



Awaba Waste Management Facility

Annual Review 2020-2021

Lake Macquarie City Council

09 August 2021

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Annual Review Title Block	
Name of Operation	Awaba Waste Management Facility
Name of Operator	Lake Macquarie City Council
Development Consent/Project Approval #	10_0139
Name of Holder of Project Approval	Lake Macquarie City Council
Annual Review Commencement Date	11 August 2020
Annual Review Completion Date	30 June 2021
I, Paul Collins, certify that this audit report is a true and accurate record of the compliance status of Awaba Waste Management Facility for the period 11 August 2020 to 30 June 2021 and that I am authorised to make this statement on behalf of Lake Macquarie City Council.	
Name of authorised reporting officer	Paul Collins
Title of authorised reporting officer	Manager Waste Services
Signature of authorised reporting officer	<i>P. Collins</i>
Date	9 August 2021

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1. Statement of compliance

This section details compliance with the conditions of the project approval 10_0139 and any other licences and approvals as at the end of the reporting period (30 June 2021).

Table 1.1 identifies whether or not non-compliances occurred during the reporting period for each statutory approval. Where non-compliances are identified, further details are provided in Table 1.2. Non-compliances have been colour-coded in that table, in accordance with the risk level descriptions provided in Table 1.3.

Table 1.1 Statement of compliance

Approval	Were all conditions of the relevant approval(s) complied with during the reporting period?
Project Approval 10_0139	No
EPL 5873	No
Trade Waste Agreement (Consent no: 2014-1036/9)	Yes

Table 1.2 Non-compliances during the reporting period

Relevant approval	Ref.	Condition description	Compliance status	Comment	Where addressed in the Annual Review
Project Approval 10_0139	Sch 4 C28	By 21 January 2016 or at a date approved by the Director-General, the Proponent shall undertake a Noise Validation of activities at the Site. The Validation shall be performed in accordance with the <i>NSW Industrial Noise Policy</i> (EPA, 2000) or the relevant policy adopted by the EPA at the time of the Validation and submitted to both the Director-General and EPA.	Non-compliant-Low risk	Operational noise validation was not undertaken prior to 21 January 2016 as required. LMCC have committed to undertaking the operational noise validation before the end of the 2021 calendar year.	Section 6.4.2 and 10.1
Project Approval 10_0139	Sch 4 C57 C58	The Proponent shall prepare and implement a Landfill Closure and Rehabilitation Management Plan for the Site to the satisfaction of the Director-General. The plan shall be submitted to the Director-General for approval within 12 months upon commencement of this approval.	Non-compliant-Administrative non-compliance	A Landfill Closure and Rehabilitation Management Plan has not been submitted to the Director-General for approval within 12 months upon commencement of this approval. LMCC has written to the DPIE to request clarification on this condition.	Section 7
Project Approval 10_0139	Sch 4 C18	The Proponent shall: <ul style="list-style-type: none"> – ensure that leachate generated by the Project is minimised and appropriately contained collected and disposed of – design and operate the leachate management system to prevent leachate from escaping to surface water, groundwater or the surrounding subsoils 	Non-compliant-Low risk	In March 2021 leachate was discharged to surface waters following extreme rainfall. The EPA were notified of this discharge. No action was taken by the EPA.	Section 6.1.2 and 10.2.
EPL 5873	L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.			

Relevant approval	Ref.	Condition description	Compliance status	Comment	Where addressed in the Annual Review
EPL 5873	R1.1	The licensee must complete and supply to the EPA an Annual Return in the approved form comprising: 1. a Statement of Compliance, 2. a Monitoring and Complaints Summary, 3. a Statement of Compliance - Licence Conditions, 4. a Statement of Compliance - Load based Fee, 5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan, 6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and 7. a Statement of Compliance - Environmental Management Systems and Practices.	Non-compliant-Administrative non-compliance	Exceedances of suspended solids in surface water monitoring results were not reported in 2020 Annual Return. LMCC amended the 2020 Annual Return as requested by the EPA.	Section 10.2.
Project Approval 10_0139	Sch 4 C51	Prior to construction, the Proponent shall prepare a Biodiversity Offset Management Plan for Lot 463 DP 1138964 in consultation with OEH and to the satisfaction of the Director-General.	Non-compliant-Low risk	Monitoring of the Awaba Biodiversity Conservation Area has not been carried out in accordance with the approved Awaba Conservation Area Plan of Management. LMCC commits to undertake the monitoring as required during the next reporting period.	Section 6.7.2 and 10.4.
	Sch 4 C3	The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria.			
Project Approval 10_0139	Sch 4 C45	The Proponent shall prepare and implement a Cultural Heritage Management Plan (CHMP) to the satisfaction of the Director-General.	Non-compliant-Low risk	Monitoring of heritage sites has not been carried out in accordance with the CHMP. LMCC commits to undertake the monitoring as required during the next reporting period.	Section 6.8.2 and 10.5.

Table 1.3 Compliance status key for Table 1.2

Risk Level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> • Potential for serious environmental consequences, but is unlikely to occur; or • Potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> • Potential for moderate environmental consequences, but is unlikely to occur; or • Potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2. Introduction

2.1 Operations overview

Lake Macquarie City Council (LMCC) operates the Awaba Waste Management Facility (AWMF) located off Wilton Road, Awaba. The site is situated around 5 kilometres to the east of the village of Awaba and 20 kilometres southwest of Newcastle. The AWMF received NSW Environment Protection Authority (EPA) approval and commenced landfilling operations in circa 1986. The AWMF first accepted general putrescible and non-putrescible waste and was situated within unlined cells. The site operations expanded to incorporate all waste within the Lake Macquarie local government area (LGA) in line with the gradual closure of all other landfill sites operated by LMCC, culminating with the closure of the Redhead landfill in 1994.

In 2010, LMCC lodged a major project application under the now-repealed Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for expansion of the AWMF. This project approval (Project Approval 10_0139) (PA), was granted by the NSW Planning Assessment Commission (PAC) in May 2013, allowing for the excavation of two additional landfill cells and continued emplacement over the existing landfill area, extending the lifespan of the landfill site by an estimated 20 years.

A modification (Mod 1) to the PA was granted in 2014, which made amendments to the PA in regard to the proposed staging of cell construction and landfilling, as well as leachate and stormwater management infrastructure.

Construction of the expansion project was completed in 2020 and operation of the expanded AWMF under the PA commenced on 11 August 2020.

The AWMF operates in accordance with an approved Landfill Environmental Management Plan (LEMP), as required by Schedule 5, Condition 2 of the PA. The LEMP provides an overall framework for environmental management of the AWMF during operation.

The AWMF is licenced under Environment Protection Licence 5873 (EPL 5873) and currently accepts:

- General Waste
 - Putrescible and non-putrescible
- Special waste
 - asbestos, animals, quarantine waste and offensive waste
- Green waste
 - Processed at the adjacent Lake Macquarie Organics Resource Recovery Facility (ORRF) operated by a third party (Remondis) under a separate approval and Environment Protection Licence 20949 (EPL 20949)..

The AWMF has a 32.5 hectare (ha) site area and is located in a broad, deep, south-facing amphitheatre between two spurs of a north-westerly trending ridgeline. Prior to filling, the base of the amphitheatre contained a gully that drained towards the south. The surrounding land acts as a buffer zone and it contains approximately 10 ha of native bushland.

2.2 Awaba Waste Management Facility (AWMF) contacts

Table 2.1 AWMF Contacts

Position	Name	Contact
Manager Waste Services	Paul Collins	02 4921 0545
Group Coordinator Waste Operations	David Brake	02 4921 0094
Waste Site Coordinator	Steven Merrett	02 4921 0794
Environmental Officer	Bay Hornery	02 4921 0683

2.3 Purpose of this report

This Annual Review discusses the environmental performance of the AWMF, in relation to compliance with the conditions of the PA, and other relevant licences and approvals. It provides a summary of operational and environmental management activities undertaken at the AWMF during the reporting period (11 August 2020 to 30 June 2021) and provides a review against predicted impacts documented in the Additions to Awaba Waste Management Facility Environmental Assessment (EA) (Cardno, 2012). The Annual Review also covers community relations and addresses any rehabilitation undertaken during the reporting period.

The Annual Review has been prepared to satisfy the conditions of the PA (in particular Schedule 5, Condition 4). Key requirements of the approval are described in Table 2.2. A map illustrating the locality and project approval boundary is provided in Figure 2.1, while the site layout is shown in Figure 2.2.

Table 2.2 Annual Review requirements

Approval	Section Reference	Requirement	Reference in this report
Project Approval 10_0139	Schedule 5, Condition 4	Annual Review One year after the commencement of operations, and annually thereafter, the Proponent shall review the environmental performance of the Project to the satisfaction of the Director-General. The review shall:	Section 4
		a. describe the operations that were carried out in the past year;	
		b. analyse the monitoring results and complaints records of the Project over the past year, which includes a comparison of these results against the: <ul style="list-style-type: none"> • relevant statutory requirements, limits or performance measures/criteria; • monitoring results of previous years; and • relevant predictions in the EA; 	Section 6 and 8.2.
		c. Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;	Section 1 and 10
		d. Identify any trends in the monitoring data over the life of the Project; and	Section 6
		e. Describe what measures will be implemented over the next year to improve the environmental performance of the Project.	Section 6 and 11.

2.4 Scope and limitations

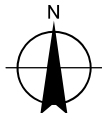
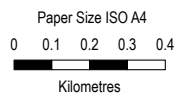
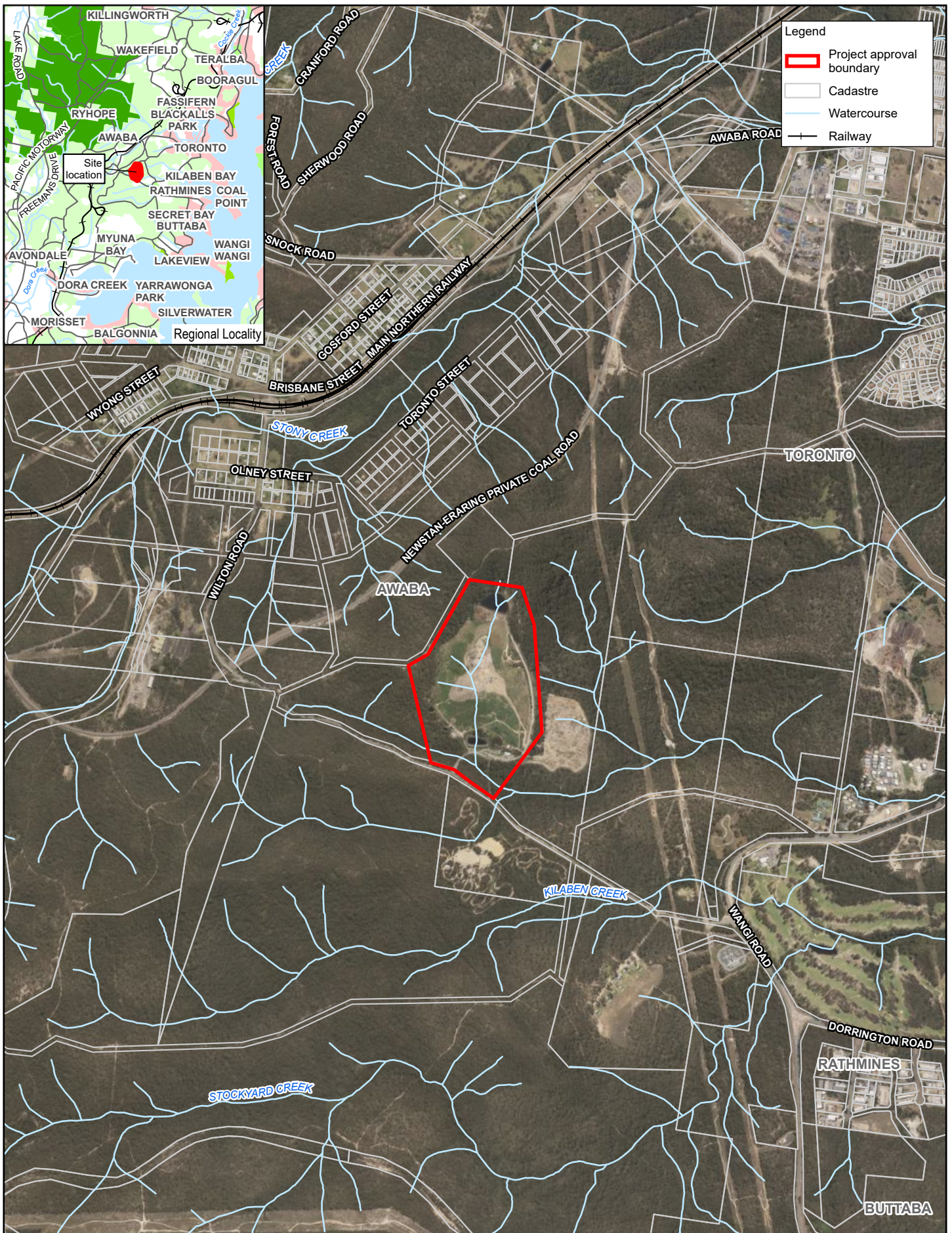
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The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.



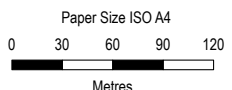
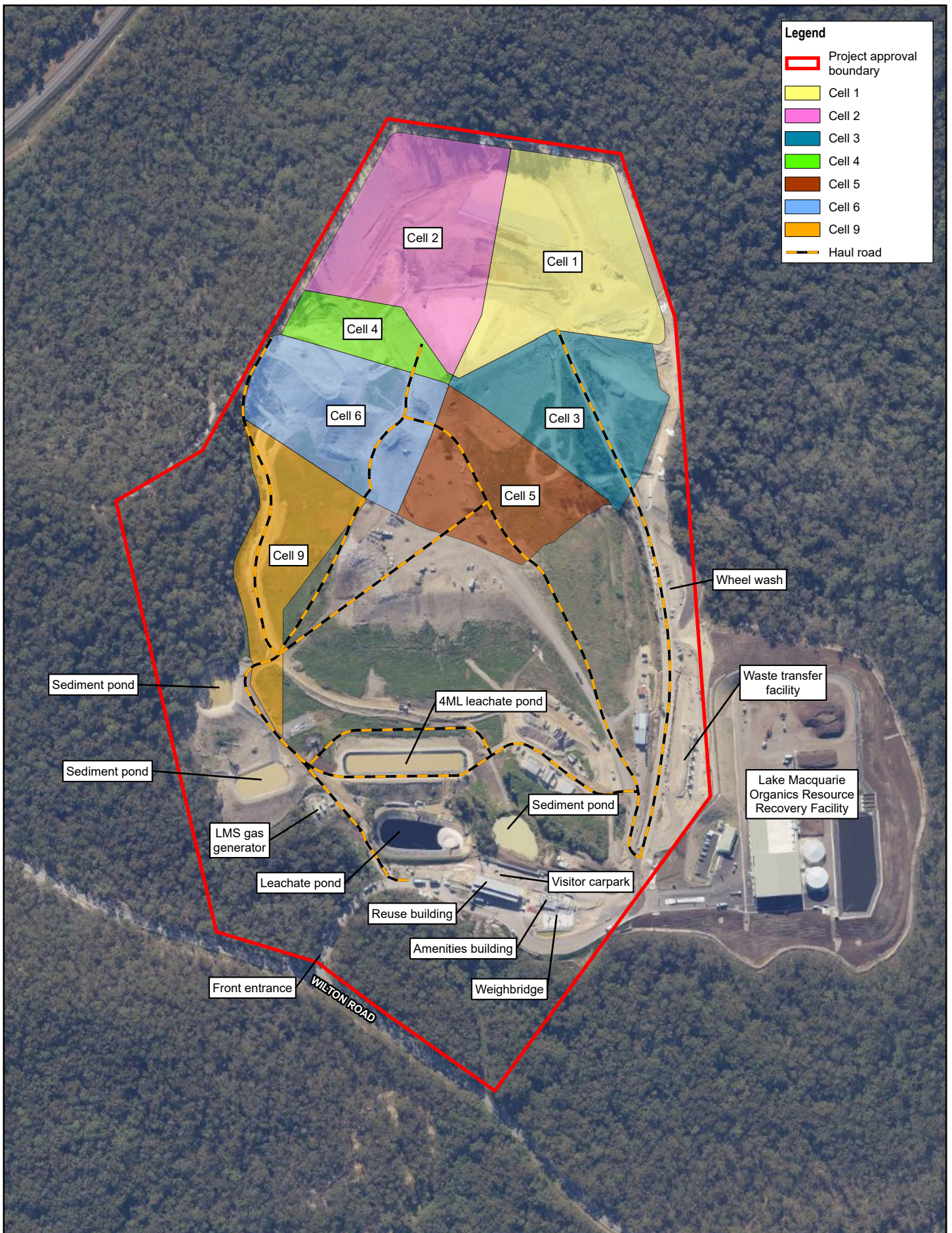
Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

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 Awaba Waste Management Facility
 Annual Review

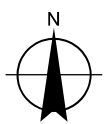
Project No. 12552705
 Revision No. 0
 Date 09/08/2021

Locality map

FIGURE 2-1



Paper Size ISO A4
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



Lake Macquarie City Council
 Awaba Waste Management Facility
 Annual Review

Project No. 12552705
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Site layout

FIGURE 2-2

3. Approvals and licences

3.1 Project Approval 10_0139

Project approval was granted on 8 May 2013 for the expansion of the AWMF.

A modification (Mod 1) to the PA was granted in 2014, which made amendments to the PA in regard to the proposed staging of cell construction and landfilling, as well as leachate and stormwater management infrastructure.

No changes or modifications to the PA occurred during the current reporting period.

3.2 Environment Protection Licence (EPL) 5873

LMCC operates the AWMF under EPL 5873, with an anniversary date of 13 October. The AWMF operated under EPL 5873 prior to commencement of operations of the expansion of the AWMF under the PA. Variations to EPL 5873 have been granted by the NSW Environment Protection Authority (EPA) to incorporate the expansion of the AWMF, which continues to operate under EPL 5873. Monitoring results are reported to the EPA in accordance with the EPL and are published on the LMCC website.

Activities to which the EPL applies are: Composting and waste disposal by application to land.

No variations to EPL 5873 occurred during the current reporting period.

3.3 Trade waste agreement

Prior to the expansion of the AWMF under the PA, a sewer connection was established to Hunter Water Corporation (HWC) reticulated sewage system as a due diligence action pending the PA. Discharge to the sewer is governed by the concentration limits imposed by HWC through the Trade Waste Agreement (TWA) (Consent no: 2014-1036/9) granted on 23 March 2018.

No amendments were made to the TWA during the reporting period.

4. Summary of operations

4.1 Operational activities

4.1.1 Waste handling and recovery

Acceptance of waste

The AWMF includes a landfilling operation, which is the main function of the site. The landfill is licensed to accept the following wastes for waste disposal by application to land:

- Asbestos waste
- General solid waste (non-putrescible)
- General solid waste (putrescible)

Waste arrives at the AWMF from a variety of sources, including LMCC collection vehicles, waste collection contractors, and waste self-hauled by businesses and residents. Upon entering the AWMF, the waste is classified and charged based on the type and quantity of the waste to be disposed.

A waste transfer station located to the east of the main internal site road allows members of the public to drop off their mixed residual waste for landfilling, as well as specific materials for recovery, such as green waste, timber, concrete, mattresses or metals.

Monitoring of waste is undertaken in accordance with the approved Waste Screening, Acceptance and Resource Monitoring Programme, which details the screening and acceptance procedures and the monitoring requirements for waste and resource recovery.

Special waste

The AWMF has additional acceptance requirements in relation to wastes classified by the AWMF as “special waste.” Waste is classified “special waste” if the site supervisor considers that the waste requires special handling by the operators at the tip face, and immediate covering to prevent possible environmental or occupational impacts (e.g. from dust or odour), or for confidential reasons.

These special wastes generally refer to asbestos, dead animals, sewage sludge, and confidential documents.

The procedure for acceptance of these special wastes is as follows:

- The site supervisor is notified of the type and quantity of special waste. A date and time is scheduled for the disposal of the special waste. The special waste must arrive onsite before 12.00 pm Monday to Friday.
- The special waste is brought to the facility and then screened and weighed.
- The special waste is then disposed of in a safe manner usually in a designated area away from the tip face and covered immediately after disposal.

Community Recycling Centre

The Community Recycling Centre (CRC) provides the community with a safe way to dispose of problem household waste, free of charge. Problem household waste is accepted and disposed of via the NSW EPA’s contractor (Cleanaway). These wastes include:

- Paint - oil and water based (in liquid form only)
- Gas cylinders
- Fire extinguishers
- Fluorescent light globes and tubes
- Household batteries
- Motor oils
- Other oils
- Smoke detectors

LMCC also receives the following waste items at the CRC:

- Co-mingled household recyclables
- Electronic waste
- Polystyrene
- Vehicle batteries

Vehicle batteries are collected by LMCC which are sold for scrap metal content (lead). Other items consisting of non-ferrous metals may be processed onsite (not as part of the CRC operations) to ensure maximum value is achieved for scrap, including removal of ferrous fasteners and sorting of metal categories.

Food and garden organics

A contractor-built and operated Organics Resource Recovery Facility (ORRF) for Food Organics and Garden Organics (FOGO) processing has been constructed on a site adjacent to the AWMF. Source separated FOGO waste entering the facility is directed to the organic waste processing facility. The ORRF is operated and maintained by a third party (Remondis) under a separate approval and EPL and does not form part of the expanded AWMF under the PA.

Quantities and types of waste received

The AWMF is approved to accept no more than 150,000 tonnes of waste per annum. This limit may be exceeded only in accordance with extraordinary conditions outlined in the site EPL. The quantities and types of waste received during the reporting period are provided in Table 4.1.

Table 4.1 Summary of waste received during the reporting period

Waste	Approved limit	Previous reporting period*	This reporting period (tonnes)
Municipal	Maximum of 150,000 tonnes in total of all waste types may be disposed per annum	NA	55,754
Construction and demolition		NA	12,549
Commercial and industrial		NA	2,266
Total		NA	70,569

* As this is the first Annual Review for the project, no previous reporting period applies.

Resource recovery

The effectiveness of resource recovery at the AWMF is monitored in accordance with the approved Waste Screening, Acceptance and Resource Monitoring Programme. The effectiveness of resource recovery measures are analysed through benchmarking against previous years' recovery rates and reported annually through LMCC's State of the Environment Report. The 2019-2020 State of the Environment Report was published during the reporting period and includes analysis of the effectiveness of resource recovery measures up to the end of the 2019-2020 financial year. Resource recovery data for the current reporting period will be published in the 2020-2021 State of the Environment Report during the next reporting period. The effectiveness of resource recovery measures at the AWMF up to the end of the 2019-2020 financial year is summarised in Table 4.2 and Figure 4.1. It can be seen that waste disposal to landfill per capita has generally reduced over time with a reduction of 50.89 percent in the 2019-2020 financial year compared with a baseline established in 2007-2008.

Table 4.2 Summary of waste diverted from landfill

	2007-2008	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Total waste received (t)	160,335	93,518	86,494	91,875	93,728	107,996
On-site use for operations (t)	32,040	5,338	3,110	5,337	3,924	4,831
Green waste and recyclables diverted from landfill (t)	10,105	27,742	26,643	23,696	39,758	40,451.5
Waste to Landfill (t) (excluding cover material)	118,190	84,557*	80,663*	85,740*	63,360*	62,245
ABS - revised resident population (ABS March 2019)		201,811	202,847	203,502	204,914	205,901
Waste to landfill generated per capita (kg)	615	419	398	421	309	302
Compared to 2007-2008 waste reduction baseline (615kg per capita)	baseline	↓31.87%	↓35.28%	↓31.60%	↓49.75%	↓50.89%

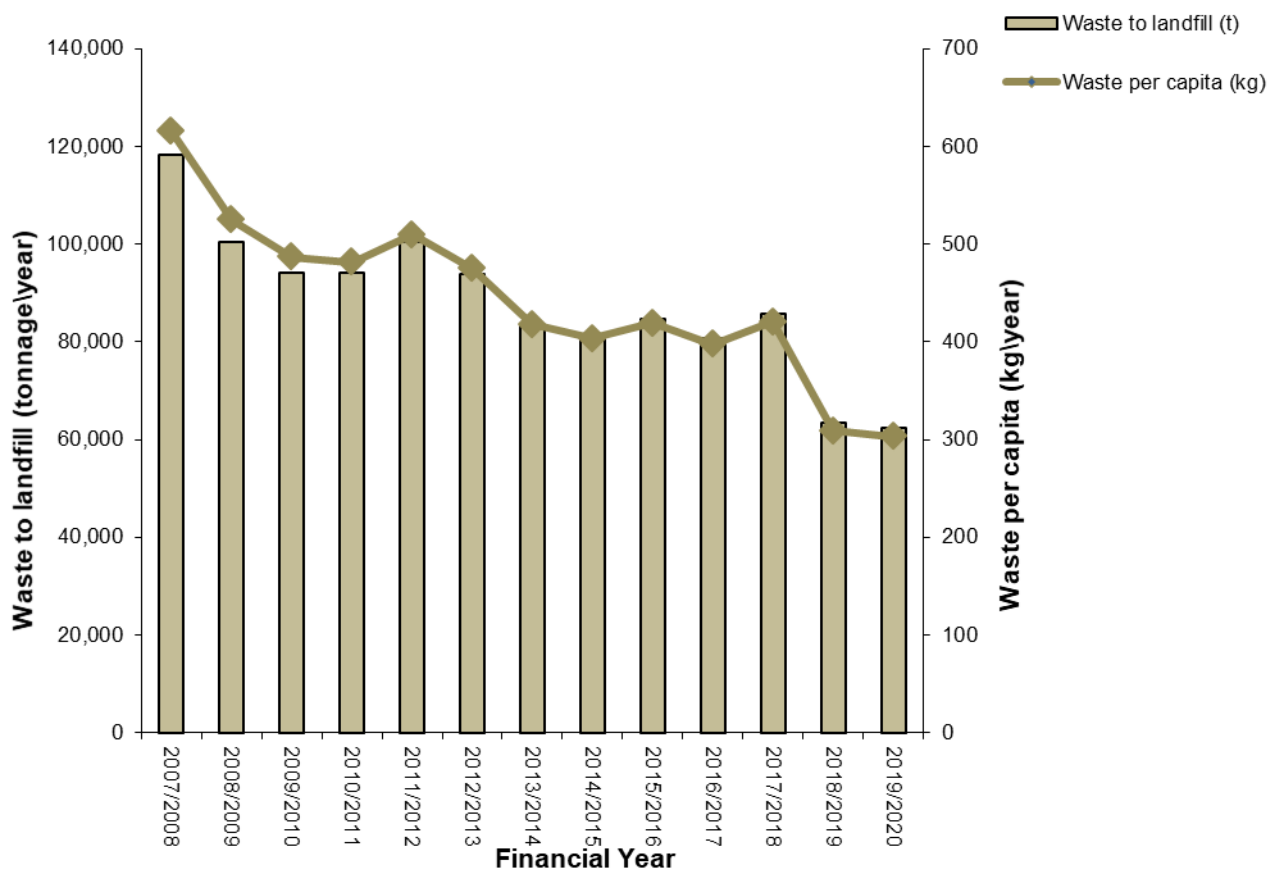


Figure 4.1 Summary of waste to landfill

4.1.2 Landfill operations

The landfill operations are undertaken in accordance with the Fill-Out Plan, which forms part of the LEMP.

Landfill operations are carried out in accordance with Schedule 4, Condition 7 of the PA and Conditions O6 and O7 of EPL 5873, which includes the following:

- Minimise the exposed or cleared areas at the landfill.
- Progressively revegetate all completed areas of the landfill and stabilise any exposed areas that are not required for operational purposes for a period greater than 90 days.
- Minimise the tracking of mud and waste from the site on public roads.
- Fill the landfill cells in a systematic manner as detailed in the Fill-Out Plan.
- Maximise landfill compaction rates ($\geq 0.75 \text{ t/m}^3$ required, goal of achieving 0.85 t/m^3).
- Cover the active landfill area at the end of daily waste disposal and compaction activities with either:
 - Minimum 150 millimetres (mm) of virgin excavated natural material (VENM) soil.
 - An EPA approved synthetic cover.
 - Biodegradable plastic sheeting.
- Progressively cap the landfill cells with a capping layer approved by the EPA.
- Revegetate the covered landfill cells following the capping of each cell once they reach their final design height.

All waste is compacted as it is tipped in the landfill. The working face is covered with alternative daily cover (spray cover) on a daily basis, as approved by the EPA.

Intermediate cover is used to provide a more effective barrier between refuse and the environment during extended periods of time. VENM soil is applied to a minimum depth of 250 mm (inclusive of any daily cover already in place) over all surfaces of the landfill that will be exposed for more than 90 days.

Intermediate cover includes a top layer of dredging materials which readily self-seeds providing vegetation protection from wind and water erosion.

Landfill cells are progressively capped during operations, and specifically when the level of waste reaches final heights within each landfill cell.

Final capping comprises five layers, including:

- Seal bearing surface
- Gas drainage layer
- Sealing layer
- Infiltration layer
- Revegetation layer

The cap is graded to a degree to facilitate appropriate stormwater flow off site (clean water) or to a sedimentation pond, reducing the potential for ponding onsite (dirty water).

The vegetation layer is maintained at all times to ensure the cap remains in a working condition and stormwater is draining from the affected area.

During the reporting period, landfill cell 1 (see Figure 2.2) was commissioned on 11 August 2020, which represented the commencement of operations under the PA. From 11 August to 31 December 2020, filling of cell 1 was undertaken concurrently with the existing landfilling area. From 31 December 2020 to 30 June 2021, landfill operations has exclusively comprised filling of cell 1.

4.1.3 Hours of operation

The AWMF operates within the following hours in accordance with Schedule 4, Condition 30 of the PA:

- Monday to Friday 8:00 am – 4:00 pm
- Weekend & Public Holidays 8:00 am – 4:00 pm
- Christmas Day Closed

4.1.4 Equipment

Sufficient and appropriate plant, equipment and machinery is used onsite and maintained to meet operational requirements. This includes equipment for:

- Dust suppression (i.e. water cart)
- Fire control and fire-fighting
- Waste inspection
- Waste handling
- Environmental monitoring
- The proper and efficient operation of the AWMF.

In accordance with Schedule 3, Condition 13 of the PA, LMCC ensure that all plant and equipment used for operation of the AWMF is:

- Maintained in a proper and efficient condition
- Operated in a proper and efficient manner

A list of key equipment used on site is provided in Table 4.3

Table 4.3 *Equipment at AWMF during the reporting period*

Description	Number on site
Traxcavators	2
Landfill Compactor	1
Alternate Daily Cover Vehicle / Water Cart	1
Steel Drum Roller	1
Flexi Drive Pumps	3
Diesel Pumps	3
2 Tonne Tipper	1
4 Wheel Drive dual cab utility	1
Avant 750 Loader	1
Hook Lift Trucks	2
Subaru Outback Wagon	1

4.1.5 Hazard and risk management

Chemicals, fuels and oils

All chemicals, fuels and oils used on site are stored in appropriately bunded areas in accordance with the requirements of all relevant Australia Standards, and the EPA's Storing and Handling Liquids: Environmental Protection – Participants Handbook.

Fire management

Fires are managed in accordance with the Fire Management Plan for the site, which includes measures to minimise the risk of fire onsite. Adequate firefighting capacity is maintained onsite to ensure that any fires are extinguished promptly.

LMCC record details of all fires at the site in accordance with Condition R4 of EPL 5873.

No fires were recorded onsite during the reporting period.

Incident and emergency response

Incidents and emergency response are managed in accordance with the Awaba Waste Pollution Incident and Emergency Response Plan, which forms Appendix F of the LEMP.

4.1.6 Construction activities

The construction activities undertaken during the reporting period was limited to the completion of construction of the waste transfer station roof, which commenced construction on 18 June 2020 and was completed 20 November 2020.

5. Actions required from previous annual review

As this is the first Annual Review for the AWMF, no actions were required from the previous Annual Review during the reporting period.

6. Environmental management and performance

Environmental management at the AWMF is undertaken in accordance with the site LEMP. This section details the implementation and effectiveness of the management measures identified in the LEMP and issue-specific-sub-plans.

The following issue-specific sub-plans are implemented under the over-arching LEMP:

- Soil, water and leachate management plan
- Greenhouse gas management plan
- Air quality and odour management plan
- Operational noise management plan
- Biodiversity management plan
- Biodiversity conservation area plan of management
- Cultural heritage management plan

The LEMP also includes measures for the control of:

- Pests, vermin and noxious weeds
- Litter

The following sections aim to provide:

- A comprehensive review of the monitoring results of the project over the past year, which includes a comparison of these results against the:
 - the relevant statutory requirements, limits or performance measures/criteria
 - the monitoring results of previous years
 - the relevant predictions in the EA
- Trends in the monitoring data over the life of the project.
- Discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies.
- Measures which will be implemented over the next year to improve the environmental performance of the project.

As this is the first Annual Review for the AWMF, future Annual Reviews will also compare monitoring results with results from the previous year and analyse trends in the monitoring data over the life of the project.

6.1 Soil, water and leachate

6.1.1 Environmental management

Soil, water and leachate management at AWMF is undertaken in accordance with the approved Soil, Water and Leachate Management Plan (SWLMP), which has been prepared in accordance with the PA.

The SWLMP acts as the overarching document governing water management at AWMF and includes the following subplans:

- Surface water management plan (SWMP), including an erosion and sediment control plan (ESCP)
- Leachate management plan (LMP)
- Surface water, groundwater and leachate monitoring program
- Surface water, groundwater and leachate response plan

Stormwater is managed at the AWMF in accordance with the SWMP. The key objectives of stormwater management at AWMF are to:

- Minimise erosion and sediment generation at the source.
- Maintain discharge levels to pre-development values.
- Divert runoff from disturbed areas through sediment basins prior to discharge offsite.

These objectives are achieved through the following approach:

- Minimise the volume of clean surface water running onto the site from off site.
- Minimise the extent of disturbed areas.
- Minimise surface water from running onto disturbed areas of the site by staging operations and, where necessary, utilising surface water diversion drains and bunds for disposal and processing areas.
- The perimeter of landfilled areas must be contoured to mitigate stormwater running onto these surfaces in all rainfall events less than or equal to the 1 in 10 year 24 hour duration event.
- Minimise erosion of disturbed areas by utilising at source control measures.
- Ensure all surface water runoff from disturbed areas of the site is managed prior to reuse or discharge offsite.
- Ensure all erosion and sediment controls are properly maintained by implementing an inspection and monitoring schedule.
- Separate 'clean' and 'dirty' water, where possible.
- Fast-track rehabilitation of capped areas to expedite diversion off-site.
- Install retarding features for discharge offsite to control peak flow discharge.
- Provide surface water drainage in the trafficked impervious areas.
- Provide staff education and adopting strategies for early identification of potential surface water issues.

Erosion and sediment control at AWMF is guided by the ESCP, and is consistent with the "Blue Book" - *Managing Urban Stormwater, Soils and Construction, Volume 1* (Landcom, 2004). The key objectives of erosion and sediment control at AWMF are to:

- Prevent soil erosion.
- Minimise generation of sediment laden water and prevent sediment laden water from discharge off site.
- Prevent surface water contamination by sediment.

These objectives are achieved through the following approach:

- Minimise stormwater (clean water) (volume and velocity) from running onto downstream works by appropriate staging of the work and, where necessary, utilising existing site or temporary stormwater diversion drains and bunds.
- Minimise erosion of disturbed areas by utilising erosion control measures, including:
 - Wheel wash
 - Water carts
 - Sediment fencing
- Maximise the potential for stormwater runoff from disturbed areas of the site to be treated to an acceptable standard prior to reuse or discharge offsite, by utilising the following sediment control measures:
 - Diversion drains and rock check dams
 - Sediment ponds
 - Outlet energy dissipaters/level spreaders
- Minimise the amount of stormwater runoff leaving the site by maximising reuse on-site.
- Manage all erosion and sediment controls so that they are properly maintained by implementing an inspection and monitoring schedule.
- Manage stockpiles so that they are appropriately constructed and managed to maximise reuse of topsoil
- Provide stormwater devices in trafficked areas.

Leachate at AWMF is managed in accordance with the LMP. The key objectives of leachate management at AWMF are to:

- Prevent groundwater pollution by leachate.
- Prevent surface water pollution by leachate.
- Prevent amenity impacts to nearby waterways.

These objectives are achieved through the following approach:

- Minimise leachate generation through the following strategies:
 - The size of the active face and subsequent daily cover footprint is minimised as far as practical to reduce the portion of rainfall able to infiltrate through cover into the waste.
 - Final capping is installed once areas have reached final levels to reduce the portion of rainfall able to infiltrate through cover into the waste.
 - Landfill development is efficiently staged to maximise the amount of final capped areas in comparison to the landfill footprint.
 - Designing and commissioning new cells is staged in a manner which maximises the separation of stormwater and leachate for as long as possible.
 - Establishing perimeter diversion drains with each new cell, and maintaining those around existing cells, to direct site stormwater around the landfill areas.
- Effectively contain and collect leachate through the following strategies:
 - All future landfill cells will include a leachate barrier system and associated leachate collection system.
 - Leachate will continue to be collected from the unlined areas and quarry cell as they are progressively capped.
- Dispose of leachate via
 - the sewer connection as per the Trade Waste Agreement with Hunter Water.
 - Tankering leachate to Hunter Water’s Edgeworth Wastewater Treatment Works under an agreement with Hunter Water
- Monitor leachate quantities and quality.

Surface water, groundwater and leachate monitoring program

LMCC undertakes a surface water, groundwater and leachate monitoring program to implement the ongoing monitoring of potential environmental impacts of the AWMF on surface and ground water quality. The monitoring program allows LMCC to comply with regulatory requirements for monitoring, including the monitoring requirements of EPL 5873, identify and address potential issues based on performance trends and respond to unforeseen environmental incidents.

The locations of monitoring points as specified in Clause P1 of EPL 5873 are summarised in Table 6.1 and shown on Figure 6.1. These include five groundwater quality monitoring points, two wet weather discharge and surface water quality monitoring points, two other surface water quality monitoring points and one leachate quality monitoring point.

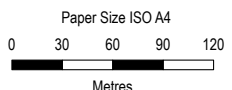
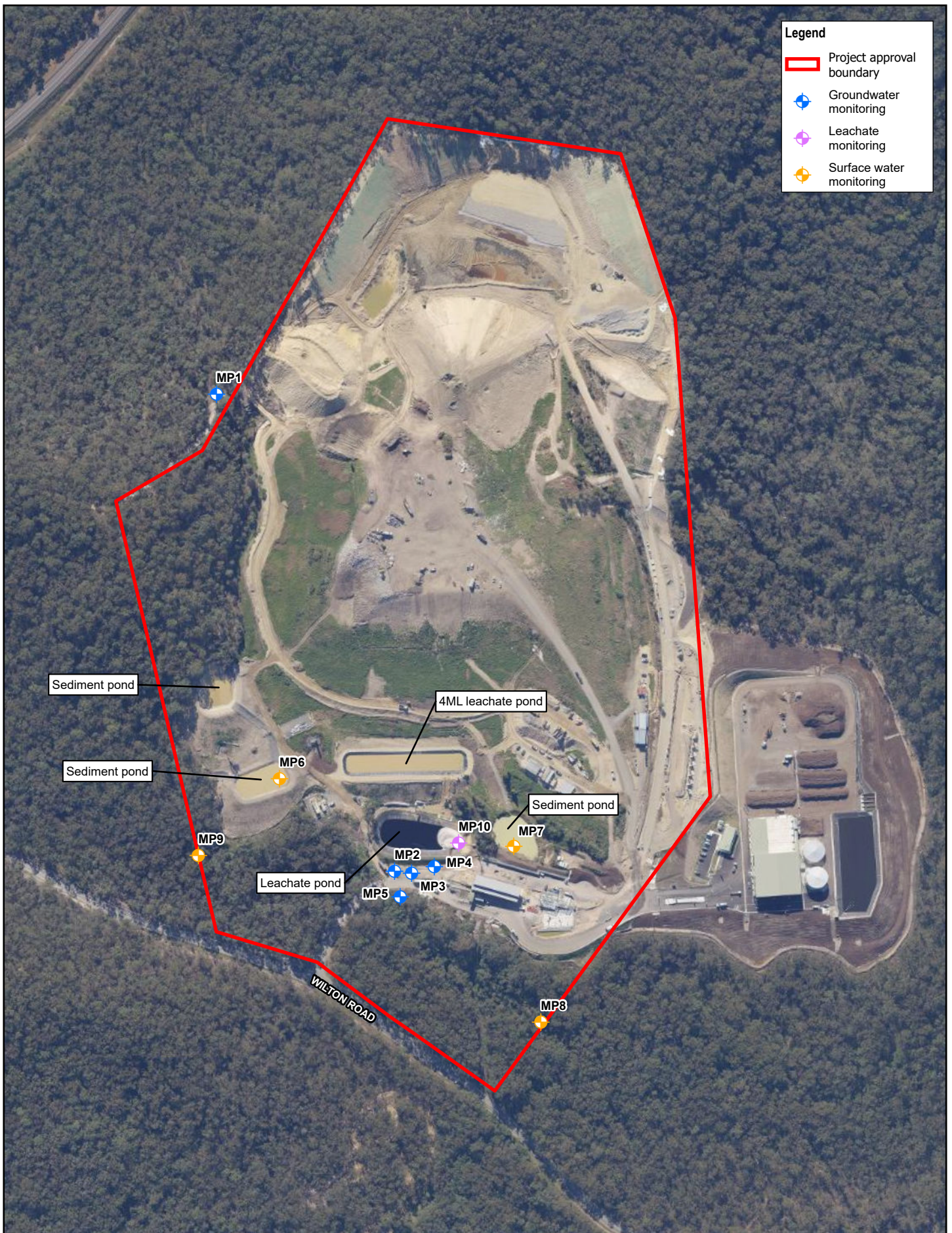
Table 6.1 Discharge and monitoring point locations

EPA identification number	Type of monitoring/discharge point
1	Groundwater quality monitoring upgradient of the site
2 to 5	Groundwater quality monitoring downgradient of the site
6 and 7	Wet weather discharge Surface water quality monitoring
8 and 9	Surface water quality monitoring
10	Leachate quality monitoring

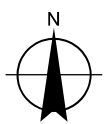
Groundwater, surface water and leachate samples are analysed for a broad chemical suite. Table 6.2 details the water quality indicator parameters tested for surface water, groundwater and leachate samples.

Table 6.2 Water quality testing parameters

Parameter	Monitoring point (MP)	Frequency
Alkalinity (as calcium carbonate)	All	Quarterly
Aluminium	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Ammonia	All	Quarterly
Arsenic	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Barium	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Benzene	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
BOD	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
	10	Quarterly
Cadmium	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Calcium	All	Quarterly
Chloride	All	Quarterly
Chlorinated volatile compounds	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Chromium (hexavalent)	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Chromium (total)	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Cobalt	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Conductivity	1, 2, 3, 4, 5, 6, 7, 8 and 9	Quarterly
Copper	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Ethyl benzene	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Fluoride	All	Quarterly
Iron	All	Quarterly
Lead	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Magnesium	All	Quarterly
Manganese	All	Quarterly
Mercury	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Nitrate	All	Quarterly
Organochlorine pesticides	All	Quarterly
Organophosphate pesticides	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
PCBs	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
pH	All	Quarterly
Phosphate	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Polycyclic aromatic hydrocarbons	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Potassium	All	Quarterly
Sodium	All	Quarterly
Sulfate	All	Quarterly
Toluene	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Total dissolved solids	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
Total organic carbon	All	Quarterly
Total petroleum hydrocarbons	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly
	10	Quarterly
Total Phenolics	All	Quarterly
Total Suspended Solids	6, 7, 8, 9 and 10	Quarterly
Zinc	1, 2, 3, 4, 5, 6, 7, 8 and 9	Yearly



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Lake Macquarie City Council
Awaba Waste Management Facility
Annual Review

Project No. 12552705
Revision No. 0
Date 09/08/2021

Monitoring point locations

FIGURE 6-1

Water quality criteria

EPL 5873 restricts the discharge of surface water from the site to 50 mg/L of total suspended solids. This concentration limit is only permitted to be exceeded at the discharge point of the two final sedimentation dams (MP6 and MP7) for the duration of the overflow “whenever a wet weather overflow is occurring due to stormwater events greater than or equal to a 90th percentile 5 day rainfall duration”.

No other criteria are specified in EPL 5873 or PA. All groundwater and surface water results are benchmarked against ANZECC Guidelines for Freshwater 95% protection level trigger values (assessment criteria) in accordance with the approved SWLMP.

Quality of leachate is required to be monitored under EPL 5873 (at MP10 as shown on Figure 6.1), although environmental discharges are not permitted. For this reason, there are no benchmark levels that must be considered under EPL 5873.

6.1.2 Environmental performance

Historic monitoring

Surface water, groundwater and leachate quality monitoring in accordance with EPL 5873 has been undertaken at the AWMF since 2000 prior to the operation of the expansion project. This monitoring program has been continued for the expansion project and includes monitoring locations established to assess impacts associated with the existing operation of the AWMF prior to the operation of the expansion project. As such the results of the monitoring program during the reporting period represent the cumulative impacts of operation of both the existing AWMF and the expansion project under the PA.

In July 2020 LMCC commenced a review of the monitoring program, with the aim of investigating elevated ammonia concentrations in groundwater downgradient of the existing AWMF site (GHD, 2020). The review included a statistical summary of monitoring data from April 2012 to April 2020 (see Appendix A). This summary provides an indication of the historical range of water quality parameters detected at the AWMF prior to the commencement of operations of the expansion project under the PA, and therefore associated with existing operations rather than the expansion project. This data has been included to provide a comparison between monitoring data for the reporting period with existing conditions at the AWMF prior to operations of the expansion project under the PA commencing and will be referred to in the following sections.

Monitoring during the reporting period

Three monitoring events occurred during the reporting period on the following dates:

- 12 October 2020 (MP6, MP7, MP8 and MP9 could not be sampled as the sites were dry).
- 20 January 2021 / 22 March 2021 (MP6 and MP7 were dry in January and were sampled in March).
- 30 June 2021.

Results of the monitoring program during the reporting period are provided in Appendix B, while time series graphs of quarterly monitored parameters with detections above the limit of reporting (LOR) are provided in Appendix C. As this is the first Annual Review for the expansion project under the PA, trends in annually monitored parameters were not able to be analysed given there is only a single data point for these parameters.

A review of the groundwater monitoring results found that:

- Groundwater at all monitoring locations was slightly acidic with pH ranging from 4.94 to 6.58 across all monitoring points. This is generally consistent with historical monitoring data prior to the expansion project.
- Electrical conductivity values detected during the reporting period were generally within the range of the historical monitoring data prior to the expansion project, ranging from 1100 to 1190 $\mu\text{S}/\text{cm}$ at MP1, 1200 to 1550 $\mu\text{S}/\text{cm}$ at MP2, 2700 to 3880 $\mu\text{S}/\text{cm}$ at MP3, 1970 to 2310 $\mu\text{S}/\text{cm}$ at MP4, and 5680 to 6620 $\mu\text{S}/\text{cm}$ at MP5.

- Concentrations of ammonia were above the assessment criteria (0.9 milligrams per litre (mg/L)) at MP3 (range: 38.3 to 55.0 mg/L) and MP4 (range: 6.74 to 10.2 mg/L) at all monitoring events during the reporting period, and at MP5 (4.48 mg/L) in October 2020. Ammonia concentrations were below the assessment criteria at MP1 and MP2 throughout the reporting period and at MP5 in January and June 2021. Historically, ammonia concentrations have been elevated at MP3 and to a lesser extent MP4, consistent with monitoring results in the reporting period.
 - Nitrate concentrations were above the assessment criteria (0.7 mg/L) at MP4 in January (2.34 mg/L) and June (1.72 mg/L) 2021. Nitrate concentrations were below the assessment criteria at all other locations throughout the reporting period. The elevated nitrate concentrations detected at MP4 during the reporting period are higher than historical monitoring results prior to the expansion project at this location.
 - Concentrations of metals were above the assessment criteria at several locations during the reporting period, including:
 - Zinc (assessment criteria: 0.008 mg/L) at MP1 (0.065 mg/L), MP2 (0.012 mg/L), MP4 (0.396 mg/L) and MP5 (0.021 mg/L).
 - Copper (assessment criteria: 0.0014 mg/L) at MP1 (0.04 mg/L) and MP2 (0.002 mg/L).
 - Lead (assessment criteria: 0.001 mg/L) at MP1 (0.004 mg/L).
 - Aluminium (assessment criteria: 0.01 mg/L) at MP2 (0.012 mg/L).
 - Chromium (assessment criteria: 0.001 mg/L) at MP3 (0.002 mg/L).
- Metal concentrations have been historically high at all monitoring points, including MP1, which is located upgradient from the site. This suggests a background source of elevated metal concentrations in local groundwater.
- Major ions were generally consistent with historical monitoring data prior to the expansion project with the following exceptions:
 - Calcium concentrations at MP4 in January 2021 (74 mg/L) and June 2021 (104 mg/L) were higher than the historic maximum (58 mg/L).
 - Bicarbonate and total alkalinity at MP4 in October 2020 (279 mg/L), January 2021 (298 mg/L) and June 2021 (412 mg/L) was higher than the historic maximum (177 mg/L).
 - Concentrations of total petroleum hydrocarbons (TPH) were below the LOR at all locations during the reporting period, with the exception of MP4, which recorded 1010 µg/L (C10-C36 total).
 - All other parameters were below the LOR during the reporting period.

A review of the surface water monitoring results found that:

- Surface water at MP6 and MP7 was slightly alkaline with pH ranging from 7.65 to 8.04 across both locations. Surface water at MP8 (6.03 to 6.19) and MP9 (5.84) was slightly acidic. This is generally consistent with historical monitoring data prior to the expansion project, with the exception of MP8, which was more acidic than the historical monitoring data at this location, which ranges from 7.12 to 7.24.
- Electrical conductivity values at MP7 (439 to 765 µS/cm) and MP9 (425 µS/cm) were generally within the range of the historical monitoring data prior to the expansion project during the reporting period. Electrical conductivity values at MP6 (382 to 510 µS/cm) and MP8 (198 to 238 µS/cm) were slightly lower than the range of the historical monitoring data prior to the expansion project at these locations during the reporting period.
- Concentrations of total suspended solids exceeded the concentration limit of 50 mg/L prescribed in EPL 5873 at MP6 (60 mg/L) and MP7 (224 mg/L) in March 2021. This exceedance occurred following a stormwater event greater than a 90th percentile rain event and is therefore permitted under Clause L2.5 of EPL 5873. This exceedance was reported to the EPA on 1 April 2021.
- Concentrations of ammonia were above the assessment criteria (0.9 mg/L) at MP6 in March 2021 (3.83 mg/L) and at MP7 in March 2021 (1.12 mg/L) and June 2021 (3.43 mg/L). Ammonia concentrations were below the assessment criteria at MP8 and MP9 throughout the reporting period. Historically, ammonia concentrations have been elevated at MP6 and MP7, consistent with monitoring results in the reporting period.

- Nitrate concentrations were above the assessment criteria (0.7 mg/L) at MP6 in March 2021 (0.75 mg/L), at MP7 in March (1.12 mg/L) and June (3.43 mg/L) 2021, and at MP8 in June 2021 (1.57 mg/L). Nitrate concentrations were below the assessment criteria at MP9 during the reporting period. Nitrate concentrations have historically been elevated at all surface water monitoring locations. The nitrate concentrations detected at MP6 and MP9 during the reporting period were lower than the historic range at these locations. The Nitrate concentrations detected at MP7 and MP8 during the reporting period were generally consistent with the historical monitoring results prior to the expansion project at these locations.
- Metals concentrations were not analysed at MP8 and MP9 during the reporting period. Concentrations of several metals were above the assessment criteria at MP6 and MP7 during the reporting period, including:
 - Zinc (assessment criteria: 0.008 mg/L) at MP6 (0.015 mg/L).
 - Copper (assessment criteria: 0.0014 mg/L) at MP6 (0.006 mg/L) and MP7 (0.004 mg/L).
 - Chromium (assessment criteria: 0.001 mg/L) at MP6 (0.002 mg/L) and MP7 (0.002 mg/L).
 Metal concentrations at MP6 and MP7 during the reporting period, were within the historic range at these locations.
- Major ions were generally consistent with historical monitoring data with the following exceptions:
 - Sodium concentrations were lower than the historical range at MP6 in March (33 mg/L) and June (37 mg/L) 2021, at MP7 in March 2021 (38 mg/L) and at MP8 in January (32 mg/L) and June (26 mg/L) 2021.
 - Potassium concentrations were lower than the historical range at MP6 in March (18 mg/L) and June (20 mg/L) 2021, and at MP8 in January (3 mg/L) and June (2 mg/L) 2021.
 - Magnesium concentrations were lower than the historical range at MP6 in March (14 mg/L) and June (10 mg/L) 2021, and at MP8 in January (5 mg/L) and June (4 mg/L) 2021.
 - Chloride concentrations were lower than the historical range at MP6 in March (29 mg/L) and June (39 mg/L) 2021, and at MP8 in January (57 mg/L) and June (42 mg/L) 2021.
 - Sulphate concentrations were lower than the historical range at MP7 in March 2021 (19 mg/L), at MP8 in March (less than LOR) and June (10 mg/L) 2021, and at MP9 in January 2021 (9 mg/L).
 - Bicarbonate and total alkalinity was lower than the historical range at MP6 in March (193 mg/L) and June (118 mg/L) 2021, and at MP8 in January (23 mg/L) and June (23 mg/L) 2021.
- All other parameters were below the LOR during the reporting period.

A review of the leachate (MP10) monitoring results found that:

- Leachate was slightly alkaline during the reporting period, with pH ranging from 8.28 to 8.42. This is generally consistent with historical monitoring data prior to the expansion project.
- Ammonia concentrations ranged from 767 mg/L to 1140 mg/L during the reporting period. This is within the range of historic monitoring data prior to the expansion project.
- Nitrate concentrations ranged from 0.2 mg/L to 11.5 mg/L during the reporting period. This is within the range of historic monitoring data prior to the expansion project.
- All major ions were within the range of the historic monitoring data prior to the expansion project during the reporting period.
- TPH (C10-C36 total) ranged from 1140 to 2650 µg/L. This is within the range of the historical monitoring data prior to the expansion project.
- BTEXN (benzene, toluene, ethylbenzene, xylenes and naphthalene) and organochlorine pesticides were below LOR throughout the reporting period.

Leachate discharge

In March 2021 the AWMF experienced extreme rainfall of over 300 mm in three days, and over 400 mm in 10 days. This resulted in an extreme increase in leachate generation, which exceeded the storage capacity of the leachate storage dams. To avoid overtopping of the lower leachate dam, which has no engineered spillway, a controlled discharge of low concentration leachate was carried out from 21 to 24 March 2021. Approximately 2.6 megalitres of leachate was discharged. The EPA were notified of this discharge on 30 March 2021. No action was taken by the EPA.

6.1.3 Improvement and initiatives

Prior to operation of the expanded AWMF commencing under the PA, LMCC had identified the potential risk of leachate contaminated groundwater migrating offsite and has been proactively investigating this risk with the aim of implementing an effective solution.

LMCC has undertaken investigative work (GHD, 2020) to determine the potential migration pathways for leachate from the site. Investigations aimed to identify potential options for improvements to the surface water and groundwater monitoring program and ultimately develop potential remediation options to address this issue. These potential monitoring improvements are currently being considered and will be implemented if considered necessary following more detailed investigations.

Monitoring has identified high ammonia concentrations in the western sediment ponds, indicating leachate seepage from the western slope of the landfill. LMCC constructed a sub-surface interception trench drain between the landfill and the sediment ponds. The trench drain intercepts sub-surface leachate flows and assists with dewatering of the landfill mass to reduce leachate levels. The trench drain provides a preferential pathway for leachate to move into instead of surcharging into surface water drainage and the sediment ponds. The effectiveness of this measure will be assessed through ongoing monitoring.

Historically, the AWMF disposed of leachate by spray irrigation over landfilled areas to facilitate evapotranspiration. Prior to the expansion of the AWMF, a sewer connection was constructed to allow for the discharge of leachate to sewer in accordance with a HWC Trade Waste Agreement as a due diligence action pending the PA. LMCC has continued to discharge leachate to sewer and tanker to HWC's Edgeworth Wastewater Treatment Works to avoid the need to irrigate leachate onsite.

During the reporting period, LMCC commenced construction of a bunded area for leachate truck transfers, to minimise the risk of any leachate spills entering the environment.

6.2 Greenhouse gases/landfill gas

6.2.1 Environmental management

Greenhouse gas (GHG) and landfill gas emissions are managed at the AWMF in accordance with the approved greenhouse gas management plan (GGMP). Greenhouse gas management at AWMF aims to:

- Reduce potential greenhouse gas emissions from the operation of the facility.
- Continue to progressively apply existing landfill gas management measures across the existing and future landfill areas.

Greenhouse gas emission estimates for the AWMF from the EA (Cardno, 2012) suggest that landfill methane emissions are likely to constitute >99% of total GHG emission from the AWMF between 2011 and 2100. Greenhouse gas management at the AWMF therefore focusses on the management of landfill gas. Landfill gas management measures at the AWMF include:

- Progressive installation and operation of a landfill gas collection and treatment system.
- Completion of a regular program for monitoring landfill gas.
- Daily and intermediate covering of the landfilled waste to minimise the rate of landfill gas generation and to minimise uncontrolled fugitive emissions to the atmosphere.
- Placement of only a limited quantity of waste below prevailing ground level to reduce the potential for lateral subsurface landfill gas emissions.
- All buildings on-site are designed and constructed so as to minimise the likelihood of landfill gas entering and accumulating within them.

Landfill gas generated at the AWMF is currently managed by an active landfill gas collection and treatment system that is designed, installed and operated by a specialist contractor, LMS Energy. Landfill gas is extracted from the waste mass using a fan (or blower), which directs the extracted gas to the treatment plant (flare or engine). Landfill gas treatment at the AWMF is predominately undertaken at the Awaba Renewable Energy Facility (REF) via combustion in a landfill gas fuelled reciprocating engine that drives a generator to create renewable electricity (which is ultimately exported to the electricity grid). During periods of engine downtime, or when otherwise required, landfill gas can be directed to a landfill gas flare located at the AWMF.

Greenhouse gas monitoring

Gas combustion at the Awaba Renewable Energy Facility (REF) and gas flare is reported under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) by LMS Energy.

Landfill gas monitoring

LMCC implements a landfill gas monitoring program in accordance with the requirements of EPL 5873, including:

- Monitoring of landfill gas across areas of the AWMF where intermediate or final cover materials have been placed.
- Monitoring of landfill gas inside all buildings / structures.

Surface landfill gas emissions are monitored monthly in accordance with the landfill gas monitoring program. Monitoring is undertaken in accordance with the techniques identified within Benchmark Technique 17 of the *NSW EPA Environmental Guidelines: Solid Waste Landfills (1996)* to measure methane gas concentrations. Samples of the atmosphere are taken 5 centimetres (cm) above the landfill surface in any areas with intermediate or final cover and any new cells where cover material has been applied to a depth exceeding 300 mm.

For landfill gas surface emissions monitoring, the threshold for corrective action is methane concentrations exceeding 500 parts per million (ppm) at any point on the landfill surface for intermediate and finally-capped areas.

Landfill gas accumulation monitoring is implemented to demonstrate that gas is not accumulating at dangerous levels in enclosed spaces on or near the landfill. The gas accumulation monitoring program consists of monthly methane monitoring in all buildings and other enclosed structures within 250 metres of the landfill. The threshold level for further investigation and corrective action is detection of methane at concentrations above 25 % of the lower explosive limit (LEL) or 12,500 ppm.

6.2.2 Environmental performance

Greenhouse gas monitoring

Landfill gas combustion monitoring results at the Awaba REF and gas flare during the reporting period year are provided in Table 6.3 and Figure 6.2. A total of 31,377 tonnes of carbon dioxide equivalent (CO_{2e}) methane was combusted at the Awaba REF during the reporting period, generating 5,347,738 kilowatt hours (KWH) of renewable energy. An additional 1,974 tonnes of CO_{2e} methane was combusted via the gas flare during the reporting period.

Table 6.3 Landfill gas combustion monitoring during the reporting period

Month	Volume of landfill gas flow (scm)			CO _{2e} (tonnes)		Exported KWH
	Flares	REF	Total	Flares	REF	
Aug	2,530	376,628	379,158	N/A	2,938	538,102
Sep	18,568	327,848	346,416	152	2,522	439,382
Oct	4,205	352,636	356,841	N/A	2,682	456,178
Nov	460	358,250	358,710	N/A	2,742	464,662
Dec	69,246	281,268	350,514	N/A	2,140	350,331
Jan	21,310	355,176	376,486	N/A	2,637	429,964
Feb	8,816	315,328	324,144	N/A	2,503	410,779

Month	Volume of landfill gas flow (scm)			CO ₂ e (tonnes)		Exported KWH
	Flares	REF	Total	Flares	REF	
Mar	11,100	360,986	372,086	114	3,611	600,639
Apr	107,546	353,418	460,964	1,089	3,380	575,002
May	62,547	301,593	364,140	619	2,849	492,518
Jun	845	361,397	362,242	N/A	3,373	590,181
TOTALS	307,173	3,744,528	4,051,701	1,974	31,377	5,347,738

Volume of Landfill Gas Flow - scm

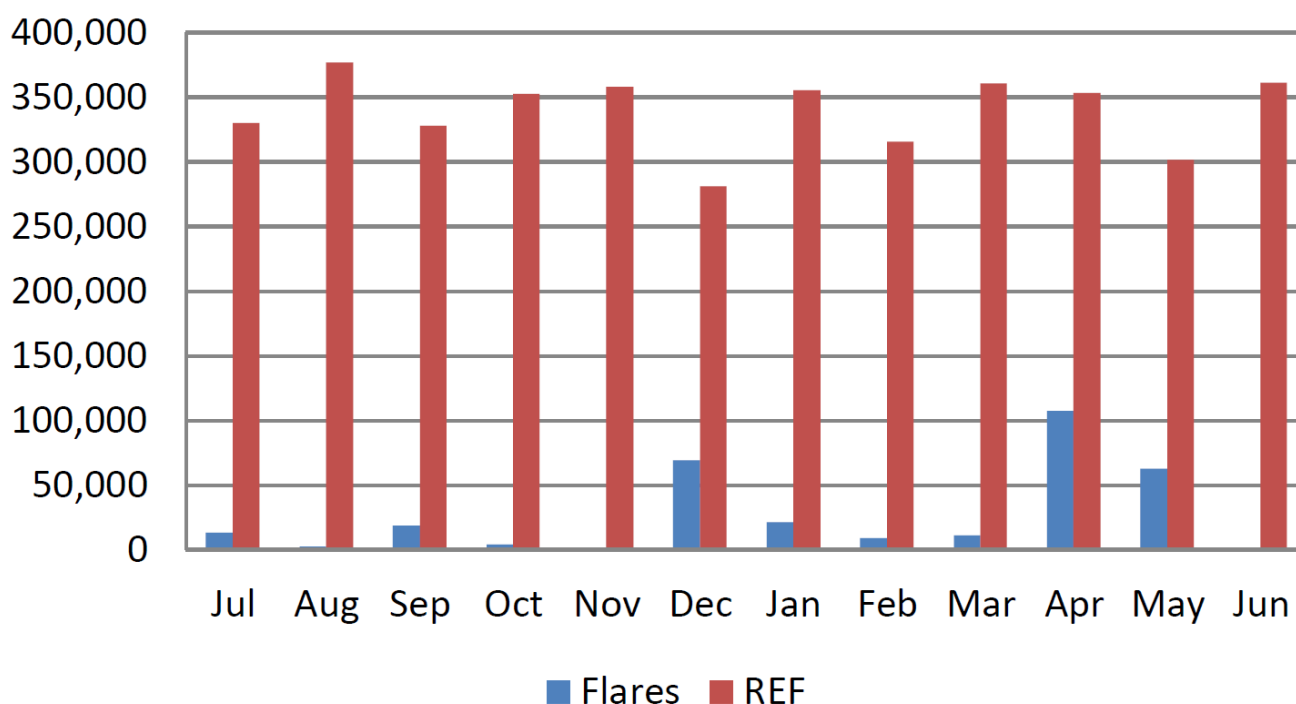


Figure 6.2 Volume of landfill gas flow during the reporting period

Landfill gas monitoring

Landfill gas surface emissions monitoring events for the reporting period were undertaken monthly in accordance with the GGMP. Results of landfill gas surface monitoring are placed on the LMCC website in accordance with EPL 5873. No reportable exceedances of the methane concentration threshold level (500 ppm) were recorded in the reporting period.

Where minor, unreportable detections of landfill gas are encountered, these are rectified through application and compaction of additional cover material.

Results for the monthly landfill gas accumulation monitoring are placed on the LMCC website in accordance with EPL 5873. Methane concentrations for all enclosed spaces within 250 metres of the landfill were negligible during the reporting period and therefore were below the prescribed detection threshold levels.

6.2.3 Improvement and initiatives

During the reporting period the landfill gas collection system was expanded to cover the completed final lift in the existing landfill working face. This area is now generating additional gas for combustion in the Awaba REF for renewable energy generation.

6.3 Air quality and odour

6.3.1 Environmental management

Air quality and odour management at the AWMF is undertaken in accordance with the approved Air Quality and Odour Management Plan (AQOMP). The objectives of the AQOMP are to:

- Prevent air pollution
- Prevent amenity impacts from odour and dust

These objectives are achieved through the implementation of a range of management measures aimed at reducing dust emissions, minimisation of combustion by-products and odour management.

Dust management strategies at the AWMF include:

- Designated vehicle routes to limit airborne dust generation.
- Wheel wash facility to prevent build-up of dust on sealed roads.
- Sealing of access roads and operational areas where practical.
- Regular sweeping of sealed roads.
- A water tanker is permanently located onsite to wet down unsealed roads and stockpiles as required.
- Soil stockpiles or intermediate landfill cover are managed to encourage grass cover to reduce the likelihood of wind erosion.

Combustion by-products at the AWMF include emissions from methane combustion for electricity generation or flaring and exhaust emissions from plant and equipment. Emissions from these sources are managed through the following strategies:

- Electricity generation and gas flaring plant and equipment is maintained to minimise undesirable combustion by-products.
- All plant and equipment used at the AWMF is maintained with pollution control equipment in good working order to manufacturer's specification.
- Any plant or equipment observed to be producing excessive exhaust emissions is taken off-line until necessary repairs or modifications are completed.

Potential odour sources at the AWMF include waste at the active landfill tip-face, and leachate storage treatment and irrigation. Odours from these sources are managed through the following strategies:

- Minimising the active area of the tip-face to that required to accommodate anticipated vehicles tipping at any one time.
- Daily cover is used to temporarily cap the active tip face when not in active use.
- Aeration of leachate storage ponds to prevent anaerobic conditions which can increase potential for odours.
- Any leachate that has been stored in anaerobic conditions is not used for irrigated on site.

The AQOMP also includes a number of pre-emptive and reactive based measures to reduce the impact of dust and odours during adverse meteorological conditions and other extraordinary events.

No quantitative air quality monitoring is required by the approved AQOMP.

Complaints relating to dust and odour are investigated and actioned in accordance with Awaba Waste Management Facility / Green Waste Processing Facility – Complaints Management Procedure.

6.3.2 Environmental performance

Potential air quality and odour impacts from the AWMF were assessed as part of the EA (PAE Holmes, 2012). The primary objective of the assessment was to assess the potential air quality and odour impacts from the expanded AWMF through:

- a quantitative assessment of the potential air quality and odour impacts of the project, including cumulative impacts.
- a demonstration that the ongoing operation of the AWMF is able to comply with the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act) and *Protection of the Environment Operations (Clean Air) Regulation 2010*.

The assessment found that the bushland buffer surrounding the AWMF provides significant protection of receivers from dust and odour impacts.

Modelling estimates that odour impact assessment criteria is not exceeded beyond 250 metres from the facility and dust deposition will be minor beyond 100 metres. No sensitive receivers were identified within these distances

The assessment determined that operational air quality and odour emissions are predicted to be well within acceptable criteria when current management practices are correctly applied.

The predicted odour ground level concentrations are below the most stringent air quality goals at all residential receivers.

Based on a worst case assessment of the onsite power generation plant, air pollutant levels (as indicated by nitrogen dioxide (NO₂) concentrations) due to the gas turbines and excess flaring of landfill gas are predicted to be 12.5 µg/m³ at the nearest residential receiver, which is well below the assessment criteria of 246 µg/m³. Similarly, concentrations of carbon monoxide (CO), volatile organic compounds (VOCs) and sulphur dioxide (SO₂) are predicted to be negligible.

The maximum predicted 24-hour PM₁₀ concentration at a residence is 7.1 µg/m³ which is well below the assessment criteria of 50 µg/m³. All annual average predictions are well below 1 µg/m³, which is well below the assessment criteria of 30 µg/m³. Dust deposition levels are predicted to be below 0.6 g/m²/month, which is well below the assessment criteria of 2 g/m²/month.

Dust levels during site operation are predicted to be low and controllable through good site environmental practice and commonly applied dust management measures as identified in Section 6.3.1.

LMCC receives all complaints relating to both the AWMF and the adjacent ORRF, which is operated by a third party (Remondis) and is subject to a separate approval and EPL. During the reporting period LMCC received 59 complaints relating to odour. All of these complaints were attributable to the ORRF.

No complaints relating to air quality or odour from the AWMF were received during the reporting period. The management measures identified in the AQOMP are considered to be effective and will continue to be employed during the next reporting period.

6.3.3 Improvement and initiatives

While not related to the performance of the expanded AWMF, LMCC provides operational assistance to Remondis to assist in managing the odour performance of the ORRF. This includes, receiving and investigating odour complaints, before forwarding to Remondis for action, and working cooperatively with Remondis and the EPA regarding odour complaint management and mitigation measures.

6.4 Operational Noise

6.4.1 Environmental management

Operational noise management at the AWMF is undertaken in accordance with the approved Operational Noise Management Plan (ONMP). The objective of the ONMP are to ensure that noise emissions from activities associated with the operation of the AWMF do not result in adverse impacts on neighbouring sensitive receivers by:

- Identifying legislative obligations and noise targets for environmental noise control.
- Identification of significant noise generating activities and surrounding sensitive noise receivers.
- Providing guidance on appropriate measures to reduced operational noise emissions.
- Providing a framework for noise complaint investigation and response.
- Identifying responsibilities for implementation of noise control measures.

Operational noise management measures identified in the ONMP and implemented at the AWMF include the following:

- Plant and equipment is selected for use on site with consideration to acoustic performance.
- Plant and equipment used on site has noise control devices fitted at all times.
- Plant and equipment used on site is maintained in good working order.
- Any equipment identified as being responsible for exceeding specified noise limits or resulting in a noise complaint is removed from service where maintenance and repair are required to prevent elevated noise emission.
- Truck drivers and plant operators are made aware of relevant noise minimisation practices including adherence to the site speed limit, minimising the use of engine brakes while descending the haul road, and observing operational time restrictions.
- Noisy activities outside typical operational practices that have potential to impact on nearby residences are only conducted for short durations and/or incorporate additional noise management practices such as additional muffling of equipment or installation of temporary noise barriers.
- Any significant construction works have a project specific Construction Noise Management Plan prepared prior to commencement.

Noise monitoring

Due to the appreciable buffer to the worst effected sensitive noise receiver regular acoustic measurements are not required as part of the ONMP to monitor the operational noise performance of the AWMF.

Performance is gauged by monitoring of complaint history and feedback from community engagement undertaken in line with the Community Education Program (see Section 8).

Any significant upward trend in noise complaints received by LMCC must initiate a review of noise management measures at the AWMF and update of ONMP as required.

Complaints regarding alleged noise from the AWMF are managed in line with LMCC's established customer service protocols and in line with LMCC's Customer Charter.

6.4.2 Environmental performance

The AWMF is bounded by a sizable bushland buffer however there are various commercial, industrial and residential land uses in the surrounding environment which are within the acoustic range of the facility.

Based on the nature of surrounding development, sensitive noise receivers identified in the ONMP that warrant consideration are limited to:

- Residential premises in Awaba township located approximately 800 metres to the north
- Toronto Adventist Primary School located approximately 1.3 kilometres to the east
- Leisure Life Caravan Village (manufactured homes estate) located approximately 1.3 kilometres to the east
- Toronto residential areas located approximately 1.7 kilometres to the northeast

The conditions of the PA specify that operational noise from the AWMF shall not exceed:

- a. an LA10(15 minute) noise emission criterion of 45dB(A) (7am to 6pm) Monday to Sunday;
- b. an LA10 (15 minute) noise emission criterion of 45 dB(A) during the evening (6pm to 10pm) Monday to Friday; and
- c. at all other times, an LA10 (15 minutes) noise emission criterion of 35dB(A), except as expressly provided by the EPL.

Operational noise of the expanded AWMF was assessed in the EA (Cardno, 2012). The assessment concluded that the operation of the expanded AWMF was not significantly different from the existing facility and would not result in any net increase in noise impact on surrounding receivers. Additional assessment of operational noise impacts was undertaken as part of the ONMP, to determine whether the noise limits set out in the PA would be achieved. The findings of this assessment are summarised below.

Routine noise generating activities at the AWMF include truck movements between the waste transfer station and the tip face, and heavy earth moving machinery and compaction of the active landfill cell.

Due to shielding of residential premises in Awaba by a ridgeline beyond the western boundary of the AWMF site, the most effected noise receivers are predicted to be the school and manufactured home estate located 1.3 kilometres to the east.

Predicted sound power levels from heavy machinery used at the AWMF are shown in Table 6.4. This accounts for the highest level of noise generating activity during typical operation of the AWMF.

Table 6.4 Predicted equipment noise levels dB(A)

Plant type	Model	Indicative Sound Power Level – SWL dB(A)	Predicted Noise Level at 1300 m dB(A) (School & Manufactured Home Estate)
Traxcavator	Liebherr LR634	110	40
Compactor	Tana E520	110	40
Truck	Isuzu FX2 240 350 (23T GVM)	107	37
Combined level*			44

**assuming simultaneous operation of 1 compactor, 1 truck, and 1 traxcavator.

The predicted noise levels are derived from linear distance attenuation predictions, which do not account for various other losses including ground loss, vegetation and shielding topography that would reduce received noise levels further. Accordingly, the actual maximum noise levels at the nearest sensitive receivers are predicted to be significantly lower than shown in Table 6.4.

Additionally, the predicted levels represent maximum predicted noise levels, being more stringent than the regulatory noise targets which are based on an L_{10 (15 min)} statistical calculation (noise level exceeded 10% of the time).

The predicted noise levels indicate that noise targets set out in the PA conditions for the AWMF will be achieved.

No complaints relating to operational noise were received during the reporting period. The management measures identified in the ONMP are considered to be effective and will continue to be employed during the next reporting period.

Operational noise validation

Schedule 4, Condition 28 of the PA requires LMCC to undertake operational noise validation prior to 21 January 2016. Operation of the expanded AWMF under the PA commenced on 11 August 2020. On 9 June 2021, LMCC informed DPIE of failure to undertake the operational noise validation as required by the PA. In response, the DPIE has required LMCC to undertake the operational noise validation prior to the end of the 2021 calendar year. The results of the operational noise validation will be reported in the next reporting period.

6.5 Litter control

6.5.1 Environmental management

Litter control at the AWMF is undertaken in accordance with the approved LEMP and aims to:

- Prevent spread of litter off site to the environment.
- Prevent amenity impacts from litter.
- Maintain site visual appeal.

Measures to control litter onsite include:

- Cover and compact waste daily.
- Litter fences around part of the perimeter of the active landfill area.
- Signs to advise drivers of their responsibility to ensure material does not fall from their vehicles and litter public roads.
- Daily inspection and clearance (as resources permit) of the site (and if necessary, surrounding area) of litter resulting from the landfilling operations.

6.5.2 Environmental performance

During the reporting period, litter control performance was monitored daily through visual inspections and resources allocated to manual litter patrols on an as needs basis.

No litter related incidents at AWMF were recorded during the reporting period. Current management controls are considered to be appropriate.

6.6 Pest, vermin and weeds

6.6.1 Environmental management

Pest, vermin and noxious weed management at the AWMF is undertaken in accordance with the approved LEMP and aims to:

- Minimise the sources of food and habitat for pests and vermin.
- Use professional pest exterminators/controllers if an outbreak is detected.
- Prevent spread of weeds off site to the surrounding areas.

Measures to control pests, vermin and noxious weed onsite include:

- Cover and compact waste daily.
- Inspect the site on a regular basis to ensure that these measures are working effectively, and that pests, vermin or noxious weeds are not present on site in sufficient numbers to pose an environmental hazard, or cause the loss of amenity in the surrounding area.
- Signs to advise drivers of their responsibility to ensure material does not fall from their vehicles and litter public roads.
- Control weeds by the use of chemical herbicides and pesticides on an as needs basis (determined by the LMCC Vegetation and Pest Management Coordinator).

6.6.2 Environmental performance

Pests, vermin and noxious weed control performance was monitored periodically through visual inspections during the reporting period and resources allocated to manage on an as needs basis.

No pest, vermin and noxious weed related incidents at AWMF were recorded during the reporting period. Current management controls are considered to be appropriate.

6.7 Biodiversity

6.7.1 Environmental management

Biodiversity impacts at the AWMF are managed in accordance with the approved Biodiversity Management Plan (BMP). The BMP includes measures to manage biodiversity impacts during both construction and operation of the expanded AWMF.

The BMP identifies specific plans and protocols required to manage flora and fauna impacts, in accordance with the conditions of the PA. Including incorporation of a vegetation and fauna management plan and a translocation plan.

The vegetation and fauna management plan and translocation plan apply for the operational life of the expanded AWMF, whereas the protocols relating to the construction stage only cease to have effect following the completion of construction.

LMCC has implemented a Biodiversity Offset Strategy (BOS) as detailed in Schedule 4, Condition 50 of the PA. In implementing the BOS, LMCC has established the Awaba Biodiversity Conservation Area to adequately compensate the project's impacts on biodiversity, ensuring compliance with the PA offset requirements. The Awaba Biodiversity Conservation Area also provides biodiversity offsets for two other LMCC development projects, the Lake Macquarie Transport Interchange (LMTI) and the Awaba Alternative Waste Treatment facility (now the ORRF, see Section 4.1.1). The Awaba Biodiversity Conservation Area and allocation of offset for the expanded AWMF is shown in Figure 6.3.

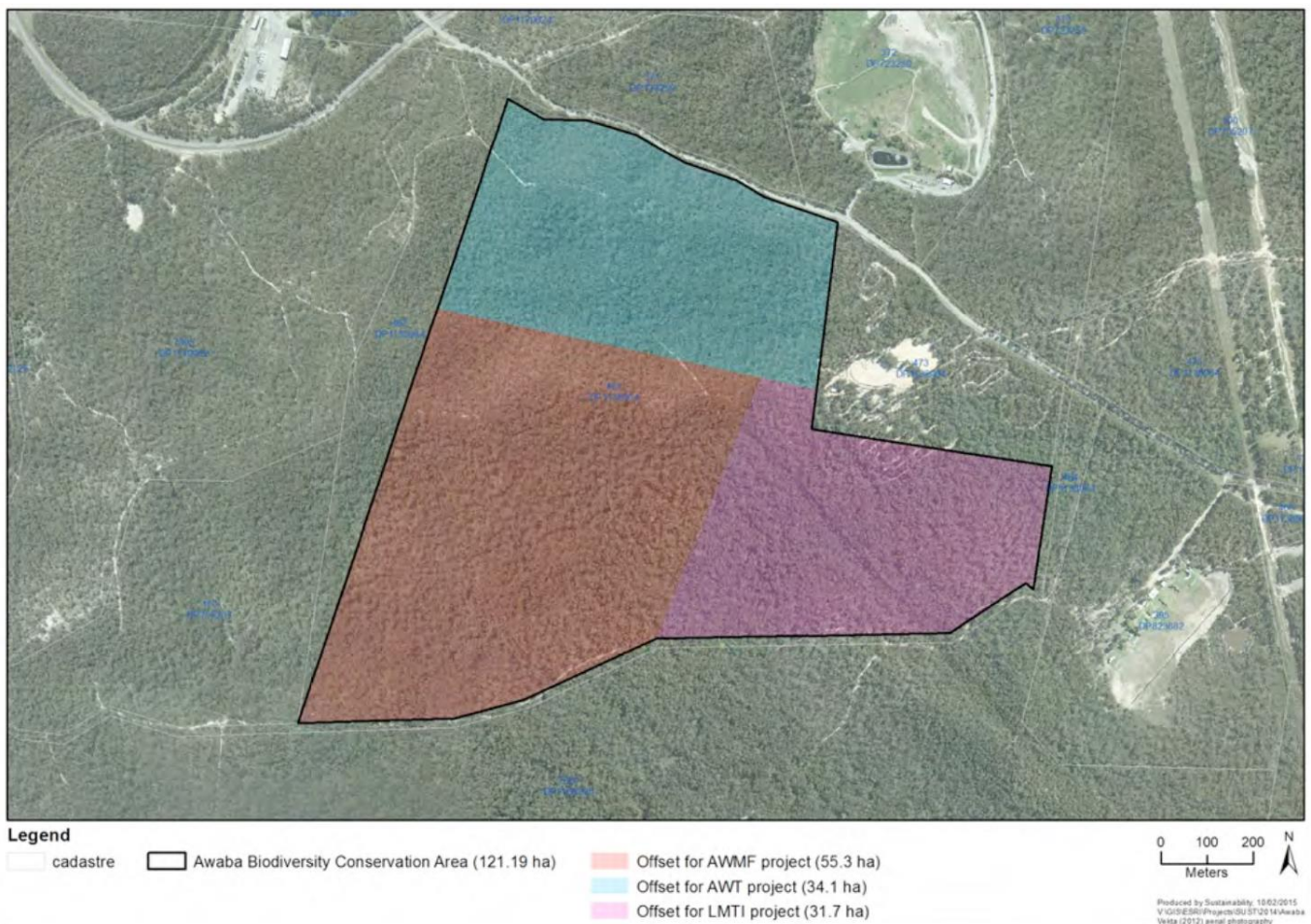


Figure 6.3 Awaba Biodiversity Conservation Area (source: Awaba Biodiversity Conservation Area Plan of Management, 2015)

The Awaba Biodiversity Conservation Area Plan of Management (ABCAPoM) was prepared in accordance with Schedule 4, Condition 51 of the PA. The ABCAPoM outlines how the land will be managed to protect and maintain its biodiversity offset values. Key roles of the plan are:

- To record the biodiversity offset strategy and to document biodiversity values of the land.
- To provide a framework for ongoing management of the land, by outlining key issues, objectives, management areas, actions and a budget.
- To identify requirements for monitoring and evaluation.
- To identify a process of stakeholder consultation in managing the land and revising the plan as required.

The ABCAPoM includes guidelines for the management of the land in relation to the following issues:

- Weed management.
- Maintaining biodiversity and threatened species.
- Access and track management.
- Bush fire management.
- Feral animal management.
- Governance, monitoring and reporting.

The ABCAPoM includes a flora and fauna survey and monitoring program, which is required to be reported on annually to evaluate the effectiveness of management measures at maintaining the biodiversity value of the land.

6.7.2 Environmental performance

No impacts to biodiversity outside of those predicted in the EA have occurred during the reporting period. No clearing of vegetation was undertaken onsite during the reporting period. The management strategies specified by the BMP and implemented across the site are considered adequate to address potential biodiversity impacts within the project approval boundary and will continue to be implemented during the next reporting period.

No monitoring of the Awaba Biodiversity Conservation Area was recorded during the reporting period. LMCC is currently investigating the status of this monitoring and will implement the monitoring program in accordance with the ABCAPoM during the next reporting period.

6.8 Heritage

6.8.1 Environmental management

Cultural heritage management at AWMF is undertaken in accordance with the approved Cultural Heritage Management Plan (CHMP), which has been prepared in accordance with the PA.

The objective of the CHMP is to provide guiding policies and principles for the management of Aboriginal heritage and cultural values and historic heritage, within the AWMF site. The CHMP provides the framework for the protection of cultural values throughout construction and operation of the expanded AWMF under the PA.

The CHMP includes a range of management measures to protect cultural heritage values during both construction and operation of the expanded AWMF, including:

- Incident and complaint management.
- Site inductions.
- Procedures for discovery of previously unknown heritage objects.
- Procedures for discovery of potential human remains.
- Protection of cultural heritage sites.
- Repatriation of salvaged sites.
- Procedures for any works within the biodiversity offset area.

Prior to construction commencing, an Aboriginal archaeological salvage program was undertaken in accordance with the approved CHMP. The salvage program included repatriation of one salvaged culturally modified tree (45-7-0332) and other artefacts uncovered during the salvage program. Additionally, one culturally modified tree (45-7-0331) was retained and protected onsite.

The CHMP requires ongoing monitoring of any repatriation location site protection measures to be undertaken by LMCC on an annual basis to ensure that any necessary repairs to fencing work is undertaken in a timely manner.

The CHMP also requires ongoing monitoring of 45-7-0331, including periodic inspection by an arborist to assess the health of the tree.

6.8.2 Environmental performance

No consultation or salvage activities were undertaken during the reporting period, as no excavation or land clearing has occurred in previously undisturbed areas. Additionally, no areas have been disturbed outside of the approved project boundary and there have therefore been no impacts to cultural heritage during the reporting period.

Visual inspections by AWMF staff, indicate that the culturally modified tree (45-7-0331) appears to be in good health. No arborist inspections were undertaken during the reporting period. The culturally modified tree (45-7-0331) will be assessed by an arborist during the next reporting period.

Inspection of the repatriation site for the culturally modified tree (45-7-0332) was not undertaken during the reporting period. The site will be inspected during the next reporting period.

7. Rehabilitation

Schedule 4, Conditions 57 and 58 of the PA require LMCC to prepare a Landfill Closure and Rehabilitation Management Plan for the expanded AWMF within 12 months of the commencement of the PA.

LMCC has written to the DPIE on 8 July 2021 to request clarification on this condition, given that the operational life of the AWMF is expected to be in the order of 30 years and the rehabilitation activities would not commence until closer to this time. Due to anticipated changes in legislation, technology and community expectation, any rehabilitation and closure management plan developed at this time would likely be subject to significant variation and redundancy in contrast to any plan developed closer to the end of the site's operational life.

No rehabilitation activities were undertaken during the reporting period. LMCC will report on the status of compliance with these conditions of the PA in the next reporting period, following receipt of DPIE's response.

8. Community

8.1 Engagement activities or initiatives

LMCC prepared a Community Education Program in accordance with the Schedule 5, Condition 11 of the PA. The Community Education Program guided engagement activities to encourage use of the CRC and to promote resource recovery.

Community engagement activities during the reporting period included the following:

- LMCC carried out a customer insight waste project from September 2020 to February 2021, which focused on gaining insight into the customers' experience and behaviours when visiting the AWMF. This survey also captured peak times, demographics of visitors, resident use of the AWMF apportioned to different areas of the LGA and reasons for using the site. The results of the project will guide operational improvements at the AWMF, which will assist in optimising resource recovery efforts.
- LMCC also commissioned a self-haul audit undertaken in May 2021 to analyse the composition of self-haul waste received at the AWMF. The resulting composition analysis will assist with resource recovery initiatives in the next reporting period.

Due to COVID restrictions, LMCC were unable to undertake compost giveaways, which have proven to be an effective community engagement initiative in the past.

8.2 Complaints

Complaints handling and management at the AWMF is undertaken in accordance with the approved Complaints Handling and Investigation Procedure, which forms part of the LEMP.

The purpose of the procedure is to manage complaints received by LMCC regarding the environmental performance of both the AWMF and the ORRF, which is operated by the third party contractor, Remondis under a separate approval and EPL.

Both LMCC and Remondis have obligations under their respective EPL's to record, investigate and report pollution incidents and complaints at the time they are identified.

Generally, the public assume both facilities are operated by LMCC, and will forward inquiries to LMCC regarding the operations of both facilities. It is therefore important that initially the inquiry is assessed and assigned to the correct organisation, in a timely manner, to record, investigate, report and respond to such inquiries.

Following receipt of a complaint an initial investigation is undertaken to determine the source of the complaint and to assign the complaint to either the AWMF, the ORRF or another relevant entity within LMCC.

Further investigation is then undertaken to:

- determine the cause of the incident.
- Implement controls to manage the incident.
- Implement controls to reduce the risk of it occurring again.
- Consult with relevant LMCC staff.

The complainant is then updated regarding the outcome of the investigation.

During the reporting period, LMCC received 59 complaints relating to odour. All of these complaints were attributable to the ORRF and not related to operation of the expanded AWMF.

LMCC received 11 complaints attributable to the AWMF during the reporting period (see Table 8.1). All of these complaints were related to the level of service provided by the AWMF. No complaints related to the environmental performance of the AWMF were received during the reporting period.

Table 8.1 Summary of complaints received during the reporting period

Nature of complaint	Description	Date
Cost of service or value of rates	Feedback on bulk waste collections and the costs at AWMF.	August 2020
Council decision	Complaint that bins at the CRC are too high.	December 2020
Level of service	Complaint regarding waiting times at the AWMF.	December 2020
Level of service	Complaint about general amenity at the AWMF.	January 2021
Level of service	Complaint regarding level of service at the AWMF.	January 2021
Level of service	Complaint regarding level of service at the AWMF.	February 2021
Cost of service or value of rates	Complaint regarding costs at the AWMF	February 2021
Council decision	Complaint regarding layout of the AWMF.	March 2021
Cost of service or value of rates	Complaint regarding lack of signage of fees at the AWMF.	March 2021
Council decision	Complaint regarding operations at the AWMF	March 2021
Council decision	Complaint regarding bulk waste restrictions and fees at the AWMF	June 2021

9. Independent audits

No Independent audits were undertaken during the reporting period. The first independent environmental audit for the expanded AWMF will be undertaken during the next reporting period.

10. Incidents and non-compliances

As identified in Table 1.2 of the Statement of Compliance, low risk non-compliances occurred during the reporting period. The incidents and non-compliances that occurred for each environmental aspect are detailed in the following sub-sections.

No penalty infringement notices were received during the reporting period.

10.1 Operational noise

On 9 June 2021, LMCC self-reported a non-compliance with Schedule 4 Condition 28 of the PA 10_0139 for failing to undertake the Operational Noise Validation (ONV) prior to 21 January 2016 as required. DPIE issued a Record of Breach on 27 July 2021, notifying LMCC that they had committed an offence against section 4.2 of the *Environmental Planning and Assessment Act 1979* by carrying out development not in accordance with the conditions of development consent. LMCC have committed to undertaking the ONV in accordance with Schedule 4 Condition 28 of the project approval before the end of the 2021 calendar year.

10.2 Soil, water and leachate

In March 2021 the AWMF experienced extreme rainfall of over 300 mm in three days, and over 400 mm in 10 days. This resulted in extreme increase in leachate generation, which exceeded the storage capacity of the leachate storage dams. To avoid overtopping of the lower leachate dam, which has no engineered spillway, a controlled discharge of low concentration leachate was carried out on from 21 to 24 March 2021. Approximately 2.6 megalitres of leachate was discharged. The EPA were immediately notified of this discharge by phone, and in writing on 30 March 2021 in accordance with R2.1, R2.3, R2.4 and R2.5 of EPL 5873. No action was taken by the EPA.

On 5 March 2021, the EPA notified LMCC to amend the 2020 Annual Return to include exceedances of the suspended solids concentration limits at MP6 and MP7 in April and July of 2020. LMCC believed the exceedances to be permitted under condition L2.5, due to a wet weather overflow event equal to a 90th percentile five day rainfall duration. Upon further investigation, it was determined that a 90th percentile five day rainfall event had not occurred. LMCC amended the 2020 Annual Return accordingly.

Throughout the reporting period, LMCC notified the EPA of exceedances of water quality monitoring criteria in accordance with condition R2 of EPL 5873 on 26 August 2020, 3 November 2020, 20 January 2021 and 1 April 2021. Details of exceedances are provided and Section 6.1.2.

LMCC are currently investigating and implementing a number of initiatives to improve water and leachate management performance onsite. These are detailed in Section 6.1.3.

10.3 Rehabilitation

Refer to Section 7.

10.4 Biodiversity

The ABCAPoM includes a flora and fauna survey and monitoring program, which is required to be reported on annually to evaluate the effectiveness of management measures at maintaining the biodiversity value of the land.

No monitoring of the Awaba Biodiversity Conservation Area, as required by the ABCAPoM, was recorded during the reporting period. LMCC is currently investigating the status of this monitoring and will implement the monitoring program in accordance with the ABCAPoM during the next reporting period.

10.5 Heritage

The CHMP requires ongoing monitoring of any repatriation location site protection measures to be undertaken by LMCC on an annual basis to ensure that any necessary repairs to fencing work is undertaken in a timely manner.

The CHMP also requires ongoing monitoring of 45-7-0331, including periodic inspection by an arborist to assess the health of the tree.

Visual inspections by AWMF staff, indicate that the culturally modified tree (45-7-0331) appears to be in good health. No arborist inspections were undertaken during the reporting period. The culturally modified tree (45-7-0331) will be assessed by an arborist during the next reporting period.

Inspection of the repatriation site for the culturally modified tree (45-7-0332) was not undertaken during the reporting period. The site will be inspected during the next reporting period.

11. Activities proposed for next reporting period

Activities that are proposed for the next Annual Review reporting period are detailed in Table 11.1.

Table 11.1 Activities proposed for next reporting period

Activity	Target Completion Date
Continue landfilling in cell 1.	Ongoing
Construction of a weather shelter over the plant maintenance slab.	June 2022
Construction of a leachate tankering bunded area.	June 2022
Undertake leachate aeration trial.	Ongoing
Undertake landfill access road rehabilitation.	June 2022
Continue ongoing investigation of southern leachate migration and implementation of associated mitigation measures	Ongoing
Continue long term leachate management investigation and implementation	Ongoing
Undertake commissioning of cell 2	June 2022
Independent Environmental Audit	October 2021
Operational noise validation	December 2021
Implement the annual monitoring program as required by the ABCAPoM	Ongoing
Implement the annual monitoring program as required by the CHMP	Ongoing

12. References

Cardno (2012), *Additions to Awaba Waste Management Facility Environmental Assessment*, prepared for Lake Macquarie City Council.

GHD (2020), *Awaba Waste Management Facility Investigation of leachate migration Stage 1: Desktop Review*

Landcom (2004), *Managing Urban Stormwater: Soils and Construction (the Blue Book) Volume 1*

PAE Holmes (2012), *Air Quality and Odour Assessment – Awaba Landfill Extension*. Report prepared for Cardno on behalf of Lake Macquarie City Council.

Appendix A

**Summary of historic water quality
monitoring data**

Table A.1 Statistical summary of groundwater quality monitoring data 2012 to 2020 (source: GHD, 2020)

Analytes	Units	MP1			MP2			MP3			MP4			MP5		
		Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median
Physio-chemical parameters		n(31)			n(33)			n(33)			n(26)			n(31)		
pH Value		5.91	6.48	6.23	4.96	5.82	5.29	6.52	7.17	6.71	5.78	6.5	6.19	5.9	6.36	6.03
Electrical Conductivity	µS/cm	1040	1450	1210	1660	9530	6030	566	5070	3480	1880	2320	2170	4510	8600	6820
Nutrients		n(31)			n(33)			n(33)			n(26)			n(31)		
Ammonia as N	mg/L	0.03	0.18	0.06	0.05	2.23	0.11	0.88	116	44.2	0.5	8.42	1.73	0.13	0.87	0.49
Nitrite as N	mg/L	0.01	1.07	0.04	0.01	0.18	0.03	0.02	3.06	0.04	0.01	0.06	0.02	0.01	0.21	0.02
Nitrate as N	mg/L	0.02	0.37	0.08	0.02	0.46	0.045	0.01	49.7	0.02	0.01	0.46	0.02	0.01	0.7	0.035
Nitrite + Nitrate as N	mg/L	0.03	1.35	0.08	0.02	0.46	0.055	0.01	52.8	0.03	0.01	0.47	0.02	0.01	0.7	0.04
Mayor Anions		n(31)			n(33)			n(33)			n(26)			n(31)		
Sodium	mg/L	111	199	148	314	1770	977	104	646	415	252	486	299	798	1510	1150
Potassium	mg/L	8	12	10	6	32	16	6	128	52	7	11	9	15	28	19
Calcium	mg/L	12	20	15	3	30	16	1	276	38	5	58	12	18	38	30
Magnesium	mg/L	32	48	39	22	212	120	3	119	66	37	54	46	89	174	143
Bicarbonate Alkalinity	mg/L	54	152	91	10	47	23	97	1540	567	23	177	110	125	208	145
Carbonate Alkalinity	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chloride	mg/L	256	444	307	505	3220	1520	60	1170	734	469	690	604	1300	2530	1940
Sulphate	mg/L	11	35	28	134	321	239	1	127	13	3	225	16	163	279	213
Hydroxide Alkalinity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Alkalinity	mg/L	54	152	91	10	47	23	97	1540	567	23	177	110	125	208	145
Dissolved metals		n(31)			n(33)			n(33)			n(26)			n(31)		
Manganese	mg/L	1.1	2.8	1.8	0.1	0.9	0.5	0.0	1.5	0.5	0.1	0.6	0.2	0.3	0.7	0.5
Iron	mg/L	0.004	12.4	2.0	0.0	54.2	0.05	0.0	123.0	3.9	0.1	94.4	40.6	0.01	10.8	2.0
Total metals		n(7)			n(7)			n(7)			n(7)			n(6)		
Manganese	mg/L	2.02	2.29	2.16	0.42	0.88	0.65	0.89	1.07	0.98	0.26	0.30	0.28	0.49	0.53	0.51
Iron	mg/L	1.3	8.3	3.8	52.3	93.5	71.7	151.0	163.0	156.0	98.4	175.0	130.0	6.7	14.2	8.7
Aluminium	mg/L	0.12	0.23	0.13	0.002	66.1	33.1	0.00	31.1	20.8	13.5	175.0	17.7	6.0	20.2	10.2
Arsenic	mg/L	ND	ND	ND	0.023	0.056	0.032	0.01	0.015	0.014	0.006	0.031	0.010	0.002	0.008	0.005
Barium	mg/L	0.136	0.181	0.164	0.031	0.119	0.095	0.328	1.23	1.055	0.273	1.990	0.480	0.023	0.076	0.051
Cadmium	mg/L	0.0001	0.0001	0.0001	0.030	0.030	0.030	0.000	0.017	0.009	0.0001	0.0001	0.0001	0.020	0.020	0.020
Chromium	mg/L	0.001	0.001	0.001	0.018	0.049	0.033	0.002	0.030	0.021	0.012	0.135	0.014	0.005	0.017	0.009
Cobalt	mg/L	0.008	0.034	0.028	0.011	0.063	0.043	0.002	0.008	0.006	0.001	0.007	0.002	0.001	0.003	0.002
Copper	mg/L	0.005	0.009	0.007	0.013	0.023	0.016	0.012	0.027	0.021	0.008	0.056	0.009	0.005	0.006	0.006
Lead	mg/L	0.008	0.021	0.010	0.022	0.052	0.033	0.034	0.072	0.054	0.028	0.341	0.049	0.009	0.018	0.012
Mercury	mg/L	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
Zinc	mg/L	0.007	0.123	0.088	0.034	0.341	0.234	0.041	0.148	0.066	0.031	0.349	0.065	0.023	0.075	0.044

n(number): number of data per site and group of chemicals

Table A.2 Statistical summary of surface water and leachate quality monitoring data 2012 to 2020 (source: GHD, 2020)

Analytes	Units	MP6			MP7			MP8			MP9			MP10			Assessment Guidelines
		Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	
Physico-chemical parameters		n(19)			n(11)			n(2)			n(31)			n(32 ^a , 1 ^b)			ANZECC DGV
pH Value		8.03	8.99	8.25	7.09	8.6	8.1	7.12	7.24	7.18	5.78	7.23	5.94	7.51	8.46	8.11	6.5-8
Electrical Conductivity	µS/cm	1400	11800	3910	348	1620	933	396	1860	1128	286	1630	333	14900	14900	14900	
Nutrients		n(19)			n(11)			n(2)			n(31)			n(31)			
Ammonia as N	mg/L	0.06	74.3	1	0.03	27.5	1.55	0.4	0.69	0.545	0.06	3.2	1.63	1.34	1470	745	0.9
Nitrite as N	mg/L	0.05	6.28	0.92	0.01	2.37	0.12	0.02	0.13	0.075	0.2	0.2	0.2	0.05	628	54.4	0.7
Nitrate as N	mg/L	2.92	94.6	31	0.05	13.6	0.94	0.16	1.36	0.76	4.94	4.94	4.94	0.02	193	4.3	
Nitrite + Nitrate as N	mg/L	3.02	98.4	32	0.06	16	1.06	0.18	1.49	0.835	5.14	5.14	5.14	0.02	780	66.35	
Mayor Anions		n(19)			n(11)			n(2)			n(31)			n(31)			
Sodium	mg/L	193	2030	515	44	219	82	60	283	171.5	42	212	45	399	2540	1205	
Potassium	mg/L	84	877	223	9	104	20	19	66	42.5	4	52	4	215	1150	566.5	
Calcium	mg/L	31	140	59	18	60	46	7	26	16.5	3	24	5	55	158	105	
Magnesium	mg/L	27	148	56	10	31	24	6	31	18.5	7	28	8	47	142	98.5	
Bicarbonate Alkalinity	mg/L	239	1530	477	38	392	250	34	248	141	13	186	15	1080	6760	4040	
Carbonate Alkalinity	mg/L	1	357	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	92	550	100	
Chloride	mg/L	268	2870	736	42	309	131	76	422	249	65	317	70	190	2570	1820	
Sulphate	mg/L	2	40	17	27	87	46	15	15	15	13	30	15	1	82	10	
Hydroxide Alkalinity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Total Alkalinity	mg/L	239	1880	486	38	392	250	34	248	141	13	186	15	1080	6760	4040	
Dissolved metals		n(19)			n(11)			n(2)			n(31)			n(31)			
Manganese	mg/L	0.01	8.09	0.08	0.02	0.40	0.11	0.01	0.25	0.13	0.03	0.28	0.07	0.028	0.727	0.472	1.9
Iron	mg/L	0.25	52.30	0.57	0.07	3.14	0.25	0.60	5.92	3.26	0.19	0.67	0.42	0.12	6760 ^c	6.56	
Total metals		n(3)			n(2)			n(1)			n(1)			n(0)			
Manganese	mg/L	0.095	0.095	0.095	0.55	0.55	0.55	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Iron	mg/L	ND	ND	ND	0.57	0.89	0.73	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aluminium	mg/L	0.130	1.030	0.240	0.5	0.65	0.575	0.44	0.44	0.44	<0.01	<0.01	<0.01	ND	ND	ND	0.055
Arsenic	mg/L	0.007	0.027	0.009	0.005	0.008	0.007	0.004	0.004	0.004	<0.001	<0.001	<0.001	ND	ND	ND	0.013
Barium	mg/L	0.146	0.215	0.204	0.080	0.112	0.096	0.174	0.174	0.174	0.149	0.149	0.149	ND	ND	ND	
Cadmium	mg/L	0.000	0.001	0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	ND	ND	ND	0.0002
Chromium	mg/L	0.012	0.066	0.038	0.001	0.002	0.002	0.013	0.013	0.013	<0.001	<0.001	<0.001	ND	ND	ND	0.001
Cobalt	mg/L	0.012	0.042	0.023	0.001	0.002	0.002	0.009	0.009	0.009	0.023	0.023	0.023	ND	ND	ND	
Copper	mg/L	0.018	0.045	0.026	0.002	0.004	0.003	0.003	0.003	0.003	<0.001	<0.001	<0.001	ND	ND	ND	0.0014
Lead	mg/L	0.001	0.005	0.003	0.002	0.003	0.003	0.003	0.003	0.003	<0.001	<0.001	<0.001	ND	ND	ND	0.0034
Mercury	mg/L	<0.0001	<0.0001	<0.0001	0.550	0.550	0.550	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	ND	ND	ND	0.0006
Zinc	mg/L	0.052	0.118	0.069	0.012	0.084	0.048	0.011	0.011	0.011	0.019	0.019	0.019	ND	ND	ND	0.008

n(number): number of data per site and group of chemicals

Appendix B

Water quality monitoring data

Table B.1 Groundwater monitoring results for the reporting period

	Units	LOR	ANZECC 95% fresh water guideline	Groundwater														
				MP1			MP2			MP3			MP4			MP5		
				12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21
Physiochemical parameters																		
pH	pH Unit	0.01	6.5 - 8.0	6.26	6.18	6.28	6.28	5.11	4.94	5.05	6.54	6.58	6.29	6.36	6.56	6.05	6.04	6.07
EC	µS/cm	1		1190	1180	1100	1200	1550	1270	3880	2870	2700	2310	2300	1970	6620	5680	5990
TSS	mg/L	1																
TDS	mg/L	1		702			3270			2070			3370			4180		
Major ions																		
Hydroxide Alkalinity as CaCO ₃	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1		127	104	102	15	15	9	541	437	464	279	298	412	166	152	146
Total Alkalinity as CaCO ₃	mg/L	1		127	104	102	15	15	9	541	437	464	279	298	412	166	152	146
Sulphate as SO ₄ ²⁻	mg/L	1		24	26	25	118	127	102	<10	<10	4	13	35	48	239	222	192
Chloride	mg/L	1		315	314	310	307	453	338	1010	712	606	539	609	398	2130	1750	1600
Calcium	mg/L	1		16	16	16	3	2	2	43	41	48	18	74	104	28	24	26
Magnesium	mg/L	1		39	40	38	8	17	7	78	59	58	43	47	46	130	112	114
Sodium	mg/L	1		139	150	136	225	275	226	505	383	338	334	305	222	1150	1010	1050
Potassium	mg/L	1		10	10	9	4	4	4	53	46	43	12	30	23	18	15	18
Phosphate	mg/L	0.01		<0.01			<0.01			<0.05			<0.05			<0.01		
Fluoride	mg/L	0.1		0.3	0.3	0.3	0.2	0.6	0.2	0.2	0.3	0.2	0.2	0.1	0.2	0.7	0.6	0.6
Nutrients																		
Ammonia as N	mg/L	0.01	0.9	0.13	0.26	0.14	0.06	0.09	<0.01	55	43.9	38.3	9.88	10.2	6.74	4.48	0.5	0.32
Nitrate as N	mg/L	0.01	0.7	0.01	0.01	0.02	0.07	0.06	0.12	<0.10	0.02	0.01	<0.10	2.34	1.72	0.02	0.04	0.09
Total Organic Carbon	mg/L	1		1	<1	3	5	3	5	79	33	37	46	73	46	5	<1	5
BOD	mg/L	2		3			3			6			14			3		
Phenols (Total)	mg/L	0.05	0.32	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals																		
Aluminium	mg/L	0.01	0.055	0.04			0.12			<0.01			<0.01			<0.01		
Arsenic	mg/L	0.001	0.013	<0.001			<0.001			<0.001			<0.001			0.001		
Barium	mg/L	0.001		0.16			0.008			0.24			0.243			0.024		
Cadmium	mg/L	0.0001	0.0002	<0.0001			<0.0001			<0.0001			<0.0001			<0.0001		
Chromium	mg/L	0.001	0.001	<0.001			<0.001			0.002			<0.001			<0.001		
Cobalt	mg/L	0.001		0.024			0.002			0.002			0.002			0.002		
Copper	mg/L	0.001	0.0014	0.04			0.002			<0.001			<0.001			<0.001		
Lead	mg/L	0.001	0.0034	0.004			<0.001			<0.001			<0.001			<0.001		
Mercury	mg/L	0.0001	0.0006	<0.0001			<0.0001			<0.0001			<0.0001			<0.0001		
Zinc	mg/L	0.005	0.008	0.065			0.012			<0.005			0.396			0.021		

	Units	LOR	ANZECC 95% fresh water guideline	Groundwater														
				MP1			MP2			MP3			MP4			MP5		
				12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21
Dissolved Metals																		
Dissolved Manganese	mg/L	0.001	1.9	1.74	1.56	1.21	0.0335	0.0755	0.0306	0.311	0.302	0.251	0.697	0.689	0.811	0.584	0.52	0.45
Dissolved Iron	mg/L	0.005		9.88	10.1	15.6	0.015	0.186	0.006	4.96	22.5	10.2	28	0.502	14.7	5.74	6.13	1.47
Organochlorine Pesticides (OC)																		
alpha-BHC	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Hexachlorobenzene (HCB)	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
beta-BHC	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
gamma-BHC	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
delta-BHC	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Heptachlor	µg/L	0.5	0.09	<0.005	<0.5	<0.5	<0.005	<0.5	<0.5	<0.005	<0.5	<0.5	<0.005	<0.5	<0.5	<0.005	<0.5	<0.5
Aldrin	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Heptachlor epoxide	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
trans-Chlordane	µg/L	0.5	0.08	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
alpha-Endosulfan	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
cis-Chlordane	µg/L	0.5	0.08	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Dieldrin	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
4,4'-DDE	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Endrin	µg/L	0.5	0.02	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
beta-Endosulfan	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
4,4'-DDD	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Endrin aldehyde	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Endosulfan sulfate	µg/L	0.5	0.2	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
4,4'-DDT	µg/L	2	0.01	<0.010	<2.0	<2.0	<0.010	<2.0	<2.0	<0.010	<2.0	<2.0	<0.010	<2.0	<2.0	<0.010	<2.0	<2.0
Endrin ketone	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Methoxychlor	µg/L	2		<0.010	<2.0	<2.0	<0.010	<2.0	<2.0	<0.010	<2.0	<2.0	<0.010	<2.0	<2.0	<0.010	<2.0	<2.0
Total Chlordane (sum)	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Sum of DDD + DDE + DDT	µg/L	0.5	0.03	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
Sum of Aldrin + Dieldrin	µg/L	0.5		<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5	<0.010	<0.5	<0.5
BTEXN																		
Benzene	µg/L	1	950	<1			<1			<1			<1			<1		
Toluene	µg/L	5		<2			<2			<2			<2			<2		
Ethylbenzene	µg/L	2		<2			<2			<2			<2			<2		
meta- & para -Xylene	µg/L	2		<2			<2			<2			<2			<2		
ortho-Xylene	µg/L	2		<2			<2			<2			<2			<2		
Total Xylenes	µg/L	1		<2			<2			<2			<2			<2		
Sum of BTEX	µg/L	1		<1			<1			<1			<1			<1		
Naphthalene	µg/L	5	16	<5			<5			<5			<5			<5		
Total Polychlorinated biphenyls	µg/L	1		<1			<1			<1			<1			<1		

	Units	LOR	ANZECC 95% fresh water guideline	Groundwater														
				MP1			MP2			MP3			MP4			MP5		
				12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21
Monocyclic Aromatic Hydrocarbons																		
Styrene	µg/L	5		<5			<5			<5			<5			<5		
Isopropylbenzene	µg/L	5		<5			<5			<5			<5			<5		
n-Propylbenzene	µg/L	5		<5			<5			<5			<5			<5		
1,3,5-Trimethylbenzene	µg/L	5		<5			<5			<5			<5			<5		
sec-Butylbenzene	µg/L	5		<5			<5			<5			<5			<5		
1,2,4-Trimethylbenzene	µg/L	5		<5			<5			<5			<5			<5		
tert-Butylbenzene	µg/L	5		<5			<5			<5			<5			<5		
p-Isopropyltoluene	µg/L	5		<5			<5			<5			<5			<5		
n-Butylbenzene	µg/L	5		<5			<5			<5			<5			<5		
Sulfonated Compounds																		
Carbon disulfide	µg/L	5		<5			<5			<5			<5			<5		
Fumigants																		
2,2-Dichloropropane	µg/L	5		<5			<5			<5			<5			<5		
1,2-Dichloropropane	µg/L	5		<5			<5			<5			<5			<5		
cis-1,3-Dichloropropylene	µg/L	5		<5			<5			<5			<5			<5		
trans-1,3-Dichloropropylene	µg/L	5		<5			<5			<5			<5			<5		
1,2 Dibromoethane(EDB)	µg/L	5		<5			<5			<5			<5			<5		
Oxygenated compounds																		
Vinyl Acetate	µg/L	50		<50			<50			<50			<50			<50		
2- Butanone	µg/L	50		<50			<50			<50			<50			<50		
4-Methyl-2-pentanone (MIBK)	µg/L	50		<50			<50			<50			<50			<50		
2-Hexanone(MBK)	µg/L	50		<50			<50			<50			<50			<50		
Total Petroleum Hydrocarbons																		
C6 - C9 Fraction	µg/L	20		<20			<20			<20			<20			<20		
C10 - C14 Fraction	µg/L	50		<50			<50			<50			<50			<50		
C15 - C28 Fraction	µg/L	100		<100			<100			<100			920			<100		
C29 - C36 Fraction	µg/L	50		<50			<50			<50			90			<50		
C10-C36 TOTAL	µg/L	50		<50			<50			<50			1010			<50		
Total Recoverable Hydrocarbons																		
C6 - C10 Fraction	µg/L	20		<20			<20			<20			<20			<20		
C6 - C10 Fraction minus BTEX	µg/L	20		<20			<20			<20			<20			<20		
C10 - C16 Fraction	µg/L	100		<100			<100			<100			<100			<100		
C16 - C34 Fraction	µg/L	100		<100			<100			<100			970			<100		
C34 - C40 Fraction	µg/L	100		<100			<100			<100			<100			<100		
C10 - C40 Fraction (Sum)	µg/L	100		<100			<100			<100			970			<100		
C10-C16 Fraction minus Naphthalene	µg/L	100		<100			<100			<100			<100			<100		

	Units	LOR	ANZECC 95% fresh water guideline	Groundwater														
				MP1			MP2			MP3			MP4			MP5		
				12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21
Polynuclear Aromatic Hydrocarbons																		
Naphthalene	µg/L	1	16	<1.0			<1.0			<1.0			<1.0			<1.0		
Acenaphthylene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Acenaphthene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Fluorene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Phenanthrene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Anthracene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Fluoranthene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Pyrene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Benz(a)anthracene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Chrysene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Benzo(b+j)fluoranthene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Benzo(k)fluoranthene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Benzo(a)pyrene	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Indeno(1.2.3.cd)pyrene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Dibenz(a,h)anthracene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Benzo(g,h,i)perylene	µg/L	1		<1.0			<1.0			<1.0			<1.0			<1.0		
Sum of polycyclic aromatic hydrocarbons	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Benzo(a)pyrene TEQ (zero)	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Organophosphorus Pesticides (OP)																		
Dichlorvos	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Demeton-S-methyl	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Monocrotophos	µg/L	2		<2.0			<2.0			<2.0			<2.0			<2.0		
Dimethoate	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Diazinon	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Chlorpyrifos -methyl	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Parathion-methyl	µg/L	2		<2.0			<2.0			<2.0			<2.0			<2.0		
Malathion	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Fenthion	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Chlorpyrifos	µg/L	0.5	0.01	<0.5			<0.5			<0.5			<0.5			<0.5		
Parathion	µg/L	2	0.004	<2.0			<2.0			<2.0			<2.0			<2.0		
Pirimphos-ethyl	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Chlorfenvinphos	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Bromophos-ethyl	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Fenamiphos	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Prothiofos	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Ethion	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Carbophenothion	µg/L	0.5		<0.5			<0.5			<0.5			<0.5			<0.5		
Azinphos Methyl	µg/L	0.5	0.02	<0.5			<0.5			<0.5			<0.5			<0.5		
Hexavalent Chromium	mg/L	0.01	0.001	<0.01			<0.01			<0.10			<0.10			<0.01		

	Units	LOR	ANZECC 95% fresh water guideline	Groundwater														
				MP1			MP2			MP3			MP4			MP5		
				12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21
Halogenated Aromatic Compounds																		
Chlorobenzene	µg/L	5		<5			<5			<5			<5			<5		
Bromobenzene	µg/L	5		<5			<5			<5			<5			<5		
2-Chlorotoluene	µg/L	5		<5			<5			<5			<5			<5		
4-Chlorotoluene	µg/L	5		<5			<5			<5			<5			<5		
1.3-Dichlorobenzene	µg/L	5		<5			<5			<5			<5			<5		
1.4-Dichlorobenzene	µg/L	5		<5			<5			<5			<5			<5		
1.2-Dichlorobenzene	µg/L	5		<5			<5			<5			<5			<5		
1.2.4--Trichlorobenzene	µg/L	5		<5			<5			<5			<5			<5		
1.2.3--Trichlorobenzene	µg/L	5		<5			<5			<5			<5			<5		
Trihalomethanes																		
Chloroform	µg/L	5		<5			<5			<5			<5			<5		
Bromodichloromethane	µg/L	5		<5			<5			<5			<5			<5		
Dibromochloromethane	µg/L	5		<5			<5			<5			<5			<5		
Bromoform	µg/L	5		<5			<5			<5			<5			<5		
Halogenated Aliphatic Compounds																		
Dichlorodifluoromethane	µg/L	50		<50			<50			<50			<50			<50		
Chloromethane	µg/L	50		<50			<50			<50			<50			<50		
Vinyl chloride	µg/L	50		<50			<50			<50			<50			<50		
Bromomethane	µg/L	50		<50			<50			<50			<50			<50		
Chloroethane	µg/L	50		<50			<50			<50			<50			<50		
Trichlorofluoromethane	µg/L	50		<50			<50			<50			<50			<50		
1.1-Dichloroethene	µg/L	5		<5			<5			<5			<5			<5		
Iodomethane	µg/L	5		<5			<5			<5			<5			<5		
trans-1.2-Dichloroethene	µg/L	5		<5			<5			<5			<5			<5		
1.1-Dichloroethane	µg/L	5		<5			<5			<5			<5			<5		
cis-1.2-Dichloroethene	µg/L	5		<5			<5			<5			<5			<5		
1.1.1-Trichloroethane	µg/L	5		<5			<5			<5			<5			<5		
1.1-Dichloropropylene	µg/L	5		<5			<5			<5			<5			<5		
Carbon Tetrachloride	µg/L	5		<5			<5			<5			<5			<5		
1.2-Dichloroethane	µg/L	5		<5			<5			<5			<5			<5		
Trichloroethene	µg/L	5		<5			<5			<5			<5			<5		
Dibromomethane	µg/L	5		<5			<5			<5			<5			<5		
1.1.2-Trichloroethane	µg/L	5	6500	<5			<5			<5			<5			<5		
1.3-Dichloropropane	µg/L	5		<5			<5			<5			<5			<5		
Tetrachloroethene	µg/L	5		<5			<5			<5			<5			<5		
1.1.1.2-Tetrachloroethane	µg/L	5		<5			<5			<5			<5			<5		
trans-1.4-Dichloro-2-butene	µg/L	5		<5			<5			<5			<5			<5		
cis-1.4-Dichloro-2-butene	µg/L	5		<5			<5			<5			<5			<5		
1.1.2.2-Tetrachloroethane	µg/L	5		<5			<5			<5			<5			<5		

	Units	LOR	ANZECC 95% fresh water guideline	Groundwater														
				MP1			MP2			MP3			MP4			MP5		
				12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21
1,2,3-Trichloropropane	µg/L	5		<5			<5			<5			<5			<5		
Pentachloroethane	µg/L	5		<5			<5			<5			<5			<5		
1,2-Dibromo-3-chloropropane	µg/L	5		<5			<5			<5			<5			<5		
Hexachlorobutadiene	µg/L	5		<5			<5			<5			<5			<5		
= Exceeds ANZECC 95% fresh water guideline																		

Table B.2 Surface water and leachate monitoring results for the reporting period

Analyte	Units	LOR	ANZECC 95% fresh water guideline/ EPL criteria	Surface water															Leachate		
				MP6			MP7			MP8			MP9			MP10					
				12/10/20	22/03/21	30/06/21	12/10/20	22/03/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	20/01/21	30/06/21	12/10/20	22/01/21	30/06/21			
				Site dry			Site Dry			Site Dry			Site Dry			Site dry					
Physiochemical parameters																					
pH	pH Unit	0.01	6.5 - 8.0		8.06	7.74		8.02	7.65		6.19	6.03		5.84		8.42	8.28	8.39			
EC	µS/cm	1			510	382		439	765		238	198		425							
TSS	mg/L	1	50		60	24		224	22		12	94		<5		82	55	33			
TDS	mg/L	1			320			402													
Major ions																					
Hydroxide Alkalinity as CaCO3	mg/L	1			<1	<1		<1	<1		<1	<1		<1		<1	<1	<1			
Carbonate Alkalinity as CaCO3	mg/L	1			<1	<1		<1	<1		<1	<1		<1		<1	<1	<1			
Bicarbonate Alkalinity as CaCO3	mg/L	1			193	118		144	198		23	23		17		4470	2960	4800			
Total Alkalinity as CaCO3	mg/L	1			193	118		144	198		23	23		17		4470	2960	4800			
Sulphate as SO ₄ ²⁻	mg/L	1			31	18		19	30		<10	10		9		<10	22	<1			
Chloride	mg/L	1			29	39		36	96		57	42		123		2500	1970	189			
Calcium	mg/L	1			36	17		20	35		4	3		6		110	73	68			
Magnesium	mg/L	1			14	10		11	17		5	4		10		105	69	69			
Sodium	mg/L	1			33	37		38	76		32	26		55		1710	1190	1320			
Potassium	mg/L	1			18	20		25	26		3	2		4		761	521	571			
Phosphate	mg/L	0.01																			
Fluoride	mg/L	0.1			0.2	0.2		0.2	0.2		<0.1	<0.1		<0.1		0.8	0.6	0.6			

Analyte	Units	LOR	ANZECC 95% fresh water guideline/ EPL criteria	Surface water										Leachate		
Nutrients																
Ammonia as N	mg/L	0.01	0.9	3.83	0.04	1.12	3.43	0.04	0.04	0.02	1140	767	789			
Nitrate as N	mg/L	0.01	0.7	0.75	0.48	1.07	6.22	<0.01	1.57	<0.01	0.37	11.5	0.2			
Total Organic Carbon	mg/L	1		16	19	20	26	16	16	5	612	386	436			
BOD	mg/L	2		2		<2			--		33	139	23			
Phenols (Total)	mg/L	0.05	0.32	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			
Metals																
Aluminium	mg/L	0.01	0.055	0.02		0.04										
Arsenic	mg/L	0.001	0.013	0.003		0.004										
Barium	mg/L	0.001		0.055		0.042										
Cadmium	mg/L	0.0001	0.0002	<0.0001		<0.0001										
Chromium	mg/L	0.001	0.001	0.002		0.002										
Cobalt	mg/L	0.001		<0.001		<0.001										
Copper	mg/L	0.001	0.0014	0.006		0.004										
Lead	mg/L	0.001	0.0034	<0.001		<0.001										
Mercury	mg/L	0.0001	0.0006	<0.0001		<0.0001										
Zinc	mg/L	0.005	0.008	0.015		0.007										
Dissolved metals																
Dissolved Manganese	mg/L	0.001	1.9	0.0013	0.0006	0.0015	0.0715	0.128	0.0686	0.054	0.464	0.372	0.388			
Dissolved Iron	mg/L	0.005		0.088	0.172	0.223	0.112	0.876	0.397	0.073	9.18	6.92	7.82			
Organochlorine Pesticides (OC)																
alpha-BHC	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Hexachlorobenzene (HCB)	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
beta-BHC	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
gamma-BHC	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
delta-BHC	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Heptachlor	µg/L	0.5	0.09	<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Aldrin	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Heptachlor epoxide	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
trans-Chlordane	µg/L	0.5	0.08	<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
alpha-Endosulfan	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
cis-Chlordane	µg/L	0.5	0.08	<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Dieldrin	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
4,4'-DDE	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Endrin	µg/L	0.5	0.02	<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
beta-Endosulfan	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
4,4'-DDD	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Endrin aldehyde	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Endosulfan sulfate	µg/L	0.5	0.2	<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
4,4'-DDT	µg/L	2	0.01	<0.010	<2.0	<0.010	<2.0	<2.0	<2.0	<2.0	<0.010	<2.0	<2.0			
Endrin ketone	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			
Methoxychlor	µg/L	2		<0.010	<2.0	<0.010	<2.0	<2.0	<2.0	<2.0	<0.010	<2.0	<2.0			
Total Chlordane (sum)	µg/L	0.5		<0.010	<0.5	<0.010	<0.5	<0.5	<0.5	<0.5	<0.010	<0.5	<0.5			

Analyte	Units	LOR	ANZECC 95% fresh water guideline/ EPL criteria	Surface water										Leachate					
Sum of DDD + DDE + DDT	µg/L	0.5	0.03			<0.010	<0.5		<0.010	<0.5		<0.5	<0.5		<0.5	<0.5	<0.010	<0.5	<0.5
Sum of Aldrin + Dieldrin	µg/L	0.5				<0.010	<0.5		<0.010	<0.5		<0.5	<0.5		<0.5	<0.5	<0.010	<0.5	<0.5
BTEXN																			
Benzene	µg/L	1	950			<1			<1								<1	<1	
Toluene	µg/L	5				<2			<2								<2	<2	
Ethylbenzene	µg/L	2				<2			<2								<2	<2	
meta- & para -Xylene	µg/L	2				<2			<2								<2	<2	
ortho-Xylene	µg/L	2				<2			<2								<2	<2	
Total Xylenes	µg/L	1				<2			<2								<2	<2	
Sum of BTEX	µg/L	1				<1			<1								<1	<1	
Naphthalene	µg/L	5	16			<5			<5								<5	<5	
Total Polychlorinated biphenyls	µg/L	1				<1			<1										
Monocyclic Aromatic Hydrocarbons																			
Styrene	µg/L	5				<5			<5										
Isopropylbenzene	µg/L	5				<5			<5										
n-Propylbenzene	µg/L	5				<5			<5										
1,3,5-Trimethylbenzene	µg/L	5				<5			<5										
sec-Butylbenzene	µg/L	5				<5			<5										
1,2,4-Trimethylbenzene	µg/L	5				<5			<5										
tert-Butylbenzene	µg/L	5				<5			<5										
p-Isopropyltoluene	µg/L	5				<5			<5										
n-Butylbenzene	µg/L	5				<5			<5										
Sulfonated Compounds																			
Carbon disulfide	µg/L	5				<5			<5										
Fumigants																			
2,2-Dichloropropane	µg/L	5				<5			<5										
1,2-Dichloropropane	µg/L	5				<5			<5										
cis-1,3-Dichloropropylene	µg/L	5				<5			<5										
trans-1,3-Dichloropropylene	µg/L	5				<5			<5										
1,2 Dibromoethane(EDB)	µg/L	5				<5			<5										
Oxygenated compounds																			
Vinyl Acetate	µg/L	50				<50			<50										
2- Butanone	µg/L	50				<50			<50										
4-Methyl-2-pentanone (MIBK)	µg/L	50				<50			<50										
2-Hexanone(MBK)	µg/L	50				<50			<50										
Total Petroleum Hydrocarbons																			
C6 - C9 Fraction	µg/L	20				<20			<20								<20	<20	
C10 - C14 Fraction	µg/L	50				<50			<50								650	240	580
C15 - C28 Fraction	µg/L	100				<100			<100								1950	900	1880
C29 - C36 Fraction	µg/L	50				<50			<50								50	<50	180
C10-C36 TOTAL	µg/L	50				<50			<50								2650	1140	2640

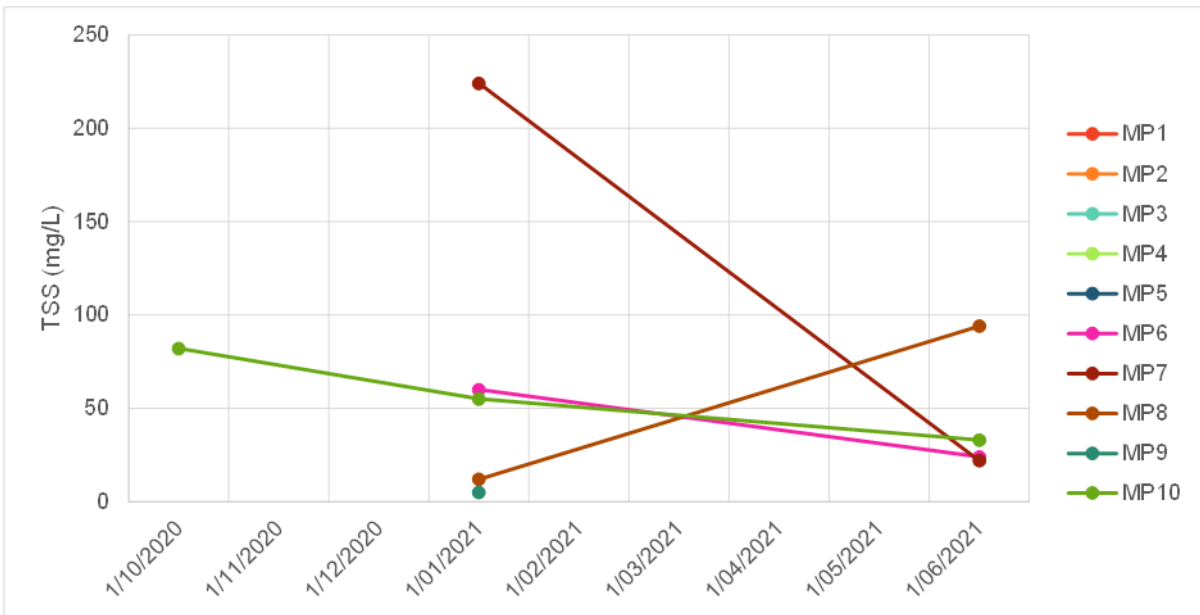
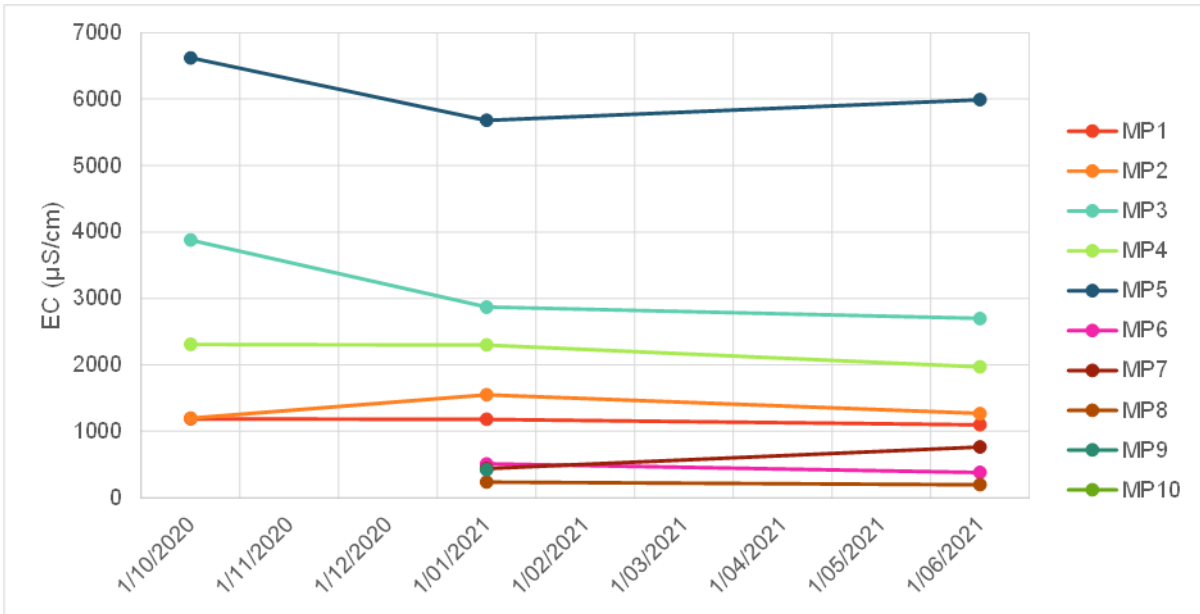
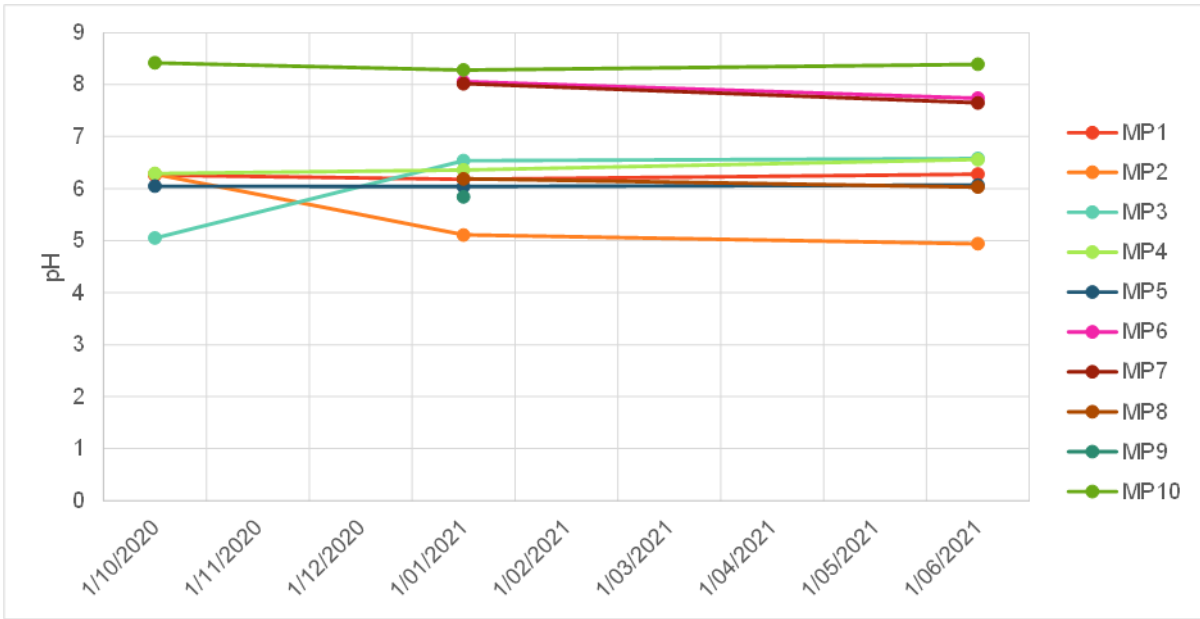
Analyte	Units	LOR	ANZECC 95% fresh water guideline/ EPL criteria	Surface water										Leachate			
Total Recoverable Hydrocarbons																	
C6 - C10 Fraction	µg/L	20		<20											<20	<20	
C6 - C10 Fraction minus BTEX	µg/L	20		<20											<20	<20	
C10 - C16 Fraction	µg/L	100		<100											940	400	800
C16 - C34 Fraction	µg/L	100		<100											1680	800	1800
C34 - C40 Fraction	µg/L	100		<100											<100	<100	<100
C10 - C40 Fraction (Sum)	µg/L	100		<100											2620	1200	2600
C10-C16 Fraction minus Naphthalene	µg/L	100		<100											940	400	
Polynuclear Aromatic Hydrocarbons																	
Naphthalene	µg/L	1	16	<1.0													
Acenaphthylene	µg/L	1		<1.0													
Acenaphthene	µg/L	1		<1.0													
Fluorene	µg/L	1		<1.0													
Phenanthrene	µg/L	1		<1.0													
Anthracene	µg/L	1		<1.0													
Fluoranthene	µg/L	1		<1.0													
Pyrene	µg/L	1		<1.0													
Benz(a)anthracene	µg/L	1		<1.0													
Chrysene	µg/L	1		<1.0													
Benzo(b+j)fluoranthene	µg/L	1		<1.0													
Benzo(k)fluoranthene	µg/L	1		<1.0													
Benzo(a)pyrene	µg/L	0.5		<0.5													
Indeno(1.2.3.cd)pyrene	µg/L	1		<1.0													
Dibenz(a.h)anthracene	µg/L	1		<1.0													
Benzo(g.h.i)perylene	µg/L	1		<1.0													
Sum of polycyclic aromatic hydrocarbons	µg/L	0.5		<0.5													
Benzo(a)pyrene TEQ (zero)	µg/L	0.5		<0.5													
Organophosphorus Pesticides (OP)																	
Dichlorvos	µg/L	0.5		<0.5													
Demeton-S-methyl	µg/L	0.5		<0.5													
Monocrotophos	µg/L	2		<2.0													
Dimethoate	µg/L	0.5		<0.5													
Diazinon	µg/L	0.5		<0.5													
Chlorpyrifos -methyl	µg/L	0.5		<0.5													
Parathion-methyl	µg/L	2		<2.0													
Malathion	µg/L	0.5		<0.5													
Fenthion	µg/L	0.5		<0.5													
Chlorpyrifos	µg/L	0.5	0.01	<0.5													
Parathion	µg/L	2	0.004	<2.0													
Pirimphos-ethyl	µg/L	0.5		<0.5													
Chlorfenvinphos	µg/L	0.5		<0.5													

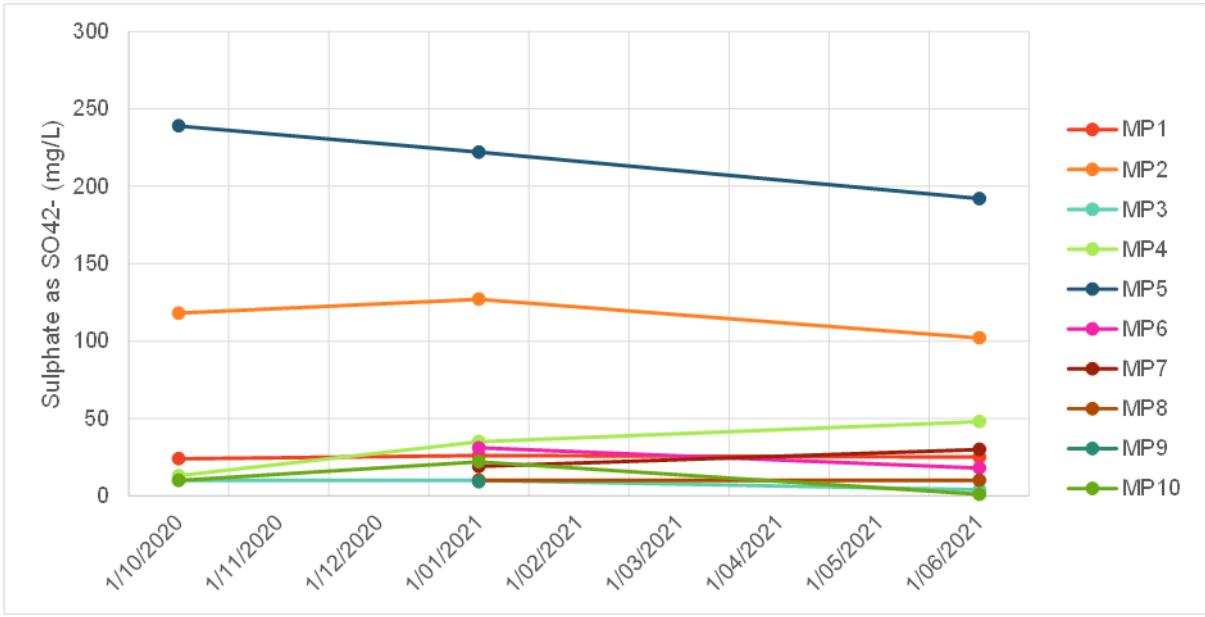
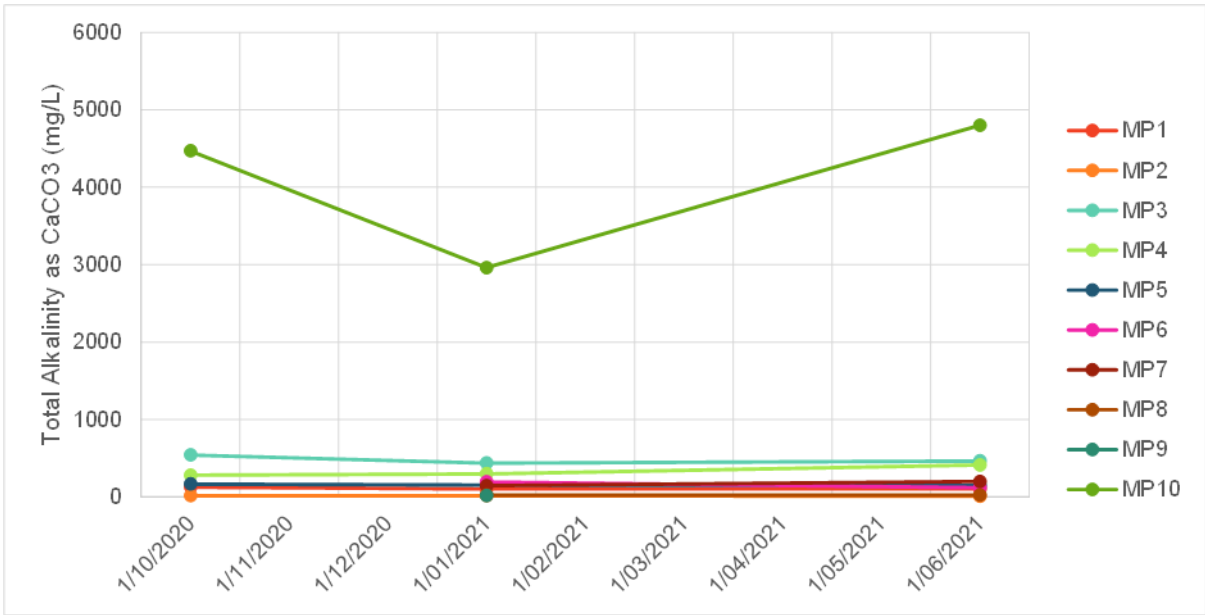
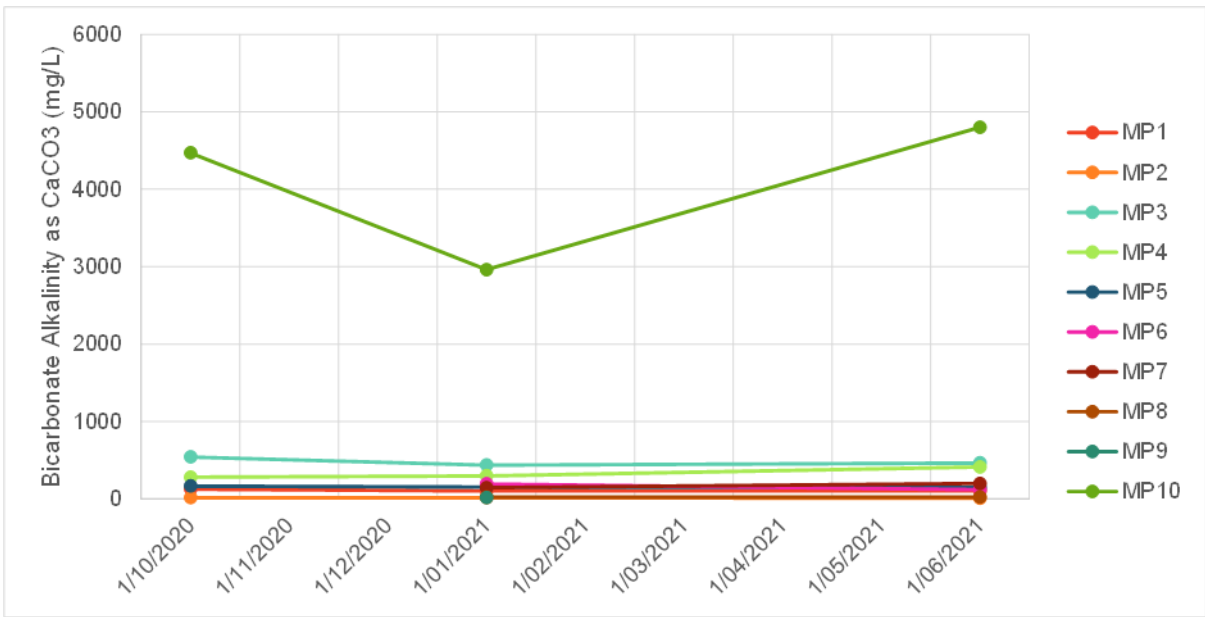
Analyte	Units	LOR	ANZECC 95% fresh water guideline/ EPL criteria	Surface water										Leachate			
1.1.1.2-Tetrachloroethane	µg/L	5															
trans-1.4-Dichloro-2-butene	µg/L	5															
cis-1.4-Dichloro-2-butene	µg/L	5															
1.1.2.2-Tetrachloroethane	µg/L	5															
1.2.3-Trichloropropane	µg/L	5															
Pentachloroethane	µg/L	5															
1.2-Dibromo-3-chloropropane	µg/L	5															
Hexachlorobutadiene	µg/L	5															

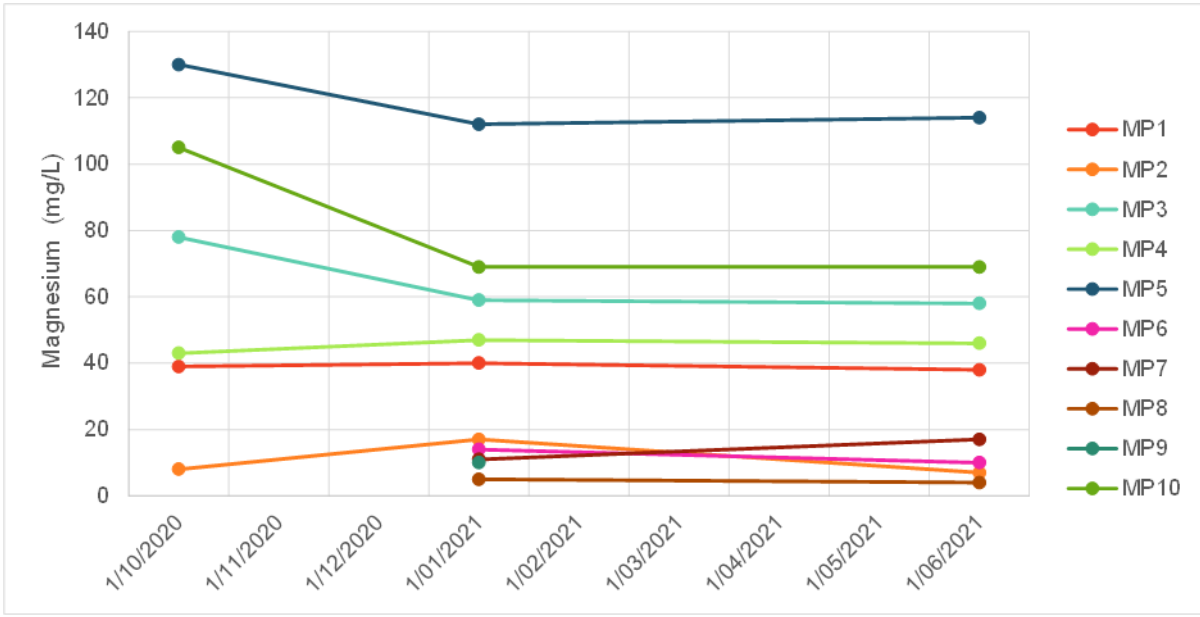
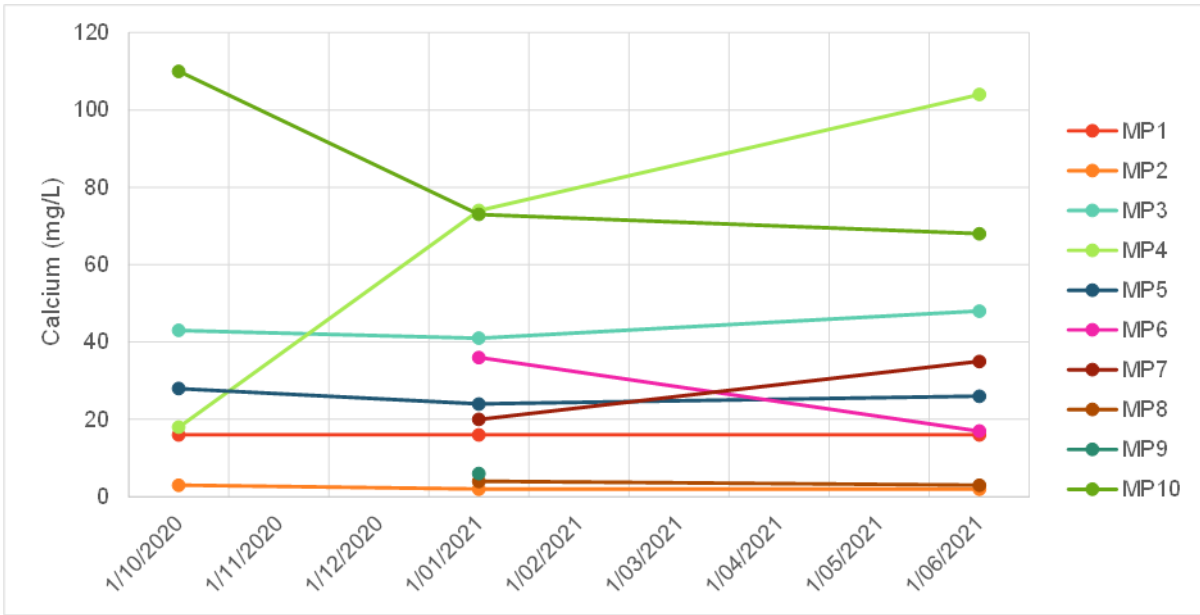
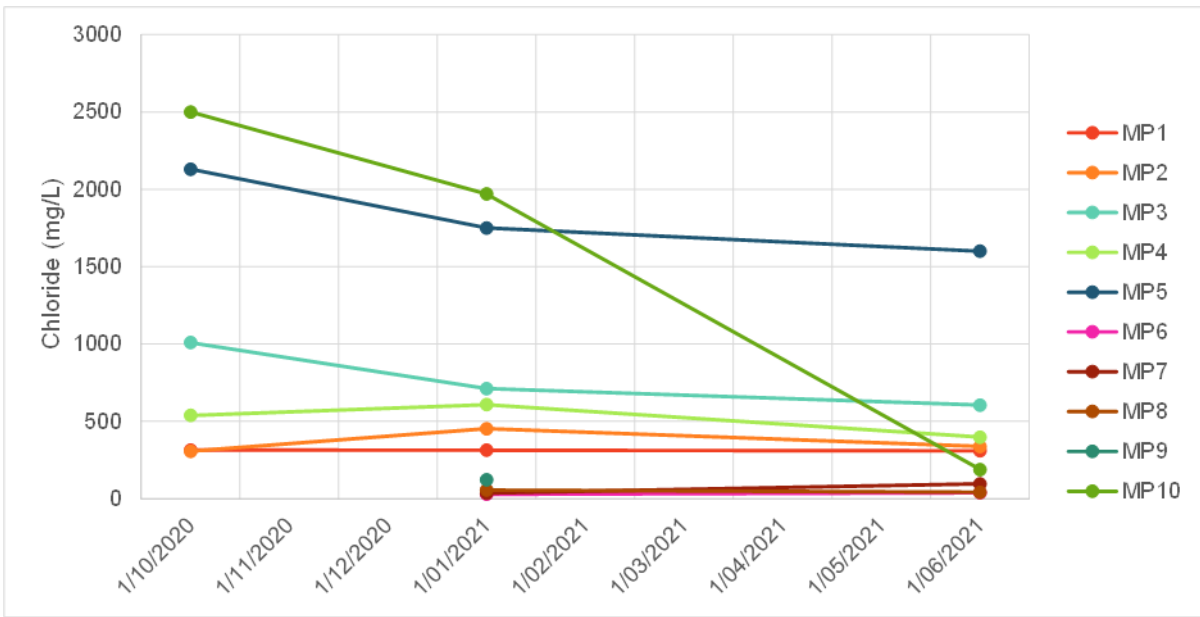
= Exceeds ANZECC 95% fresh water guideline/EPL criteria

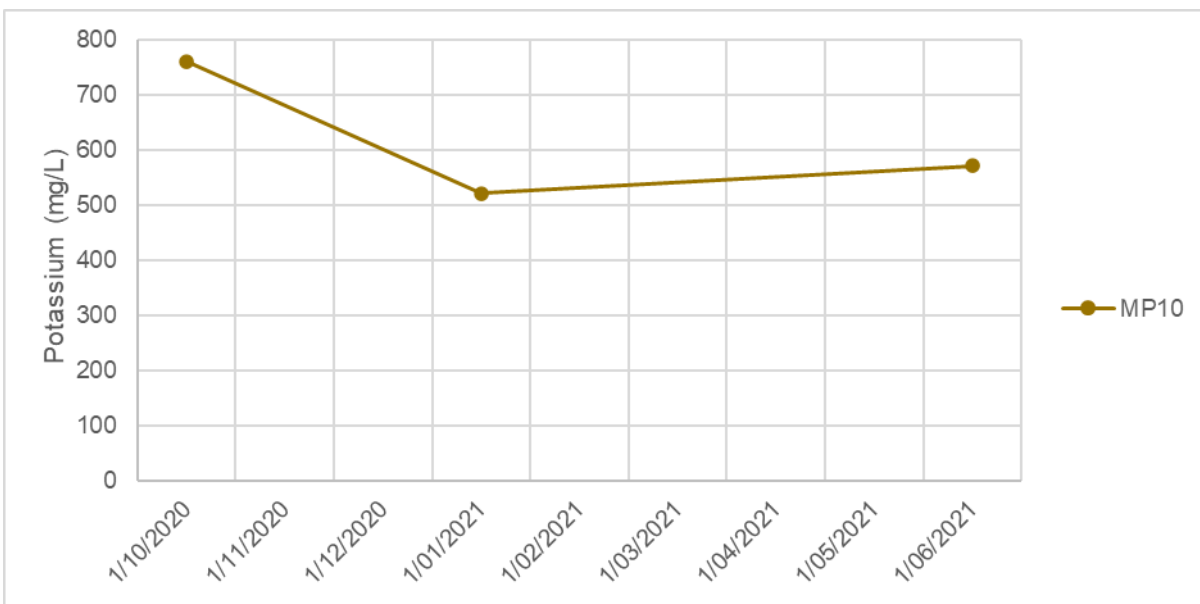
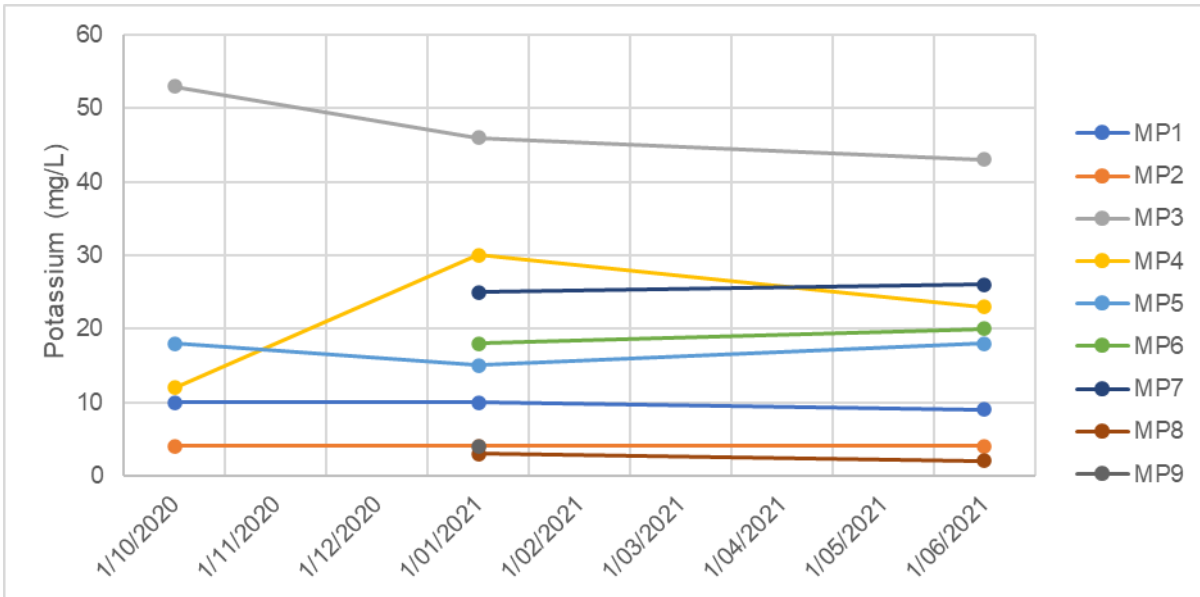
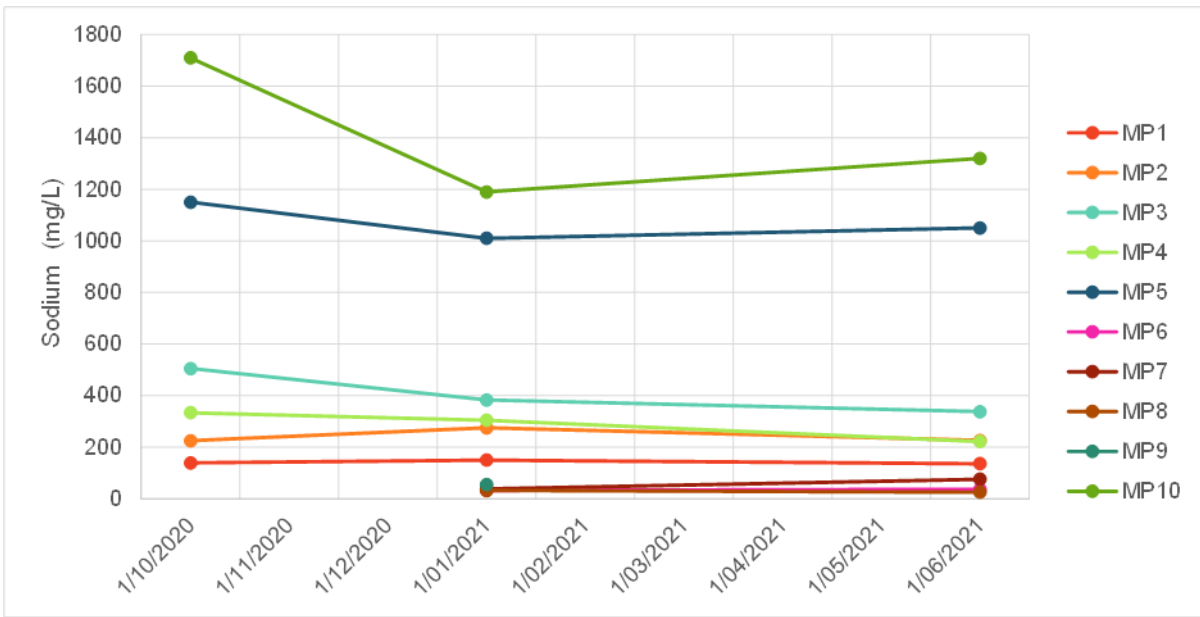
Appendix C

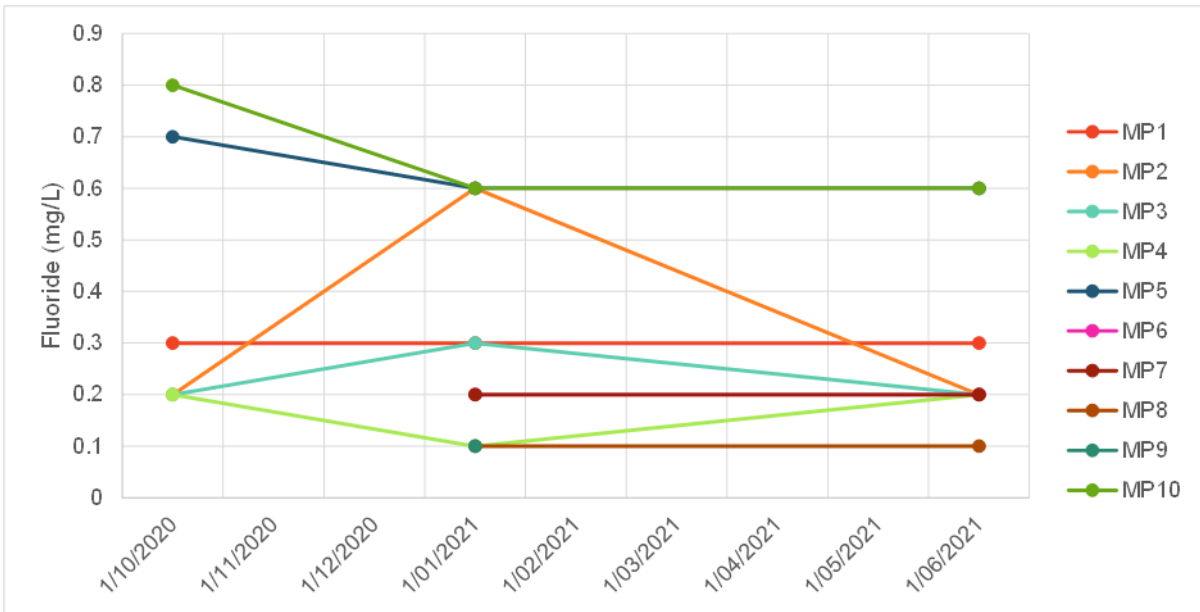
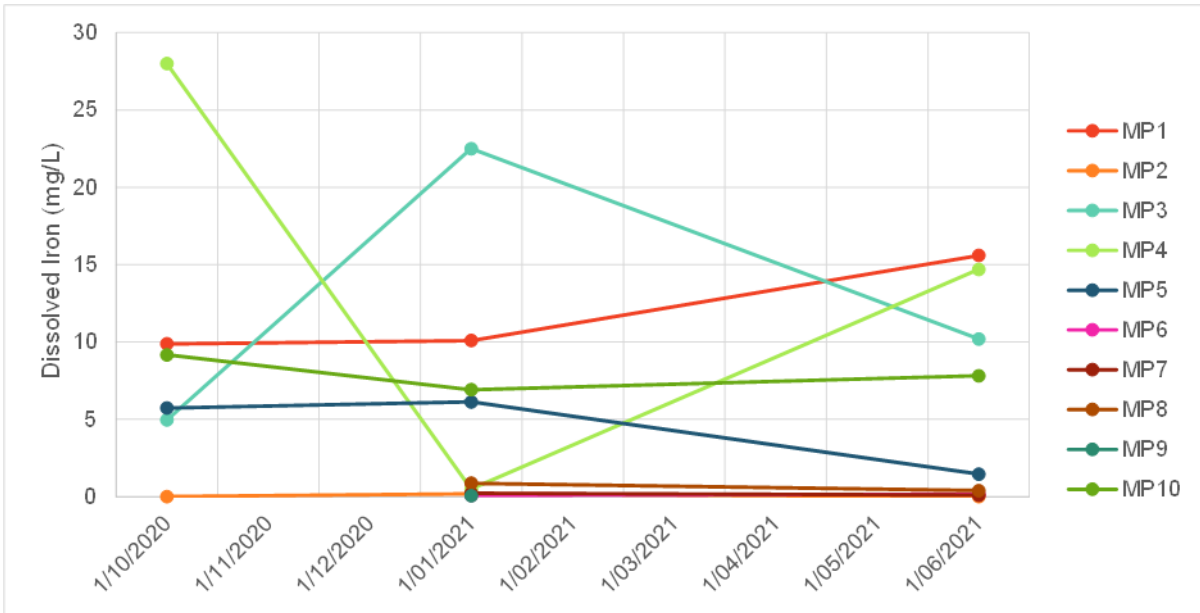
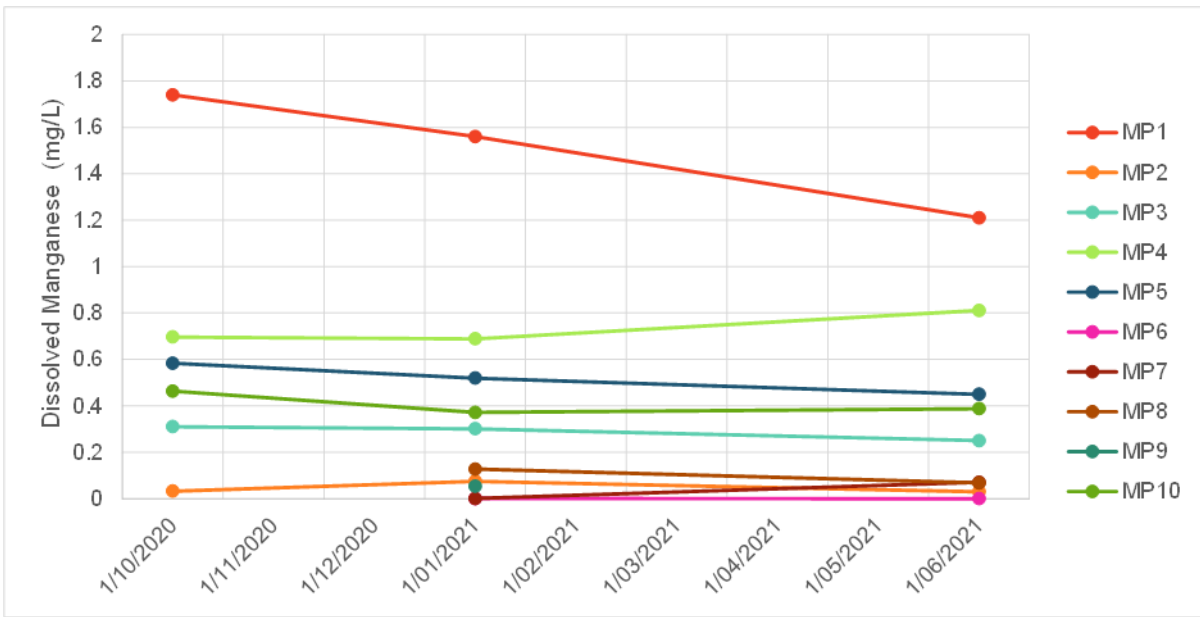
Water quality monitoring charts

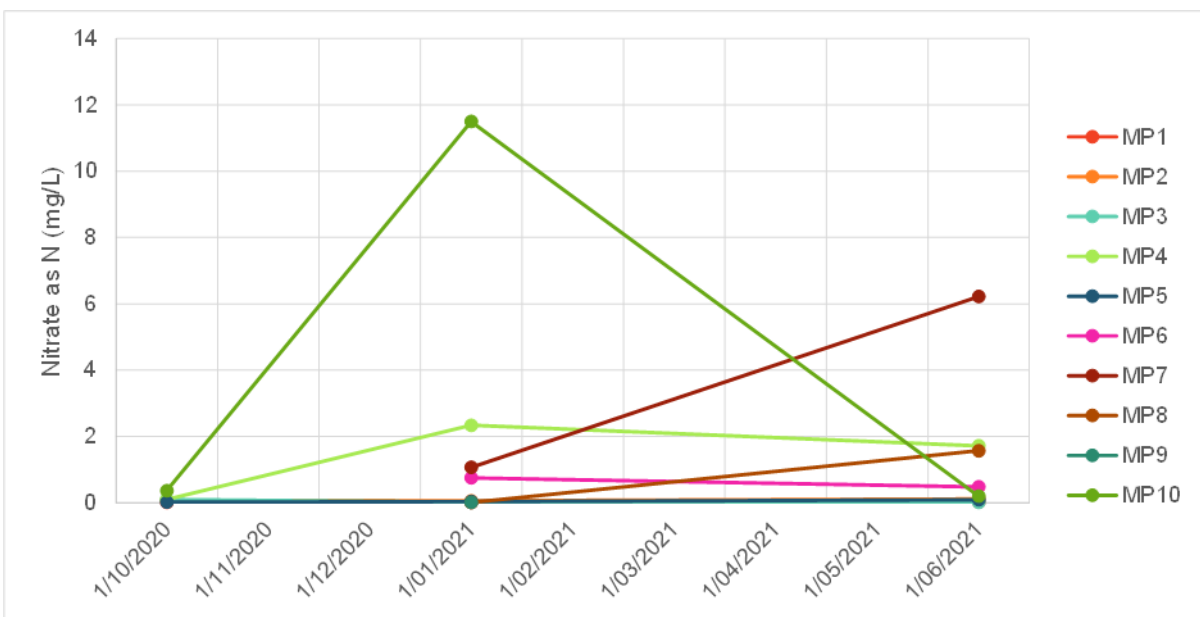
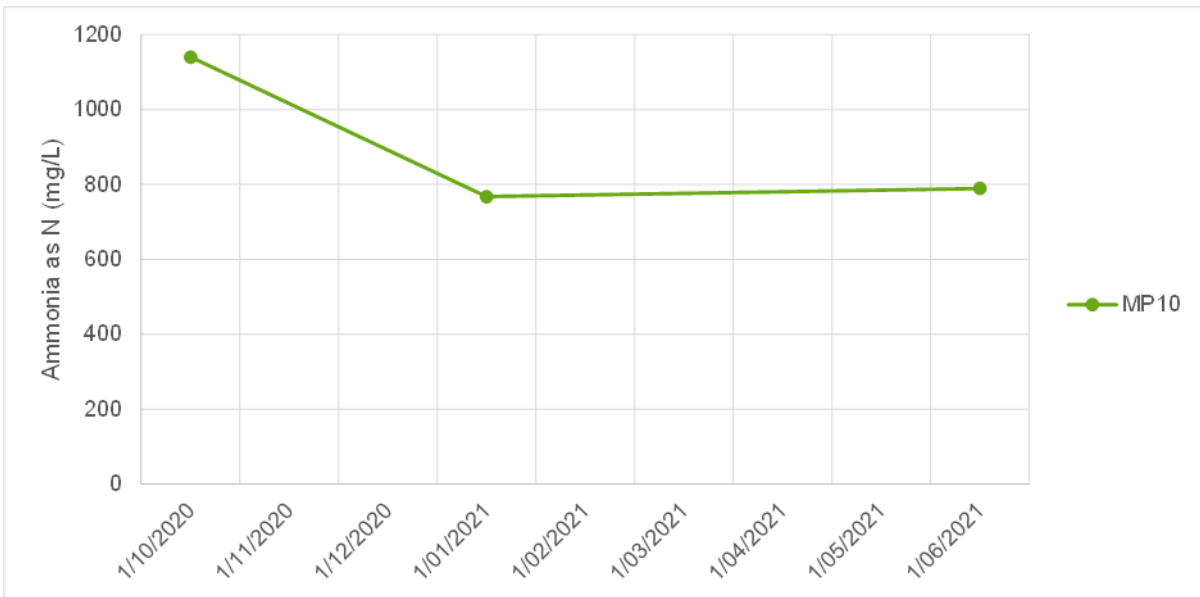
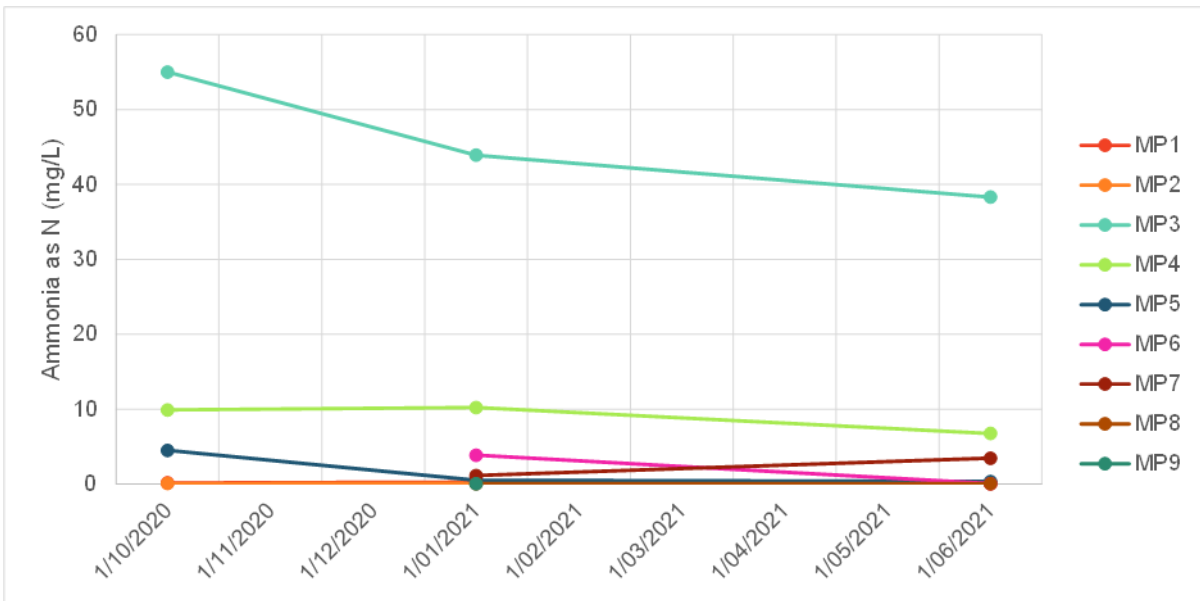


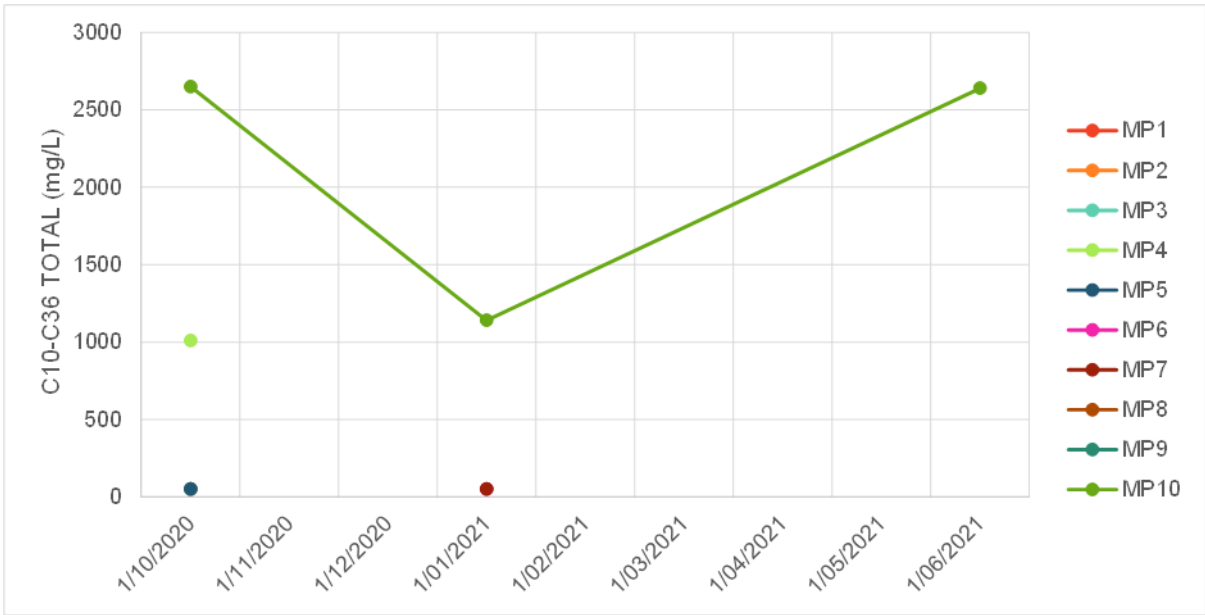
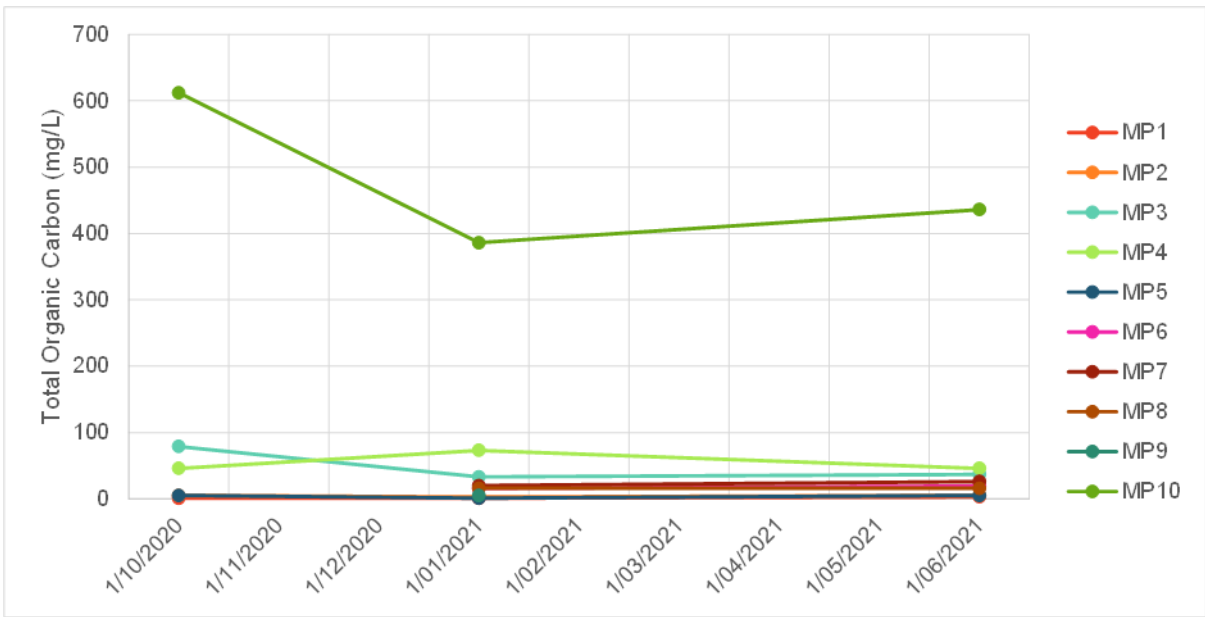














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