL) was slightly lower than previous reporting periods due to insufficient rainfall events; • pH (average 7.6) neutral – to slightly alkaline consistent with previous reporting period; • EC (average 1700 µS/cm) is slightly higher than but generally consistent with previous readings representing fresh water; • SO_4 (average 297.5 mg/L) is generally consistent with previous periods; • Pb and Zn (average 0.0002 mg/L and 0.076 mg/L respectively) are generally consistent with previous periods. • NH_3 (average 0.1) is consistent with previous reporting periods. • TOC (3 mg/L) is consistent with the previous reporting period and historical trends. The concentration is indicative of natural conditions. Veolia will continue to monitoring this parameter in the future to ensure water quality at this location is preserved.

Parameter	Results/Discussion
	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 7.2** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 778.93 m RL) was consistent with long term average since 2004; • pH (average 7.33) neutral, consistent with previous reporting period; • EC (average 6835 µS/cm) and SO_4 (average 3947.5 mg/L) is consistent with previous periods; • Pb (average 0.0002 mg/L) indicates a stable trend consistent with the previous reporting period. • Zn (average 0.05 mg/L) is generally consistent with previous reporting periods. • NH_3 (0.12 mg/L) same as previous monitoring periods of non-detection rates; • TOC (4 mg/L) is consistent 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 7.3** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 791.42 m RL) was consistent with long term average since 2004; • pH (average 7.47) near neutral is consistent with previous reporting period; • EC (average 1997.5 µS/cm) is consistent with previous readings representing fresh water; • SO_4 (average 30.7 mg/L) is stable and consistent with previous periods; • Pb (average 0.0002 mg/L) and Zn (average 0.024 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 (4 mg/L) result is consistent with historical results. The concentration is indicative of natural conditions. Veolia will continue to 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.

Parameter	Results/Discussion
MB4	MB4 is located downstream of the Bioreactor. Based on the results provided in **Table 7.4** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 773.76 m RL) was consistent with long term average since 2004; • pH (average 5.6) slightly acidic, consistent with previous reporting period; • EC (average 1605 µS/cm) represents fresh water salinity and is consistent with previous period. This trend is reflected in SO_4 (average 195.75 mg/L) results for this period; • Pb (average 0.0049 mg/L) remains stable while Zn (average 0.9 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 (2 mg/L) result is consistent with historical results. The concentration is indicative of natural conditions. Veolia will continue to 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 downstream of Evaporation Dam 3 and upstream of the Bioreactor. Based on the results provided in **Table 7.5** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 791.02 m RL) was consistent with historical results; • pH (average 6.07) slightly acidic consistent with previous reporting period; • EC (average 5457.5 µS/cm) represents brackish water and the trend is mirrored by SO_4 (average 887 mg/L) consistent with previous periods; • Pb (average 0.0006 mg/L) and Zn (average 11.7 mg/L) is consistent with previous periods; • TOC (4 mg/L) and NH_3 average of 0.6 mg/l is lower than previous reporting period. Veolia will continue to monitoring this parameter in the future to ensure water quality at this location is preserved.
MB7	MB7 is located upstream of Evaporation Dam 3. Based on the results provided in **Table 7.6** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 785.93 m RL) was consistent with long term average since 2004; • pH (average 7.62) neutral is consistent with the previous reporting period; • EC (average 7467.50 µS/cm) and SO_4 (average 231.75 mg/L) follow a similar stable trend to previous reporting periods ; • Pb (average 0.0002 mg/L) is consistent throughout the reporting

Parameter	Results/Discussion
	period whilst Zn (average 0.18 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 (15 mg/L) appears consistent with the previous reporting period. The concentration is indicative of natural conditions. Veolia will continue to 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 7.7** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 780.6 m RL) was consistent with previous monitoring periods; • pH (average 7.36) neutral is consistent with previous reporting periods; • EC (average 7747.5 µS/cm) is of brackish quality consistent with previous readings; • SO_4 (average 3717.5 mg/L) mirrors EC and is generally consistent with previous periods; • Pb (average 0.0002 mg/L) is stable while Zn (average 0.007 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 (4 mg/L) appears consistent with the previous reporting period. The concentration is indicative of natural conditions. Veolia will continue to 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 7.8** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 784.39 mRL) was consistent with previous monitoring periods; • pH (average 7.47) is neutral – slightly alkaline and consistent with previous reporting period; • EC (average 7685 µS/cm) indicating brackish water and SO_4 (average 986.25 mg/L) follow similar trends consistent with previous periods; • Pb (average 0.0005 mg/L) remains stable while Zn (average 0.23 mg/L) is consistent with previous monitoring periods. • NH_3 (0.1 mg/L) is at non detection rates; • TOC (12 mg/L) is slightly higher but reflective of historical results in previous reporting periods. All trends indicate fairly stable concentrations at this location with no

Parameter	Results/Discussion
	evidence of contamination from mining or Bioreactor activities.
WM1	WM1 is located northeast of the landfill void. Based on the results provided in **Table 7.9** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 740.24 m RL) is consistent with previous monitoring periods; • pH (average 7.69) neutral – to slightly alkaline consistent with previous reporting period; • EC (average 2902.5 µS/cm) represents slightly brackish water, and is consistent with previous historical records; • SO_4 (average 1607.5 mg/L) is similar in trend to EC and demonstrating a long term upward trend; • Both Pb (average 0.007 mg/L) and Zn (average 6.22 mg/L) remain consistent with previous reporting periods. • NH_3 (average 0.1 mg/L) is close to, or within, non-detection rates; • TOC (3 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 7.10** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 784.09 mRL) is consistent with long term averages; • pH (average 7.7) neutral is consistent with the previous period. • EC (average 10170 µS/cm) is representative of saline water and consistent with the previous reporting period; • SO_4 (average 313 mg/L) is consistent with previous monitoring periods. • Pb (average 0.0002 mg/L) and Zn (average 0.009 mg/L) are both lower than the previous reporting period but 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 (14 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 7.11** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 786.06 m RL) is consistent with the previous reporting period; • pH (average 6.39) is slightly acidic, but stable and consistent with previous reporting period; • EC (average 13,750 µS/cm) represents brackish to slightly saline water, consistent with previous reporting period; • SO_4 (average 372.25 mg/L) mirrors EC's stable trend;

Parameter	Results/Discussion
	• Pb (average 0.0042 mg/L) and Zn (average 0.214 mg/L) are both similar to the previous reporting period and generally consistent with historical fluctuations. • NH_3 (average 0.1 mg/L) is close to, or within, non-detection rates; • TOC (4 mg/L) is consistent with previous monitoring period reflecting natural conditions; All trends are relatively consistent and there is no indication of contamination from mining or Bioreactor activities.
MW8S	MW8S is located northern side of ED3N. Based on the results provided in **Table 7.12** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 785.76 m RL) was consistent with long term average since 2004; • pH (average 7.44) is neutral and consistent with previous reporting period; • EC (average 11225 µS/cm) remains stable with previous reporting period results; • SO_4 (average 1328 mg/L) continues to show a declining trend but is generally consistent with previous periods; • Pb (average 0.0003 mg/L) is stable whilst Zn (average 0.86 mg/L) continues to show a declining trend from historical records. • NH_3 (average 0.1 mg/L) is close to, or within, non-detection rates; • TOC (7 mg/L) is consistent with previous monitoring period reflecting natural conditions; The fluctuations noted could be attributed to the recharging of this well only following significant wet weather events which indicates that this well intercepts the shallow unconfined aquifer. There is no indication of contamination from mining or Bioreactor activities.
MW8D	MW8D is located adjacent to MW8S. Based on the results provided in **Table 7.13** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 786.35 m RL) was consistent with long term average since 2004; • pH (average 6.88) slightly acidic to neutral consistent with previous reporting period. • EC (average 9580 µS/cm) represents brackish water which is consistent with previous readings; • SO_4 (average 3650 mg/L) mirrors EC consistent with previous periods; • Pb (average 0.0002 mg/L) and Zn (average 24.5 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 period

Parameter	Results/Discussion
	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 7.14** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 786.33) was consistent with previous reporting period; • pH (average 7.04) consistent with previous reporting period; • EC (average 10,900 µS/cm) remains stable, consistent with previous reporting period for brackish water; • SO_4 (average 5092.5 mg/L) is consistent with previous periods; • Pb (average 0.0002 mg/L) and Zn (average 0.122 mg/L) were both generally consistent with historical results. • NH_3 (< 0.1 mg/L) is at non detection rates; • TOC (5 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.

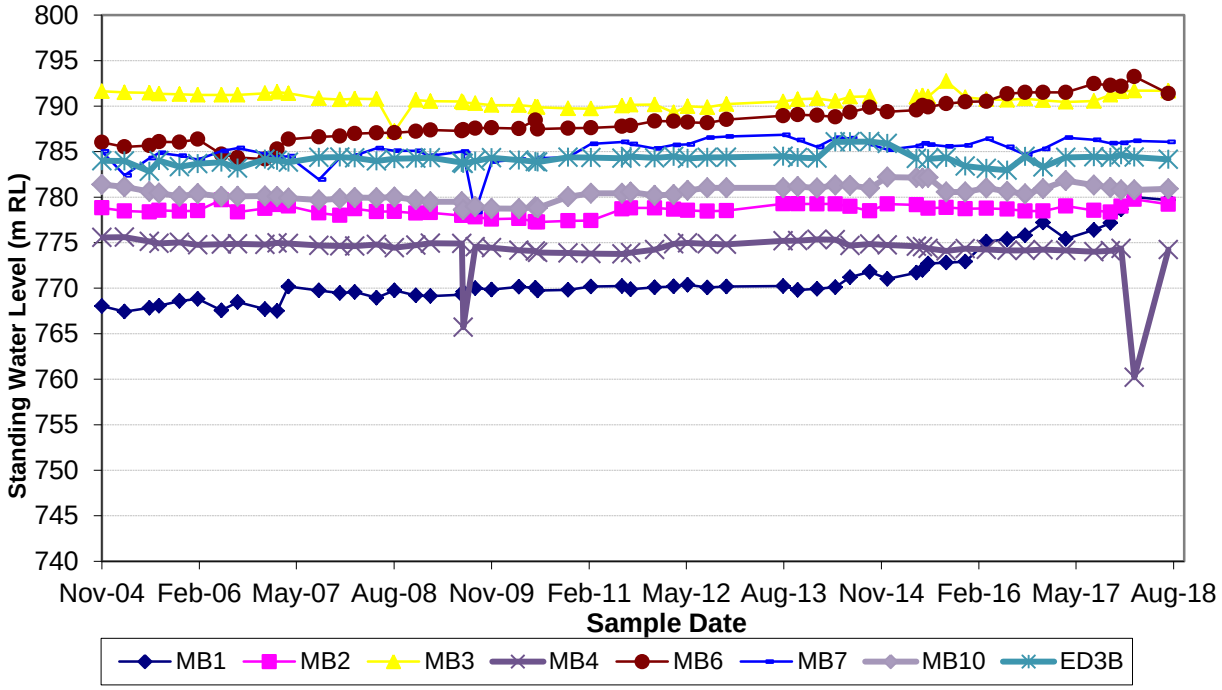


Figure 3.4.7A – Groundwater Levels – MB1 to MB10 and ED3B

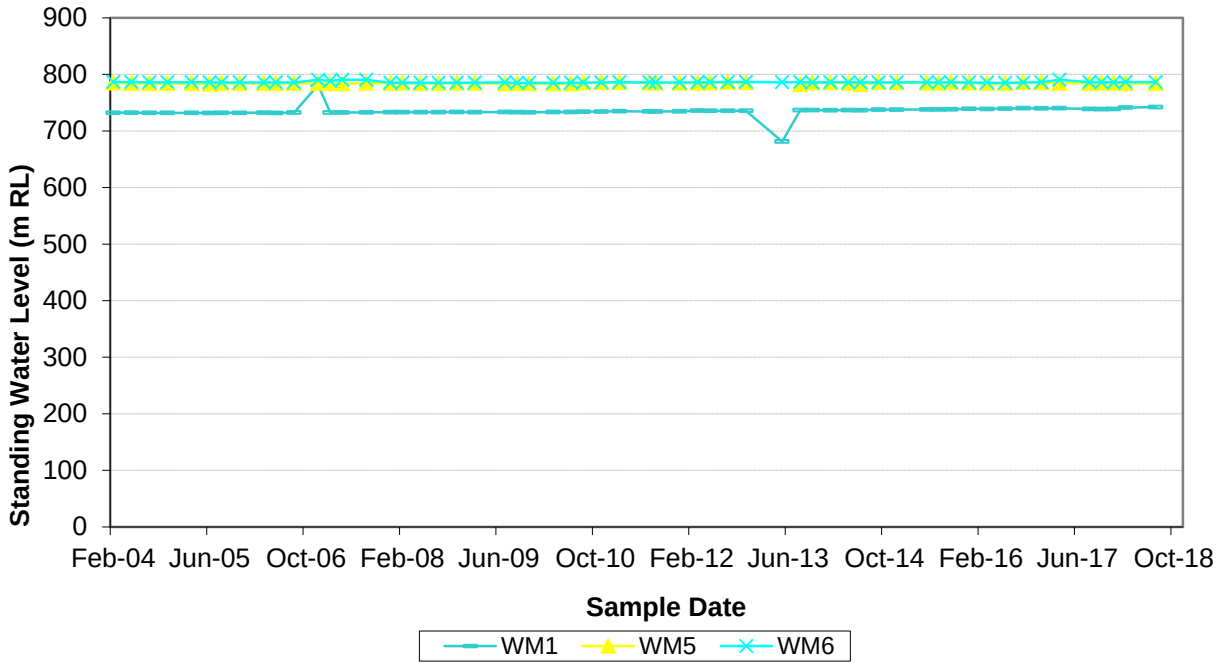


Figure 3.4.7B – Groundwater Levels – WM1 to WM6

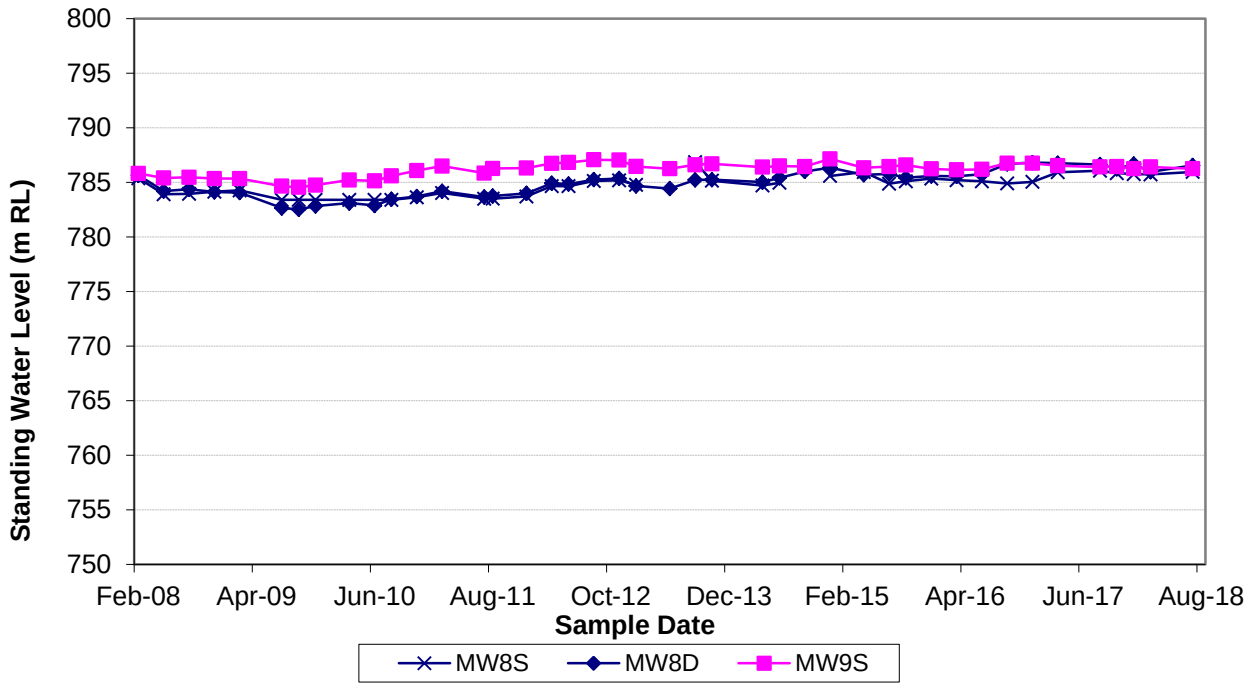


Figure 3.4.7C – Groundwater Levels – MW8S to MW9S

3.4.8 MBT Groundwater Monitoring Results

The ground water monitoring well was installed on 25 January 2017, immediately down gradient of the leachate aeration to enable the monitoring and detection of any leachate migration from the dam to the underlying groundwater.

Following the installation of the monitoring well, one baseline monitoring round was conducted in February 2017 to classify the general characteristics of groundwater encountered at the site prior to operations, as stipulated in the EPL. Four quarterly groundwater quality monitoring at WMBT Point 11 was undertaken in this reporting period as required by the EPL. Results are summarised in **Table 3.4.8** below. Detailed data is provided in Tables **7.15** (refer **Appendix 3**).

The key quality indicators selected are the same as listed in section 3.4.6 to detect any pollutants in groundwater samples are the same as those deemed characteristic for leachate. These key quality indicators are depicted in the trend graphs Figures **3.4.8** (refer **Appendix 4**). In addition to water quality monitoring, standing water levels (SWL) of the wells are also measured in metres relative to sea level (m RL) and are depicted in the subsequent graphs Figures **3.4.8A.**

Table 3.4.8: Bioreactor Groundwater Monitoring Results

Parameter	Results/Discussion
WMBT Point 11	WMBT Point 11 is located down gradient of the MBT leachate aeration pond. Based on the results provided in **Table 7.15** (refer **Appendix 3**), the groundwater quality at this location can be described as: • SWL (average 785.75 m RL) was consistent with the previous reporting period. The minimum level measured was 785.4 m RL and maximum level measured was 786.06 m RL. • pH (average 7.8) and is to slightly alkaline, which is consistent with previous reporting period; • EC (average 13875 µS/cm) is slightly lower than but generally consistent with previous reporting period readings; • SO_4 (average 541.5 mg/L) is consistent through this reporting period and lower than the average of the previous period; • Pb and Zn (average 0.00045 mg/L and 0.03775 mg/L respectively) are generally consistent with previous period with minor fluctuations. • NH_3 (average 0.1) is consistent with previous reporting periods. • TOC (14 mg/L) is slightly higher than the previous reporting period. This is due to a higher measurement in the first round of this reporting period. TOC concentration reduced to a lower level towards the end of the reporting period. All trends at this location indicate consistent concentration and there is no indication of contamination from leachate or MBT activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

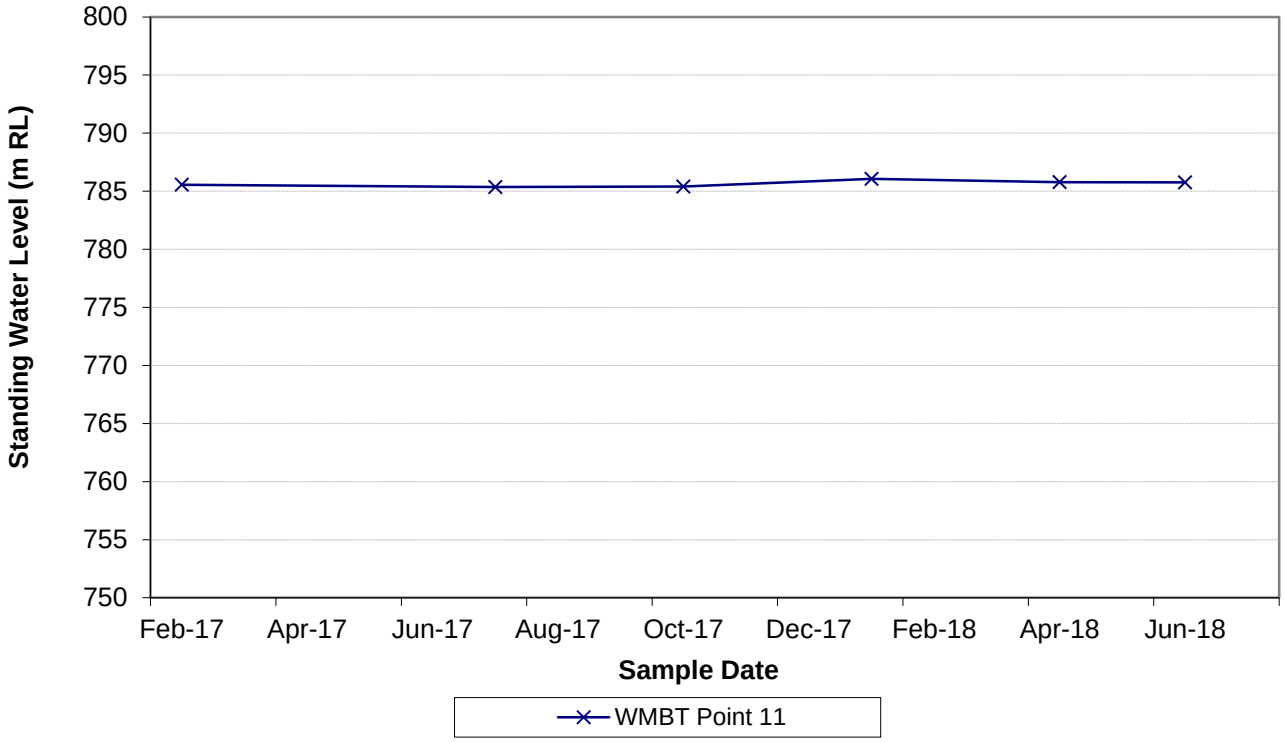


Figure 3.4.8 - Groundwater Levels - WMBT Point 11

3.4.9 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. Each location consists of a shallow (reference A) and deep (reference B) piezometer.

The findings of the monitoring are summarised in Table 3.4.9 below and detailed quarterly levels are provided in Tables **8.1 – 8.5** (refer **Appendix 3**). Standing water levels (SWL) of the piezometers are depicted Figures 3.4.9.1.

Table 3.4.9: Bioreactor Piezometers Level Monitoring Results

Parameter	Results/Discussion
P38A & P38B	P38 is located east of the void. Standing water levels are presented in **Table 8.1** (refer **Appendix 3**). This monitoring location was deemed unsafe to access due to a rock slip on the Southern side of the Bioreactor void wall in 2010. An application to remove this monitoring point from the licence was submitted to the EPA and rejected during this reporting period. Following this decision, Veolia engaged a geotechnical consultant and earthmoving company to provide safe access. Monitoring re-commenced immediately. SWL in P38A (shallow aquifer)) indicated a stable standing water level ranging from 776.18 metres Relative Level (m RL) to 776.23 RL during

Parameter	Results/Discussion
	this reporting period. SWL in P38B (deep) ranged from 770.90 m RL to 771.11 m RL in this reporting period, consistent with previous reporting periods.
P44 & P45	P44 and P45 were decommissioned at the end of quarter 1 in this reporting period and replaced by P200A and 200B
P200A & P200B	P200 is located east of the void. Standing water levels are presented in **Table 8.2** (refer **Appendix 3**). SWL in P200A (shallow) showed a range of 754.46 m RL to 757.23 m RL and is stable. SWL in P200B (deep) showed a range of 754.15 m RL to 756.95 m RL and is stable.
P58A & P58B	P58 is located west of the void. Standing water levels are presented in **Table 8.3** (refer **Appendix 3**). SWL in P58A (shallow) showed a range of 763.95 m RL to 764.24 m RL and is stable. SWL in P58B (deep) is similar to previous reporting period fluctuating between 751.85 m RL and 753.68 m RL.
P59A & P59B	P59 is located west of the void and to the south of P58. Standing water levels are presented in **Table 8.4** (refer **Appendix 3**). SWL in P59A (shallow) ranged from 784.86 m RL to 786.88 m RL in this reporting period, consistent with previous reporting period. SWL in P59B (deep) ranged between 784.58 m RL and 786.48 m RL, consistent with previous reporting period.
P100A & P100B	P100 is located northeast of the void. Standing water levels are presented in **Table 8.5** (refer **Appendix 3**). SWL in P100A (shallow) is consistent with the previous reporting period averaging between 738.10 m RL to 739.46 m RL. P100B (deep) averaged between 711.49 m RL and 722.84 m RL which indicates water above the base level of 698.29 m RL which has been recorded in previous periods. This increase is likely due to the compaction of landfill waste at higher levels within the void preventing water ingress.

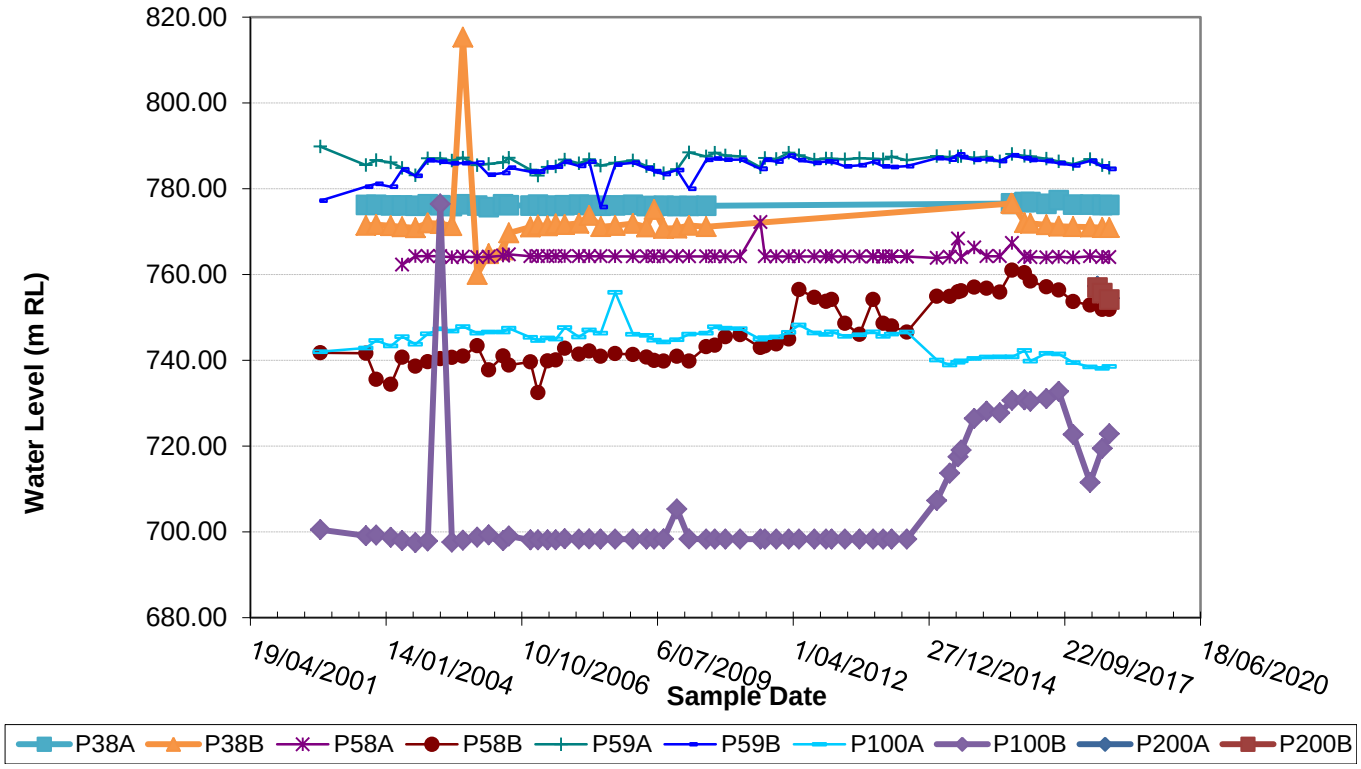


Figure 3.4.9.1 – Piezometer Standing Water Levels – P38 to P200

3.4.10 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 taken monthly as detailed in Table 3.4.10, which shows that the dam Relative Levels (RL) of ED3S, ED3S-S and ED3N Lagoon 4 remained below their respective freeboard levels at all times during the reporting period.

Table 3.4.10: Bioreactor Evaporation Dam Volume Monitoring Results (RL - mAHD)

	ED3 SOUTH		ED3 NORTH			
Date	**ED3S**	**ED3S-S**	**ED3N Lagoon 1**	**ED3N Lagoon 2**	**ED3N Lagoon 3**	**ED3N Lagoon 4**
	RL	**RL**	**RL**	**RL**	**RL**	**RL**
Sep-17	790.89	793.47	790.51	791.12	790.64	790.45
Oct-17	790.85	793.6	790.42	791.08	790.60	790.46
Nov-17	790.79	793.52	790.37	791.00	790.51	790.61
Dec-17	790.79	793.49	790.31	791.01	790.49	790.67
Jan-18	790.73	793.31	790.12	791.11	790.29	790.66
Feb-18	790.89	793.25	790.07	791.18	790.24	790.73
Apr-18	790.79	793.11	789.95	791.12	790.14	790.77
Apr-18	790.69	793.01	789.87	790.99	790.04	790.75
May-18	790.67	792.95	789.82	791.05	789.99	790.76
Jun-18	790.69	792.92	789.79	791.20	789.99	790.82
Jul-18	790.69	792.91	789.76	791.15	789.96	790.91
Aug-18	790.69	792.89	789.98	791.09	789.96	790.97
Minimum	**790.67**	**792.89**	**789.76**	**790.99**	**789.96**	**790.45**
Mean	**790.76**	**793.20**	**790.08**	**791.09**	**790.24**	**790.71**
Maximum	**790.89**	**793.6**	**790.51**	**791.20**	**790.64**	**790.97**
Max Freeboard levels	**791.2**	**793.6**	**791.3**	**791.1**	**791**	**791.3**

3.4.11 Extraction of Water

Table 3.4.11.1 below provides the volume of the water extracted from the Willeroo Borefield.

Table 3.4.11.1: Willeroo Bore Field Extraction Volume

Month	Willeroo Bore Field Usage Volume per month KL
Sep-17	1522.3
Oct-17	824.4
Nov-17	865.7
Dec-17	1341.7
Jan-18	291.8
Feb-18	226.1
Mar-18	232.7
Apr-18	275.2
May-18	267.6
Jun-18	353.2
Jul-18	273.4
Aug-18	131.7
Total	**6605.8**

Heron commenced dewatering of the mine workings in May 2017 required for Heron Mine project. Water extracted from the mine decline is summarised in Table 3.4.11.2. Extracted water was transferred to ED2.

Table 3.4.11.2: Water extracted from the mine decline (Heron Resources)

Month	Heron mine dewatering September 2017 - April 2018 Volume per month KL
Sep-17	2928
Oct-17	11009
Nov-17	4404
Dec-17	14543
Jan-18	17712
Feb-18	7471
Mar-18	Pump turned off
Apr-18	93839

Total Ground water extracted during the reporting period – **103,141 KL**

Leachate extracted from the Bioreactor for the water year (1 July 2017 to 30 June 18) was 85,435 m^3. Leachate is treated through the existing Leachate Treatment Plant before being transferred to the ED3 dams for evaporation. For the monthly ED3 lagoon system Relative Levels refer to Table 3.4.10.

Additional assisted evaporators were installed in ED3N in February 2018 to reduce the volume of the ED3 dams.

3.5 Noise

3.5.1 Noise Monitoring

Operational activities at the Woodlawn Bioreactor and Crisps Creek IMF were restricted within the approved operating hours described in **Table 3.5.1** as per Conditions of the Consent.

Table 3.5.1 Approved Hours of Operation

Activity	Day	Hours
Operations	Monday- Saturday	6:00am-10:00pm
	Sunday & Public Holidays	Nil

No noise complaints were received during this reporting period indicating that noise at the Bioreactor was likely maintained within the 35 dB(A) LAeq (15 minute) criteria at the nearest residential receiver. Noise monitoring will be undertaken by Veolia on the receipt of any such complaints..

3.5.2 MBT Noise Monitoring

Operational activities at the Facility were restricted within the approved operating/construction hours described in **Table 3.5.2.1** as per Schedule 3, Condition 27 of the Consent.

Table 3.5.2A - Approved Hours of Construction & Operation

Activity	Day	Hours
Operation Hours	Monday – Saturday	6:00am – 10:00pm
Emergency Hours	Monday – Sunday	Anytime

Note: Operation of BRS Drums and associated infrastructure is permitted over 24 hours.

Noise limits are stipulated in the Consent to ensure the site does not generate nuisance noise emissions as a result of construction or operational activities.

Table 3.5.2B- Noise Impact Assessment Criteria dB(A)

Parameter	Performance Measure	Standards	Statutory Requirement
Residences on privately owned land (during construction)	Laeq (15min) = 40dB	NSW Industrial Noise Policy (EPA)	Schedule 3, Condition 25
Residences on privately owned land (during operations)	Laeq (15min) = 35 dB		
Traffic Noise on privately owned land	Laeq (1 hour) = 60dB	Environmental Criteria for Road Traffic Noise (DECC)	Schedule 3, Condition 26

SLR Consulting was engaged to conduct operational noise monitoring to conduct a noise audit of the Woodlawn Mechanical Biological Treatment Facility, to determine if any impact of operational activities on nearby receivers occurs in regards to the emission of nuisance noise.

3.5.2.1 Operational Noise

Ambient noise measurements were conducted at the two locations as identified as the nearest residences on privately owned land, as specified in Condition 25 of the Consent. The results of the operator-attended measurements confirm the noise impact assessment criteria (Refer to Table 3.5.2.2) is complied with at the nearest residences on privately-owned land, with LAeq(15minute) noise levels recorded below 35 dBA at both locations. The operator-attended measurements also recorded levels higher than LAeq(15minute) 35 dBA, and in these instances the ambient noise environment was due to natural sounds such as birds, insects and frogs.

3.5.2.2 Traffic Noise

Traffic noise levels were calculated at the nearest residence to the road between the Crisps Creek Intermodal Terminal and Woodlawn MBT, for comparison with the Traffic Noise Impact Assessment Criteria specified in the approval. The results of the operator-attended measurements and calculation confirm the Project Approval (06_0239) noise criteria is complied with at the nearest residence on privately-owned land.

A copy of the noise audit report was submitted to the DPE on the 6 December 2017. The performance of the Facility in managing potential noise emissions was also assessed on the receipt of any noise complaints. No noise complaints were received in this reporting period.

3.6 Waste

3.6.1 Waste Conformance

All waste received as part of the expanded operations was in accordance with the waste types permitted in the Consent and EPL.

Acceptance and screening of waste prior to final disposal was in accordance with the requirements of the Veolia Control of Non-Conforming Waste Procedure and NSW Resource Recovery Screening & Recording of Waste Procedure to ensure only conforming waste is received. Visual assessments of incoming waste were conducted by operators, as tipping/unloading occurred on the landfill surface.

No records of non-conforming waste were recorded during this reporting period. Incoming waste and the waste was received as per the condition 20, schedule 5 of project approval 10_0012.

3.6.2 Waste Volume Monitoring and Recording

The Consent stipulates that the expanded operations must not exceed the maximum annual input rates in following **table 3.6.2.1**.

Table 3.6.2.1 Maximum annual input rates for Woodlawn Bioreactor

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

All waste received is recorded in the Systems, Applications and Products in Data Processing (SAP) software. SAP also records vehicle registrations, the date and time of delivery, the gross and tare weight of the vehicle, as well as the nature and origin of the waste delivered by each contractor.

Table 3.6.2.2 Maximum annual input rates for Crisps Creek

Received by Rail from Sydney	Received by rail from Sydney for processing at the Woodlawn AWT
900,000 tpa	280,000 tpa

The data provided by SAP is used to track and monitor the amount of incoming waste in accordance with the limits of the Consent. **Table 3.6.2.3** indicates that the Woodlawn Bioreactor has remained within the annual waste limit stipulated within the Consent.

Table 3.6.2.3 Incoming waste tonnage via rail and road per month for Woodlawn Bioreactor, MBT facility and Crisps Creek (IMF) during 2017/2018 reporting period.

Monitoring Period	Incoming Waste Received at the Woodlawn Bioreactor Via Crisps Creek IMF (tonnes)	Incoming Waste Received at the MBT Via Crisps Creek IMF (tonnes)	Incoming Waste Volumes received residual as waste from MBT (tonnes)	Incoming regional waste received by road (tonnes)
September 2017	46,809.660	9,516.640	6,281.670	3,723.000
Oct 2017	47,953.910	9,401.820	5,733.480	3847.060
Nov 2017	57,279.010	9,543.020	5,377.480	4844.890
Dec 2017	58,633.830	7,973.580	4,847.100	4615.880
January 2018	56,923.520	8,927.670	7,065.060	3781.840
February 2018	49,225.700	10,826.120	7,304.780	4521.440
March 2018	52,159.200	11021.500	8443.080	5282.990
April 2018	52,666.240	8,926.880	6,226.460	4693.860
May 2018	53,068.850	10,881.130	7,199.540	8808.030
June 2018	47,066.560	10,675.680	7,467.120	8495.380
July 2018	48,193.720	12,048.220	6,635.820	9654.720
August 2018	50,342.900	12,590.980	7,685.120	9328.360
TOTAL	**620,323.10**	**122,333.24**	**80,266.71**	**71,597.45**

Comparing the Total from Table 3.6.2.3 with the maximum input rates (Table 3.6.2.1 and 3.6.2.2) shows that the waste received at the Woodlawn was with in the allowed limits.

Table 3.6.2.3 Forecast waste tonnages for the 2018/2019 reporting period.

Reporting period	Forecast Waste Received at the Woodlawn Bioreactor Via Crisps Creek IMF (tonnes)	Forecast Waste Received at the MBT Via Crisps Creek IMF (tonnes)	Forecast Waste received residual as waste from MBT (tonnes)	Forecast regional waste received by road (tonnes)
2018/19	630,000	143,000	80,000	90,000

3.6.3 MBT Waste Volume Monitoring

3.6.3.1 Waste Acceptance and Screening

Waste was screened in accordance with the NSW Resource Recovery Screening and Recording of Waste Procedure at the Clyde Transfer Terminal and Banksmeadow Transfer Terminal sites before the loading of waste into containers for the transportation to the Facility. If any waste is detected that is not acceptable through the screening process, it is rejected and cannot be loaded into the containers.

Once the waste is received at the Facility, the operator of the grapple crane inspected the waste as it is discharged from the vehicle, to check for non-conforming waste. In the event that easily extractable, bulk recyclable waste was detected this waste was separated from the general waste stream and set aside for removal from the facility to another facility licensed to receive this type of waste for processing or recycling. This includes waste types identified as less desirable to processing operations. No records of non-conforming waste were recorded during this reporting period.

3.6.3.2 Waste Volume Monitoring

Schedule 3, Condition 2 of the Consent stipulates that the Facility must not receive or process more than 240,000 TPA of mixed waste and 40,000 TPA of garden waste. Under the Facility operations (Stage 1), the site is approved to accept and treat 184,000 TPA, which includes 144,000 TPA of mixed waste and 40,000 TPA of garden waste. The WRVCP details the Waste Monitoring Program used to monitor and record incoming waste at the Facility. The performance measures for the waste volumes are detailed in **Table 3.6.5.2B.**

Table 3.6.5.2A - Stage 1 Waste Parameters and Performance Measures

Parameter	Performance Measure	Standards	Statutory Requirement
Mixed waste	240,000 TPA	NSW EPA Waste Classification Guidelines	Schedule 3, Condition 2
Garden waste	40,000 TPA		

Veolia utilised the data provided by PWS to track and monitor the amount of incoming waste transported by rail to Crisps Creek Intermodal Facility and transferred to the Facility. **Table 3.6.5.2B** indicates that the Facility has remained within the annual waste limit stipulated within the Consent. Veolia shall continue to monitor incoming waste tonnages at the Facility for the following operational year.

Table 3.6.5.2B - Incoming Waste Tonnages during Operations (Sep 2017 – Aug 2018) at MBT

Source	Waste Type	Total TPA
Banksmeadow Transfer Terminal	Mixed Waste	81,839.56
Clyde Transfer Terminal	Mixed Waste	40,493.68
	TOTAL	122,333.24

3.7 Pests and Vermin

The management of pest and vermin at the Bioreactor and IMF were maintained through preventative and responsive mitigation measures as per the Landscaping Management Plan in the LEMP. Such measures included:

- Inspection of the site by a registered pest controller every two months;
- Weekly Site inspections to record site conditions such as evidence of vermin and pests; and
- Placement of rodent bait stations at various locations around the site

No pest and/or vermin complaints or management issues were reported during the operation of the Bioreactor during the reporting period.

3.8 Rehabilitation

Rehabilitation of the mine void through landfilling is a continuous process. Final rehabilitation works shall be completed in accordance with the closure and rehabilitation plan. The areas to be rehabilitated include:

- The Bioreactor
- Former Mineral Processing Area - Plant Area
- Evaporation Dam 3

- Evaporation Dam 1
- Power Station; and
- Office and car park areas

In 2008 to 2010, Veolia commissioned Golder Associates Pty Ltd to do a detailed contamination assessment of the Former Mineral Processing Area. Veolia post this assessment transported the main contaminates to the tailings dam area, which included the lead reverse tailings dam, which was located in the south part. Landscaping and reshaping the current area will begin post construction activities by Heron Resources.

Veolia will consult with OEH on the final rehabilitation plans and plant species to be adopted within the rehabilitation areas, once a suitable rehabilitation design is selected and additional detail is developed.

Other areas of the mine site are subject to a current development approval by Heron Resources Limited Pty Ltd (Heron). Under the approved development, Heron are proposing to undertake further underground mining and reprocessing over various areas of the mine site. Rehabilitation of other areas, will be the responsibility as identified in Heron Mining Operations Plan (MOP).

On the ongoing basis, Veolia has undertaken vegetation monitoring and tree planting programs at the Eco-Precinct site. Tree planting aims to increase native species, which in turn creates new habitats for native fauna. Tree planting programs may include the following activities:

- Identification of suitable locations for planting;
- Assessment of existing vegetation and trees;
- Purchase of native saplings;
- Planting of saplings, generally with local volunteer groups
- Funding of tree planting program
- Installation of sapling tubes / tree guards
- Application of fertiliser and/or mulch as required

Mixed Waste Organic Output produced from the MBT will be focused on rehabilitation of Heron area of operation initially – tailing dams.

SECTION 4 ENVIRONMENTAL PERFORMANCE

The environmental performance of the expanded operations was assessed through the results of environmental monitoring, internal inspections, as well as external environmental audits.

4.1 Non-Compliances and Corrective Actions

4.1.1 Non-Compliance

The Independent Enviornmental Audit (IEA) carried out for the Bioreactor and IMF in this reporting period (2017-2018) determined non-compliances against the PA. These are summarised as followed in **Table 4.1.1** below and the status of corrective actions to resolve/manage these non-compliances are also provided.

Table 4.1.1: 2017-2018 period findings and non-compliance against the Consent

Finding	Consent Condition	Recommendation	Corrective Action	Status
Community Liason Committee	Schedule 7 condition 2 of Project Approval 10_0012	Verify that all current members of the CLC have been endorsed by the DPE	Seek endorsement from DPE	Completed 22/05/2018
Train movements at IMF – Veolia received an official caution on the 13/07/18	Schedule 5 condition 20 of Project Approval 10_0012	Clarify with DPE whether approval is required for continued splitting of the second train each day at Goulburn into two movements to the IMF until the Tarago rail upgrade works are complete	Veolia will seek clarification from DPE if splitting of the second train at Goulburn will trigger any approval requirements.	Tarago Loop Extension works are expected to commence in the second half of 2019. Once these works are completed there will no longer be a need to split Train 2. At this point in time the entire Train 2 will access the IMF at around 11:45am and depart at 4.30pm. Note: splitting of train has not caused any operational interruptions or environmental harm and no complaints have been received at the CC IMF.

There were two non-compliances in this reporting period (2017-2018), which is a reduction from the last reporting period (2016-2017) where there were six non-compliances. The corrective

actions for which were all completed. The Odour Management is an ongoing activity and with the Evaporation Dam 1 and 2 lining assessment, Veolia completed the Ecological Risk Assessment and Evaporation Plan in the 2017-2018 reporting period.

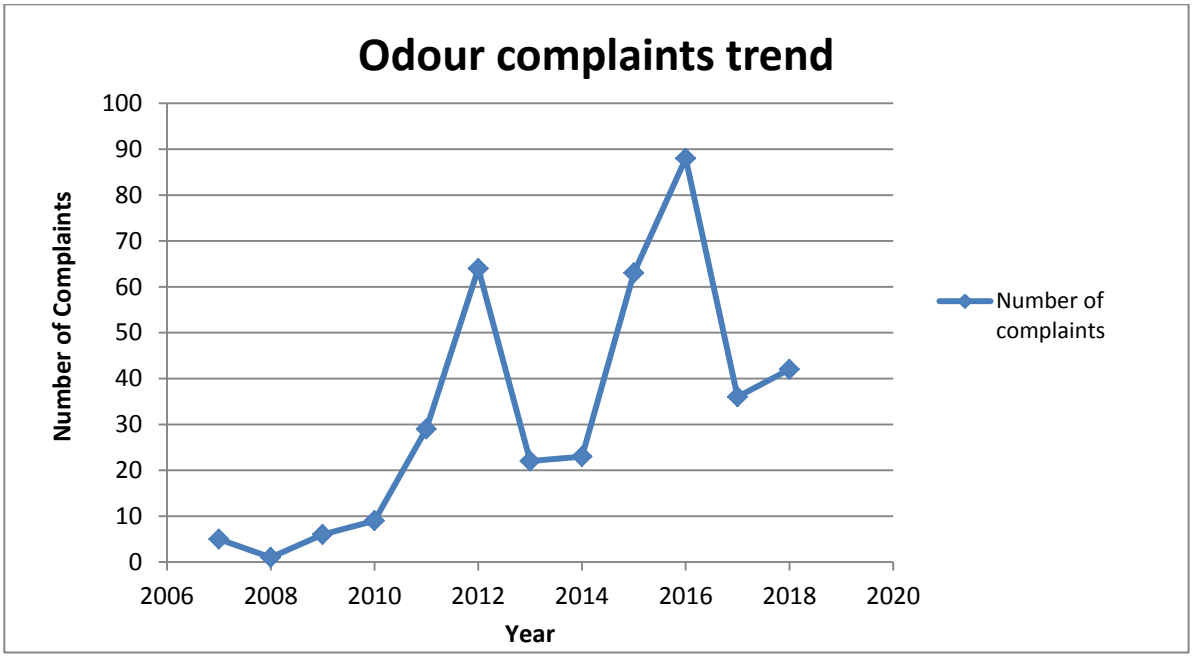
No IEA is yet required to be scheduled for the MBT until the next reporting period.

4.2 Complaints

Veolia operates a 24-hour telephone complaints line that enables the receipt of complaints from members of the public, as required under the EPLs. Other complaints that were received off site during this reporting period were logged by the EPA. Veolia recorded a total of 42 complaints, relating only to odour, during this reporting period. Upon receipt of an odour complaint, Veolia recorded all details into the site complaints register as required under the EPL, and Site Management followed up with the complainant to determine the nature (and scale) of the odour.

In order to engage proactively 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. These liaisons are facilitated through either the Community Liaison Committee (CLC) to voice their concerns with the Bioreactor site and at the Tarago & District Progress Association Inc. (TADPAI) meetings. Veolia continues to implement activities to eliminate and minimise odour sources at the site based on annual odour audit recommendations.

Figure 4.2: odour complaints trend



SECTION 5 CONCLUSION

Based on the results of monitoring undertaken at the Bioreactor, IMF and MBT sites in accordance with the respective PA conditions and EPLs, the overall environmental performance of the Woodlawn Eco-Precinct in this reporting period can be demonstrated to be well managed.

Bioreactor, IMF and MBT Improvements

A number of improvements to the environmental management of the Woodlawn Bioreactor have been implemented during this reporting period. These improvements were implemented as a result of the recommendations and findings identified by independent environmental audits, regulatory inspections as well as Veolia's internal assurance program.

Examples of these improvements include:

- Completed Ecological Risk Assessment for Evaporation Dam 1 and 2
- Construction of the Leachate Treatment Plant commenced in December 2017 as part of the Long Term Leachate Treatment Project
- Completed construction of HDPE lined dam within ED1 footprint to store treated effluent from the new Leachate Treatment Plant
- Installed leachate extraction pumps in the areas where LFG extraction is impacted by the leachate
- Designing of the new waste tipping profile and quality assurance of the tipping activity to meet the profile design
- LFG extraction wells extension to the new tipping lift with perforated pipe sections
- Use of matured MWOO for capping inside of the MBT Fermentation Building to improve MWOO composting process
- Increased frequency and use of new cleaning techniques to clean both inside and outside of the MBT facility buildings to ensure litter and leachate is contained

Veolia intend to undertake following to improve the community and environmental performance in the next reporting period:

- Groundwater and surface water assessment around ED1 as part of the Evaporation Dam Seepage Management Strategy for ED1
- Construct a series of buffer/collection ponds in different catchment areas around the void as part of the new storm water management in the Void
- Leachate minimisation strategy
- Commission and operation of the new Leachate Treatment Plant to extract and treat leachate more efficiently
- Further assessment of the west side of the Bioreactor to further improve the groundwater monitoring network as WM4 was decommissioned during the previous reporting period

- MBT odour control system humidification recirculation system to improve moisturisation of biofilter medium and reduce wastewater generation
- Install and commissioning additional aerator inside of MBT aeration pond to improve leachate quality and reduce potential odour
- In consultation with the NSW EPA, re-establish site specific exemption at Woodlawn Eco-Precinct and Woodlawn Mine for the ongoing use of MWOO

REFERENCES

- Veolia Environmental Services Environment Assessment: Woodlawn Expansion Project Volume 1 – Main Report, URS Australia Pty Ltd, August 2010
- Veolia Environmental Services Environment Assessment: Woodlawn Expansion Project Volume 2 – Appendices, URS Australia Pty Ltd, August 2010
- Waste Classification Guidelines Part 1: Classifying Waste, NSW Environment Protection Authority, November 2014;
- Environmental Guidelines: Solid Waste Landfills Second Edition, April 2016.
- Ramboll Environ (2016). Woodlawn Bioreactor and Crisps Creek Intermodal Facility Independent Environmental Audit 2016, Ramboll Environ. December 2016

APPENDICES

Appendix 1 – Site Location Plan

Appendix 2 – Monitoring Location Plan

Appendix 3 – Tables

Appendix 4 – Figures

Appendix 5 – Complaints Register

Appendix 6 – Figures in Reports