BINGO INDUSTRIES

2019 Annual Environmental Review - Eastern Creek Recycling Ecology Park

VERSION CONTROL

Date	Doc Version	Authorised by
20 March 2020	00 – Internal Review and Signoff	Ros Dent
19 May 2020	01 – Final for External Submission	Ros Dent

REVISION DETAIL

Date	Revision #	Section / Paragraph	Description of Change	Authorised by
20 March 2020	00	Whole document	New Document	Ros Dent
19 May 2020	01	Whole document	Review and Addition of Content	Ros Dent

Compliance Report Declaration Form	
Project Name	Eastern Creek Recycling Ecology Park
Project Application Number	MP06_0139 (as modified)
Description of Project	Waste Recycling and Landfill Facility
Project Address	1 Kangaroo Avenue, Eastern Creek, NSW 2766
Proponent (Licensee)	Dial A Dump (EC) Pty Ltd (previously ThaQuarry Pty Ltd & ACN 114 842 453 Pty Ltd)
Title of Compliance Report	2019 Annual Environmental Review - Eastern Creek Recycling Ecology Park
Compliance Reporting Period	1 January 2019 to 31 December 2019

Declaration

I declare that I have reviewed relevant evidence and prepared the contents of the Annual Environmental Review and to the best of my knowledge:

- the Annual Environmental Review has been prepared in accordance with all relevant conditions of consent;
- the Annual Environmental Review has been prepared with consideration of the Compliance Reporting Post Approval Requirements;
- the findings of the Annual Environmental Review are reported truthfully, accurately and completely;
- due diligence and professional judgement have been exercised in preparing the Annual Environmental Review; and
- the Annual Environmental Review is an accurate summary of the compliance status of the development.

Notes:

Under section 10.6 of the Environmental Planning and Assessment Act 1979 a person must not include false or misleading information (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is false or misleading in a material respect. The proponent of an approved project must not fail to include information in (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is materially relevant to the monitoring or audit. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000; and

The Crimes Act 1900 contains other offences relating to false and misleading information: section 307B (giving false or misleading information – maximum penalty 2 years' imprisonment or 200 penalty units, or both).

Name of Authorised Reporting Officer	
Title	
Signature	
Date	
Qualification	
Company	
Company Address	

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Executive Summary

In 2019 Bingo Industries (Bingo) acquired Dial A Dump (EC) Pty Ltd (DADI). DADI is the operator of a major recycling facility and general solid waste (non-putrescible) landfill facility now known as the 'Bingo Eastern Creek Recycling Ecology Park' (previously the Genesis Facility). This facility is operated in accordance with major project approval MP 06_0139 (as modified).

This Annual Environmental Review (AER) is written to satisfy Schedule 5, Condition 3 and has also considered the requirements of the compliance reporting guideline *'Compliance Reporting Post Approval Requirements'* (DPE, 2018) and provides information to allow the NSW Department of Planning, Industry and Environment (DPIE) to assess the facilities post approval activities and monitoring and reporting compliance to ensure it adequately addresses the requirements in the project approval conditions.

Statement of compliance

During the reporting period there were 12 non-compliances identified and reported by the proponent. An overview of the status of compliance with each relevant approval for the operation is presented in Table 0.1. Details of the non-compliances including actions taken or proposed by the proponent to address the non-compliance is provided in Section 6, and where required further detail has been provided throughout the document.

Table 0.1: Statement of Compliance

Relevant Approval	Were all conditions complied with?	If NO, total number of non-compliances				
		High	Medium	Low	Administrative non-compliance	Total
Project Approval 06_0139 (as modified)	NO	-	-	3	3	**6**
EPL13426	NO	-	-	-	5	**5**
EPL20121	YES	-	-	-	-	**0**
Trade Waste Agreement (No. 35580)	YES	-	-	-	-	**0**

There were zero non-compliances with a risk level of "High" or "Medium", that is no non-compliance with the potential to cause significant or serious environmental consequences.

There were four non-compliances with a risk level of "Low", these were all individual circumstances for unrelated aspects. Eight non-compliances during the reporting period were "Administrative" only.

Document Structure

An overview of the structure of this document is provided below:

Section 1 Provides an overall context and introduction to the AER

Section 2 Details the approvals relevant to the facility, including any relevant changes and/or modifications proposed or implemented (particularly during the reporting period)

Section 3 Includes an overview of the important aspects for the operation of the facility

Section 4 Provides an update on the status of non-compliances identified by previous reports, including previous Independent Environmental Audits, Annual Environmental Reviews or other stakeholder/regulator Audits or reports

Section 5 Provides a comprehensive review of the environmental management and performance (monitoring results) of the project over the past year, including identification of emerging trends and/or discrepancies between the predicted and actual impacts of the project

Section 6 Details the non-compliances identified during the reporting period including actions taken or proposed by the proponent to address the non-compliance

Section 7 Lists and provides details of incidents which occurred, or where applicable, updates to previously reported incidents for which there was noteworthy action taken during the reporting period

Section 8 Details the complaints received during the reporting period including actions taken or proposed by the proponent to address the complaint

Section 9 Provides an overview of the activities to be completed to improve environmental performance during the next reporting period

Appendix A Water quality monitoring results presented for 2019 as well as long-term graphs to support the analysis provided in Section 5.1

1 Introduction

1.1 Background

Dial A Dump (EC) Pty Ltd, a wholly owned subsidiary of Bingo Industries (Bingo), operates a major recycling facility and general solid waste (non-putrescible) landfill facility now known as the 'Bingo Eastern Creek Recycling Ecology Park' (the facility) at Kangaroo Avenue, Eastern Creek (refer to Figure 1.1).

The existing facility includes the operation of a major Resource Recovery Facility (RRF) and a general solid (non-putrescible) landfill. The RRF includes a Materials Processing Centre (MPC), Waste Transfer Station (WTS) and a crushing and screening operation at the Segregated Materials Area (SMA).

The facility is located at Eastern Creek in the Blacktown local government area. The subject land of the facility includes Lot 1 in DP 1145808 and Lot 2 in DP 1247691. The general operations area, including the surface area of the quarry, is approximately 60 hectares (Ha). The subject land of the facility is shown on Figure 1-2.

The original project approval for the site was granted by the Minister for Planning in 2009 (MP 06_0139) under Section 75J of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). The operations commenced in 2012 and the project approval has been modified five times, most recently in March 2016.

Dial A Dump (EC) Pty Ltd is also the licence holder of EPLs 20121 and 13426, and one trade waste agreement (TWA), Consent – 35580.

1.2 Purpose of the Document

The purpose of this Annual Environmental Review (AER) is to satisfy Condition 3 of Schedule 5 in the Project Approval MP 06_0139 (as modified). Information provided in the AER relates to the requirements of Condition 3 as set out below:

a) Describe the works that were carried out in the past year, and the works that are proposed to be carried out over the next year;
b) Include a comprehensive review of the monitoring results and complaints records 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; and
   - the relevant prediction in the EA;
c) Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
d) Identify any trends in the monitoring data over the life of the project;

e) Identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
f) Describe what measure will be implemented over the next year to improve the environmental performance of the project.

This document has also considered the requirements of the compliance reporting guideline *'Compliance Reporting Post Approval Requirements'* (DPE, 2018) and provides information to assess the facilities post approval activities and monitoring and reporting performance, as well as addressing the points raised by the NSW Department of Planning, Industry and Environment (DPIE) in relation to the 2017 and 2018 Annual Reviews (in their letter dated 14 March 2019).

1.3 Key Project Personnel

The key site project personnel, including contact details, at the time of submitting this AER is presented in Table 1.1. Responsibility for maintaining the OEMP and supporting sub-plans lies with the General Manager.

Table 1.1: Key Project Personnel

Role	Details	Contact?
Director	Rodney Johnson	0408 919 562
General Manager	Simon Sherwood	0429 293 909
Site Operations Manager	Paul Smyth	0459 555 449
Environment Officer	Hugh Goymour	0437 131 620

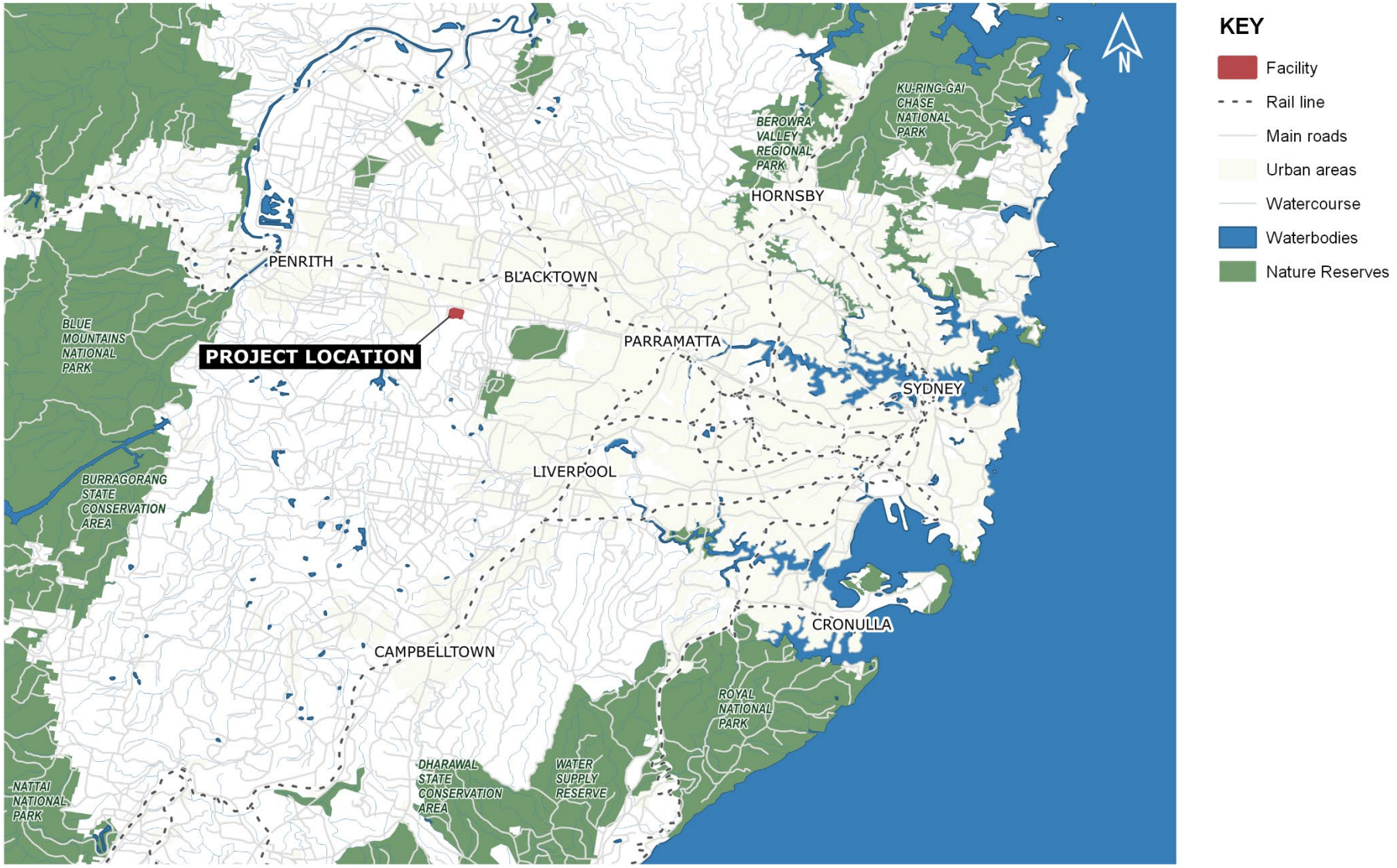


Figure 1-1: Regional Context

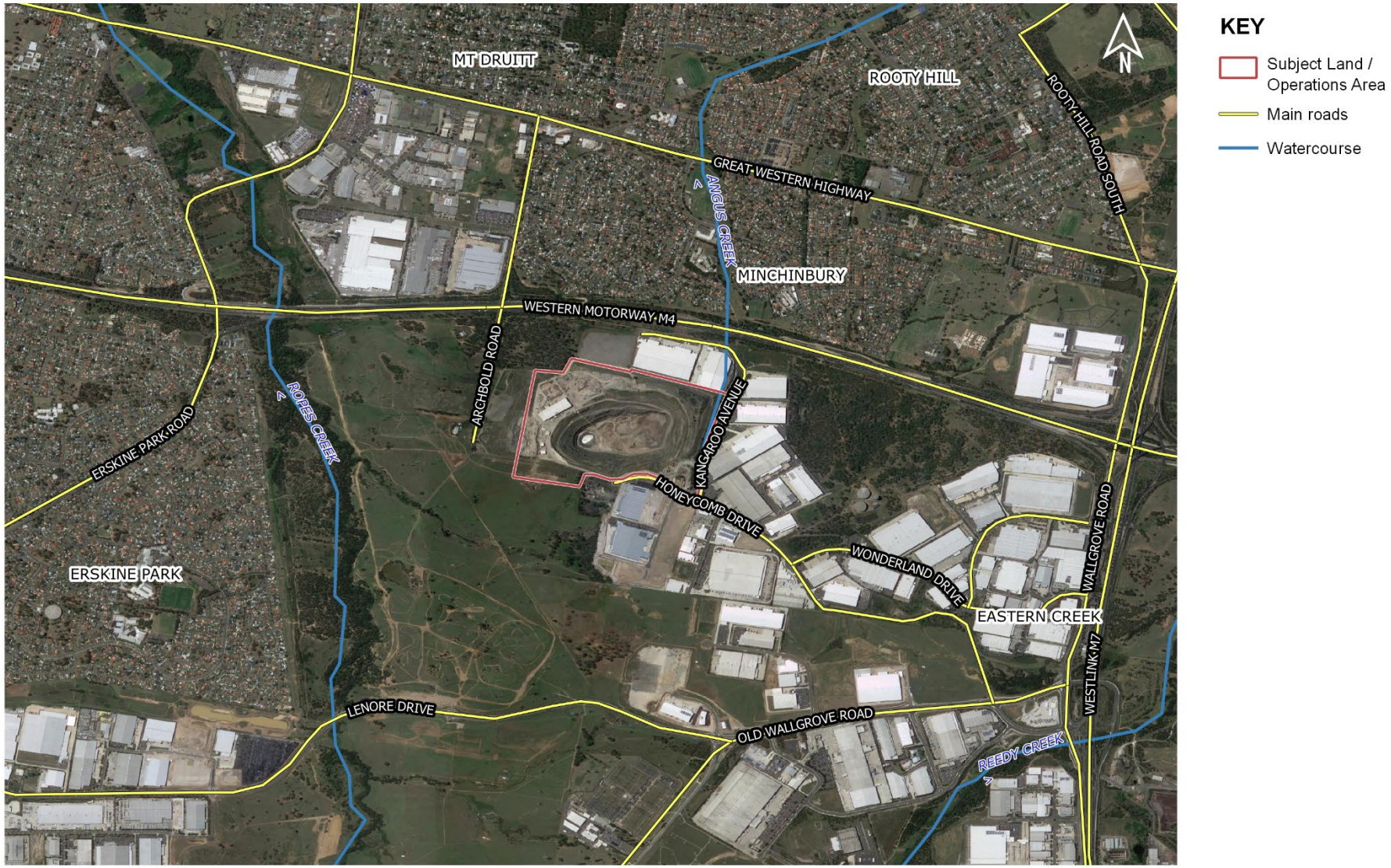


Figure 1-2: Local Context

2 Approvals

2.1 Project Approval

The original project approval for the site was granted by the Minister for Planning in 2009 (MP 06_0139) under Section 75J of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The operations commenced in 2012 and the project approval has been modified five times, most recently in March 2016. The following activities have been approved under Part 3A of the EP&A Act:

- Capacity to receive up to 2Mtpa of the following general solid waste (non-putrescible) types:
    - construction and demolition waste;
    - commercial and industrial waste;
    - waste streams complying with acceptable waste for general solid waste (non-putrescible) facilities; and
    - green waste.
- Use of fixed and mobile plant to process (sort, screen, sieve, crush, grind, shred, chip and compost) waste to produce products for application to land (road base, aggregate, landscaping soil, bedding sand, mulch, wood chip, compost and asphalt derived products);
- Testing and on-site storage of products for resale from the site to (predominantly) the construction and landscaping sectors;
- Landfilling of up to 0.7M tpa of waste, which caps the intake to the landfill of waste which is unsuitable or uneconomic for resource recovery (contaminated soil, asbestos waste and loads which cannot be physically sorted). Landfilling also includes residual non-recyclable material after the processing of co-mingled waste from recycling in the MPC;
- Quarantine and transfer of unsuitable wastes to off-site licensed waste facilities for disposal.
- Construction and operation of associated infrastructure, plant and equipment; including upgrading of internal roads and reshaping of earthen amenity berms;
- Segregated hardfill materials such as rock, sand soil, brick or concrete are also received at the Segregated Materials Area (SMA) within the Facility. These materials are crushed and screened for testing and sale for beneficial re-use; and
- Retention and conservation of a significant area on adjacent land beyond the north-west corner of the site, incorporating a remnant endangered ecological community (EEC) of Cumberland Plain Woodland (CPW).

A summary of the planning approval history including an overview of each of the previous modifications is provided in Table 2.1.

Table 2.1: Summary of Changes to Project Approval

Approval	Date of approval	Summary
Original project approval	22 November 2009	A waste recovery facility including a Class 2 (non-putrescible) landfill Total throughput of 2 million tonnes per annum Landfilling of up to 700,000 tonnes per annum of non-putrescible waste including asbestos Stockpiling of up to 50 tonnes of tyres at any one time Stockpiling of up to 20,000 tonnes of green waste at any one time
Modification 1	30 September 2010	Installation of conveyor and chute Permit two-way traffic on Fourth Avenue Construction of concrete bay walls within the Greenwaste Processing Area Relocation of the wheelwash.
Modification 2	9 November 2010	Administrative amendment to correct the land (lot and DP) to which the project applies
Modification 3	5 December 2011	Amendments to final landform level of the fill pad at Area D Revision of operational landform levels and the site's stormwater design Revision of the Voluntary Planning Agreement (VPA) Retrospective approval of various buildings/structures, including: - additional internal office and external amenities at the weighbridge - new administration and amenities buildings - relocation of the vehicle turning bay.
Modification 4	14 December 2013	Extension of the operational hours for the MPC.
Modification 5	17 March 2016	Construction of an additional pre-sort enclosure (PSE) adjacent to the MPC.
Modification 6	Lodged with DPIE, recommendation made February 2020	Modified the construction and operating hours. Increased landfill volume limits for the site.
Modification 7	Withdrawn on the 12 July 2019	Proposed modifications to the site entry point and the site layout. This Modification was withdrawn following the acquisition of DADI by Bingo.

2.2 Environment Protection Licences

The facility operates under two Environment Protection Licences (EPL) issued by the NSW Environment Protection Authority (EPA). These include:

- EPL No. 20121, which relates to the recycling and resource recovery arm of the operation; and
- EPL No. 13426, which relates to the management and regulation of the general solid waste (non-putrescible) landfill operation including Special Waste (asbestos).

The relevant controls of each licence are set out below.

2.2.1 EPL 20121: Recycling and Resource Recovery

EPL 20121 applies to the resource recovery processes carried out on the site and allows for the storage of up 667,000 tonnes of waste at any one time.

Of this the following fractions of waste may be stored:

- a maximum of 20,000 tonnes of garden waste;
- 50 tonnes of tyres; and
- individual wood waste stockpiles (both processed and unprocessed) must not exceed 2,000 tonnes each (notably there is no overall limit or a limit of the number of stockpiles).

2.2.2 EPL 13426: Landfill and Waste Storage

Under the provisions of EPL 13426, a total of 700,000 tonnes of waste may be directed to landfill in a calendar year.

The facility is approved to accept up to 2 million (M) tonnes per annum (tpa) of construction, demolition, commercial and industrial waste and green waste clean-ups. The majority of the waste is directed to the RRF for sorting, processing and resale as products suitable for application to land such as road base. The facility recycles an estimated 85% of all incoming waste. Material which is unsuitable or uneconomical for recovery or recycling is disposed to landfill.

On 21 December 2018, the Licensee submitted an application for the variation of the Licence. The purpose of the application was to approve the use of 'ConCover' as an approved alternative daily cover.

Following consultation with the EPA and the provision of daily procedures for use of 'ConCover', a notice of variation of licence (Notice Number 1575668) was received on 7 June 2019. The following variations were made to the licence:

- Conditions O5.5 and O5.6 were added to approve the use of 'ConCover' as an alternative daily cover; and
- As a result of these additions, previous conditions O5.5 to O5.24 had numbering changes.

On 17 December 2019, the Licensee submitted a Licence Variation Application. On 22 January 2020, the Licensee made a further request that several additional variation requests be considered with the already submitted Licence Variation application. This application is currently under consideration by the EPA and are summarised in Table 2.2.

Table 2.2: Summary of EPL13426 Licence Variation Application

Licence condition number	Details of proposed change	Reason for proposed change
O5.16	*Delete*	On 18 July 2017, the Licensee submitted the "DADI Landfill Leachate Management Contingency Systems Design, PSM1034-003R Rev 1 (June 2017)" to the EPA. This document presented the drawings and specifications for the Dial-a-Dump Landfill Leachate Management Contingency Systems (LMCS) design. The Licensee considers that the requirements of Conditions O5.16, O5.17 and O5.18 are no longer relevant as they contain references to the "upper floor liner" and "RL 25 mAHD", which are contrary to the proposed design of the Leachate Management Contingency System.
O5.17	*Delete*	
O5.18	*Amend* Prior to construction of the upper permanent leachate barrier and collection system at 60m AHD, the licensee must submit to the EPA a detailed design report including a construction quality assurance (CQA) program. The report must contain: details of the engineered features of the permanent leachate barrier and collection system, leachate storage and disposal infrastructure, stormwater management controls, gas management system, proposed daily and intermediate covering, proposed filling plan and groundwater and gas monitoring networks. This must include detailed plans and specifications and full "for construction" engineering drawings. The CQA program must contain enough details of the proposed installation methods, tests, inspections and other verifications to demonstrate that all materials and constructed features will conform to the required plans and specifications.	
P1.2	Monitoring points 21 (BH10d) and 22 (BH12d) be replaced by BH25d and BH26d, respectfully. Monitoring point 12 (BH15s) be replaced by BH15sA. Monitoring point 31 (Temporary groundwater interception sump) be removed without replacement Monitoring point 32 (leachate quality monitoring) sampling point location details be changed.	The existing monitoring wells associated with points 21 and 22 experience difficulties to perform due to dry well or pump failure. BH15s surface features were destroyed by mobile plant activity. The temporary groundwater sump has not been accessible since the basal floor liner was covered by waste. The leachate quality monitoring point with descriptions related to a "sump" is inaccurate based on the current floor level relative to the

Licence condition number	Details of proposed change	Reason for proposed change
		known sump at the base of the riser. The safest way to sample raw leachate is through a small tap located on the infill pipe to the leachate treatment plant.
M2.2	Change Zinc from 'monthly' monitoring to 'yearly' for all groundwater monitoring points: Monitoring points 7 to 30. Remove sampling point 31 without replacement.	No other analytes are sampled on this time frame, and does not appear to have a field within the e-connect portal for monthly data. The Licensee considers this is an admin error. Access to this monitoring point has not existed since the base of the landfill was still accessible.
M7.4	Remove references to EPA Points 31 and 32 and replace with the leachate riser in the landfill.	References to EPA Identification No 31 and 32 in Condition M7.4 would no longer be relevant (assuming other requests made herein are approved). The most suitable location to monitor height of the leachate would be from the leachate riser in the landfill.
O5 Waste Management - New Conditions	New conditions be created outlining approval of additional alternative daily cover materials, including: - Recovered fines; - Posi-shell spray-on mortar; and - Mixed Waste Organic Outputs (MWOO).	Additional alternative daily cover materials are proposed to provide increased operational flexibility and alternative mechanisms for covering waste by close of operation each day. The Licensee can avoid environmental or safety risks through the application of an approved alternative daily cover.

2.3 Trade Waste Agreement

The operation on site involves the operation of a Wastewater Treatment Plant (WWTP) for the processing of leachate generated by the landfill and timber yard. The operation requires a Trade Waste Agreement (TWA) with Sydney Water in order to discharge to sewer after treatment is complete. The agreement (Consent No: 35580) allows for discharge of treated waste with conditions set out in the TWA, the key conditions of this agreement include:

- Maximum rate of discharge 14 l/s
- Maximum daily discharge of 650kl
- Maximum daily average of 550kl
- Treated material is tested every 21 days

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

3 Operations Summary

3.1 Overview

This existing facility includes the operation of a major Resource Recovery Facility (RRF) and a general solid waste (non-putrescible) landfill. The construction and operation of an RRF and General Solid Waste landfill at an existing quarry and surrounding land at the site were approved under the original project approval (MP 06-0139) in 2009. The RRF includes a Materials Processing Centre (MPC) and a Waste Transfer Station (WTS).

The facility is approved to accept up to 2 million tonnes per annum (tpa) of construction, demolition, commercial and industrial and green waste. The majority of the waste is directed to the RRF for sorting, processing and resale. The RRF generates products suitable for application to land such as road base. The facility recycles an estimated 85% of all incoming waste. Material which is unsuitable or uneconomical for recovery or recycling is diverted from the RRF and disposed to landfill via a conveyor belt and chute system. This residual (non-recyclable) waste is estimated to be approximately 15% of waste processed through the RRF.

The facility currently landfills at a rate of approximately 629,000 tonnes per annum, however market demand is forecast to increase in the future, putting pressure on the ability of the facility to continue to receive direct-to-landfill waste and also receive and process co-mingled waste for recycling. The cap on landfill volumes at 700,000 tonnes per annum equally constrains the future ability of the facility to receive direct-to-landfill waste and co-mingled recyclable waste. This is because the processing and sorting of comingled waste creates a by-product (approximately 15% of co-mingled waste volume) which also requires disposal to landfill.

The site is accessed via a private access road off a temporary intersection at Kangaroo Avenue, approximately 150 m north of the intersection of Kangaroo Avenue and Honeycomb Drive.

Upon entering the site, delivery vehicles queue along the internal road and proceed to weighbridges situated close to the main operational areas, comprising the Materials Processing Centre, the Segregated Materials Area and related plant and equipment.

After the weighbridge trucks are directed to the MPC; crushing and screening area; or the landfill. All vehicles travel along internal roads around the west and north of the MPC then divert to the south to enter the MPC; to the north to enter the crushing and screening area; or to the north-east to enter the landfill.

All departing vehicles travel back to the weighbridge via a wheel wash to the east of the MPC.

The landfill (former quarry) pit comprises approximately 75% of the site area. The MPC, timber waste, green waste, sales yard, crushing and screening and workshop area are situated to the west and north-west of the landfill pit.

The operational areas of the site are surrounded to the east, west and north by an environmental bund constructed of overburden from the former quarry which shields receptors from views of, and noise generated from, the facility.

Operations at the facility are managed in accordance with a suite of existing environmental management plans with the principal document being the Operations Environmental Management Plan (OEMP) supported by issue-specific sub-plans which have been developed in accordance with the development consent.

Table 3.1: Summary compliance with relevant operational conditions

Activity	Approved Annual Limit	Previous Reporting Period (actual)	This Reporting Period (actual)	Next Reporting Period (forecast)
Total waste received (tonnes)	2,000,000	1,318,632	1,626,421	2,000,000
Landfilling (tonnes)	700,000	693,939	698,505	1,000,000[i]

[i] Modification 6 to the Project Approval, which has been lodged with DPIE, seeks to increase the landfill limit so that 1,000,000 tonnes per annum could be sent 'direct-to-landfill' (i.e. an increase of 300,000 tpa). The forecast landfilling amount for the next reporting period reflects this proposal but it subject to receiving the necessary approvals.

EPL20121 also contains limits on the amount of waste which can be stored at any one time, including a total amount (667,000 tonnes), as well as for specific waste types including garden waste (20,000 tonnes), tyres (50 tonnes) and individual wood waste stockpiles (must not exceed 2,000 tonnes – note there is no overall limit or a limit of the number of stockpiles). These limits are reported to the NSW EPA monthly via the Waste and Resource Reporting Portal, and also subject to six-monthly site volume surveys (also reported to the NSW EPA). These limits were complied with during the reporting period.

3.2 Site Location and Layout

The facility comprises a Resource Recovery Facility (RRF) and a general solid waste (non-putrescible) landfill. The landfill is a former quarry site (Pioneer Quarry) and the RRF includes a Materials Processing Centre (MPC) and a Waste Transfer Station.

The landfill (former quarry) pit represents the central feature of the site area. The MPC, timber waste, green waste, sales yard, crushing and screening area and workshop area are situated in the west and north-west sectors of the site. The operational areas of the site are surrounded to the east, west and north by an environmental bund constructed of overburden from the former quarry which shields receptors from views of, and noise generated from, the facility.

The operations area of the site, including the surface area of the quarry, is approximately 60 hectares (Ha). The current layout of the facility is illustrated in Figure 3.1.

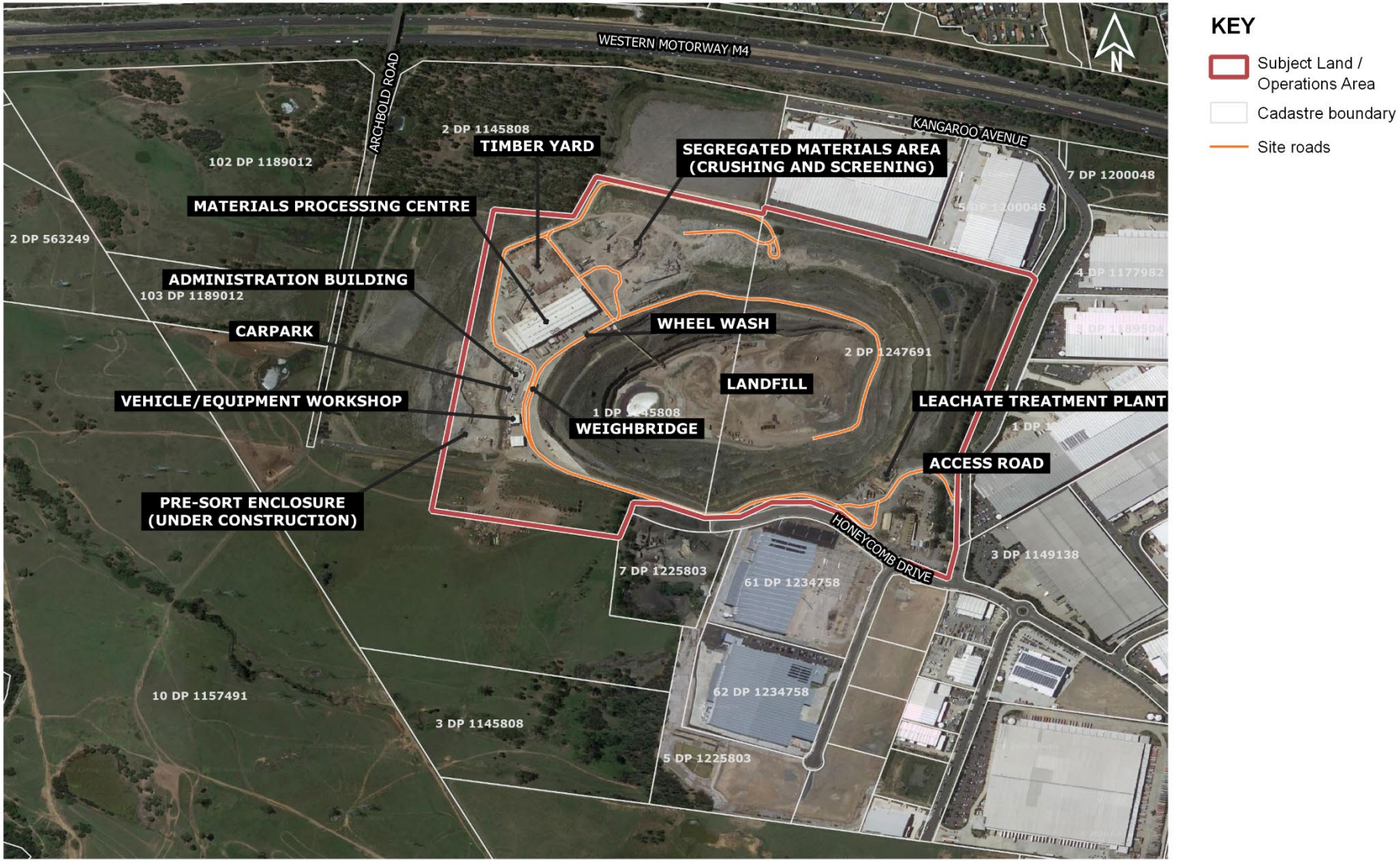


Figure 3-1: Site Layout

3.3 Process

Waste received on site is directed to one of two destinations for processing (recycling/reuse) or disposal (landfill). Initially, the load is received by truck at the weighbridge upon entering the site where it is weighed, inspected and assigned an internal destination. Waste suitable for recycling is directed to either the MPC (if comingled) or segregated materials area (SMA) for crushing and screening; and waste suitable for disposal is directed to the landfill.

The following processes occur at the internal waste destinations.

3.3.1 Material Processing Centre

The MPC opened 8 June 2012 and operates pursuant to EPL 20121.

Mixed or comingled building and demolition waste is transported by truck to the facility where it is unloaded within the MPC. The existing MPC is a large building of cast concrete slab, steel and Colorbond construction typical of the surrounding industrial buildings within the Precinct.

Waste which is received within the MPC is subject to processing by the fixed plant contained inside the building.

Accepted material is moved to the pre-sort area where bulky material such as metals, fibro sheeting and treated timbers are removed and stockpiled. Timber is directed to the timber yard, bricks and concrete are directed to the crushing and screening area and metals are on-sold to metal recyclers.

The remaining material is moved to the construction and demolition waste sorting plant feed stockpile, and then fed into a shredder which re-sizes it to 450 mm or less. The material passes through the plant, which sorts material using magnets, screens, blowers and picking stations. Sorted material which cannot be recycled is disposed to the landfill via a chute.

Recyclable sorted material comprises timber, crushing and screening feed and metals. Timber is shredded and timber that complies with the resource recovery exemption is sold as mulch and the timber that does not comply with the exemption and is not treated is sold as particle board feed or boiler fuel.

Bricks, concrete, ceramics and aggregates are used as stock in the SMA and metals are on-sold to metal recyclers. Materials such as plasterboard, plastics and cardboard are transferred to alternative recycling facilities.

3.3.2 Segregated Materials Area

The SMA is principally used for the receipt, processing dispatch and stockpiling of inert construction and demolition materials, such as sand dirt concrete, brick tiles and asphalt.

Materials received within the SMA come from both pre-sorted loads, transferred from the MPC and also from direct loads of material deposited within the area. Once delivered to the SMA

materials are sorted into relevant categories (i.e. brick, concrete, sand, soil, stone and bitumen) for reprocessing into a variety of products for sale.

From these primary materials delivered direct to the SMA or sorted at the MPC, all different kinds of aggregates and road base can be produced. All products produced on site are routinely tested by independent third parties to ensure compliance with any relevant resource recovery exemptions and to ensure consistent quality products are produced.

All stockpiles heights are limited to within the height of the amenity berms as required by the project approval and are maintained in accordance with all current legislative and regulatory requirements.

The product is produced by a variety of machinery that is currently used as required within the area and generally consists of two mobile crushers plus auxiliary equipment (such as screens, stockpilers and reclaimers).

Mobile equipment (such as loaders and excavators) used to relocate materials and products are also used within the area on an 'as required' basis.

3.3.3 Landfill

Waste directed to the landfill is categorised as:

- General solid waste, which is sub-categorised into construction and demolition waste containing small quantities of recyclables and soil containing recoverable brick, concrete and timber.
- Asbestos waste, which could be wrapped asbestos (sheeting), asbestos soil and construction and demolition waste containing asbestos.

Any waste that cannot be recycled or reprocessed through the MPC, or SMA, is also sent to landfill.

The landfill receives residual, non-recyclable waste from the MPC via a conveyor and chute.

Alternatively, loads of construction and demolition general solid waste may be accepted directly into the landfill via approved third parties.

The material is deposited at the base of the landfill and pushed into place, spread and compacted by a steel wheeled landfill compactor. Cover is placed by a bulldozer. Each 'lift' of waste is placed along a 50 m tipping face with a daily lift thickness not exceeding 2 m. Filling progresses in panels across the floor of the main tipping area.

The waste is covered in accordance with the EPL requirements. Minimal areas of waste are exposed at any time, which reduces the potential for leachate generation during rain.

The active tipping area is covered daily with a minimum of 150 mm of virgin excavated natural material or an alternative daily cover, as required by Condition O5.4 of EPL 13426.

i. Asbestos waste

If identified, asbestos waste is inspected as follows:

- wrapped asbestos is inspected for correct wrapping and sealing; and
- asbestos soil and other asbestos waste are inspected for sufficient moisture content to prevent the generation of dust during handling.

All asbestos waste is then disposed of in dedicated and restricted areas of the landfill.

ii. Leachate management

Leachate is managed in accordance with EPL 13426, the *Leachate Collection, Conveyance and Management Plan* and the *Soil, water and leachate management plan* (SWMP).

Infiltration of water through the cover is minimal as evapo-transpiration exceeds rainfall for 80% of the year in the area. Additionally, the steep slope batters of the covered waste results in high water runoff, which is directed to the water management system. Therefore, most leachate generation results from water entrained in the deposited waste or from heavy rainfall which inundates the waste prior to covering.

A high-density polyethylene (HDPE) leachate liner was installed at the base of the landfill, which was encapsulated by two geotextiles.

Perforated polyethylene pipes were placed in an aggregate drainage layer above the liner, which is further covered with geotextile. The pipes collect any leachate and drain via gravity to a concrete lined sump at the lowest elevation of the landfill, from which it is pumped to leachate storage tanks.

The leachate is pumped to sequential batch reactors, which are processing tanks used for the treatment of waste water. There are four 110 kilolitre (kL) tanks at the facility which have a decanting capacity of 50 kL/7-9 hours. The system can treat 600 kL every 24 hours.

The treated leachate is discharged into a Sydney Water sewer as permitted by Trade Waste Agreement 35580, which allows the discharge of up to 650 kL a day of pre-treated waste water into Sydney Water infrastructure and is tested every twenty one (21) days.

Leachate volumes and quality are monitored as follows and reported in the annual return to the EPA:

- the leachate level in the sump is monitored weekly;
- the quality of untreated leachate is monitored quarterly; and
- leachate generation rates are monitored to calibrate the leachate model.

Groundwater is sampled quarterly or yearly (depending on analyte) and analysed in accordance with Condition M2.2 of the EPL 13426 to determine if landfill operations are impacting water quality. If analysis of the samples indicates that environmental trigger levels for groundwater are exceeded, an action plan or remediation plan is implemented to inform the EPA of the exceedance,

re-sample to establish a trend, determine and remediate the source if there is a trend, and remediate the impacted area. Further details are provided in Section 5.1.2.

iii. Landfill gas

The landfill does not accept putrescible waste and, therefore, there is reduced potential for the generation of landfill gas compared to facilities which do accept such waste.

Landfill gas generation and movement is monitored quarterly via shallow boreholes in accordance with the site's *Landfill Gas Monitoring Program* to determine if gas is moving laterally to adjacent lots. Gas is also monitored at the surface every month to identify if there are faults in the gas management system or capping layers. Further details are provided in Section 5.2.2.

Landfill gas will continue to be monitored in accordance with the EMS and *Landfill Gas Monitoring Program* and managed as required pending results of monitoring

iv. Water management

Surface water at the facility is managed in accordance with the site's *Operations Environmental Management Plan* (OEMP).

Water that falls on the landfill is managed as leachate, with such water falling on the site managed as described above in Section 3.3.3(ii).

Water that falls on the walls and road is directed to the clean water pond. A lined clean water pond is provided in a covered area of the landfill, with a new pond installed when a major high lift has occurred prior to the runoff from the landfill surface entering the clean water pond. The clean water pond can accommodate a 1 in 50 year average recurrence interval 24-hour storm. Sediment is allowed to settle and the resulting clean water collected by a water tanker for use in dust suppression and cleaning of machinery. There is also a transfer pump in the basin which can transfer water to other basins and tanks in the facility.

Runoff volumes will marginally decrease over time as the floor of the landfill raises towards to the top of the void, as the raising of the floor decreases the surface area of the void walls.

3.4 Hours of operation

The current hours of operation identified within Condition 39, 39a, 39b and 39c of the consent condition and L5 of EPL 13426 and condition L5 of EPL 20121 are summarised in Table 3.2.

Table 3.2: Hours of Operation

Activity	Days	Hours of Operation
Construction	Monday – Friday	7:00am to 6:00pm
	Saturday	8:00am to 4:00pm
	Sunday and Public Holidays	Nil

Activity	Days	Hours of Operation
MPC Operations (waste deliveries and chute use)	Monday – Friday	7:00am to 6:00pm
	Saturday, Sunday and Public Holidays	8:00am to 4:00pm
Crushing and screening	Monday – Friday	7:00am to 6:00pm
MPC (including maintenance)	Monday – Friday	6:00am to 10:00pm
	Saturday, Sunday and Public Holidays	6:00am to 4:00pm
Landfill Deliveries (by truck only)	Monday – Sunday	7:00am to 6:00pm

3.5 Employment

The facility directly employs approximately 120 people, which includes up to 20 truck drivers transporting material to and from the site. The facility also contributes to indirect employment such as maintenance personnel and short-term contractors.

3.6 Public Safety

Since the Facility opened in mid-2012 a number of measures have been implemented to minimise the risks to the public and to ensure public safety. These measures are regularly reviewed for applicability and customers are regularly reminded of their need to consider the safety of others on site with flyers regarding driving behaviour whilst on site.

- the site is fenced;
- speed signs and speed bumps erected at the end of DADI Drive entrance (approaching the Workshop);
- access points to the site are gated and locked after hours (with security patrols after hours);
- access points to the site have security and warning signs;
- all visitors (including consultants) must sign in & out of the visitors register located at the Administration Office;
- the site is under video surveillance; and
- restricted general access to potentially hazardous zones (e.g. inside the chute).

4 Previous Report Actions

The following section provides information regarding previous non-compliances and actions/commitments from previous reports.

The Department (in a letter dated 14 March 2019) has requested that Bingo provides information that indicates the number of non-compliances from the IEA and annual reviews, the number that have been closed out and only provide a status (as at the end of the reporting period) for those actions that were outstanding at the commencement of the reporting period. It was also requested that Bingo consider providing this information in the format of a table.

Presented in **Table 4.1**, is a summary status of non-compliances from a comprehensive review of previous reports. **Table 4.2** then provides a summary of the outstanding actions from previous reports relevant to this reporting period, including an overview of the actions taken to address the action and a reference to where this has been discussed in this report.

It should be noted, the summary of actions from previous reports only includes those actions that were outstanding at the commencement of this reporting period. For example, all actions from the 2015 IEA had been closed by the operator prior to the reporting period, as reported in the 2016 Annual Review, hence are not included in **Table 4.2**.

Table 4.1: Summary status of Non-compliances from previous reports

Previous Report	Total Non-compliances identified	Non-compliances addressed prior to the commencement of the reporting period	Non-compliances outstanding at the commencement of the reporting period
2015 Independent Environmental Audit	45	45	-
2016 Annual Review	9	9	-
2017 Independent Environmental Audit [i]	58	47	**9**
2017 Annual Review	11	11	-
2018 Annual Review	3	2	**1**
2018 EPA Audit [ii]	28	8	**20**
DPIE Warning Letter received 10 May 2019	2	-	**2**

[i] It is noted that the 2017 IEA included various nomenclature for their findings, this summary report has included all "Observation", "Administrative non-compliance" and "Non-Compliant" findings.

[ii] The full 2018 EPA Audit is available for download from the EPA website at https://apps.epa.nsw.gov.au/prpoeoapp/ViewPOEONotice.aspx?DOCID=-1&SYSUID=1&LICID=13426

Table 4.2: Summary of outstanding actions from Previous Report

Actions Required from Previous Reports	Requested By	Action Taken by the Operator	Where Discussed in Annual Review
2017 Independent Environmental Audit			
MP06_0139 Sch 3 – 28: Revise the surface water, groundwater and leachate response plan to ensure it contains all required information	Independent Auditor	A specialist consultant has been engaged to review and update the Eastern Creek Environmental Management Plan and relevant subplans. This recommendation will be addressed in the scope of work for this project.	Section 9 (Activities to be Completed in the Next Reporting Period)
EPL20121 O4.1: Update the Emergency Management Manual	Independent Auditor		
Landscape and Vegetation Management Plan #1: Consider revising the management plan such that the existing conifer plantings does not directly conflict with the sites requirements.	Independent Auditor		
Landscape and Vegetation Management Plan #2: There may be merit in critically reviewing the VMP to confirm ongoing compliance (e.g. checks for dumping, monitoring of transects etc.)	Independent Auditor		
MP06_0139 Sch 3 – 54: Review erosion and sediment control practices for works underway on the western amenity berm. Revegetate this area with native grasses following works	Independent Auditor	Site runoff water and sediment control measures are being adequately maintained on site by the Licensee maintains in accordance with the Consolidated Stormwater Management Plan prepared by Martens and Associates. This includes the Fortnightly OSD Pit visual inspection program which inspects erosion and sediment control devices. Rehabilitation required by these findings has not yet been undertaken as the construction work is still ongoing. Rehabilitation of areas associated with Mod 5 Earthworks is included in the project scope of works.	Section 9 (Activities to be Completed in the Next Reporting Period)
Soil Water and Leachate Management Plan: Rehabilitate disturbed areas as soon as possible following any soil disturbance	Independent Auditor		

Actions Required from Previous Reports	Requested By	Action Taken by the Operator	Where Discussed in Annual Review
MP06_0139 Sch 4 – 2: Predictive site measures for Site Closure Management Plan	DPIE	Opinion submitted by Consulting Earth Scientists provided to the Department that the long period of time and the likelihood of legislative changes before closure militated against providing a meaningful report at this time. Bingo has not received a response from the Department.	No further details required in the Annual Review
EPL20121 L3.1 & L3.4: Update the compliance status of this audit criterion in line with the findings of the court.	Independent Auditor	In a letter dated 12 April 2019 to DPIE, the Licensee proposed that these matters will be addressed in the 2019 Annual Review.	Section 6 (Non-compliances) and Section 7 (Incidents)
2018 Annual Review			
EPL13426 O5.4: 20 December 2018 correspondence was received from the EPA regarding the use of concover in the landfill	EPA	On 7 June 2019, EPL 13426 was varied to approve the use of 'ConCover' as an alternative daily cover.	Section 2.2.2 (EPL 13426: Landfill and Waste Storage)
2018 EPA Compliance Audit			
EPL13426 L1.3: Maintenance of freeboard and depth indicators not undertaken by the licensee.	EPA	Dams and swales have been desilted. Development of a program maintenance schedule for the desilting.	No further details required in the Annual Review
EPL13426 L3.4: The licensee was not disposing of all outputs produced from the waste processing and /or resource recovery facility at the landfill. Some waste has gone through chute and then transported to QLD for disposal.	EPA	The Licensee has entered the details of the destination facility and the amount of waste transported into the EPA's Online Waste Tracking portal. Currently no waste is being transported offsite for landfilling.	No further details required in the Annual Review

Actions Required from Previous Reports	Requested By	Action Taken by the Operator	Where Discussed in Annual Review
EPL13426 L5.1: Licensee operating outside of hours of operation.	EPA	The Licensee has noted there is a need to increase the hours of operation to meet the demand for access to the Landfill, this amendment to operating hours is the subject of MP06_0139 MOD6.	Section 2.1 (Project Approval), Section 5.4 (Noise) and Section 9 (Activities to be Completed in the Next Reporting Period)
EPL13426 O2.1: Licensee has not maintained in-pit dam.	EPA	New boat purchased for use in the removal of litter from the in-pit dam. Investigations were undertaken into alternate means of cleaning the dam surface, that cannot not be impacted by inclement weather. i.e. 2 man drag net. The design of the in-pit dam when relocated will facilitate ease of maintenance without requiring the use of a boat.	Section 9 (Activities to be Completed in the Next Reporting Period)
EPL13426 O5.4(a)(i): Licensee had not applied daily cover to a minimum of 15 centimetres over all exposed landfill waste prior to ceasing operations at the end of the day.	EPA	Tool Box Talks and site meetings are held regularly with the operational onsite staff informing them of conditions of the EPL. Waste is and will continue to be covered in accordance with EPL. The licensee has responded to a show cause notice issued by EPA to the licensee on 21 February 2019.	No further details required in the Annual Review
EPL13426 O5.4(a)(ii): Licensee also using unapproved alternative daily cover – ConCover.	EPA	The Licensee submitted an application for a variation to licence condition O5.4 to reinstate the use of Concover. Conditions O5.5 and O5.6 have been added to the latest version of the EPL (version 7 June 2019) approving the use of 'ConCover' as an alternative daily cover.	Section 2.2.2 (EPL 13426: Landfill and Waste Storage)

Actions Required from Previous Reports	Requested By	Action Taken by the Operator	Where Discussed in Annual Review
EPL13426 O5.10: The licensee had not submitted and maintained a filling plan for the disposal of waste sequentially in each landfill cell, that is updated at intervals no greater than 12 months.	EPA	Revised filling plans were submitted to the EPA on 25 March 2019.	No further details required in the Annual Review
EPL13426 O6.6: Chemicals on site not stored in appropriately designed impervious bunded area.	EPA	The Licensee has undertaken an improvement of their chemical storage areas providing additional bunding to store chemicals.	No further details required in the Annual Review
EPL13426 M2.1: The Licensee did not collect all samples from the prescribed locations (the licensee sampled at points BH25d and BH26d instead of at BH10d and BH12d), or at prescribed frequencies (Zinc, Total Organic Carbon and Ammonia were sampled quarterly and not monthly as required).	EPA	The Licensee has submitted an application for a variation to licence condition M2.1 to ensure the license aligns with current practices.	Section 2.2.2 (EPL 13426: Landfill and Waste Storage)
EPL13426 M7.4: Licensee has not sampled the height of leachate at the required weekly frequency.	EPA	Installation of a transducer (logger) which monitors and records leachate levels. The Licensee has submitted an application for a variation to licence condition M7.4 to ensure the license aligns with current practices.	Section 2.2.2 (EPL 13426: Landfill and Waste Storage)
EPL13426 R2.1: The licensee did not notify the EPA of a fire that occurred on 25 May 2018, immediately after they became aware of the fire.	EPA	The Licensee has updated their procedures to inform relevant regulatory authorities in a timely manner.	No further details required in the Annual Review
EPL13426 E4.1: The alternative cover material used to cover waste contained particles bigger than 50mm.	EPA	The Licensee notes condition E4.1(a) and will continue to monitor compliance with the daily cover requirements in the relevant site checklists; Based on the photos presented by EPA, the Licensee considers that the Auditor has mistaken a stockpile of 40/70 aggregate that is used as a drainage material in the leachate collection system for daily cover.	No further details required in the Annual Review

Actions Required from Previous Reports	Requested By	Action Taken by the Operator	Where Discussed in Annual Review
Protection of the Environment Operations (General) Regulation 2009- Chapter 7, Part 3A: Several findings including: • 098 C (1) b) Likelihood of such hazards occurring; • 098 C (1) d) Inventory of potential pollutants; • 098 C (1) k) Detailed map; • 098 C (1) m) Staff training program; • 098 C (1) o) Dates the plan was updated; • 098 C (1) p) Testing and maintaining the Plan; • 098 E (1) & (2) a) Testing of plan; and • 153F Implementation of plan.	EPA	The PIRMP has been reviewed and updated and addresses the issues raised by the EPA audit. A test of the updated PIRMP was conducted on 22 February 2019.	No further details required in the Annual Review
DPIE Warning Letter received 10 May 2019			
MP06_0139 Sch 3 – 21(d): Siltation fencing along the amenity berm up to the sediment basin in the north western corner of the site was damaged and in disrepair and was not constructed nor maintained in accordance with the requirements outlined in the Blue Book.	DPIE	The silt fence was fully repaired.	No further details required in the Annual Review
MP06_0139 Sch 5 – 5: Failing to notify the Secretary of incidents as soon as practicable after becoming aware of the incidents. Failing to provide the Secretary with a detailed report on the incident within 7 days.	DPIE	Integration of the Bingo certified EMS including SOP-SEQ001 & OPL-SEQ024 and comprehensive incident register.	No further details required in the Annual Review

5 Environmental Management and Performance

Bingo is committed to delivering the highest standards of environmental performance to meet or exceed legal and other requirements. This section details the implementation and effectiveness of the control strategies for risks identified in the OEMP and issue specific sub-plans.

Operations at the facility are managed in accordance with the site Operation Environmental Management Plan. The following issue-specific sub-plans are implemented under the above over-arching plan:

- Soil, water and leachate management plan;
- Air quality, odour and greenhouse gas management plan;
- Pests, vermin feral animals and declared noxious weeds management plan;
- Landscape and vegetation management plan;
- Noise monitoring program; and
- Aboriginal Heritage Management Plan.

The following sections have been divided by the sub-plan categories, each of these sections aims 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 prediction 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; and
- Measures which will be implemented over the next year to improve the environmental performance of the project.

Environmental Data Management System

Environmental data management is the foundation of effective environmental performance and is the key to success. Proper environmental data management guides decisions, measures success, and can forecast the future.

During the reporting period, Bingo implemented an Environmental Data Management System (EDMS) to improve monitoring and reporting of environmental performance and compliance. The EDMS delivers a platform to manage environmental data through the lifecycle of environmental monitoring, including planning, sample collection, data validation, storage, and reporting. The fully implemented EDMS strengthens the EMS accreditation, demonstrating our commitment to ISO 14001 and environmental management.

5.1 Soil, Water and Leachate Management

The Project Approval (Sch. 3, Cond. 21) requires that a Soil, Water and Leachate Management Plan (SWLMP) be prepared by a suitably qualified and experienced expert, in consultation with the EPA and Blacktown City Council. The SWLMP is required to include a surface water, groundwater and leachate monitoring program, the requirements of which must comply with Sch. 3, Cond. 27.

A SWLMP was prepared for the site by Douglas Partners in consultation with EPA and Blacktown City Council and subsequently submitted to DP&E and approved on 23 December 2011. This plan is reviewed and updated as required. The plan (as updated) is provided on the project website.

This Section has been prepared to address the concerns raised by the Department in a letter dated 14 March 2019 in relation to the 2017 and 2018 Annual Reviews. In particular, this section includes:

- A comprehensive review of all monitoring results during the past year, including a comparison of the results to the relevant statutory requirements, an analysis of these results against the relevant impact assessment criteria, monitoring results from previous years and predictions in the EIS and/or Supplementary Report, and the identification of trends over the life of the development for all data required to be reported;
- The analysis of the monitoring results has been tabulated and/or graphed where practical to aid in the identification of compliance and trends over time; and
- A description of non-compliances with the monitoring program reported in annual returns submitted during the reporting period, including actions that are being taken to rectify any issues.

The Soil, Water and Leachate Management Plan describes the management and mitigation measures that are to be implemented in order to prevent, or minimise, the potential impacts on water quality from the Project. Environmental management and performance surface water, groundwater and leachate is detailed in the sections below, as follows:

- 5.1.1 Surface Water;
- 5.1.2 Groundwater; and
- 5.1.3 Leachate.

The Soil, Water and Leachate Management Plan also outlines the surface water, groundwater and leachate monitoring program which is undertaken in order to effectively monitor and report water character from the site, and ensure early detection and reporting of possible pollution of water. The monitoring program is consistent with the monitoring requirements of Condition M2 of EPL 13426 at all the locations listed in Condition P1.2 of EPL 13426 and P1.3 of EPL 20121.

Groundwater, surface water and leachate samples collected for the project are analysed for a broad chemical suite designed specifically to assess the chemical characteristics of the different surface waters and aquifer units and enable comparison against the leachate created by the operation. Table

5.1 details the key water quality indicator parameters for sampling surface water, groundwater and leachate.

The network of monitoring locations is shown in Figure 5-1 (note the EPL Point # is a reference from EPL 13426).

Table 5.1: Key water quality indicator parameters

Category	Parameters	
Physicochemical parameters (measured in the field)	pH (field)	Total dissolved solids [ii]
	EC (field)	Total suspended solids [v]
	Redox Potential (field) [i]	
Ammonia and Nutrients	Ammonia	Total organic carbon (TOC)
	Nitrite [ii]	Phosphorus [iv]
	Nitrate [ii]	
	Nitrite + Nitrate (oxidised nitrogen) [i]	
Major Cations and Anions	Calcium [iv]	Chloride [iv]
	Magnesium [iv]	Fluoride [iv]
	Potassium [iv]	Sulphate [iv]
	Sodium [iv]	
Alkalinity	Total (as calcium carbonate) [iii]	
Metals	Aluminium [iv]	Copper
	Arsenic	Lead
	Barium [iv]	Manganese [iv]
	Cadmium	Mercury
	Chromium (III+VI)	Nickel [iii]
	Cobalt [ii]	Zinc
Hydrocarbons	Total petroleum hydrocarbons (TPH) [iv]	Benzene, toluene, ethyl benzene and xylenes (BTEX) [iv]
	Phenols [iv]	Poly Aromatic Hydrocarbons [ii]
Pesticides	Organochlorine pesticides [ii]	Organophosphate pesticides [ii]

i Groundwater samples only

ii Leachate samples only

iii Surface water samples only

iv Groundwater and leachate samples (not surface water)

v Surface water and leachate samples (not groundwater)

Figure 5-1: Water Monitoring Locations

5.1.1 Surface Water

The key objectives of surface water management for the Project are as follows:

- No significant impacts on the community or environment;
- Prevention of surface water contamination;
- Minimising soil erosion/sediment generation and transport off the site; and
- Maximise use of collected water on site for dust suppression.

These objectives are met by implementing the mitigation and management measures detailed in the Soil, Water and Leachate Management Plan. These management measures include:

- Site area separation and gradation to separate 'clean' and 'dirty' water;
- Gross pollutant sumps and traps to reduce sediment levels and pollution of stormwater;
- Regular visual inspection of the stormwater treatment control measures on a monthly basis and after major rain events;
- Maintenance and repair of surface water infrastructure (i.e. draining system, hardstand areas, gross pollutant sumps/traps and Onsite Sediment Detention (OSD) basins), to ensure continued segregation of 'clean' and 'dirty' water, sediment control and water quality;
- Keeping sedimentation basins in a drawn-down state by preferential use of the water by tankers for dust suppression; and
- Maintenance of roads to reduce erosion and sedimentation, protect stormwater drains along with daily litter collection and sweeping of paved roads.

Surface water flows from the operational footprint and the surrounding area discharges into the stormwater system via gross pollutant traps. Stormwaters will then exit the stormwater system into overland swales before flowing to one of two surface water OSD basins.

One of the key surface water management objectives for the site is to maximise the use of collected water on site for dust suppression, thus minimising the occurrence of stormwater discharges from site and reducing any potential impact on surrounding waterways. However, during large events, stormwaters will discharge from the site via the surface water OSD basin overflow (weir). These events are required to meet the water concentration limits prescribed by Condition L2 of EPL 13425 and 20121 and shown in Table 5.2.

Table 5.2: Water concentration limits

Pollutant	Units of Measure	100 percentile concentration limit
Ammonia	milligrams per litre	1
pH	pH	6.5 - 8.5
Total Suspended Solids	milligrams per litre	50

Surface Water Monitoring points have been established at each of the surface water OSD basins, as well as separate monitoring points for their corresponding discharge points.

Surface Water Monitoring and Results Analysis

The surface water monitoring program is undertaken by an independent appropriately qualified expert. During the reporting period water quality monitoring was conducted quarterly by Consulting Earth Scientist (CES). There was a 100% compliance with the surface water monitoring program in 2019 with all samples prescribed by EPL 13426 (Condition M2.2) collected in accordance with those requirements.

Results of the quarterly surface water monitoring program as well as long-term trends in surface water quality results is shown in Appendix C - Section C1.1 2019 Surface Water Monitoring Results and C1.2 Long-term Surface Water Quality Monitoring Graphs.

A review of the quarterly surface water monitoring results found that:

- Ammonia monitoring during 2019 has presented low or no concentration of ammonia;
- pH levels were relatively stable in comparison to previous sampling events;
- There were two pH results which exceeded the water concentration limits as they were above 8.5. The north-west basin recorded 8.57 in Q1 and the south-west basin recorded 8.63 in Q2. Both returned to levels below the water concentration limits in subsequent monitoring samples.
- The majority of Total Suspended Solids (TSS) results for the life of the project have presented concentrations below the water concentration limit of 50mg/L.
- There were two TSS results which exceeded the water concentration limit. The south-west basin recorded 100mg/L in Q2 and the north-west basin recorded 110mg/L in Q3. Both returned to levels below the water concentration limits in subsequent monitoring samples.
- Metals have remained within historical ranges, and generally low concentrations in 2019.
- Note, water concentration limits during the routine quarterly monitoring program as reported above, do not constitute a non-compliance. The sampling events are for understanding representative water quality of the standing water in the OSDs. Discharge events (for which water concentration limits do apply) are discussed separately below.

There were four offsite discharge events during the reporting period, as follows:

- 18-20 March. On 18 March, offsite discharges occurred from south-west only, and on 19-20 March offsite discharges occurred from both the south-west and north-west;
- 9 July. Offsite discharges occurred from both the south-west and north-west during this event;
- 29 July. Offsite discharges occurred from north-west only during this event; and
- 18 September. Offsite discharges occurred from both the south-west and north-west during this event.

The EPL 13426 (Condition M2.3) requires the collection of samples within 24 hours of an authorised offsite discharge, or within 3 days of the first discharge that is occurring as a result of a rainfall event, from either surface water OSD basin overflow (weir). Wet weather surface water

monitoring is undertaken as required by an independent appropriately qualified expert. Samples were collected as required for each of the offsite discharge events listed above.

The results of the wet weather surface water monitoring are shown in Appendix C - C1.1.2 Special Frequency Monitoring Results.

A review of the monitoring results found that:

- Ammonia presented at low or no concentration during offsite discharges;
- pH and TSS exceeded the water concentration limits at the south-west basin on 18 March (pH – 8.69 and TSS – 82mg/L);
- TSS exceeded the water concentration limit at the south-west (150mg/L) and north-west basin (120mg/L) on 19 March;
- Water concentration limits were exceeded for TSS (1,700mg/L) at the south-west basin and pH (pH – 8.8) at the north-west basin on 18 September;
- These exceedances were the result of a significant rainfall event at the premises (refer to further detail below); and
- All other results were within expected ranges based on the previous years of routine monitoring for the site.

With regards to the exceedances of the water concentration limits listed above, it is noted that the site had received significant rainfall in the days prior to these discharge events. In accordance with EPL 13426, Condition L2.4 the licensee is not taken to have exceeded a concentration limit specified in this licence, for monitoring points 5 and 6, if the discharge has occurred solely as a result of a rainfall event at the premises exceeding a total of 45 millimetres over any consecutive five day period and the licensee has taken all practical measures to avoid or minimise water pollution.

The rainfall for the period 14 to 20 March, which includes the offsite discharge event period 18 to 20 March, is shown in Table 5.3. It can be seen from this table that this offsite discharge event was related to a rainfall event exceeding a total of 45mm over any consecutive five-day period. In this case, the licensee is not taken to have exceeded the water concentration limits.

Table 5.3: Rainfall during the period 14 to 20 March

	14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar
Daily Rainfall (mm)	1	33	18	42	45	3	0
(5-day) Cumulative Rainfall (mm)	1	34	52	94	139	141	108

Rainfall observations from BOM weather station 067019 (Prospect Reservoir)

The rainfall recorded from BOM weather station 067019 (Prospect Reservoir) for the 18 September shows 74mm was received on that day. This was preceded by 14mm on 17 September. This demonstrates the offsite discharge event was related to a rainfall event exceeding a total of 45mm over any consecutive five-day period and again not taken to have exceeded the water concentration limits.

5.1.2 Groundwater

Regional groundwater quality is generally poor, with high salinity levels from connate salts within the formation or alternatively from leaching of accumulated salt from the soil profile (McNally, 2009; Old, 1942) and the limited flushing due to low groundwater flow rates.

The EIS for the project predicted that the combination of the in-situ geology and the proposed leachate collection system would result in concentrations of parameters in groundwater which are below the level where impacts on the surrounding groundwater and surface water systems may occur.

The landfill leachate collection system and control measures have been designed and installed in accordance with best practice to further minimise the potential for impacts to underlying groundwater.

A network of 23 groundwater monitoring bores has been installed for the Project. The purpose of the groundwater monitoring network is to confirm that landfill operations are not giving rise to groundwater impacts. The monitoring network has been designed to generally target three aquifer units as described in Table 5.4 and represented in Figure 5-2.

Table 5.4: Description of aquifer units for the Project (IGGC, 2013)

Aquifer unit	Approximate Depth (mAHD)	Description	Hydraulic Conductivity	Formation
Shallow	70 to 40	Residual clay generally to 5m to 20m depth underlain by highly weathered shale and sandstone	Very low to low (0.003 to 0.25 m/d)	Bringelly Shale (weathered)
Intermediate	40 to -30	Poorly fractured (intermediate) bedrock strata. Limited evidence that fracture zones are extensive or interconnected	Negligible or very low (0.004 to 0.043 m/d)	Bringelly Shale
Deep	-30 to -80	Poorly fractured (deep) bedrock strata	Negligible or very low (0.004 to 0.011 m/d)	Bringelly Shale

All groundwater bores are required to be sampled on a quarterly basis in accordance with EPL13426. Water quality monitoring has been undertaken for the project since October 2012. Sampling of groundwater is undertaken by an external contractor, during the reporting period there were four sampling events undertaken by CES.

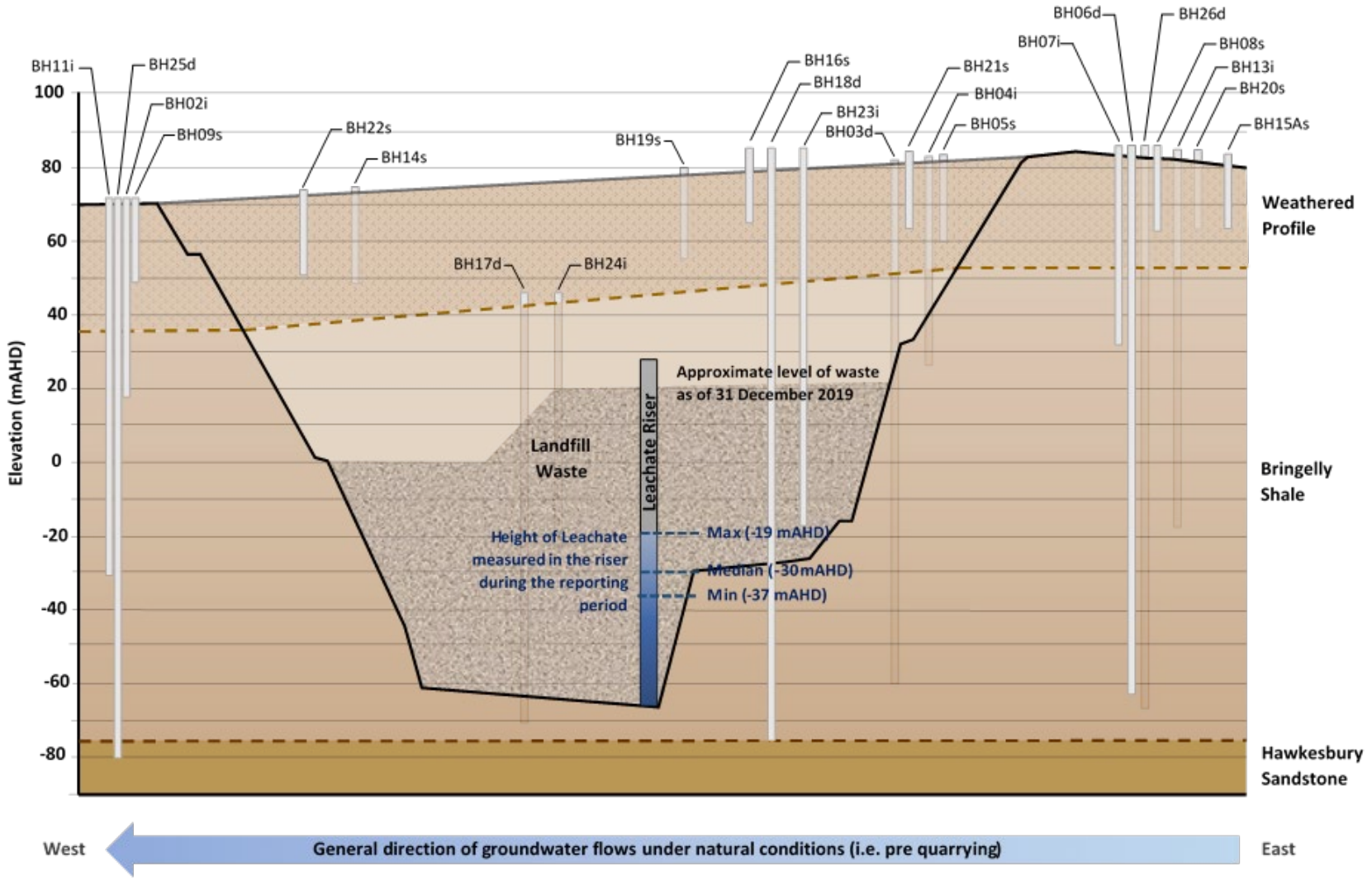


Figure 5-2: Conceptual Groundwater Monitoring Network Cross Section

Groundwater Monitoring and Results Analysis

Assessment of site groundwater quality is undertaken using trend analysis of monitoring data. The results of the suite of key water quality indicator parameters undertaken for the project to date are presented in Appendix C. Analysis of all groundwater bores demonstrates that results are consistent from year to year with no indications of any leachate contamination of groundwater wells.

Monitoring program completion

During the reporting period there was a very high compliance with the groundwater monitoring program prescribed by EPL 13426 (Condition M2.2).

There were five (5) occasions where the quarterly monitoring suite (12 samples) was unable to be collected from one of the groundwater monitoring wells (60 samples not collected). There was a further three (3) individual samples not collected throughout the year for a total of 63 samples not collected. The groundwater monitoring program requires a total of 1,541 samples to be collected, so there was a 96% compliance with the monitoring program in 2019.

A description of the non-compliances with the monitoring program, including actions to rectify any issues that have been undertaken or proposed is provided in Table 5.5.

Table 5.5: Summary of non-compliances with the groundwater monitoring program

Location	Date	Samples not Collected	Reason for non-compliance	Corrective actions proposed or undertaken
BH21s	Q2	Full quarterly suite	The well was dry	Continue to sample when conditions permit
BH21s	Q3	Full quarterly suite		
BH4i	Q3	Full quarterly suite		
BH15s	Q3	Full quarterly suite	Surface infrastructure of BH15s was destroyed by mobile equipment.	A replacement groundwater monitoring well, BH15As, was installed prior to the subsequent monitoring visit
BH25d	Q3	Redox sample	Insufficient sample was collected to allow for field records to be analysed	Currently seeking approval for the use of hydro sleeve sampling technology to improve sample collection
BH4i	Q4	Redox sample		
BH16s	Q4	Redox sample		
BH3d	Q4	Full quarterly suite	Unable to collect sample due to a faulty pump that is unable to retrieved.	Currently seeking approval for the use of hydro sleeve sampling technology to improve sample collection

Physicochemical field parameters

The major findings for physicochemical field parameters of groundwater samples for this monitoring year are as follows:

- pH in the shallow monitoring wells ranged from 6.96 to 8.39, and had an average of 7.5;
- The average pH in the intermediate (7.5) and deep (7.4) monitoring wells was similar to the pH in the shallow monitoring wells, if results from BH13i and BH17d are excluded;
- The pH results recorded at BH13i ranged from 11.64 to 11.79, and at BH17d they ranged from 12.01 to 12.41. These ranges are consistent with results of previous sample events;
- The minimum pH recorded was 5.86 (BH23i) in the intermediate monitoring wells. All other pH results were above 6.5;
- The average Electrical Conductivity (EC) concentration is lowest in the shallow monitoring wells (5,408 µS/cm) and highest in the deep monitoring wells (7,359 µS/cm);
- The average EC concentration in the intermediate monitoring wells was 5,588 µS/cm. This was influenced by the concentration in BH04i and BH07i, both averaging >15,000 µS/cm;
- The lowest EC concentration was recorded at BH02i (351 µS/cm). The highest EC concentration was recorded at BH07i (17,564 µS/cm);
- These EC results are consistent with results of previous sample events and long-term ranges.

Time series of field EC and pH for the groundwater monitoring bores are presented in Appendix C – Section C2.2 Long-term Groundwater Quality Monitoring Graphs.

Ammonia and Nutrients

Ammonia concentration is the primary leachate indicating parameter. Water quality results for ammonia concentrations are summarised as follows:

- Elevated levels of ammonia are present in a number of boreholes located across the site. This is "likely to reflect natural hydrochemistry in a confined aquifer of this type: these levels are slightly higher than those typically found in Bringelly Shale groundwater but similar and higher levels are observed in association with igneous formations of similar composition to the Minchinbury Diatreme (PB, 2006), Possibly derived from trapping of volcanic gas within the formation" (IGGC, 2013).
- The concentration of ammonia measured in all wells during the reporting period is consistent with fluctuations in ammonia levels in the past;
- Ammonia concentrations in BH17d have historically been highly variable in nature, however, levels now appear to be stabilising with background levels for the site;
- There has been no leachate odour or hydrogen sulphide odour recorded during the groundwater monitoring to date and colour observations do not suggest the presence of leachate; and
- Ammonia concentrations of all the groundwater monitoring bores for the Project indicates that the groundwater is not being impacted by leachate.

Major Cations and Anions

The major findings for major cation and anion characteristics of groundwater samples for this monitoring year are as follows:

- Groundwater at the majority of monitoring sites is typically dominated by sodium and chloride;
- Magnesium and Sulphate are generally present in higher concentrations in the shallow monitoring wells;
- Calcium and Potassium are generally present in higher concentrations in the intermediate and deep monitoring wells.

Alkalinity

The major findings for alkalinity for this monitoring year are as follows:

- Groundwater quality associated with volcanic bodies, such as the Minchinbury Diatreme, can be highly alkaline;
- The average Alkalinity was highest in the deep monitoring wells 1,050mg/L, followed by the shallow monitoring wells 1,032mg/L. The average Alkalinity was lowest in the intermediate monitoring wells 516mg/L.
- The highest Alkalinity result was recorded at BH17d (5,100mg/L). This was recorded in Q3 and was significantly higher than the range for this monitoring point (typically between 1,000 to 2,000). The subsequent monitoring result was 1,900mg/L (returning to the typical range).
- The lowest Alkalinity result was recorded at BH2i (150mg/L). This is within the historical range for alkalinity results in the intermediate wells.

Metals

The major findings for dissolved metals for this monitoring year are as follows:

- Metal concentrations detected during the reporting period are generally comparable to previous monitoring years;
- The majority of metal concentrations detected were below the laboratory LOR, or at low concentrations;
- Aluminium concentrations above 55µg/L were recorded for BH11i (170µg/L), BH13i (240µg/L) and BH17d (390µg/L);
- Concentrations of Barium decreased at BH2i to 0.061mg/L (2018: 49.7mg/L), and increased at BH6d increase to 28mg/L (2018: 13.8mg/L).
- Chromium concentrations increased at BH17d to 0.046mg/L. Chromium concentrations are typically below the laboratory LOR, or at low concentrations. This trend will continue to be investigated in subsequent monitoring samples;
- Copper concentration at BH3d decreased to 0.002mg/L (2018: 3.95mg/L), this is within the typical range for copper concentrations across the site;

- Lead concentrations increased at BH16s (7µg/L), BH22s (5µg/L), BH13i (10µg/L) and BH17d (5µg/L). Lead concentrations were not detected at BH3d, this is a significant decrease since 2018 when 26µg/L was detected at this location;
- Zinc concentration at BH6d decreased to 0.17mg/L (2018: 3.9mg/L), this is within the typical range for zinc concentrations across the site;

Concentrations of dissolved metals in groundwater are presented in Appendix C – Section C2.2 Long-term Groundwater Quality Monitoring Graphs.

Hydrocarbons

The major findings for hydrocarbons are as follows:

- Total Petroleum Hydrocarbon (TPH) detections were below the laboratory LOR, with the exception of BH14s, BH4i, BH11i, BH24i, BH6d and BH17d;
- The maximum TPH concentration was 160µg/L at BH14s (fractions C15-C28) and BH4i (fractions C10-C14);
- BTEX compound detections (i.e. benzene, xylenes and ethyl benzene) were below the laboratory LOR, with the exception of BH4i, BH11i, BH24i, BH3d, BH6d and BH17d;
- Benezene and Toluene were the main BTEX compounds detected in the exceptions listed above, although Xylene was detected at BH17d;
- Detections of Benzene, Toluene and Xylene are low, with maximums of 24µg/L, 21µg/L and 9µg/L (sum of individual values for o-xylene and m+p-xylene);
- Dissolved hydrocarbons can occur naturally in groundwater, with concentrations derived from carbonaceous material (CSIRO 2011). Detections of hydrocarbons across the site are most likely natural, however possible residues from monitoring bore drilling (e.g. lubricating oils) cannot be excluded.

5.1.3 Leachate

The key data relevant to the leachate assessment and water balance model for the Project are summarised as follows:

- The design of the infilling system allows separation of surface water run-off from the sides of the landfill from the rain falling directly onto the landfill waste and infiltrating to become leachate. This significantly reduces the volume of leachate generated;
- Based on conservative estimated volumes of surface water and leachate generated within the landfill, leachate generated by the Project is anticipated to range between 45 and 872 m^3/day, with an average of 241 m^3/day;
- In order to maintain groundwater elevations at acceptable levels within the landfill pumping rates from the landfill will be required to range between 250 m^3/day and 500 m^3/day;
- Providing that pumping rates do not fall below 241 m^3/day, the landfill will be able to be used as a leachate storage facility during times of high rainfall. This will allow a constant flow rate to be achieved from the leachate collection system and will negate the need for surface storage capacity for leachate pumped from the landfill;
- At the completion of the landfill and subsequent capping, leachate generation is likely to fall below 90 m^3/day. Due to the potentially poor ability of the regional groundwater system to absorb this volume of leachate there is potential for leachate elevations to eventually rise above the regional groundwater elevation and begin recharging the shallow perched groundwater system. Post landfill monitoring will help to quantify this process, however, there is potential for ongoing pumping to be required to prevent impact to receptors in potential hydraulic contact with the landfill.

Expected contaminants present within leachate generated by the landfill and requiring treatment included:

- Ammonia, barium, petroleum hydrocarbons and polycyclic aromatic hydrocarbons, which are considered likely to be present within likely leachate concentrations; and
- BTEX, chlorinated phenols, chloroform, cyanide, fluoride, metals and phenols, which are considered unlikely to be present at the concentrations requiring treatment, but which should be included in initial monitoring and treated if identified in excess of the trade waste criteria.

Raw leachate quality is monitored on a quarterly basis by an external contractor. Leachate quality monitoring has been undertaken for the project since January 2013. Sampling of leachate was undertaken by an external contractor, during the reporting period there were four sampling events undertaken by CES (22 February, 5 June, 25 September and 27 November).

Assessment of site leachate quality is undertaken using trend analysis of monitoring data. The results of the suite of key water quality indicator parameters undertaken for the project to date are presented in Appendix C.

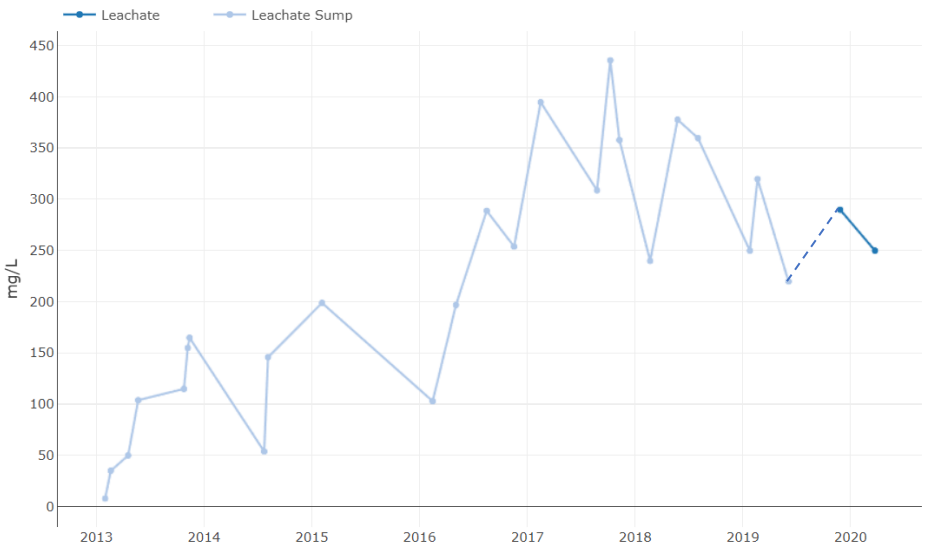
Leachate generated by the Project is sent through a Sequencing Batch Reactor (water treatment facility) before it can be sent for discharge to sewer under a Trade Waste Agreement with Sydney Water.

Treated leachate is monitored in accordance with the Trade Waste Agreement with Sydney Water. This includes continuous monitoring of the flow discharged from site and water quality samples collected every 21 days.

Leachate Monitoring and Results Analysis

Leachate extraction has been reasonably stable over recent years. For the year, there was 705mm rainfall on the landfill, treated leachate volumes were approximately 175,000 m^3 for the year. Pumping rates from the landfill were within the expected range to effectively maintain groundwater elevations at acceptable levels.

Ammonia concentrations found in the leachate are presented in Figure 5-3. The ammonia concentrations in leachate are typical of a construction and demolition waste landfill of this age. Ammonia concentrations increased during the early years of the operations but have stabilised over the past two to three years.



Leachate quality results were previously collected from a sump at the base of the leachate riser (Leachate Sump). The safest way to sample is through a small tap located on the infill pipe to the leachate treatment plant (Leachate). This graph illustrates long-term raw leachate quality with the change in sampling location indicated by a dotted line. Note, this change is included on a Licence Variation application currently under consideration by the EPA (refer Section 2.2.2 for further detail).

Figure 5-3: Ammonia concentrations in landfill leachate

Based on the monitoring data available for the groundwater monitoring points, there is no indication of leachate impacting the groundwater quality around the site. Refer to Section 5.1.1 and Appendix C for further analysis of groundwater and leachate quality monitoring.

5.2 Air Quality, Odour and GHG Management

5.2.1 Dust

Thomson Environmental Systems (TES) conducts air quality monitoring for Bingo around the boundary of the facility for two components of dust – Dust Deposition and PM_{10}. An annual report is prepared by TES to provide an analysis of the air quality monitoring results, the below provides a summary of the annual report prepared by TES.

The facility and the dust monitoring locations are shown in **Figure 5-4**. The facility is surrounded by commercial and industrial developments to the east and south and residential areas to the west and the north. The residential receivers on the west side are in the Erskine Park suburb which is located approximately 1 km from the site boundary and the residential receivers on the north are from the suburb of Minchinbury which is 160 m from the site boundary (separated by the M4 motorway).

Figure 5-4: Dust Monitoring Locations

i. Dust deposition

Dust deposition sampling started on 23 September 2016 and is being carried out at four monitoring sites (North, South, East and West). Dust deposition gauges for the four sites are collected monthly and results analysed for three fractions (insoluble, ash and combustible). The annual rolling averages are also calculated. The relevant criteria for deposited dust is specified in **Table 5.6**.

Table 5.6: Long-term criteria for deposited dust (assessed as insoluble dust)

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited Dust	Annual	2 g/m2/month	4 g/m2/month

There were only 3 (out of 48) samples that were lost/invalidated during the reporting period as discussed below:

- South DDG site (11/02/19 to 12/03/19) - The sample bottle broke in transit to the laboratory despite thorough wrapping with bubble wrap.
- East DDG site (11/02/19 to 12/03/19) - The sample could not be collected on 12/03/19 as the East site was inaccessible due to poor weather conditions. The sample was eventually retrieved on 26/03/19 but was found with a broken funnel. It was not known when the funnel was broken, therefore the sample was deemed invalid and not submitted for analysis.
- East DDG site (12/03/19 to 09/04/19) - As noted above, the sample for the period 12/03/19 to 09/04/19 was exchanged on 26/03/19. As such the sample was only exposed from 26/03/19 to 09/04/19 (14 days). Since this is significantly shorter than for the other three sites (and the typical duration of 30 + 2 days required by the AS standard), the result for the East site was deemed invalid for comparison.

The monthly insoluble dust deposition results for all the sites (including historical data for additional context) are presented in **Figure 5-5**. Monthly insoluble dust deposition values were generally below 4 g/m²/month. The 4 g/m²/month value was exceeded on 9 occasions (18.75% of samples) during the reporting period, 6 of which related to the East DDG. It must be noted that these do not count as exceedances as the 4 g/m²/month guideline refers only to the annual average.

The highest monthly deposition values at North (3.9 g/m²/month), South (5.3 g/m²/month) and West (5.6 g/m²/month) were all recorded during March (12/03/19 – 09/04/19). The highest deposition value at East (12.3 g/m²/month) was recorded during August (01/08/19 – 02/09/19).

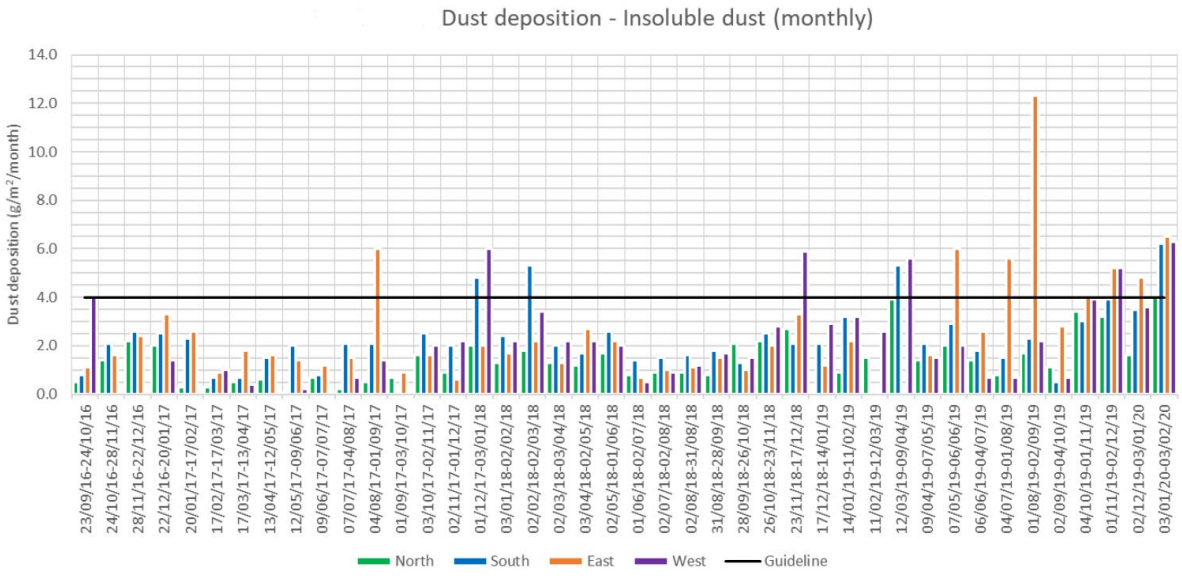


Figure 5-5: Monthly Dust Deposition – Insoluble dust (23/09/16 to 03/02/20)

The annual rolling average insoluble dust deposition results for all the sites is outlined in **Table 5.7** below. The annual rolling average dust deposition at three of the four sites (North, South and West) were well below the annual guideline of 4 g/m²/month for the reporting period.

The annual rolling average dust deposition at the East site ranged from 1.6 to 4.7 g/m²/month and exceeded the annual guideline of 4 g/m²/month from October 2019 to December 2019. This was due to elevated insoluble solids for the East site for most months since May 2019, and specifically during the period 01/08/19 to 02/09/19 (12.3 g/m²/month).

Table 5.7: Dust Deposition – Annual Rolling Averages

Dates	Corresponding Month	Number of Days	Threshold (g/m²/month)	Insoluble Solids (g/m²/month)			
				North	South	East	West
14/01/19 – 11/02/19	January	28	4	1.41	1.98	1.68	2.25
11/02/19 – 12/03/19	February	29	4	1.43	1.98	1.72	2.28
12/03/19 – 09/04/19	March	28	4	1.67	2.31	1.62	2.57
09/04/19 – 07/05/19	April	28	4	1.65	2.26	1.56	2.53
07/05/19 – 06/06/19	May	30	4	1.75	2.40	2.09	2.65
06/06/19 – 04/07/19	June	28	4	1.80	2.43	2.25	2.63
04/07/19 – 01/08/19	July	28	4	1.79	2.42	2.70	2.59
01/08/19 – 02/09/19	August	32	4	1.87	2.46	2.78	2.63
02/09/19 – 04/10/19	September	32	4	1.78	2.39	3.96	2.57
04/10/19 – 01/11/19	October	28	4	1.89	2.44	**4.17**	2.66
01/11/19 – 02/12/19	November	31	4	1.94	2.60	**4.36**	2.60
02/12/19 – 03/01/20	December	32	4	1.91	2.73	**4.72**	2.66

Historical rolling average insoluble dust deposition data from start of monitoring on 23 September 2016 are also presented in **Figure 5-6** for historical perspective.

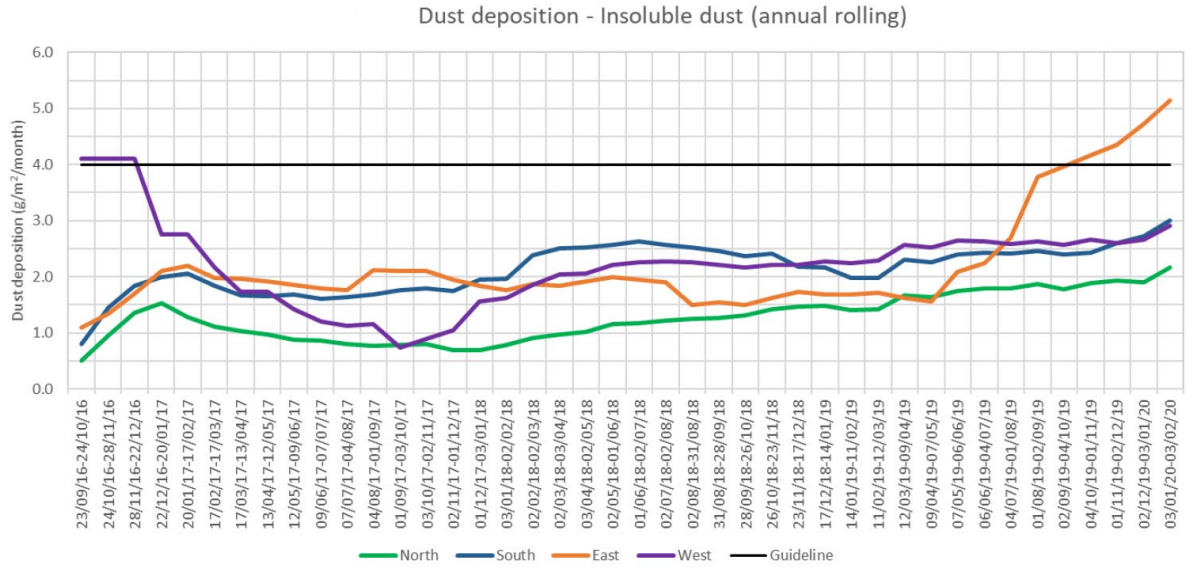


Figure 5-6: Annual Rolling Average Dust Deposition – Insoluble dust (23/09/16 to 03/02/20)

ii. PM10 results

Realtime PM_{10} concentrations are measured using a Beta Attenuation Monitor (BAM) at 93 Minchin Drive. The relevant criteria for PM_{10} concentrations is specified in **Table 5.8**.

Table 5.8: Short-term and long-term criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Particulate matter <10 µm (PM_{10})	24 hours	50 µg/m³
Particulate matter <10 µm (PM_{10})	Annual	30 µg/m³

The daily average (24-hour) PM_{10} concentrations are graphed in **Figure 5-7** and the Annual rolling average PM_{10} concentrations in **Figure 5-8**. Historical data from start of monitoring on 29 June 2016 are also shown for historical perspective. There were no PM_{10} data losses for the reporting period. Daily data capture since monitoring started on 29 June 2016 was 95%.

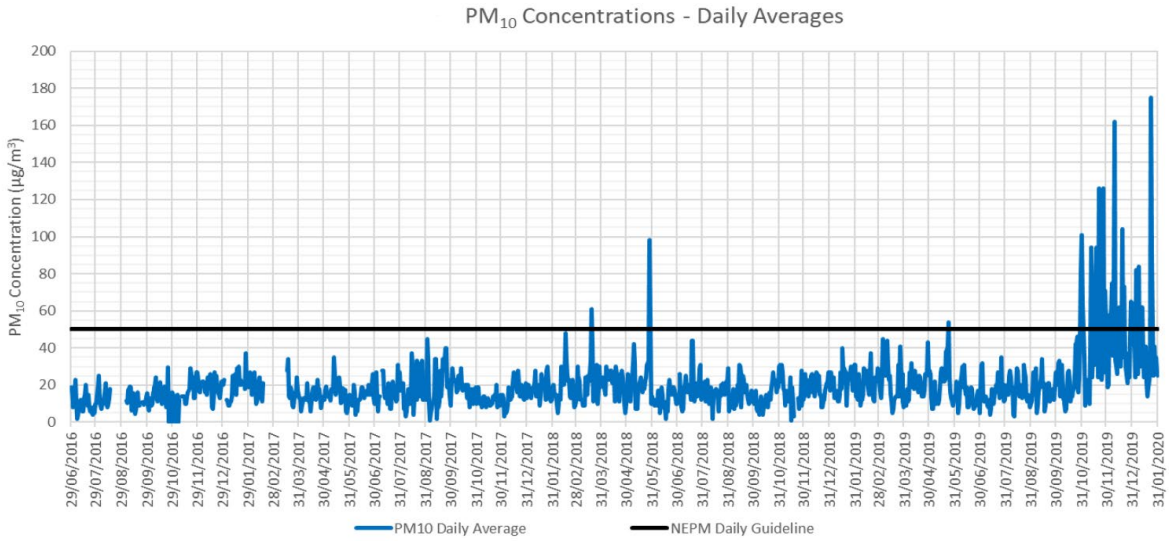


Figure 5-7: Daily Average PM_{10} concentrations (29/06/16 to 31/01/20)

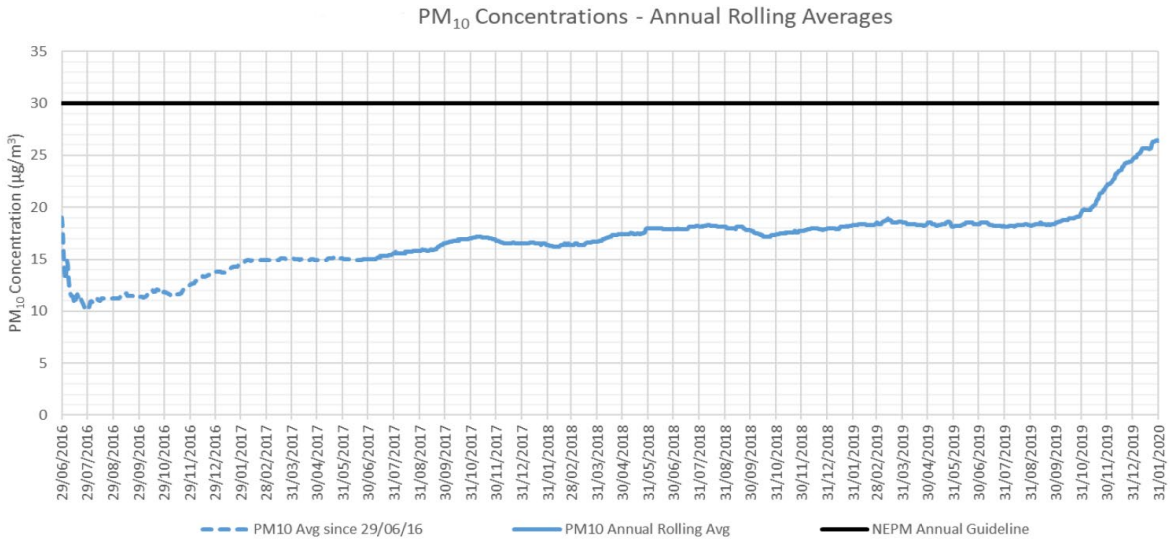


Figure 5-8: Annual Rolling Average PM_{10} concentrations (29/06/16 to 31/01/20)

The daily average PM_{10} concentrations measured were generally well below the daily (24hr) NEPM threshold of 50 µg/m^3. There were 26x exceedances of the daily (24hr) NEPM threshold of 50 µg/m^3 recorded during the reporting period. These exceedances were investigated by comparing the daily PM_{10} concentrations at the 93 Minchin Drive site to daily PM10 concentrations from nearby NSW EPA monitoring sites.

In all cases the exceedances of the daily (24hr) NEPM threshold of 50 µg/m3 were found to be linked to regional air quality events i.e. not due to Bingo's activities. In particular, the 25x exceedances which from 30 October to 31 December 2019 were related to bushfires causing widespread air quality impacts. The only other exceedance of the daily (24hr) NEPM threshold of 50 µg/m^3 during the reporting period was recorded on 24/05/2019 (54 µg/m^3). This was also attributed to regional bushfires (backburning activities at the time).

The impact of the bushfires since late October 2019 has raised the annual rolling average PM_{10} concentrations to 24.6 µg/m^3 by end December 2019. Historically annual rolling average PM_{10} concentrations have generally between 16 to 19 µg/m^3. Despite the impact of the bushfires, the annual rolling average PM_{10} concentrations have remained below the annual NEPM threshold of 30 µg/m^3 for the reporting period.

5.2.2 Landfill Gas Monitoring

In accordance with EPL 13426, Section M7.3 the licensee has prepared a Landfill Gas Monitoring Program designed to demonstrate whether landfill gas is migrating from the premises.

Consulting Earth Scientists Pty Ltd (CES) has been commissioned by Bingo Industries to implement the programme of landfill gas monitoring, which includes monitoring for:

- Sub-surface landfill gas – refer to Section 5.2.2(i);
- Landfill gas surface emissions – refer to Section 5.2.2(ii); and
- Landfill gas accumulation (enclosed structures) – refer to Section 5.2.2(iii).

The programme consists of the monitoring of landfill gas in seven (7) monitoring wells around the perimeter of the former quarry pit (i.e. landfill), gas accumulation monitoring in 13 locations and a surface gas survey across the surface of the active landfill. Sub-surface gas monitoring, surface gas survey and gas accumulation monitoring is undertaken at the site on a quarterly basis. These quarterly monitoring events are undertaken in March, June, September and December.

The subsurface gas monitoring locations and gas accumulation monitoring locations are shown in Figure 5-9.

Figure 5-9: Landfill gas monitoring locations

The Landfill Gas Monitoring Program has established threshold criteria for methane concentrations for sub-surface gas monitoring, gas accumulation monitoring and surface gas surveys. If the initial

detection of methane is at concentrations above the threshold criteria the NSW EPA are notified within 24 hours of results being received. Within 14 days of this notification, the occupier must submit a plan to the EPA for further investigation and/or remediation of the elevated gas levels. A summary of landfill gas monitoring frequencies and threshold levels for initial methane concentrations is provided in Table 5.9.

Table 5.9: Summary of monitoring frequencies and threshold levels for initial concentrations

Type of Gas being monitored	Frequency	Threshold
Sub-surface Landfill Gas	Quarterly	1% methane (v/v) [i]
Landfill gas surface emissions	Quarterly	500 parts per million (v/v)
Landfill gas accumulation (enclosed structures)	Quarterly	10 % of the LEL or 5000 ppm

i The original threshold assessment for the project was 1.25% methane (v/v), however Bingo has adopted the more conservative threshold limits in accordance with the *Environment Guidelines: Solid Waste Landfills* (EPA, 2016).

i. Sub-surface Landfill Gas

Sub-surface landfill gas is monitored in seven (7) wells located around the perimeter of the landfill (BH08s, BH14s, BH15As, BH16s, BH19s, BH21s and BH22s).

The sub-surface gas monitoring wells are compliant with the guidance presented in Section 5.3 of the *Environment Guidelines: Solid Waste Landfills* (EPA, 2016) in that the wells have been installed to depths to allow coverage of all potential unsaturated pathways for gas and have extended to the minimum reported groundwater level.

Results for the quarterly sub-surface gas monitoring are shown in shown in Table 5.10. The initial methane concentrations for gas wells BH08s, BH15s/BH15As, BH16s, BH21s and BH22s were negligible during the reporting period and therefore were below the prescribed detection threshold levels of 1.0 % *(v/v)*.

Table 5.10: Quarterly sub-surface gas monitoring for the reporting period

Location	Initial well concentrations CH_4 (%v/v)						
	Mar-2019	June-2019	Sep-2019	Dec-2019	Min	Avg	Max
BH08s	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1
BH15s/15As [i]	<0.1	<0.1	-	<0.1	0.1	0.1	0.1
BH16s	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1
BH21s	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1
BH22s	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1

i as discussed in Section 5.1.2, monitoring well BH15s was destroyed during the reporting period, with a sample unable to be collected in September. The destroyed well has been replaced by monitoring well BH15As henceforth including the sample collected in December.

As reported in the 2018 Annual Review, during December 2018 an initial methane concentration of 6.8% was recorded at BH14s. This result was reported to the NSW EPA, and a regime of monthly monitoring was established for this monitoring location. In June 2019, an initial methane concentration of 2.9% was recorded at BH19s. This result was also reported to the NSW EPA and BH19s was added to the monthly monitoring regime. The underlying Bringelly Shales has been identified as a potential ground gas source and potential cause for elevated methane concentrations.

An initial methane concentration spike of 41.1 % (v/v) was recorded at BH19s in December 2019. The concentrations recorded and flow rate data collected indicate a Gas Screening Value Threshold of <0.07 L/hr and therefore suggest a very low gas risk, in accordance with the Modified Wilson and Card Method.

A preliminary landfill gas risk assessment has been undertaken by CES on behalf of the Licensee. This report was prepared only for BH14s which was characterised as very low risk. This risk assessment was completed in October 2019, prior to a spike being recorded at BH19s in December 2019. The landfill gas risk assessment will be revisited, and a more detailed report prepared taking into consideration results from these two gas monitoring locations. Monthly sub-surface gas monitoring will be continued at gas wells BH14s and BH19s until results become stable and a more detailed landfill gas risk assessment is complete. NSW EPA will be consulted prior to reducing the frequency of monitoring at these locations

It is noted, there has been no related increases in gas accumulation in enclosed structures located nearby to these gas monitoring locations this is discussed in further detail in Section 5.2.2(iii).

Results for the monthly sub-surface landfill gas monitoring during 2019 is shown in Table 5.11. Long-term sub-surface landfill gas monitoring results are shown in Figure 5-10. The results of the sub-surface landfill gas monitoring undertaken at gas wells BH08s, BH15s/BH15As, BH16s, BH21s and BH22s during the reporting period are consistent with previous years with all initial methane concentrations remaining negligible. With the exception of the two spikes recorded at BH19s, the results from this location have been generally stable. Note, these initial methane concentration spikes have been assessed by CES as having a very low gas risk in accordance with the Modified Wilson and Card Method.

Table 5.11: Monthly sub-surface gas monitoring for the reporting period (BH14s and BH19s)

Location	Initial well concentrations CH_4 (%v/v)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Min	Avg	Max
BH14s	8.6	7.2	6.1	8.3	5.7	6.1	1.6	1.4	4.8	0.2	0.1	0.5	0.1	4.2	8.6
BH19s [i]	-	-	<0.1	-	-	2.9	1.6	0.7	0.1	3.5	4.8	41.1	<0.1	6.8	41.1

i BH19s was on a quarterly monitoring schedule until an initial methane concentration of >1%v/v was detected in June 2019

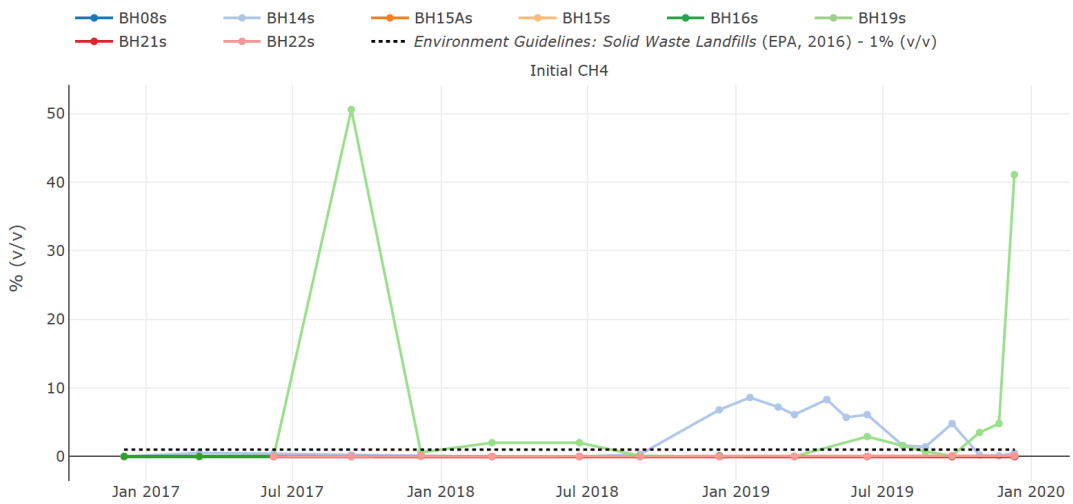


Figure 5-10: Long-term sub-surface landfill gas monitoring results

ii. Landfill Gas Surface Emissions

Surface landfill gas emissions are monitored quarterly in accordance with the Landfill Gas Monitoring Program. Monitoring is undertaken using a Gazomat Inspectra Laser methane analyser to measure methane gas equivalent concentrations. Samples of the atmosphere are taken 5 cm above the landfill surface in a grid pattern across the site, and depressions and fissures away from the sampling grid are also targeted.

For landfill gas surface emissions monitoring, the Landfill Gas Monitoring Program specifies that the threshold for corrective action is methane concentrations exceeding 500 ppm (*v/v*) at any point on the landfill surface for intermediate and finally-capped areas. This is consistent with the *Environment Guidelines: Solid Waste Landfills* (EPA, 2016).

The results of the monitoring are used to identify areas of a landfill cap that require remediation. Any areas where elevated readings are identified, especially where any exceedance of the threshold has occurred, are rectified to design conditions by reworking the landfill cap to repair any defects where emissions have been detected. Subsequent routine monitoring will retest the area of concern to ensure the area has been adequately remediated. If the exceedance is repeated and the source is still not rectified, then more detailed investigations and monitoring will be undertaken.

It is noted that gas accumulation monitoring is also conducted to ensure landfill gas concentrations do not accumulate to unsafe levels within onsite buildings, this is discussed in further detail in Section 5.2.2(iii).

Quarterly landfill gas surface emissions monitoring events for the reporting period were undertaken in March, June, September and December. Exceedances of the methane concentration threshold level (500 ppm) were recorded in March and June. On both occasions

these exceedances were detected in a location on the landfill surface that is considered a weak point of natural gas flow on the surface of the landfill (edges of the landfill surface). Corrective actions were put in place to remediate the identified areas of exceedance. Subsequent monitoring over the landfill surface undertaken in September and December did not measure any points in exceedance of the methane concentration threshold level (500 ppm).

As the subsequent monitoring has demonstrated there are no repeated exceedances, or unrectified sources, the need for more detailed investigations and monitoring has not been triggered.

The exceedances and corrective actions identified during the reporting period are summarised in Table 5.12.

The locations of the surface gas survey results are shown on Figure 5-11 and Figure 5-12.

Table 5.12: Summary of landfill gas surface emissions exceedances for the reporting period

Monitoring Period	Description of Exceedance	Corrective Action
March	Six (6) locations were identified (5 localised points and 1 area). The area of exceedance had multiple cracks in the landfill capping indicating the release of methane gas.	Corrective measures were implemented immediately by placing extra cover material and compacting existing cover material in the affected area while CES staff were still onsite.
June	Five (5) locations were identified (2 localised points and 3 areas). It was observed that the southern bund wall, where an exceedance was recorded, had multiple cracks in the landfill capping.	CES staff immediately notified and identified these exceedances to Bingo staff. Corrective measures were implemented immediately by placing extra cover material and compacting existing cover material in the affected areas

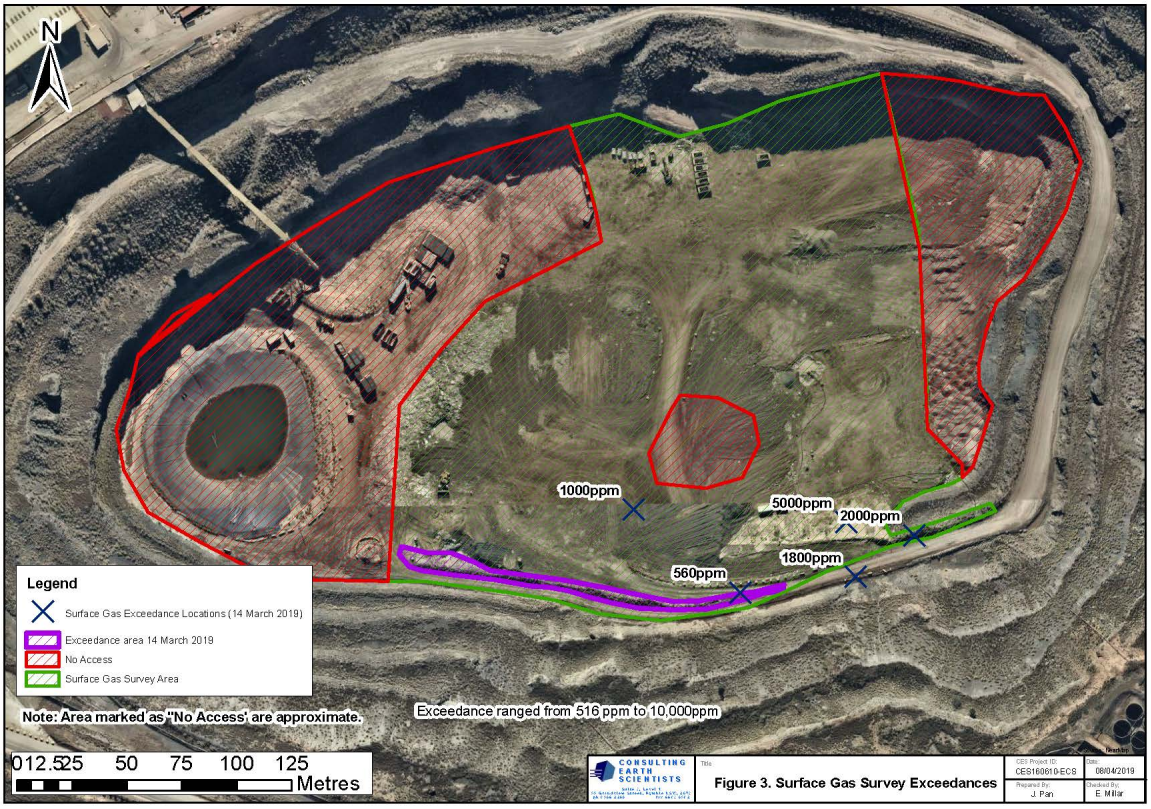


Figure 5-11: Surface gas survey exceedances recorded in March 2019 (Q1)

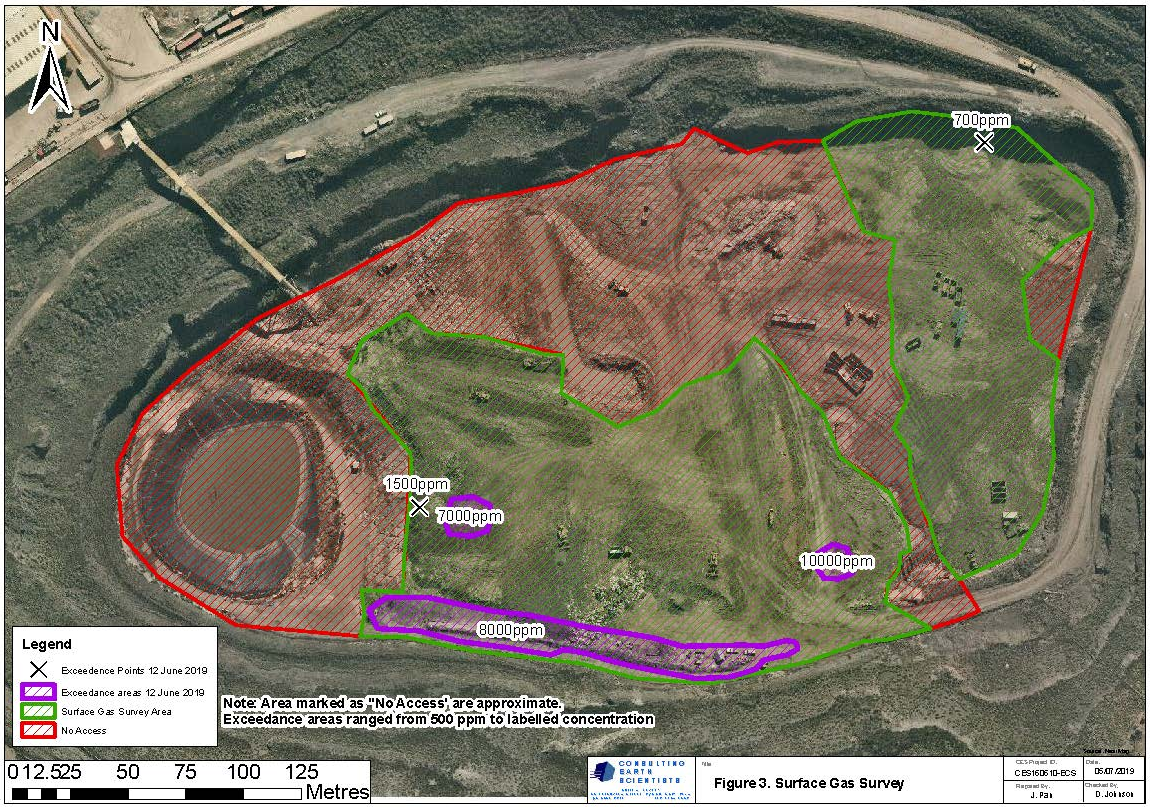


Figure 5-12: Surface gas survey exceedances recorded in June 2019 (Q2)

iii. Landfill Gas Accumulation (enclosed structures)

The landfill gas accumulation monitoring program 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 quarterly methane monitoring in all buildings and other enclosed structures within 250 metres of the landfill.

In accordance with the Landfill Gas Monitoring Program the threshold level for further investigation and corrective action is detection of methane at concentrations above 10 % of the LEL or 5,000 ppm. Note, these threshold levels are equivalent to 1% (volume/volume) which is the recommended threshold level in the *Environment Guidelines: Solid Waste Landfills* (EPA, 2016).

Results for the quarterly landfill gas accumulation monitoring show that the methane concentrations for all enclosed spaces within 250m of the landfill were negligible during the reporting period and therefore were below the prescribed detection threshold levels. Approximately 90% of the results were less than 5ppm, or less than 1,000th of the prescribed detection threshold levels. The highest reading recorded was 41.2ppm. This was recorded at the base of the landfill, location AM05 (Landfill Pit Station A), in September 2019.

Results for the quarterly landfill gas accumulation monitoring during 2019 is shown in Table 5.13.

Table 5.13: Quarterly landfill gas accumulation monitoring results for the reporting period

Location	Methane (ppm)											
	Mar-2019			Jun-2019			Sep-2019			Dec-2019		
AM01 (Main Site office)	2.8	2.8	2.8	4.0	4.1	4.0	1.9	2.0	1.9	3.0	2.8	3.0
AM03 (Weigh Bridge)	3.3	3.4	3.3	2.5	2.6	2.4	1.9	2.0	1.9	2.0	2.1	2.1
AM04 (Segregated Waste Office)	2.4	2.4	2.4	2.3	2.3	2.1	2.7	2.6	2.7	2.5	2.6	2.6
AM05 (Landfill Pit Station A)	4.5	4.6	4.0	3.2	3.3	3.1	41.2	39.7	40.0	2.5	2.5	2.4
AM06 (Landfill Pit Station B)	6.7	6.7	6.7	2.7	2.7	2.7	4.2	4.0	3.8	7.0	7.1	6.8
AM07 (MPC Spotter Station 1)	2.8	2.8	2.8	2.9	2.7	2.9	2.9	3.0	2.9	2.8	2.6	2.6
AM08 (MPC Office)	3.0	2.7	2.8	3.5	3.7	3.6	Locked			2.5	2.5	2.4
AM09 (MPC Lunchroom)	3.4	3.4	3.4	2.5	2.6	2.4	1.7	1.8	1.7	2.4	2.4	2.3
AM10 (MPC Toilets)	2.8	2.8	2.8	2.3	2.4	2.3	1.8	1.8	1.8	2.3	2.2	2.2
AM11 (Bingo Visitor Centre)	Locked			22.6	22.6	21.0	2.2	2.3	2.2	Locked		
AM12 (DADI Shed)	2.3	2.4	2.3	2.5	2.5	2.5	Locked			2.2	2.3	2.2
AM13 (Bingo Lunchroom)	3.4	3.4	3.4	9.8	10.0	9.8	2.6	2.5	2.5	1.7	1.8	1.8

5.2.3 Odour

Schedule 3, Condition 30 of the consolidated approval (MP 06_0139) states, the Proponent shall not cause or permit the emission of offensive odours from the site, as defined under Section 129 of the *Protection of the Environment Operations Act* (1997) (POEO Act). Similarly, Condition L6 of EPL 13426 and EPL 20121, do not identify a potentially offensive odour for the scheduled activities, and therefore do not permit emission of offensive odours.

The Environmental Assessment for the Project included an assessment of potential odour impacts from the normal operation of the proposed activities. The model results showed that the odour levels at nearest receptors were predicted to be below the most stringent criteria - "nuisance" level of 2 odour units "OU" as described in the *Technical notes: assessment and management of odour from stationary sources in NSW* (EPA, 2006). It is noted the Technical Framework recommends that, as a design criterion, no individual should be exposed to ambient odour levels of greater than 7 OU (99th percentile, nose response time average). The results therefore suggested that there would be no adverse odour impacts associated with the project.

Operation of the site in accordance with the standard operational practices has been sufficient in managing potentially offensive odours from site. The key odour management practices which are implemented on site, and will continue as routine, include:

- Cover all exposed landfilled waste (including daily and intermediate cover requirements);
- Inspection of waste loads to ensure that unacceptable/excluded wastes do not enter the site;
- Immediate burial of odourous or offensive wastes (note it is uncommon to receive this type of waste as it is generally an excluded waste and not permitted on site – refer above);
- Landfill gas monitoring and remediation of uncontrolled landfill emissions. Remediation is generally undertaken by repairing any defects where emissions have been detected, but may consider landfill gas extraction in the event that gas or odour emissions are detected and unable to be rectified, this is discussed in further detail in Section 5.2.2(ii);
- banning of all waste burning on site;
- ensuring that operational vehicles/equipment have acceptable emission controls;
- ensuring that waste loads are covered when vehicles enter the site; and
- response to complaints from the general public regarding odour - resulting in attempts to identify the source of the odour and immediate removal or undertaking air monitoring if the source of odour is not readily discernible.

The effectiveness of the above practices is assessed annually by a suitably qualified and independent environmental consultant, the findings and recommendations on their report will be addressed and reported on an annual basis. The Independent Environmental Audit, conducted every two years, also assess the effectiveness of the odour management practices.

During the reporting period Ektimo was engaged by the Licensee to perform a site boundary odour survey for the Project. The only notable source of odour identified at the facility were the open

Leachate Tanks within which active aeration of the collected leachate occurs on a continuous basis. The recognisable odour from the leachate tanks had sour, rotten and sulphide characters. These characters were confirmed prior to commencing the boundary odour survey by accessing the Leachate Tank compound.

Ektimo conducted two separate periods of observations of odour intensity and character with three trained field observers (0829 to 1029, 22 February 2019 and 0828 to 0957, 27 February 2019). The observations were conducted at locations downwind of the leachate tanks either at, or as near as practicable to, the boundary of the facility.

Ektimo concluded that an odour plume with leachate characters (sour, rotten or sulphide) at an offensive intensity was not present at or beyond the site boundary during the survey period. For this survey, offensive intensities of odour were defined as odours that were readily distinguishable from the background ambient palate with recognisable leachate characters. The survey was conducted to determine if this combination of intensity and character occurred at and beyond the site boundary for in excess of 10% of time at any individual location, which could be a pre-cursor for complaint.

Schedule 3, Conditions 31 and 31a of the consolidated approval (MP 06_0139) were written to address potential odour impacts of the project from the green waste area, originally proposed to include composting. These conditions require that, if the Independent Environmental Audit recommends that the green waste area be enclosed to reduce the odour impacts of the project, then the Proponent shall enclose the area to the satisfaction of the Secretary within the timeframe specified by the Secretary (Condition 31), and the Proponent shall ensure that each green waste bay has an individual cover and aerobic equipment fitted to reduce odour and the generation of leachate (Condition 31a).

There have been no recommendations made in any of the previous Independent Environmental Audits that the green waste area be enclosed to reduce the odour impacts. This is supported by findings from the annual assessment of potential odour impacts, as well as, the absence of odour complaints or incidents attributed to the Project.

Individual covers and aerobic equipment have not been fitted to each green waste bay, as required by Condition 31a. This is reflected as an administrative non-compliance for the reporting period (refer Section 6). It is the Licensee's belief that individual covers and aerobic equipment for each green waste bay is not relevant in the context of the current operation (i.e. in the absence of composting activities). Effective ongoing odour management is being demonstrated for the Project by the monitoring (as detailed above).

5.2.4 Greenhouse Gas

Schedule 3, Condition 36 requires that the Proponent implement all reasonable and feasible measures to minimise energy use on site and the scope 1, 2 and 3 greenhouse gas emissions produced on site, to the satisfaction of the Secretary.

The method of waste emplacement will inevitably lead to anaerobic conditions and decomposition processes. Accordingly, some potential for methane and carbon dioxide gas emissions exists. Methane gas has a global warming potential of ~25x the equivalent amount of carbon dioxide.

The main control available in terms of minimising greenhouse gas emissions is to minimise the organic content of material to be landfilled and thereafter to reduce the rate of gas losses to the atmosphere by capping or the conversion of the gas to a less reactive form (i.e. via combustion).

As discussed in Section 5.2.2(ii), landfill gas surface monitoring is undertaken quarterly for the Project. These surveys measure the rate of methane losses which can be used to determine the nature of potential greenhouse gas losses to atmosphere.

Uncontrolled landfill emissions identified during this monitoring are remediated, generally by repairing any defects (i.e. additional capping) where emissions have been detected, however gas collection and oxidation may be considered if required in the future in the event that gas emissions are detected and unable to be rectified.

Furthermore, opportunities for reductions in energy use and greenhouse gas emissions are continuously investigated and implemented when feasible. In 2020, the following opportunities will be investigated with implementation, if determined to be feasible, targeted for 2021:

- LED lighting retrofit for MPC 1 and older buildings; and
- Installation of solar panels on the roof of MPC 1 and 2.

A summary of the key initiatives implemented to reduce the carbon footprint of the operation to date is provided in Table 5.14.

Table 5.14: Implemented Greenhouse Gas Reduction Strategies

Area	Standard	Initiative	Outcome
Energy Efficiency			
Lighting	240v switched Fluorescent	Use of motion sensors in amenity rooms	Areas are only illuminated when in use. Reduced the lighting of these areas down to approx. 2 - 3 hours out of a 10 hour shift.
Lighting	Halogen, fluorescent and mercury vapour lighting	All new structures fitted, and retrofit existing buildings when possible, with internal / external LED	Compared with alternatives, LED lights deliver: 1. Higher energy efficiency 2. Increased lifespan 3. Instantaneous illumination

Area	Standard	Initiative	Outcome
Air Conditioning	Wall / Window mounted AC units	Replace Wall / Window mounted AC units with Split Inverter Systems	The Inverter air conditioners deliver: 1. Reduction in consumption of power 2. Quicker times to achieve desired temperature 3. Reduced Start up times of up to 30%
Wi Fi Booster	240v Connected	Solar Powered Wi-Fi Booster	Solar powered Wi-Fi booster the crushing area operates totally independent of mains power.
Equipment, Machinery and Fuel Consumption			
Weighbridges	Traffic Line 1 x Weighbridge In & 1 x Weighbridge Out	Installation of additional weighbridge and improved traffic management (increase from two to four lanes).	Installing a new weighbridge allows Traffic Controllers to better manage queues in and out of site with four lanes available to direct traffic depending on which side of the bridge the queue is growing, resulting in vastly reduced waiting (truck idling) times, reducing emissions.
Stacking Conveyors	Diesel / Hydraulic stationary	Replace, as needed, with standalone electric conveyors	The Diesel / Hydraulic stackers have a high fuel burn rate and are also large consumers of hydraulic oils and associated filters. These units are replaced with electric stackers when they reach their end of life eliminating diesel fuel & hydraulic oil consumption.
Waste Compactor	Tana Waste Compactor	Replaced the compactor with a more efficient model	In January 2017, the Tana G520 compactor was replaced by the CAT 836K compactor resulting in the following emission / fuel usage improvements: **Power** / **Fuel Usage** **Tana G520**: Cummins C540 Diesel engine, with basic emission controls / average 45.6 litres per hour **CAT 836K**: CAT C18 ACERT engine which meets Tier 4 Final/Stage emission standards / average 39.3 litres per hour
Vehicle Fleet	Any AWD vehicle suitable to convey staff around the EC site	Replace petrol powered vehicles with Diesel powered vehicles.	Removing petrol powered vehicles from the site fleet, has reduced fuel consumption and emissions.
Climb from Landfill base to exit road	Standard Gradient used was approx. 1:10 or a 4m climb over a 40m ramp	We have reduced the gradient to 1:15 or a 4m climb over a 60m ramp.	Reduced fuel burn rates and emissions as the trucks no longer have to maintain high revs in low gear ranges to exit from landfill floor.

Greenhouse Gas Emissions

Bingo Industries registered for and reported in accordance with the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act) requirements for FY19. This report detailed energy use and greenhouse gas emission for the period 1 June 2018 to 1 July 2019. The NGER Act requires all organisations or facilities above a certain size to report annually on their energy use and greenhouse gas emissions. The Eastern Creek Recycling Ecology Park triggered the NGER Act thresholds for reporting. A detailed emissions inventory has been prepared for the facility.

Bingos sustainability program will focus on opportunities to reduce energy use and ensure more efficient use of energy and a reducing greenhouse gas emissions.

5.3 Flora and Fauna Management

This section describes the specific environmental management and performance requirements to be achieved for the duration of the Project in relation to flora and fauna. Flora and fauna environmental management and performance during the reporting period are detailed in the Sections below as follows:

5.3.1 Pest, Vermin, Feral Animal & Noxious Weed Management:

i Pest, Vermin and Feral Animal Control; and

ii Weed Management.

5.3.2 Landscape and Vegetation Management Plan:

i Conservation Zone and Riparian Zone Management; and

ii Amenity Berms.

5.3.1 Pest, Vermin, Feral Animal & Noxious Weed Management

Schedule 3, Condition 14 requires the proponent to implement suitable measures to manage pests, vermin, feral animals and declared noxious weeds on site. The conditions also provides requirements to undertaken ongoing inspections and monitoring of the performance of these control measures.

The requirements of these conditions are implemented for the Licensee by a contractor in accordance with the Pests, Vermin Feral Animals and Declared Noxious Weeds Management Plan. During the reporting period the Licensee changed contractors engaged to provide this service. From January 2019 to June 2019, Bettersafe Pest and Weed Management Pty Ltd (Bettersafe) were engaged to undertake the pest, vermin, feral animal control for the Project as well as the natural area restoration and weed management.

From August 2019 the pest, vermin, feral animal control for the Project was undertaken by Silent Night Pest Management (Silent Night), while the natural area restoration and weed management is undertaken by Toolijooa Environmental Restoration (Toolijooa). Requirements related to inspection and monitoring are addressed equally by both the Licensee and contractors.

i. Pest, Vermin and Feral Animal Control

Pests, vermin and feral animals of main concern includes rats, foxes, rabbits, birds and insects such as mosquitoes. The primary mitigation measure by which pests, vermin and feral animals are minimised is by ensuring the landfill is maintained in a generally clean and tidy manner, including applying appropriate cover.

Wastes are covered at the end of each daily shift, or in the case of potentially odorous or offensive wastes immediately following disposal at the tipping face. Waste is also compacted continually during the day's tipping operations to prevent access by vermin.

Proper fencing and site security measures ensures that there is no unauthorised or out of hours dumping of wastes on the site which may attract vermin.

Areas of standing water, where mosquitoes may breed, are eliminated when identified, unless the open areas of water constitutes an operational facility, such as a leachate collection or treatment facility, sediment basin, etc.

A summary of pest, vermin, feral animal control undertaken during the reporting period is provided in Table 5.15.

Pest, vermin, feral animal control visits were undertaken routinely by Bettersafe on the following schedule; rats – monthly, foxes – 3-monthly, and rabbits – bi-monthly.

As a result of the limited success rate of routine control visits for foxes and rabbits, these control measures will now be implemented on an ad hoc basis in response to observations made during regular inspections of the site.

An inspection was undertaken by Silent Night on 30 September. During the inspection 3 foxes and 5 rabbits were observed and subsequently control measures were implemented on 10 November, however, due to rain at the time, only one rabbit was controlled during the visit. The licensee continues to work with Silent Night to control feral animals.

Table 5.15: Summary of pest, vermin, feral animal control during the reporting period

Month	Main Pest Species to be Targeted		
	Rats	Foxes	Rabbits
January	X		X
February	X	X	
March	X		X
April	X		
May	X	X	X
June	X		
July	X		
August	X		
September	X	X	X
October	X		
November	X	X	X
December	X		

X = control activities undertaken

ii. Weed Management

Regular weed control is being undertaken to identify and control weeds in accordance with the Biosecurity Act (2015). During the reporting period there was a sustained effort to treat *Cortaderia selloana* (Pampas grass) which is particularly abundant within the quarry pit area on the void walls. Note, there were no weed control activities undertaken in July as contracts for these activities were being negotiated.

A summary of natural area restoration and weed management activities undertaken during the reporting period is provided in Table 5.16.

Table 5.16: Summary of restoration and weed management during the reporting period

Month	Zone			Targeted Weed Species [ii]
	Conservation Zone	Riparian Zone	Operations Area	
January	X	X	X	**f**, g, **l**, n, q, r
February	X		X	c, n
March	X	X	X	c, g
April	X	X	X	c, n
May	X	X	X	c, g
June	X	X	X	c, n
July				
August			X	**f**
September	X		X	b, e, **f**, h, t
October			X	**f**
November			X	d, **f**, m, r
December	X		X	d, **f**, m, r

X = Area weed control activities undertaken

i Operations Area includes the quarry pit, amenity berms, sediment basins and general site access / laydown areas

ii List of targeted weed species (weeds subject to Biosecurity requirements identified in bold):

a. ***Ageratina adenophora*** **(Crofton Weed)**
b. *Asparagus asparagoides* (Bridal creeper)
c. *Bidens pilosa* (Cobblers peg)
d. *Centaurea solstitialis* (Yellow star thistle)
e. *Chloris gayana* (Rhodes grass)
f. ***Cortaderia selloana*** **(Pampas grass)**
g. *Ehrhata erecta* (Panic veldt grass)
h. *Eragrostis curvula* (African lovegrass)
i. ***Hypericum perforatum*** **(St John's Wort)**
j. ***Ligustrum lucidum*** **(Broad-leaved Privet)**
k. ***Ludwigia peruviana*** **(Ludwigia)**
l. ***Lycium ferocissimum*** **(African Boxthorn)**
m. *Onopordum acanthium* (Scotch thistle)
n. *Panicum maximum* (Guinea grass)
o. ***Parietaria Judaica*** **(Pellitory)**
p. *Ricinus communis* (Castor oil)
q. *Rubus fruticosus* (Blackberry)
r. *Senecio pterophorus* (Fireweed bush)
s. *Sida rhombifolia* (Paddys lucerne)
t. *Solanum seaforthianum* (Brazilian nightshade)

5.3.2 Landscape and Vegetation Management Plan

Schedule 3, Condition 59 requires that a Landscape and Vegetation Management Plan (LVMP) is prepared and implemented for the Project. Implementation of the LVMP is focussed on management and mitigation measures for the Conservation Areas in the Precinct Plan, as well as, landscaping for the site, including the amenity berms.

The primary objective for land management activities is to protect the lands natural values. The implementation of the LVMP aims is to retain the distribution, abundance and diversity of native species and communities presently existing on the land, and to improve the quality of existing vegetation where possible.

i. Conservation Zone and Riparian Zone Management

Schedule 3, Condition 57 (Flora and Fauna Management) provides relevant criteria in respect to the protection of the various Conservation Areas in the Precinct Plan identified and mapped in the Environmental Assessment. Schedule 3, Condition 58 contains relevant criteria in respect to creek rehabilitation and reinstatement work within Lot 2 DP 262213 (note, Lot 2 DP 262213 has been replaced by Lot 3 in DP 1145808 – as shown on Figure 3-1). It is noted, whilst the conservation areas no longer sit within the operational area owned by Bingo, the areas are still subject to the conditions of the consent. The requirements of these conditions are implemented through the Landscape and Vegetation Management Plan.

The various Conservation Areas in the Precinct Plan include the "Conservation Zone" and the "Riparian Zone". Relevant management and performance measures are presented below for each of these zones, a description of these zones is as follows:

Conservation Zone is the remnant of the Cumberland Plain Woodland located to the north west of the operational area boundary, adjacent to a closed section of Archbold Road. The Zone remains undisturbed as it is a supported habitat for a number of threatened species (including the Cumberland Plain Large Land Snail and potential for other threatened species such as Microchiroptera bats). Historically this area has been accessed by trail bike riders, with regular damage to existing fences. This zone is considered of high ecological importance.

Riparian Zone refers to the riparian corridor in the area beside the unnamed tributary of Ropes Creek. It is located to the south of the operational area. It contains remnant of the River-Flat Eucalypt Forest and an intermittent watercourse which runs to the west, and into Ropes Creek. In accordance with the Blacktown Council Precinct Plan, the Riparian Zone provides a 40 metre buffer from the top of the bank on each side of the watercourse.

This Conservation Zone is managed as a bush regeneration zone, which has the objective of returning bushland and its ecosystem processes to a natural condition. Weeds in the Conservation Zone are widespread and scattered throughout the area at a relatively low density (apart from the Boxthorn thicket), and the aim is to progressively control all weeds, not just noxious weeds, to improve the quality of the Cumberland Plain Woodland vegetation.

Management of the Riparian Zone aims to protect and conserve the existing Riparian Habitat pending any future development in this area. It is noted, during the boundary readjustment of the area, this riparian zone, has been subdivided into its own area of approximately 10ha, being Lot 3 in DP 1145808. No development works are proposed for this Lot. The Riparian Zone is periodically inspected and noxious weeds removed.

Public access to the Conservation Zone and the Riparian Corridor is restricted to maintain the integrity of the environment. Monthly photo audits are undertaken in the Conservation Zone and Riparian Zone to ensure management and mitigation measures are operating effectively.

Monitoring locations for the monthly photo audits are shown in Figure 5-13 and Figure 5-14.

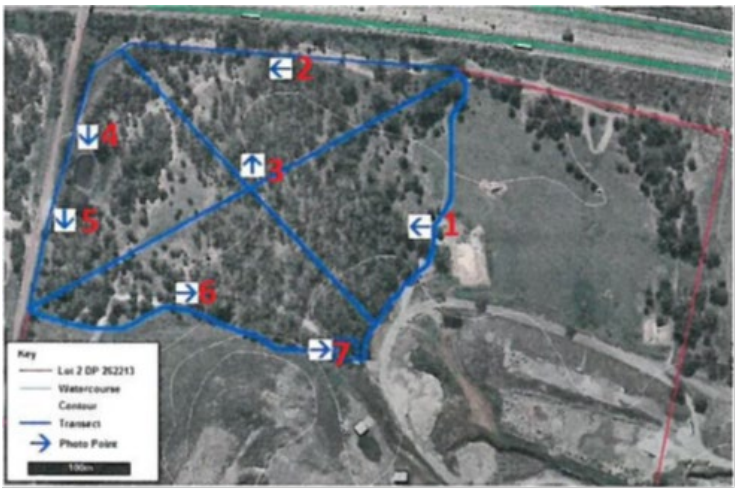


Figure 5-13: Conservation Zone – Monitoring Points

Figure 5-14: Riparian Habitat – Monitoring Points

A summary of key management activities undertaken by the Licensee in relation to the conservation areas for the life of the project to date is provided in Table 5.17.

Table 5.17: Summary of key management activities for the conservation areas to date

Timeline	Activity
Scheduled once-off activities	Fence the remnant habitat in the Riparian Zone Fence the Conservation Zone, securing all boundaries from trail bikes (provide a gate for essential access) Close single file tracks in the Conservation Zone (covered with loose earth and leaf litter) Provide structural habitat for fauna
First year of opening	Setup monitoring points and transects Weeding in the Conservation Zone (primary and secondary rounds of control), total area focus as well as specific program for African boxthorn and weeds around the dam Piling of dead boxthorn in the Conservation Zone Weeding in the Riparian Zone
Riparian Zone restoration works	The tributary into Ropes Creek had been highly affected by erosion and sedimentation. The following works have been carried out: • Trees requiring protection have been identified; • Fill material and sediment within the watercourse has been removed and used to fill the diversion trench and reinstate the ground level in the area; • The watercourse was reinstated to reflect its original channel form; • The channel was lined with rocks and gravel to address future scouring and erosion; • Topsoil was replaced, utilised material stockpiled onsite; and • The banks, restored watercourse and other areas affected by restoration works were revegetated by spray seeding of native grasses. This extends 10 metres on either side of the creek.
Ongoing periodic activities	Undertake monitoring along established transects Regular weed control is being undertaken to identify and control weeds Inspections of the property boundary and perimeter of the Conservation Zone for signs of illegal dumping or breach of fencing

During the reporting period all ongoing periodic activities were undertaken by the Licensee. Weed control undertaken during the reporting period has been described in Section 5.3.1 (ii Weed Management). A summary of the performance against key objectives for the conservation area management (as stated in the Landscape and Vegetation Management Plan) is provided in Table 5.18.

The site has achieved all performance targets for the objectives for management of the conservation areas.

Table 5.18: Summary of performance against key conservation area management objectives

Objective	Indicators	Performance Target	Achievement in 2019
Biodiversity conservation	Area of endangered ecological communities	No reduction in mapped reserve area or degradation of endangered ecological communities	YES. There has been no reduction in mapped reserve area or degradation of endangered ecological communities
Vegetation management and weeds	Presence of weed species, regeneration of native species	Reduction of weed species by 5% each year	YES. There has been a visible reduction in weeds in the, Conservation Zone and Riparian Zone.
Activities and maintenance	Regularity of inspection and cleaning, number of incidents of illegal dumping	Compliance with Plan guidelines	YES. Regular inspections were undertaken as required. There was a small number of occasions where dumped material was found. These were immediately cleaned up. During the reporting period signage around the perimeter of the site has been improved and there has been a noticeable reduction in illegal dumping since this improvement. Fencing is maintained promptly following observation of any damage.
Access and occupation	Integrity / maintenance of fencing on external boundaries to conservation areas.	No dumping of refuse in conservation areas. No use of conservation areas by recreational users, such as motorcycle riders or 4WDs.	YES. Fencing is constructed to restrict access and measures are taken to cease or prevent unauthorised or public access across the land. Non-essential pedestrian and vehicle access is prohibited, while essential pedestrian and vehicle access through or into natural areas is undertaken in a way which minimises the impact on the area.
Inspections and monitoring	Indicators to be monitoring, documentation of areas and condition.	Regular monitoring frequency	YES. Monthly photo audits are undertaken in the Conservation Zone and Riparian Zone to ensure management and mitigation measures are operating effectively
Administration	Staff resourcing and qualifications to implement land management measures.	Compliance with Plan guidelines	YES. Suitably qualified contractors are engaged to undertake natural area restoration and weed management activities.

ii. Amenity Berms

Schedule 3, Conditions 53, 54 and 55 of the Project Approval define specific planning and construction requirements for the amenity berms, visual screens and impervious barriers. The Licensee was compliant with these requirements during the construction of the site. There has been little change to the amenity berms since initial construction.

Regular inspections of the amenity berms are undertaken to ensure they remain effective in providing a visual screen around the site, noise attenuation and a shield against airborne particulate generation, with maintenance arranged as necessary. Maintenance and reshaping of the amenity berms is undertaken as required to :

- Maintain the required height of the berms;
- Ensure stability of the berms;
- Monitor and mitigate damage from erosion;
- Maintain appropriate vegetation coverage;
- Control the presence of weed species; and
- Planting on amenity berms (where applicable).

Aa part of the bulk earthworks associated with the construction of the pre-sort enclosure (as approved by Mod 5) the Amenity Berm on the western edge of site has been disturbed. Upon completion of the Mod 5 project the western berm will be revegetated to ensure the ongoing stability of the berm and minimise potential damage from erosion. This is expected to occur in 2020.

5.4 Noise

A Noise Monitoring Program has been prepared and implemented for the Project in accordance with Condition 40 of Schedule 3 of the Project Approval. The relevant criteria are set out in condition 38 of the consolidated project approval (MP 06_0139), criteria are also set in condition L4 of EPL 13426 and condition L4 of EPL 20121. Noise levels from the Project should not exceed the noise limits presented in Table 5.19.

Table 5.19: Noise Limit Criteria (at nearest affected receiver)

Location	Approval	Criteria LAeq (15 Min) dB(A)		
		Morning Shoulder	Day	Night
Any affected receivers	MP 06_0139 (Condition 38)	36	37	36
Nearest affected receiver (Minchinbury)	EPL 13426	*Not established*	36	*Not established*
	EPL 20121	*Not established*	36	35
Nearest affected receiver (Erskine Park)	EPL 13426	*Not established*	36	*Not established*
	EPL 20121	*Not established*	36	35

The nearest sensitive receivers in Minchinbury and Erskine Park are approximately 400m and 1,000m from the Project site respectively. Noise monitoring for the project has consistently shown that contributions from traffic on the Western Motorway (M4) causes the background noise levels (measured at the nearest sensitive receivers) to exceed the project limits imposed by the Development Consent and the EPLs. Due to the distance from the Project site and the background contributions from the M4, noise levels associated with the Project are predicted to comply with the noise criteria at sensitive receivers.

To meet the required noise criteria and reduce the scope for community complaints, the following noise mitigation measures are implemented on site:

- The amenity berms constructed for the Project act as noise attenuation measures;
- Compliance with the hours of operation identified within Consent Conditions and the EPL's (refer Section 3.4);
- Conducting site activities in the manner set out in the approved documentation; and
- Investigate noise related complaints as they are brought to the attention of the Eastern Creek team.

As discussed in Section 4, the NSW EPA conducted an audit inspection on 17 December 2018. An examination of weighbridge records was used by the EPA as evidence that the licensee was not complying with the hours of operation conditions (Conditions L5.1 and L5.2). For reasons outlined by Bingo, in their response to the EPA, weighbridge records are not an effective measure for monitoring compliance with hours of operation, and the Licensee has complied with the hours of

operation during 2019. It is noted, a need to increase the hours of operation to meet the demand for access to the Landfill has been identified by Bingo. This amendment to operating hours is the subject of MP06_0139 MOD6 (refer to Section 2 and Section 9).

A noise compliance assessment is completed every 6 months to determine compliance with the site noise limits criteria. The assessment is conducted with reference to current guidelines, standards and assessment methods, including consideration of the relevant requirements and exemptions (including certain meteorological conditions) of the latest version of the *NSW Industrial Noise Policy*.

As required by the Noise Monitoring Program, attended noise monitoring took place on 27 February 2019 and 2 September 2019. Results of the attended noise monitoring are shown in Table 5.20.

Table 5.20: Noise Monitoring Results

Location / Receiver	Date	Monitoring Period	Results LAeq (15 Min) dB(A)	Criteria LAeq (15 Min) dB(A)	Compliance [i]
A1 – Nearest affected receiver (Minchinbury)	27-Feb-19	Morning	54.5	36	Yes
		Afternoon	55.9	36	Yes
		Night	54.1	35	Yes
	2-Sep-19	Morning	57.5	36	Yes
		Afternoon	57.1	36	Yes
		Night	52.6	35	Yes
A2 – Nearest affected receiver (Erskine Park)	27-Feb-19	Morning	51.7	36	Yes
		Afternoon	49.1	36	Yes
		Night	67.3	35	Yes
	2-Sep-19	Morning	53	36	Yes
		Afternoon	49.7	36	Yes
		Night	53.7	35	Yes

[i] For each monitoring location and period, the attended noise monitoring determined the Project was not audible

Noise contributions from the Project at surrounding residential receivers has been assessed. The assessment found that noise levels from the Project were not audible for both monitoring locations. Traffic noise from the M4 (high traffic volume including heavy goods vehicles) is audible at both locations and dominates the environment at site A1. This assessment is consistent with previous monitoring results.

The following objectives have been met during the reporting period:

- No significant impacts on the community or environment;

- Prevent the degradation of local amenity;
- Prevent noise pollution; and
- Noise limit criteria of the Development Consent and EPLs have been achieved.

To maintain and improve the environmental performance of the Project, the following measures will be implemented and/or continued during the next reporting period:

- Revision of the Noise Monitoring Program;
- Repair and maintenance of plant and equipment;
- Maintenance of height and shape of amenity berms onsite to minimise noise generation;
- Inspection and review of non-routine high noise activities; and
- Investigation of noise sources following formal complaint.

5.5 Aboriginal Heritage Management

As part of the Environmental Assessment, an Aboriginal Heritage assessment was completed for the project in consultation with OEH and relevant Aboriginal Stakeholder Groups by Jo McDonald Cultural Heritage Management Pty Ltd (JMcD CHM, 2005).

The Licensee has prepared and implemented an Aboriginal Heritage Management Plan consistent with the principles, actions and strategies defined in the Aboriginal Heritage assessment (JMcD CHM, 2005) and in accordance with the relevant criteria for Management and Conservation of Aboriginal Heritage as set out in Schedule 3, Conditions 60 and 61 of Consolidated Approval MP06_0139.

The Project was approved in 2009 and the initial construction of the site was completed in 2011. During the initial construction surface artefacts were found in three locations to the north of the property. Since construction there has been no further discovery of any Aboriginal cultural materials. Based on the presence of surface Aboriginal sites, levels of existing disturbance, and potential for buried archaeological material, the site has been divided into three zones of archaeological sensitivity. These zones are shown on Figure 5-15 and described as follows:

- **Zone 1** (Conservation Areas) has high archaeological sensitivity;
- **Zone 2** (Cleared but Undeveloped Areas) has moderate archaeological sensitivity; and
- **Zone 3** (Operations Area) has low archaeological sensitivity.
- *It is noted, whilst the Zone 1 (Conservation Areas) and the majority of Zone 2 (Cleared but Undeveloped Areas) areas no longer sit within the operational area owned by Bingo, the areas are still subject to the conditions of the consent.*

Figure 5-15: Assessed archaeological sensitivity zoning within the project boundaries (from JMcD CHM, 2005) – non-hatched areas are Zone 3

Management Protocols

The Aboriginal Heritage Management Plan details the principles, actions and strategies for the ongoing management of aspects of cultural heritage significance. Table 5.21 outlines the key management protocols for each of the different zones of archaeological sensitivity.

Table 5.21: Management Protocols for the zones of archaeological sensitivity

Zone of archaeological sensitivity	Management Protocols
All Zones	Induction of all contractors, workers and employees on site as to their legal responsibilities as to site damage and or destruction. Consultation with the local Aboriginal community groups by the dissemination of information through DADIs website http://www.dadi.com.au/
Zone 1 High archaeological sensitivity – Conservation Areas	Access to this Zone is restricted, NO ACCESS is permitted, at any time, except for those activities specifically permitted and supervised by the Site Project Manager (or delegate). The Zone is clearly identified on maps and plans. The Zone is fenced to control access to sensitive areas. Adequate briefing of employees on site as to the nature of aboriginal heritage material which may be uncovered. Briefing all contractors on legal requirements regarding uncovered skeletal material. Any management decisions in relation to the areas of high sensitivity are carried out in consultation with the Local Aboriginal Community.
Zone 2 Moderate archaeological sensitivity - Cleared but Undeveloped Areas	There is no proposed development in this zone, which is mainly left to revegetate. The general activities undertaken in this area are no longer considered major enough to warrant further archaeological investigation, or the supervision of an archaeologist. For minor works occurring in Zone 2, the Site Project Manager (or delegate) shall monitor these works. In the event that previously unrecorded relics (Aboriginal heritage items) are encountered, works will cease immediately and the NSW Heritage Office will be notified and advice sought as to the appropriate course of action. If more extensive development proposals are considered in the future, Zone 2 areas will require further assessment.
Zone 3 Low archaeological sensitivity – Operation Areas	This zone includes the quarry pit (landfill), the resource recovery facility and all operations. This zone is highly disturbed with no aboriginal heritage concerns and has been classified as developable, and without archaeological constraint. There is no requirement for further investigation in these areas.

Monitoring to determine conformance of the Project with the Aboriginal Heritage Management Plan includes the following:

- Regular surveillance of site, including perimeter fencing and fencing to sensitive areas.
- Site inspections are conducted by the Site Operations Manager (or delegate) and the inspection results recorded on the inspection form. In the event of a non-conformance:
    - The non-conformances are to be recorded on the inspection form and the cause of the non-conformance investigated by the Site Operations Manager;
    - Corrective and/or preventative action is to be recommended by the person undertaking the inspection and the effectiveness of the corrective and/or preventative action assessed at the next monthly site inspection;
    - The Site Operations Manager will report any significant non-conformances arising from site inspections to the Group Operations Manager and General Manager; and
    - All records will be held and maintained as part of the electronic version of the EMS.
- Monthly photo audits of the Conservation Area and Riparian Corridor (high archaeological sensitivity areas) to ensure that the integrity of areas of are maintained; and
- A Complaints Register is updated monthly and is available to the public on the DADI Waste Facility website (to date there has been no complaint made in relation to matters of cultural or heritage importance).

The site has adequate control methods in place to ensure the integrity of culturally sensitive areas on site. The site has implemented work place procedures to respond to any cultural and heritage matters if they arise.

To date, the Project has been deemed compliant on all Aboriginal Cultural Heritage conditions by external auditing bodies.

The internal review process has found that all cultural and heritage matters were appropriately implemented during the reporting period. The status of these matters remains largely unchanged since construction.

6 Non-compliances

The following section details of all non-compliances that occurred during the reporting period. This section reports by exceptions only. Non-compliances that occurred during the reporting period are set out in Table 6.2, including:

- the relevant compliance requirement and its ID;
- details of the non-compliance;
- the proponent's response that have been, or are proposed to be, taken to address the non-compliance, including details of timing for undertaking such actions; and
- assessment of the risk level of the non-compliance as per the descriptions in Table 6.1.

Table 6.1: Non-compliance Risk Level Descriptions

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 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 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)

2019 Independent Environmental Audit

During the reporting period, Bingo commissioned Barnett & May (Lead Auditor) and Northstar Air Quality (specialist odour auditor) to conduct a two-yearly Independent Environmental Audit (IEA) in accordance with Schedule 5, Condition 7 of the Project Approval. The appointment of the auditors was endorsed by the DPIE.

Field inspections were undertaken by the auditors in November 2019. Review of documents and assessment of compliance with the Project's consent conditions, was yet to be finalised at the time of preparing this AER.

As required by Schedule 5, Condition 8, within 6 weeks of the completing the IEA report, Bingo will submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report. This will also be available on the project website and reported in the 2020 Annual Environmental Review.

Table 6.2: Non-Compliances during the reporting period

Relevant Approval / Condition #	Condition Description (Summary)	Type of non-compliance	Actions Taken, or Proposed by the Operator	Non-Compliance Risk Level	Where Addressed
MP06_0139 Sch 2 –9b	Structural Adequacy - No temporary structures	Demountable buildings are being temporarily used as offices.	Modification 7 to the project approval (including proposed modification to the site layout and construction of head offices) had been submitted, however was withdrawn from DPIE during the reporting period.	Low	Section 2 (Approvals)
MP06_0139 Sch 3 – 29	Air Quality Impact Assessment Criteria	Exceedance of the long-term impact assessment criteria for deposited dust at the East site.		Low	Section 5.2.1 (Dust)
MP06_0139 Sch 3 – 31a	Offensive Odour - cover and aerobic equipment fitted for green waste bay	Covers and aerobic equipment have not been fitted to individual green waste bays.	The site is currently not composting (as it was approved to do), and therefore is not experiencing the potential odour issues that would be associated with that activity.	Administrative non-compliance	Section 5.2.3 (Odour)
MP06_0139 Sch 5 – 3	Annual (Environmental Performance) Review	In a letter dated 14 March 2019 the DPIE outlined several points to be addressed in relation to the 2017 and 2018 Annual Reviews. This included: a. IEA and Annual Reviews (Previous report actions) b. Non-compliances c. Monitoring Data d. Groundwater Monitoring	In a letter dated 12 April 2019, the Licensee proposed that these matters will be addressed in the 2019 Annual Review.	Administrative non-compliance	a. Section 4 (Previous Report Actions) b. Section 6 (Non-compliances) and Section 7 (Incidents) c. Section 5 (Environmental Management and Performance)

Relevant Approval / Condition #	Condition Description (Summary)	Type of non-compliance	Actions Taken, or Proposed by the Operator	Non-Compliance Risk Level	Where Addressed
		e. Leachate Monitoring f. Complaints			d. Section 5.1.2 (Groundwater) e. Section 5.1.3 (Leachate) f. Section 8 (Complaints Records)
EPL13426 P1.2	Location of monitoring/discharge points and areas	EPL Monitoring Points 12 (BH15s), 21 (BH10d) and 21 (BH12d) location descriptions are incorrect.	On 17 December 2019, the Licensee submitted a Licence Variation Application. This included proposed changes to the EPL to address this administrative non-compliance, by amending the location descriptions.	Administrative non-compliance	Section 2 (Approvals)
EPL13426 M2.2	Water and/ or Land Monitoring Requirements	Conditions did not permit sampling at the required frequencies. During the reporting period conditions did not permit sampling at Monitoring Points 27 (BH21s) and 15 (BH4i). In addition, and for completeness, as reported in the most recent EPL Annual Return conditions did not permit sampling at Monitoring Points 19 (BH3d), 16 (BH7i) and 3 (South-west Dam).	Monitoring will continue at the accessible locations as conditions permit (i.e. when not dry or affected by blockages).	Administrative non-compliance	Section 5.1.2 (Groundwater)

Relevant Approval / Condition #	Condition Description (Summary)	Type of non-compliance	Actions Taken, or Proposed by the Operator	Non-Compliance Risk Level	Where Addressed
		Three individual quarterly redox samples were unable to be collected from monitoring points BH25d (Q3), BH4i (Q4) and BH16s (Q4).	Currently seeking approval for the use of an alternative sampling methodology (hydro sleeve technology) to improve sample outsomes.	Administrative non-compliance	Section 5.1.2 (Groundwater)
		EPL Monitoring Points 12 (BH15s) was destroyed and a sample was unable to be collected in Q3. EPL Monitoring Point 31 (temporary groundwater sump) has not been accessible since the basal floor liner was covered by waste and was therefore not sampled. Sample analysis for Zinc for all groundwater monitoring points (Monitoring points 7 to 30) has occurred 'yearly' instead of 'monthly'.	On 17 December 2019, the Licensee submitted a Licence Variation Application. This included proposed changes to the EPL to address this administrative non-compliance by: Replacing reference to BH15s with BH15As (following the destruction of surface features by mobile plant activity and subsequent repair/replacement). Removing EPL Monitoring Point 31 without replacement. Amending the frequency requirement for Zinc analysis to 'yearly'.	Administrative non-compliance	Section 2 (Approvals)
EPL13426 M7.4	Other monitoring and recording conditions	Height of the leachate was not recorded at the EPL Monitoring Points (31 and 32) as these are not accessible. It was instead recorded from heights inside the leachate riser.	On 17 December 2019, the Licensee submitted a Licence Variation Application. This included proposed changes to the EPL to address this administrative non-compliance by amending this monitoring location.	Administrative non-compliance	Section 2 (Approvals)

Relevant Approval / Condition #	Condition Description (Summary)	Type of non-compliance	Actions Taken, or Proposed by the Operator	Non-Compliance Risk Level	Where Addressed
MP06_0139 Sch 3 – 47(b)	Number of parking spaces, including spaces for disabled drivers	Failing to have clearly marked and signposted disabled parking spaces at the site on 31 January 2019. *(Warning Letter received 10 May 2019)*	The disabled car parks were refreshed with new paint and signage. It is noted, it is the Proponents view that an appropriate number of disabled car spaces were available within the facility, however did acknowledge that the paint in the dedicated disable carparks had faded.	Low	No further details required in the Annual Review
MP06_0139 Sch 5 – 5	Incident Reporting	Failing to notify the Secretary of incidents as soon as practicable after becoming aware of the incidents. Failing to provide the Secretary with a detailed report on the incident within 7 days. *(Warning Letter received 28 March 2019)*	Integration of the Bingo certified EMS including SOP-SEQ001 & OPL-SEQ024 and comprehensive incident register.	Administrative non-compliance	No further details required in the Annual Review

7 Incidents

The Licensee takes very seriously all investigations and suggestions of potential breaches of either the Act, the waste regulations or the applicable licence conditions. The Licensee is constantly reviewing its methods and practices in relation to the activities that it carries out under both its licences to ensure that it maintains one of the highest standards of any similar facility in New South Wales. The Licensee also acknowledges that all notices issued to it by the EPA are available to the public by following the attached link http://www.epa.nsw.gov.au/licensing-and-regulation/public-registers

For clarity, in line with the DPIE guidelines, "incidents" in this context means environmental non-compliances or other incidences that must be reported to a regulator under the project approval or other environmental approval conditions.

7.1 Reportable Incidents for the Reporting Period

There were two reportable incidents during the reporting period. Details of the reportable incidents are provided further below; a summary of reportable incidents is provided in Table 7.1.

Table 7.1: Summary of reportable incidents during the reporting period

Incident Date	Description	Agency/ies reported to	Status
11 Feb 2019	Grass fire in the Bin Yard	EPA (11 Feb) DPIE (18 Feb)	Incident closed. Remedial action not required (by the Licensee).
29 Mar 2019	Fire in the timber yard	EPA (29 Mar & 5 Apr) DPIE (29 Mar) SafeWork NSW (29 Mar)	Incident closed. Remedial actions completed.

11 Feb 2019: Grass fire in the Bin Yard

At approximately 2pm a fire was spotted in the bin yard. The fire was initially responded to by site staff members; including the 2 site water carts, before the arrival of the NSW Fire Brigade who were able to extinguish the fire by approximately 3pm. The incident was investigated with assistance from Endeavour Energy Incident Response Representative and determined a connection on the telegraph pole had overloaded, causing a spark to fall into the grass below, which resulted in the fire.

On 28 March 2019, the Licensee received a Warning Letter from the DPIE for failing to provide the Secretary with a detailed report on the incident within 7 days. It is noted that a detailed report for the incident was prepared on 12 February 2019 but DADI failed to provide this report to the DPIE.

29 Mar 2019: Fire in the Timber Yard

At approximately 5pm smoke was noticed coming from the QA450 screen by the timber shredder and screening plant operator. A fire grew due to a combination of burning woodchip and rubber conveyor belts. The fire was initially responded to by site staff members; including the 2 site water carts, before the arrival of the NSW Fire Brigade and Rural Fire Service who were able to extinguish the fire by approximately 7:30pm.

Approximately 100m^3 of shredded timber was affected, this was pushed into a stockpile and soaked with the watercart while the material was being moved to prevent further flair ups. All water used in controlling the fire was captured in bunds prior to being collected and disposed of by a licensed contractor (Toxfree – EPL 4602). The 100m^3 of affected shredded timber was transported to landfill.

Due to the rapid spread of the fire, the investigation was unable to determine the exact cause. Corrective and preventative actions that have/ will be implemented to prevent reoccurrence included:

- During procurement of a
- Other screens, which are designed to minimise build-up were investigated. This investigation determined the existing screen would be sufficient with additional cleaning and some re-engineering of moving parts. (Complete)
- Ensure machine is cleaned between shift changeover. (Implemented)
- Re-engineer moving parts of the screen. This will prevent build-up of materials. (Designs in progress)

7.2 Previous Reportable Incidents

In a letter dated 14 March 2019 the DPIE requested that additional information be provided for the following incidents to satisfy the conditions of the Project Approval (Sch. 5, Condition 3):

19 May 2017: Exposed suspected asbestos fragments

Department Request: *The Department acknowledges that at the time of submitting the 2017 Report the court outcome had not been finalised in relation to the EPA issuing 2 Penalty Notices regarding asbestos in the landfill. As this matter has since been resolved the Department requires you to amend in the 2018 Report to provide an update on the outcome of the court proceedings.*

DADI Response: The occurrence of the exposed suspected asbestos fragments was noted on 18 October 2016 during an EPA inspection. The EPA subsequently issued 2 penalty notices in respect of that matter nearly 12 months following the EPA inspection on or about 19 May 2017. Those matters raised in the penalty notices were disputed by the Licensee and subsequently challenged.

This incident was reported in the 2017 Annual Review where the Licensee indicated that there were current proceedings in the Local Court relating to a 'find' of asbestos in the Genesis Eastern Creek Landfill. That matter was heard by the local court on 4 April 2018, with a decision being handed down on 25 May 2018. Sentencing then followed on 19 July 2018 and it is now a matter of public record. The Licensee was fined $23,000 and required to place an advertisement in Inside Waste Magazine and on the EPA website. The Licensee has complied with all these requirements.

25 May 2018: Fire in the tipping face of the landfill

Department Request: *In the 2018 Report it was noted that on 25 May 2018 a fire incident occurred at the Site. It is the Department's understanding that the EPA has investigated a delay in reporting the incident and as a result of that investigation has issued a Formal Warning in relation 'to a non-compliance with the Licence. Please amend the 2018 Report to include details of the non-compliance and any enforcement actions as an outcome of the incident.*

DADI Response: At approximately 8:10pm a fire incident occurred in the tipping face on a cell of the non-putrescible landfill. The NSW Fire Brigade attended the incident and extinguished the fire at approximately 1:00am on 26 May 2018. This incident was subsequently investigated by the EPA and the Department thoroughly. On 23 November 2018, the DPIE requested further information and subsequently issued a show cause notice about the failure to notify the DPIE of the incident in breach of the Licensees consent conditions.

On 12 February 2019, the EPA issued a formal warning regarding the alleged non-compliance with the licence conditions and on 10 May 2019, the DPIE issued a Warning Letter for failing to provide the Secretary with a detailed report on the incident within 7 days. It is noted that the issuance of these notices was not received until after submission of the 2018 Annual Review. Hence the receipt of these formal warnings has been reported in the 2019 Annual Review.

The following incidents were reported in the 2018Annual Review. An update of actions in relation to these previous reportable incidents occurring during the reporting period is provided below.

22 August 2018: Acceptance of prohibited waste at the facility

On 22 August, 3 loads of autoclaved but unshredded medical waste was disposed of at the Landfill. Both the transporter and generator of the waste failed to provide the Licensee with product that complied with the treatment approval of autoclaving and shredding. Whilst the waste was rendered free of any biological hazards the transporter and generators failure to properly or correctly identify the waste caused the Licensee to accept a waste that would have ordinarily been reloaded and sent offsite. After significant efforts and continuous work with the EPA, the waste was disposed of within the landfill as prescribed by the EPA.

The Licensee voluntarily put new processes in place that will require a report and prior approval stating waste has met the reclassification requirements. The licensee also updated the spotters training manual and conducted tool box talks to reinforce the learnings from this incident.

The incident was separately investigated by both the EPA and the DPIE. The EPA issued a Formal Warning with regards to the incident on 3 December 2018. The DPIE issued a Warning Letter for failing to provide the Secretary with a detailed report on the incident within 7 days on 10 May 2019. Since the acquisition of the site, in order to improve compliance with incident reporting conditions of consent, Bingo has integrated the incident reporting requirements of the certified EMS including SOP-SEQ001 & OPL-SEQ024 and comprehensive incident register.

20 December 2018: Use of concover in the landfill

On 20 December correspondence was received from the EPA regarding the use of concover in the landfill. On 21 December the Licensee submitted a variation request to update EPL to include concover as an approved alternative daily cover following a successful trial. The Licence Variation application was approved during the reporting period on 19 July 2019.

8 Complaints Records

Information about how to make a complaint is available on the Genesis website at: http://www.dadi.com.au/contact-us

All complaints received are recorded in a complaint register in accordance with the site EMP. An investigation is undertaken to determine the validity of the complaint, actions are assigned to improve performance and feedback is provided to the complainant.

This Section has been prepared to address the requirements outlined in a letter dated 14 March 2019, from the Department which advised that Annual Reviews must contain detailed information as to each compliant received during the reporting period. Information should include:

a. Number of complaints received during the reporting period in comparison to the previous years;
b. Any trends regarding the subject, timing or location of complaints; and
c. Any actions undertaken or proposed as an outcome of the complaints.

There was one complaint received during 2019 relating to the washing of bins in the MPC area (with potential water quality impacts). This was the first complaint of this nature for the life of the project. As bin washing does not take place at the MPC no evidence could be found to substantiate the complaint. There were no actions required or proposed as an outcome of this complaint.

A total of 14 complaints have been received for the life of the Project. Only two of the complaints have been validated as attributable to the Project following investigation. There are insufficient validated complaints by number, origin or subject matter to determine any trends.

A detailed register of complaints and subsequent investigation and action taken is maintained on the website and available for the public viewing at: http://www.dadi.com.au/policies-reports/genesis-reporting.

A summary of complaints received for the life of the Project is provided in Table 8.1.

Table 8.1: Summary of complaints for the life of the Project

Date	Brief Description	Validated following investigation?
2019 – Oct	**Water** – EPA officer enquiry (via email) regarding washing bins in MPC area	**No**
2018 – May	**Fire** – Notification of a fire in the landfill area (by the Licensee to the EPA hotline)	**Yes**
2017 – Jun	**Sediment tracking** – EPA officer enquiry after receiving a call about material being tracked from site.	**No**
2017 – May	**Fire** – EPA officer enquiry about a fire at the premises. EPA were advised that no fire had occurred at the premises.	**No**

Date	Brief Description	Validated following investigation?
2017 – Apr	**Sediment tracking** – EPA officer enquiry after receiving a call about material being tracked from site.	**Yes**
2016 – Aug	**Odour** – EPA officer enquiry after receiving a call that there was a sewer like odour in Minchinbury.	**No**
2015 – Jun	**Odour** – EPA officer reported odour in the vicinity of Eastern Creek and expressed view it may have been generated from the Genesis premises (28 June)	**No**
2015 – Jun	**Odour** – After hours call to EPA hotline advising of overpowering smell (27 June)	**No**
2014 – Jul	**Odour** – After hours call to EPA hotline advising of pungent smell in Eastern Creek	**No**
2013 – Oct	**Shuddering** – A Minchinbury Representative advised several residents in Barossa Drive, Minchin Drive and side streets off those roads had experienced shuddering in their homes	**No**
2013 – Apr	**Odour** – EPA officer enquiry after receiving email complaints from local residents of a 'chemical-like' / 'garbage-like' odour in the St Clair and Erskine Park area	**No**
2013 – Feb	**Odour -** A Minchinbury Resident advised they had noticed an odour from Sydney Water sewer vent pipes	**No**
2012	*Nil*	-
2011	**Noise** – A Minchinbury Resident advised of a single loud banging noise in the early morning, sounded like dump truck door banging	**No**
2010	**Noise** - Dept. of Planning Officer enquiry following a noise complaint by a Minchinbury Resident	**No**

9 Activities to be Completed in the Next Reporting Period

Bingo is committed to delivering the highest standards of environmental performance to meet or exceed legal and other requirements. This section identifies the measures to be implemented in the next reporting period to improve the environmental performance of the operation. This Section also briefly outlines forecast operations for the next reporting period with a focus on significant changes and any actions resulting from a condition of a relevant approval that will be triggered in the next reporting period.

The key activities to be completed in the next reporting period are provided in Table 9.1.

Table 9.1: Key activities to be completed in the next reporting period

Activity/Task	Description
Trade Waste Agreement	A Trade Waste Agreement (TWA) with Sydney Water is required in order to discharge to sewer after treatment of leachate generated by the landfill and timber yard is complete. The existing TWA (Consent No: 35580) will expire on 20 February 2020. The TWA will be renewed with Sydney Water during the next reporting period. A review of the risk category will be undertaken during the renewal process. No further amendments to the current agreement will be proposed.
Conveyor / Chute re-design and placement	The lower section of the current conveyor/chute will need to be dismantled due to the increasing height of the landfill. Re-design and placement of the conveyor/chute will be undertaken in consultation with the relevant regulators/stakeholders.
Environmental Management Plan	Bingo has engaged a specialist environmental consultant to assist in a review and update to the site Environmental Management Plans. The scope for this project includes a review of all strategies, plans and programs relating to the project approval and to the requirements and commitments for the ECREP The Licensee will consult with relevant agencies and seek all necessary approvals during this process.
Modification 5	Modification 5 of the Project Approval (MP06_0139) involves the construction of the pre-sort enclosure (PSE). Bulk earthworks for this project were completed on October 2019. Construction of the PSE began in November 2019 and will continue during the next reporting period. The PSE will separately house an automated mechanical sorting plant similar to the existing plant in the main MPC and optimise recycling on the facility and potentially increase the waste streams able to be recycled on the premises by increasing recyclable recovery rates through front end segregation (pre shredding). It will also reduce WHS risks relating to personnel, trucks and machinery operating within the same workspace as the sorting plant.

Activity/Task	Description
Modification 6	Modification 6 of the Project Approval (MP06_0139) relates to the proposed extension to the hours of operation and removal of the annual landfill cap to promote flexibility in the site operations. The Department's assessment of this proposed modification is expected in 2020. Once approved, all related approvals, management plans and procedures will be reviewed and updated to allow the operation to be undertaken in accordance with the modified conditions.
Environmental Data Management System	In 2019, Bingo implemented an Environmental Data Management System (EDMS) to improve monitoring and reporting of environmental performance and compliance. The EDMS provides a platform to manage environmental data through the lifecycle of environmental monitoring, including planning, sampling, data validation, storage and reporting. During the next reporting period the EDMS will continue to be embedded within the environmental management of the operation by developing monitoring schedules, engaging with consultants for the use of the EDMS, creating custom reports and templates and documenting procedures.
EPL License Variations	As discussed in Section 2, on 17 December 2019, the Licensee submitted a Licence Variation Application for EPL 13426 which is currently under consideration by the EPA. The assessment of the proposed amendments by the EPA has the potential to affect forecast operations for the next reporting period, including potential alternative daily cover trials and progressing the design of the upper permanent leachate barrier and collection system (note these activities are discussed separately below). In addition, subject to receiving the approval for the proposed Modification 6 to the Project Approval, the Licensee would be required to submit further Licence Variation Applications for EPL 13426, and EPL 20121.
Alternative Daily Cover Trials	As discussed in Section 2, on 17 December 2019, the Licensee submitted a Licence Variation Application which is currently under consideration by the EPA. This included amendments to allow trials to investigate the use of alternate daily cover. Bingo will continue to engage with the EPA regarding design of the trials of alternate daily cover and results of investigations.
Upper Floor Liners and Permanent Leachate Collection Systems	EPL 13426 (Condition O5.18) currently requires a detailed design report for an upper floor liner at RL 25mAHD. This Condition is subject to a Licence Variation Application (refer to Section 2) as it is contrary to the proposed design of the Leachate Management Contingency System submitted to the EPA on 18 July 2017. Bingo will continue to engage with the EPA regarding Licence Variation Application and the design of the upper permanent leachate barrier and collection system.

Activity/Task	Description
Relocation of the in-pit surface water dam	The in-pit surface water dam is currently located in the western edge of the landfill pit. This will be relocated in the next reporting period to allow for progressive landfilling to be continued in the western half of the landfill pit. The new in-pit surface water dam will be located on the eastern edge of the landfill. Associated surface water infrastructure and gradation will also be constructed/modified to maximise separation of 'clean' and 'dirty' water in accordance with the Landfilling Plan for the facility.
Review of Air Quality Monitoring Locations	A review of the current air quality monitoring locations will be undertaken in the next reporting period. This review will ensure the adequacy of the current monitoring locations in providing reliable information to allow dust management and assessment of compliance with conditions or approval. Once approved, the AQMP will be reviewed to accommodate the requirements of MOD 6 and to bring the plans in line with current and proposed site activities and approvals.
Environmental Management and Improvement Programs	The site will continue to implement the existing controls and monitoring plans of the site Environmental Management Plan and associated sub-plans. Additional improvement programs may be implemented in response to findings by ongoing inspections and monitoring as well as findings identified by regulatory inspections.
Investigation into initiatives to reduce energy use	Opportunities for reductions in energy use and greenhouse gas emissions will be investigated, including: • LED lighting retrofit for MPC 1 and older buildings; and • Installation of solar panels on the roof of MPC 1 and 2. Implementation, if determined to be feasible, will be targeted for 2021.

Appendix A – Water Quality Monitoring Results

Appendix A – Contents

A1 Surface Water Quality Monitoring

A1.1 2019 Surface Water Monitoring Results

A1.1.1 Routine Monitoring Results

Parameter	Unit	South-West Dam				North-West Dam			
		20-Feb-19	5-Jun-19	27-Aug-19	28-Nov-19	20-Feb-19	5-Jun-19	27-Aug-19	28-Nov-19
Ammonia	mg/L	<0.005	<0.005	0.1	0.11	<0.005	<0.005	0.014	0.009
Arsenic	mg/L	0.002	0.002	0.001	0.002	0.003	0.002	0.003	0.004
Cadmium	mg/L	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI)	mg/L	<0.001	0.006	0.001	0.002	<0.001	0.003	0.004	0.001
Copper	mg/L	<0.001	0.008	0.002	0.004	0.002	0.005	0.008	0.005
EC (field)	uS/cm	514	440	819	1,648	1,251	652	1,774	2,157
Lead	mg/L	<0.001	0.008	0.002	0.002	0.002	0.002	0.011	0.004
Mercury	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel	mg/L	0.003	0.008	0.005	0.007	0.003	0.003	0.007	0.007
pH (Field)	-	7.78	8.63	7.91	8.11	8.57	8.18	8.03	8.04
TOC	mg/L	12	6	7	15	10	<1	7	12
Total Suspended Solids	mg/L	12	100	16	24	14	16	110	42
Zinc	mg/L	0.007	0.038	0.01	0.011	0.012	0.013	0.046	0.013

A1.1.2 Special Frequency Monitoring Results

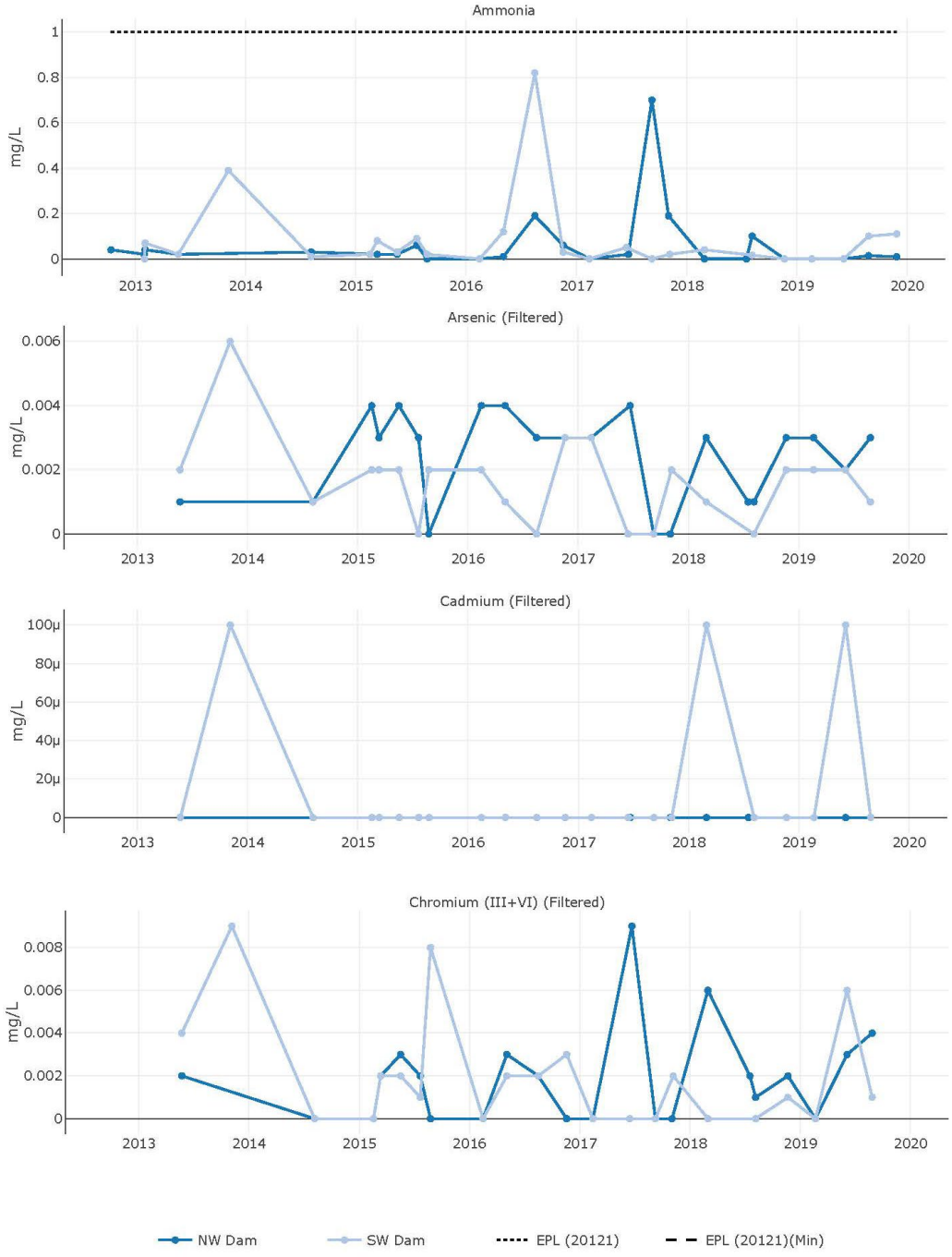
Parameters	Units	Water Concentration Limits (EPL 13426 and EPL 20121)	South-West Dam Surface Water Overflow					North-West Dam Surface Water Overflow				
			18-Mar-19	19-Mar-19	20-Mar-19	9-Jul-19	18-Sep-19	19-Mar-19	20-Mar-19	9-Jul-19	29-Jul-19	18-Sep-19
Ammonia as N in water	mg/L	1	0.047	0.058	0.016	0.053	0.048	0.007	<0.005	<0.005	<0.005	0.034
Electrical Conductivity (field)	uS/cm	n/a	368	700	850	770[i]	400[i]	1050	1130	1800[i]	1700[i]	1500[i]
pH (field)	pH units	6.5-8.5	**8.69**	8.20	8.16	7.8[i]	8.4[i]	8.37	8.35	8.1[i]	8[i]	**8.8**[i]
Total Organic Carbon	mg/L	n/a	8	14	7	8	14	8	6	10	11	24
Total Suspended Solids	mg/L	50	**82**	**150**	18	18	**1700**	**120**	30	7	12	20

n/a - Not Applicable

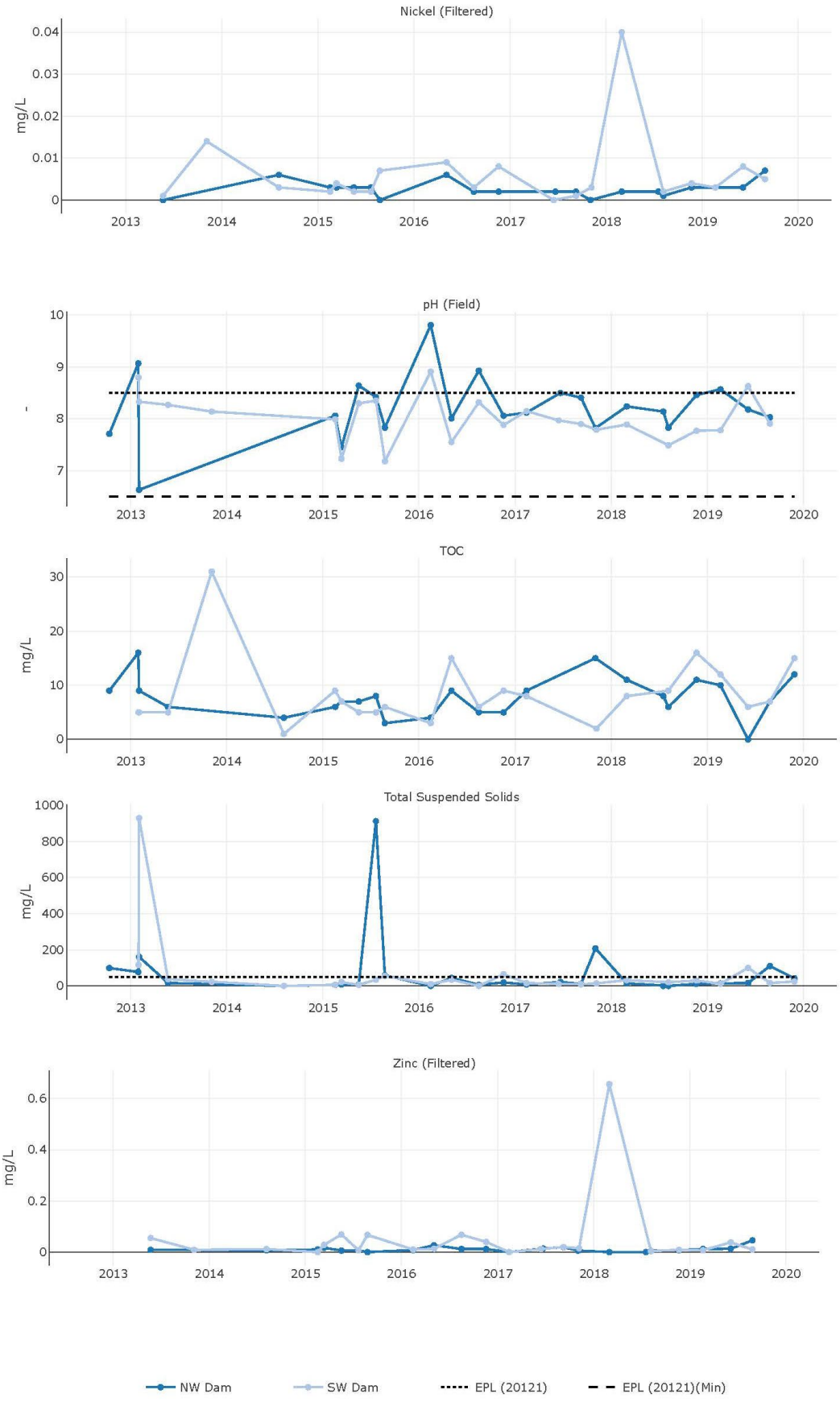
i - lab results due to insufficient sample to record field parameters

bold – results exceeding the Water Concentration Limits. *Note, these elevated results followed a significant rainfall event at the premises, and therefore (in accordance with the EPL) the licensee is not taken to have exceeded the water concentration limits.*

A1.2 Long-term Surface Water Quality Monitoring Graphs




Copper (Filtered)
mg/L
0.1
0.05
0
2013
2014
2015
2016
2017
2018
2019
2020
EC (field)
uS/cm
2500
2000
1500
1000
500
Lead (Filtered)
mg/L
0.04
0.03
0.02
0.01
Mercury (Filtered)
0.06
0.04
0.02
NW Dam
SW Dam
EPL (20121)
EPL (20121)(Min)


Nickel (Filtered)
mg/L
0.04
0.03
0.02
0.01
0
2013
2014
2015
2016
2017
2018
2019
2020
pH (Field)
-
10
9
8
7
TOC
mg/L
30
20
10
Total Suspended Solids
mg/L
1000
800
600
400
200
Zinc (Filtered)
mg/L
0.6
0.4
0.2
NW Dam
SW Dam
EPL (20121)
EPL (20121)(Min)

A2 Groundwater Quality Monitoring

A2.1 2019 Groundwater Quality Monitoring Results

A2.1.1 Quarterly Groundwater Monitoring Results

		Physiochemical (Field) Parameters			Major Cations and Anions					Alkalinity		Ammonia and Nutrients	
		pH	EC	Redox Potential	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulphate	Total (as CaCO3)	Ammonia	Nitrite + Nitrate
		-	uS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L
BH05s	Q1	7.42	4,008	9.3	76	100	3.3	970	260	680	1,200	<0.005	5.533
	Q2	7.26	4,009	58.5	76	120	6.3	870	410	700	1,100	0.026	6.08
	Q3	7.04	4,877	88.5	86	160	9	880	680	550	1,100	0.014	2.31
	Q4	7.09	3,666	39.5	88	120	2.5	620	260	910	900	<0.005	6.3
BH08s	Q1	7.13	9,489	-768	73	200	21	2,600	2,500	360	1,300	0.33	4.5
	Q2	7.95	9,363	66.7	66	180	21	2,000	2,300	350	1,300	0.47	3.8
	Q3	7.2	9,203	99.3	71	190	18	2,100	2,400	350	1,300	0.34	4.9
	Q4	7.23	9,742	-44.4	78	210	19	1,900	2,800	410	1,300	0.40	4.6
BH09s	Q1	7.64	5,984	-12.5	130	170	30	1,700	2,000	67	710	1.8	0.039
	Q2	7.53	1,649	-32.5	65	21	7.5	170	250	84	170	0.35	0.113
	Q3	7.11	4,018	-116	60	60	13	700	820	45	450	1.5	<0.005
	Q4	7.07	9,216	-106	170	240	34	1,300	3,100	4	910	3.7	0.006
BH14s	Q1	7.18	2,449	-126.5	13	17	13	890	350	6	1,000	1.1	0.01
	Q2	7.98	2,159	-102.2	12	16	12	670	340	4	1,000	1.6	<0.005
	Q3	7.52	2,650	-134.9	13	15	12	600	320	6	1,000	1.7	0.02
	Q4	7.63	2,606	-159	15	19	13	670	390	5	990	1.6	0.02
BH15s	Q1	7.06	5,784	-36.1	69	180	18	1,300	1,400	190	1,200	0.056	0.04
	Q2	7.84	5,753	-35.1	71	180	19	1,000	1,300	200	1,200	0.05	0.008
	Q3	Well Destroyed											
BH15As	Q4	8.34	7,622	-140.5	74	240	21	1,300	1,900	150	1,600	1.0	0.08
BH16s	Q1	7.22	5,067	65.4	110	180	16	1,100	1,100	360	1,000	0.05	0.826
	Q2	8.39	3,045	101	93	150	14	840	860	310	1,200	0.03	0.71
	Q3	6.96	4,365	129.5	87	140	15	730	730	270	1,100	0.01	0.706
	Q4	7.70[i]	4,700[i]	nr	97	160	15	800	900	320	1,000	<0.005	0.82
BH19s	Q1	7.46	6,490	-87.3	43	38	24	1,900	1,900	<1	780	3.7	<0.005
	Q2	7.73	6,618	-94.7	45	38	23	1,500	2,000	1	740	3.7	<0.005
	Q3	7.47	7,932	-135.6	54	50	24	1,600	2,100	<1	640	4.7	0.02
	Q4	7.61	7,634	-148.8	60	56	30	1,500	2,800	<1	630	4.8	<0.005

		Physiochemical (Field) Parameters			Major Cations and Anions					Alkalinity		Ammonia and Nutrients	
		pH	EC	Redox Potential	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulphate	Total (as CaCO3)	Ammonia	Nitrite + Nitrate
		-	uS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L
BH20s	Q1	7.45	6,387	7.49	75	140	19	1,800	1,400	320	1,400	0.38	0.76
	Q2	7.81	6,722	26.6	76	130	18	1,300	1,400	360	1,300	0.66	0.559
	Q3	7.56	7,543	121.6	83	150	15	1,500	1,700	310	1,300	0.79	0.337
	Q4	7.17	7,202	14.5	89	170	15	1,400	1,800	430	1,200	0.25	0.062
BH21s	Q1	7.03	2,941	6.4	61	80	9.4	700	420	81	1,100	0.22	0.07
	Q2						Dry						
	Q3						Dry						
	Q4	7.2	3,111	-44.6	69	84	10	600	440	89	1,100	<0.005	0.4
BH22s	Q1	7.81	3,718	6.3	24	17	8.3	1,100	600	240	960	1.5	0.009
	Q2	7.85	3,684	-76	19	16	8.8	850	590	280	1,000	0.93	0.026
	Q3	7.87	4,055	-26.5	27	21	9.1	900	550	240	1,000	0.38	1.624
	Q4	8.17	3,940	-38.1	30	26	10	960	550	420	1,000	0.016	1.8
BH02i	Q1	8.02	394.5	167.1	55	2.8	5.6	27	9	45	150	1.1	0.03
	Q2	8.1	351	-199.3	31	11	18	770	780	9	610	1.7	<0.05
	Q3	7.61	4,474	-158.6	25	14	18	950	950	6	620	3.4	<0.005
	Q4	7.52	5,083	-204.5	42	17	21	980	1,200	2	570	3.8	0.3
BH04i	Q1	7	17,000	167	190	150	53	3,700	4,400	11	490	7.7	0.566
	Q2	6.88	13,171	-178	180	140	44	2,900	4,500	<1	460	8.1	<0.025
	Q3						Dry						
	Q4	6.90[i]	14,000[i]	nr	190	150	42	2,500	4,800	2	420	8.4	<0.005
BH07i	Q1	6.79	17,201	-13.6	260	170	49	4,800	5,900	4	410	8.5	<0.005
	Q2	7.17	8,409	28.1	230	150	41	3,600	6,300	150	430	6.3	<0.025
	Q3	6.57	16,901	-44.5	240	160	44	3,700	5,400	<1	420	7.5	<0.025
	Q4	7.2	17,564	-86.7	270	180	39	3,600	6,600	<1	450	7.3	<0.050
BH11i	Q1	7.35	3,383	-112.5	38	14	21	960	970	3	450	2.3	<0.005
	Q2	8.15	3,092	-152.8	36	13	19	770	880	2	440	2.4	<0.005
	Q3	7.33	1,483	-264.7	30	6	12	260	250	13	340	1.3	<0.005
	Q4	7.83	1,306	25.3	76	6.5	14	180	160	18	400	1.1	<0.005
BH13i	Q1	11.67	5,700	-63.9	390	<0.5	25	900	1,100	12	600	5.7	0.68
	Q2	11.64	5,243	-16.8	340	<0.5	23	640	1,100	8	530	7.5	0.63
	Q3	11.79	5,535	-74.9	340	<0.5	19	610	1,000	11	520	5.2	0.56
	Q4	11.69	5,810	-116.8	370	<0.5	20	580	1,200	<1	510	7.4	0.65

		Physiochemical (Field) Parameters			Major Cations and Anions					Alkalinity		Ammonia and Nutrients	
		pH	EC	Redox Potential	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulphate	Total (as CaCO3)	Ammonia	Nitrite + Nitrate
		-	uS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L
BH23i	Q1	7.54	1,276	44.7	36	25	4.9	290	140	69	440	<0.005	1.536
	Q2	8.24	1,177	58.8	25	17	7.2	390	150	110	660	0.49	1.108
	Q3	7.87	1,344	89	39	27	4.6	260	130	80	529	0.011	0.95
	Q4	5.86	1,736	90	63	43	4.7	260	130	100	630	0.032	1.7
BH24i	Q1	8.03	1,769	-137.1	10	3.7	9.4	590	240	35	540	0.78	0.33
	Q2	8.11	1,224	-126.3	8.5	3.7	11	540	350	12	750	1.3	<0.005
	Q3	8.07	2,090	-191.4	9.3	4.2	11	530	320	9	760	1.5	0.009
	Q4	7.78	2,576	-220.2	11	5.3	13	660	470	8	800	1.8	<0.005
BH03d	Q1	7	3,800	150	190	1.2	15	700	820	2	340	3.2	0.1
	Q2	7.69	1,665	49.8	150	1	13	580	960	4	170	2.6	0.084
	Q3	7.48	3,457	-120.7	170	1	13	520	850	3	230	2.8	<0.005
	Q4	No Sample Available											
BH06d	Q1	6.56	10,710	-59.3	330	96	71	2,300	2,700	<1	1,200	5.8	<0.005
	Q2	7.17	9,927	-96.9	290	82	65	1,900	2,700	<1	1,100	6.4	<0.025
	Q3	7.37	9,706	135.9	150	86	60	1,600	2,600	<1	660	5.6	0.007
	Q4	6.76	7,433	49.6	190	50	56	1,300	2,300	<1	720	8.7	<0.005
BH17d	Q1	12.19	8,591	-124.5	360	<0.5	24	870	230	12	2,200	13	0.181
	Q2	12.41	8,199	-218.9	270	<0.5	30	760	280	11	2,050	22	0.116
	Q3	12.24	7,125	-109.2	210	<0.5	21	620	220	8	5,100	17	0.072
	Q4	12.01	8,019	-265.2	260	<0.5	26	730	320	9	1,900	27	0.07
BH18d	Q1	7.73	5,418	8.6	91	26	150	2,900	3,400	15	570	13	0.007
	Q2	7.11	10,929	-122	310	80	98	2,100	3,200	<1	920	8.2	<0.005
	Q3	7.28	10,311	-157.9	140	19	130	1,800	2,600	23	840	14	<0.005
	Q4	7.35	10,322	-166.5	160	21	130	2,000	3,400	25	810	14	0.2
BH25d	Q1	8.02	3,945	167.1	16	2	9.2	220	64	17	380	1.4	<0.008
	Q2	8.36	834	-180.7	35	2.8	8.6	160	72	39	460	1	<0.005
	Q3	8.1[i]	950[i]	nr	57	5.9	11	170	68	20	390	1.7	0.016
	Q4	7.91	1,335	-246.8	140	8.4	13	180	84	220	450	1.5	<0.005
BH26d	Q1	7.32	9,774	-136.3	220	76	80	2,600	2,900	4	1,000	6.2	0.02
	Q2	8.06	9,993	-260.1	190	72	73	1,900	2,600	3	1,000	6.9	0.006
	Q3	7.03	9,873	-117.2	220	70	61	1,500	2,500	13	1,000	6.2	0.007
	Q4	6.75	10,528	-13	260	83	75	1,800	3,200	1	650	5.3	0.31

nr - Not Recorded, nt - Not Tested

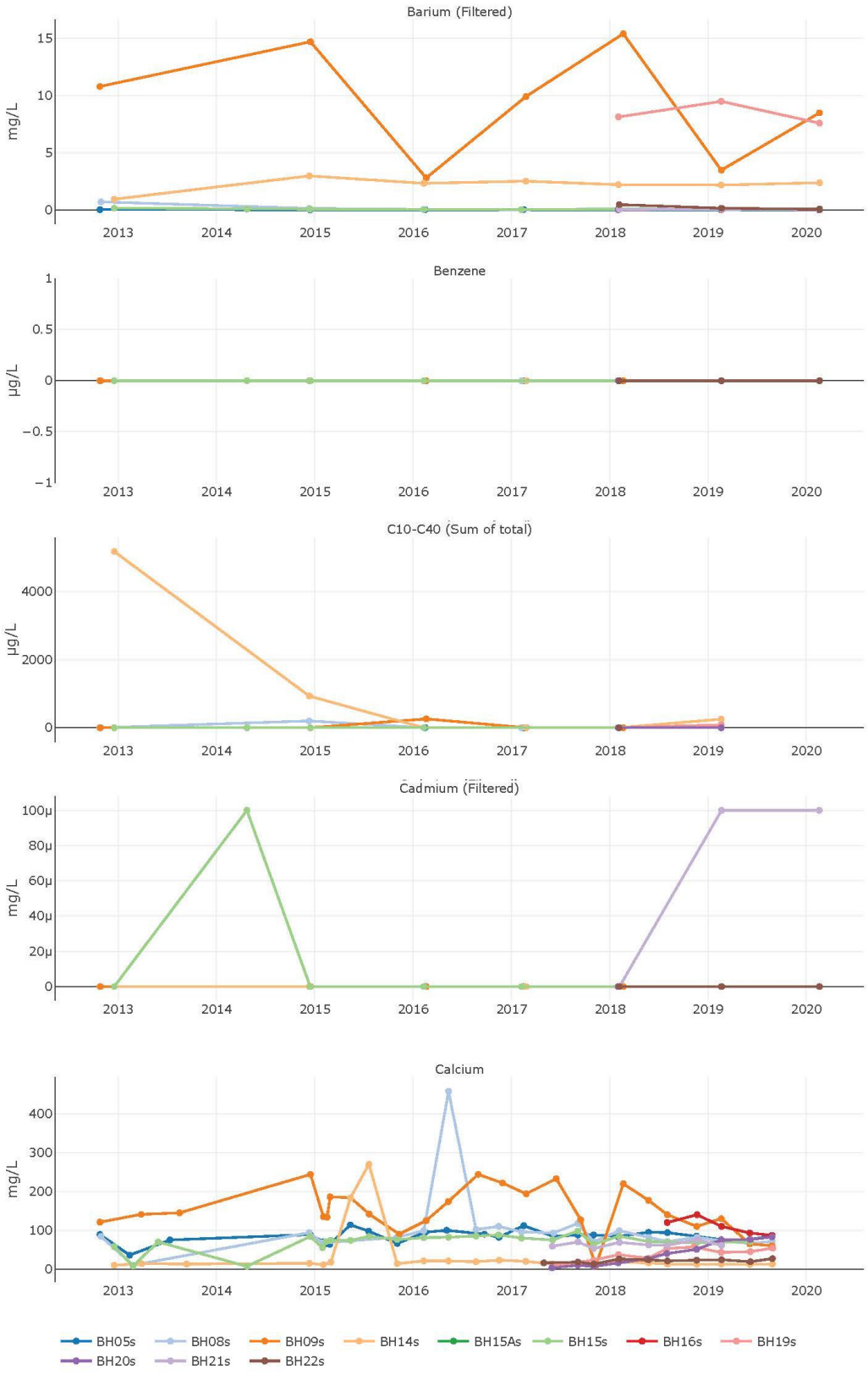
i - lab results due to insufficient sample to record field parameters

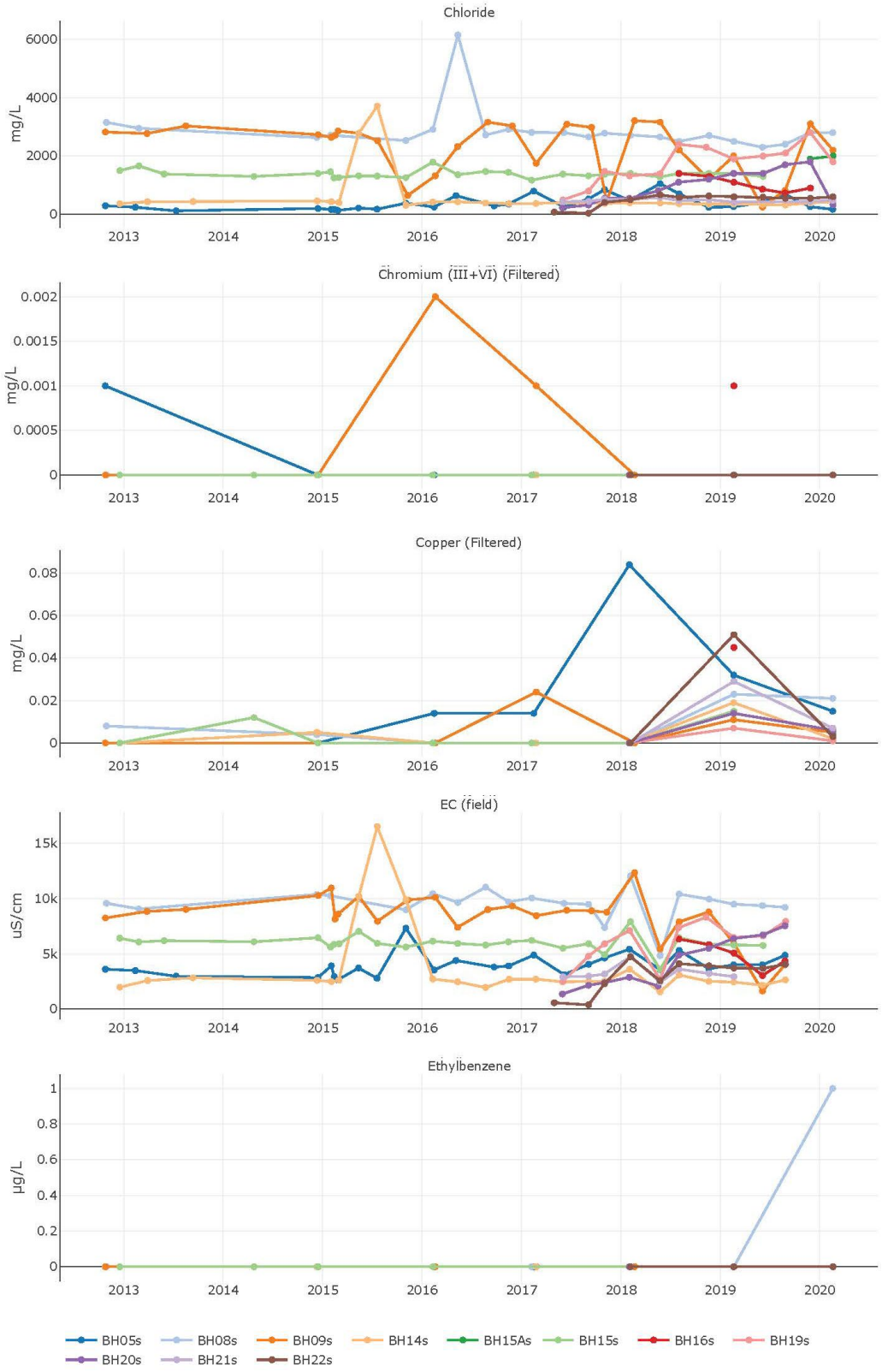
A2.1.2 Annual Groundwater Monitoring Results

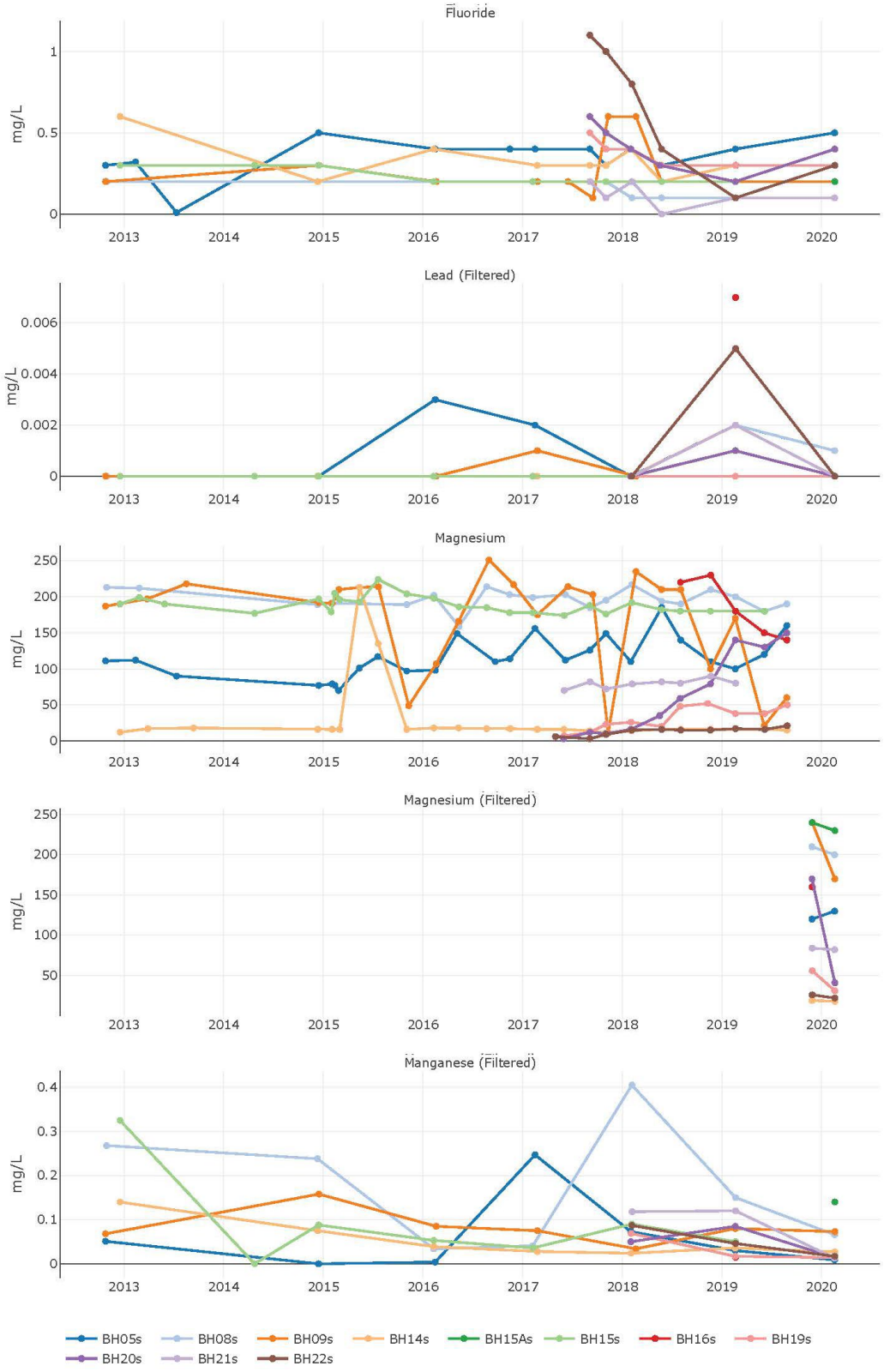
Parameter	Unit	BH05s	BH08s	BH09s	BH14s	BH15s	BH16s	BH19s	BH20s	BH21s	BH22s	BH02i	BH04i	BH07i	BH11i	BH13i	BH23i	BH24i	BH03d	BH06d	BH17d	BH18d	BH25d	BH26d
Aluminium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	0.17	0.24	0.01	0.02	<0.01	0.02	0.39	<0.01	0.01	<0.01
Arsenic	mg/L	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.005	0.002	0.002	0.009	<0.001	<0.001	0.006	<0.001	0.006	<0.001	<0.001	<0.001	0.004
Barium	mg/L	0.025	0.053	3.5	2.2	0.057	0.066	9.5	0.09	0.09	0.18	0.061	56	54	3.8	0.85	0.2	0.43	0.63	28	0.95	2.3	0.28	20
Benzene	µg/L	<1	<1	<1	<1	<1	nr	<1	<1	<1	<1	<1	2	<1	5	<1	<1	24	<1	7	21	<1	<1	<1
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.007	<0.001	<0.001	0.003	0.001	<0.001	0.004	0.001	0.046	<0.001	<0.001	<0.001
Copper	mg/L	0.032	0.023	0.011	0.019	0.015	0.045	0.007	0.014	0.029	0.051	0.002	0.002	0.013	0.017	0.022	0.044	0.011	0.002	0.01	0.02	0.03	<0.001	0.019
Ethylbenzene	µg/L	<1	<1	<1	<1	<1	nr	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoride	mg/L	0.4	0.1	0.2	0.3	0.2	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.6	0.3	0.8	1	0.1	0.1	0.1	0.3	1	0.1
Lead	mg/L	0.002	0.002	<0.001	0.002	0.001	0.007	<0.001	0.001	0.002	0.005	<0.001	0.003	0.001	0.003	0.01	0.003	<0.001	<0.001	0.001	0.005	0.003	<0.001	<0.001
Manganese	mg/L	0.03	0.15	0.08	0.036	0.05	0.015	0.017	0.085	0.12	0.046	0.099	0.27	0.24	0.095	<0.005	0.006	0.029	0.039	0.19	<0.005	<0.005	0.11	0.16
Mercury	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.00005	<0.00005	<0.00005	0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	<0.00005	<0.00005
Phenols	µg/L	<0.05	<0.05	<0.05	nr	<0.05	<50	<0.05	<0.05	<0.05	nr	<0.05	<0.05	<0.05	<50	<0.05	<0.05	<0.05	<0.05	<50	<0.05	<50	<0.05	<0.05
Phosphorus	mg/L	0.2	0.5	0.2	2.4	0.2	0.2	<0.05	0.07	0.1	<0.05	0.3	<0.05	<0.05	<0.05	0.2	<0.05	0.09	<0.05	0.07	<0.05	<0.05	0.2	<0.05
Toluene	µg/L	<1	<1	<1	<1	<1	nr	<1	<1	<1	<1	<1	3	<1	4	<1	<1	<1	1	2	20	<1	2	<1
Total Organic Carbon	mg/L	3	21	7	6	24	27	2	7	21	14	9	64	11	14	12	15	8	4	89	6	31	8	28
Total Petroleum Hydrocarbons																								
C6-C9	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	32	<10	<10	33	<10	25	92	<10	<10	<10
C10-C14	µg/L	<50	nr	<50	<50	<50	<50	<50	<50	nr	nr	<50	160	<50	<50	<50	nr	<50	<50	<50	<50	<50	<50	<50
C15-C28	µg/L	<100	nr	<100	160	<100	<100	<100	<100	nr	nr	<100	<100	<100	<100	<100	nr	<100	<100	<100	<100	<100	<100	<100
C29-C36	µg/L	<100	nr	<100	<100	<100	<100	<100	<100	nr	nr	<100	<100	<100	<100	<100	nr	<100	<100	<100	<100	<100	<100	<100
+C10-C36 (Sum)	µg/L	<50	nr	<50	160	<100	nr	<50	<50	nr	nr	<50	nr	nr	nr	<50	nr	<50	nr	<100	<50	nr	nr	<50
Xylene (m & p)	µg/L	<2	<2	<2	<2	<2	nr	<2	<2	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<2	6	<2	<2	<2
Xylene (o)	µg/L	<1	<1	<1	<1	<1	nr	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3	<1	<1	<1
Zinc	mg/L	0.22	0.048	0.039	0.033	0.049	0.39	0.026	0.36	0.21	0.14	0.008	0.052	0.044	0.066	0.086	0.097	0.016	0.02	0.17	0.06	0.041	0.002	0.081

A2.2 Long-term Groundwater Quality Monitoring Graphs

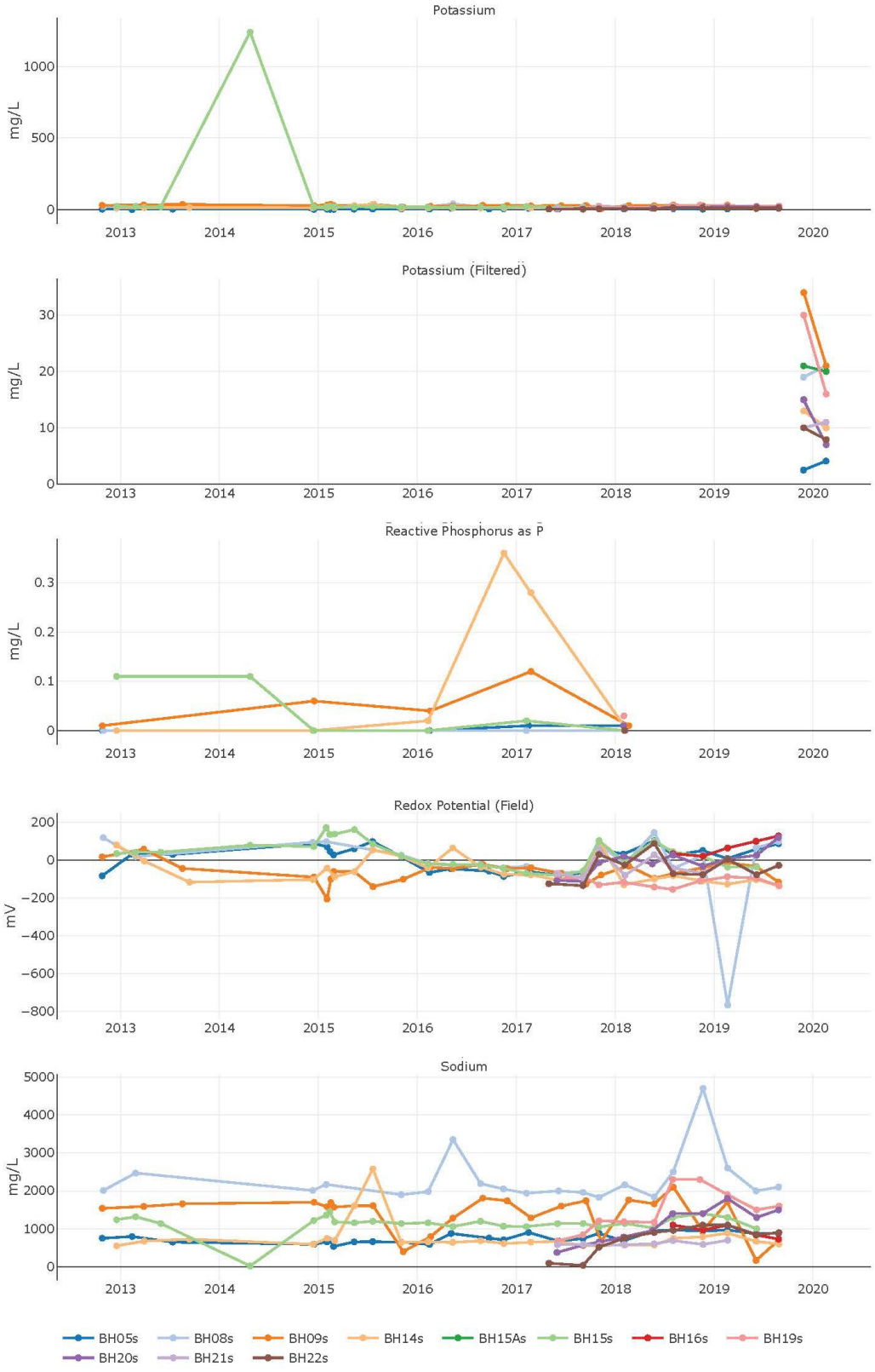
A2.2.1 Shallow Bores

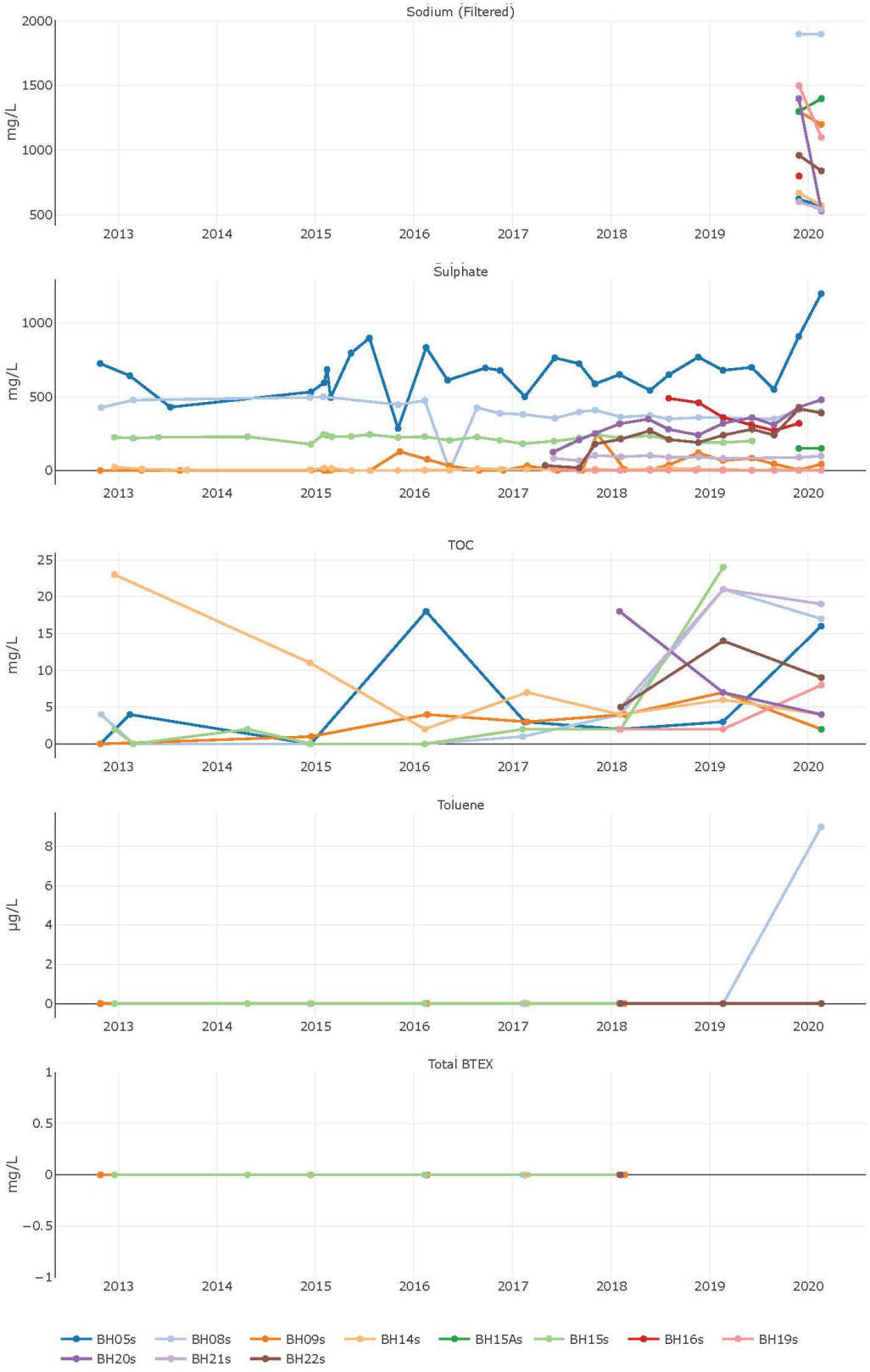

Barium (Filtered)
mg/L
15
10
5
0
2013
2014
2015
2016
2017
2018
2019
2020
Benzene
µg/L
1
0.5
0
−0.5
−1
C10-C40 (Sum of total)
µg/L
4000
2000
0
Cadmium (Filtered)
mg/L
100µ
80µ
60µ
40µ
20µ
0
Calcium
mg/L
400
300
200
100
0
BH05s
BH08s
BH09s
BH14s
BH15As
BH15s
BH16s
BH19s
BH20s
BH21s
BH22s

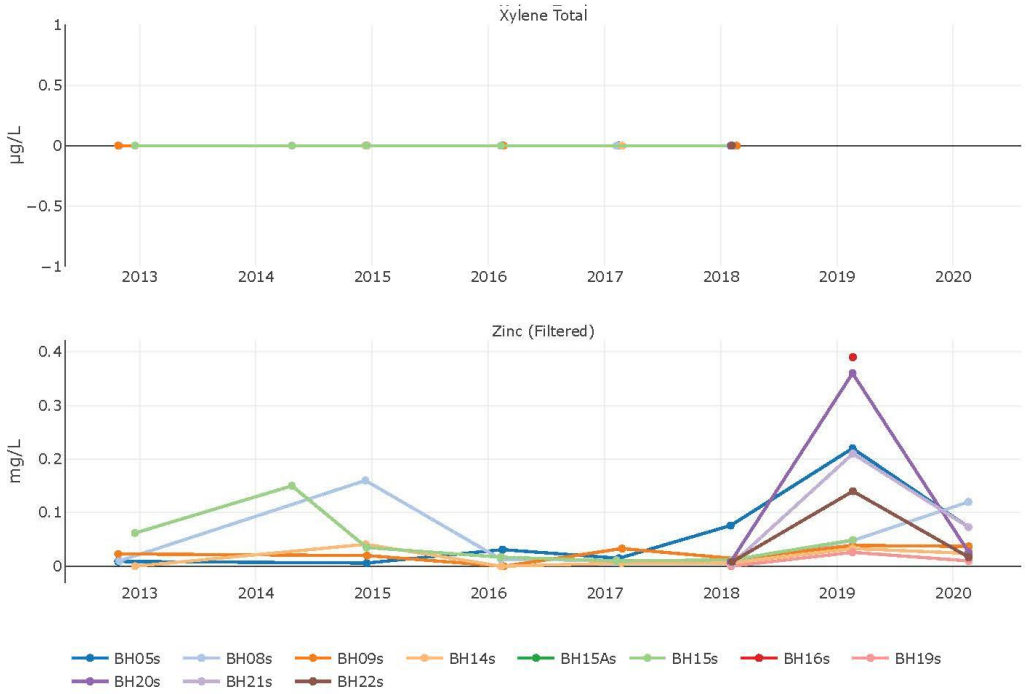

Chloride
mg/L
6000
4000
2000
0
2013
2014
2015
2016
2017
2018
2019
2020
Chromium (III+VI) (Filtered)
mg/L
0.002
0.0015
0.001
0.0005
0
Copper (Filtered)
mg/L
0.08
0.06
0.04
0.02
EC (field)
uS/cm
15k
10k
5k
Ethylbenzene
µg/L
1
0.8
0.6
0.4
0.2
BH05s
BH08s
BH09s
BH14s
BH15As
BH15s
BH16s
BH19s
BH20s
BH21s
BH22s


Fluoride
mg/L
1
0.5
0
2013
2014
2015
2016
2017
2018
2019
2020
Lead (Filtered)
mg/L
0.006
0.004
0.002
0
Magnesium
mg/L
250
200
150
100
50
Magnesium (Filtered)
Manganese (Filtered)
0.4
0.3
0.2
0.1
BH05s
BH08s
BH09s
BH14s
BH15As
BH15s
BH16s
BH19s
BH20s
BH21s
BH22s

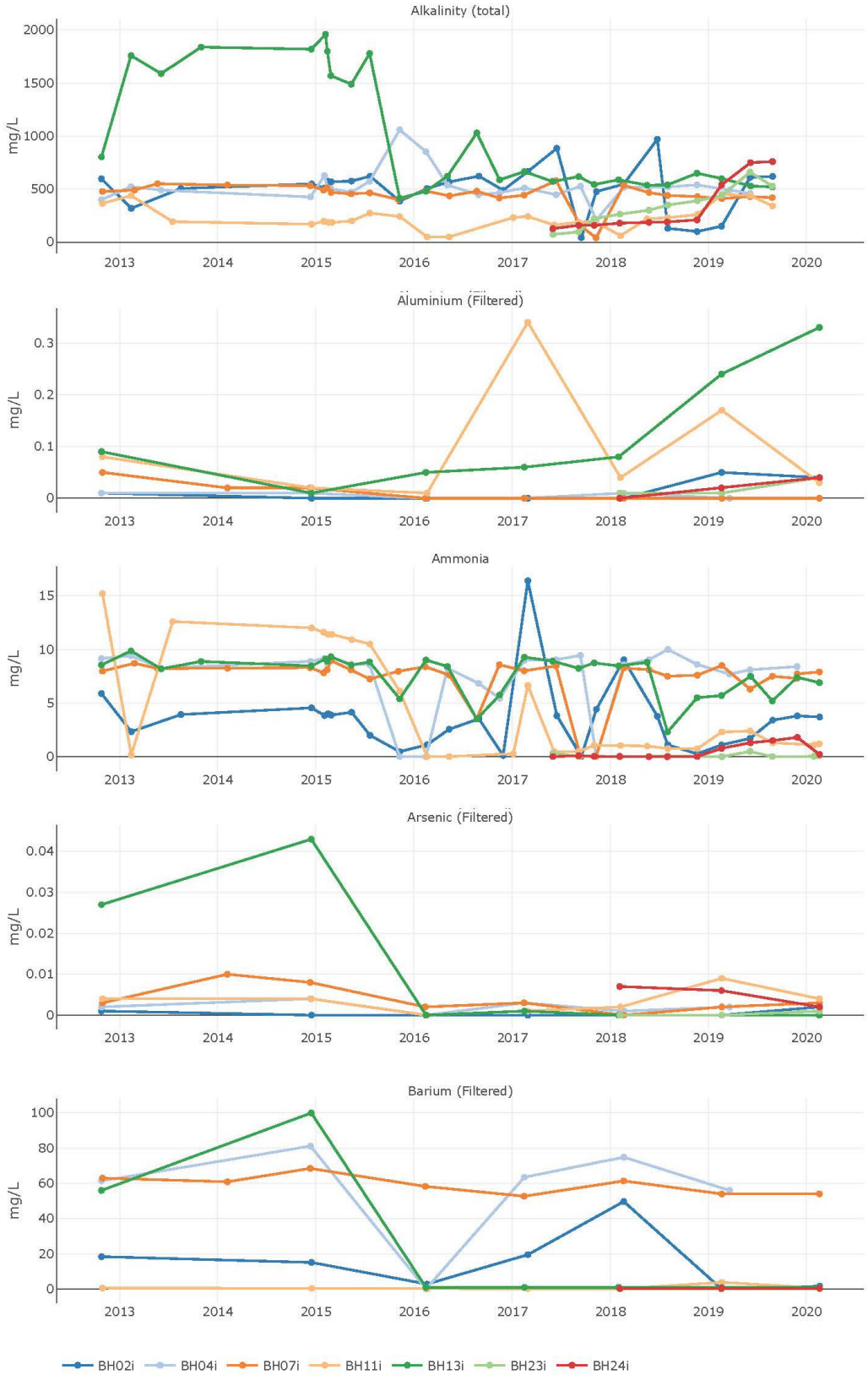

Mercury (Filtered)
mg/L
50µ
40µ
30µ
20µ
10µ
0
2013
2014
2015
2016
2017
2018
2019
2020
Nitrite + Nitrate as N
mg/L
25
20
15
10
5
0
pH (Field)
-
8
7
6
Phenolics
µg/L
15
10
5
0
Phosphorus
mg/L
2.5
2
1.5
1
0.5
0
BH05s
BH08s
BH09s
BH14s
BH15As
BH15s
BH16s
BH19s
BH20s
BH21s
BH22s

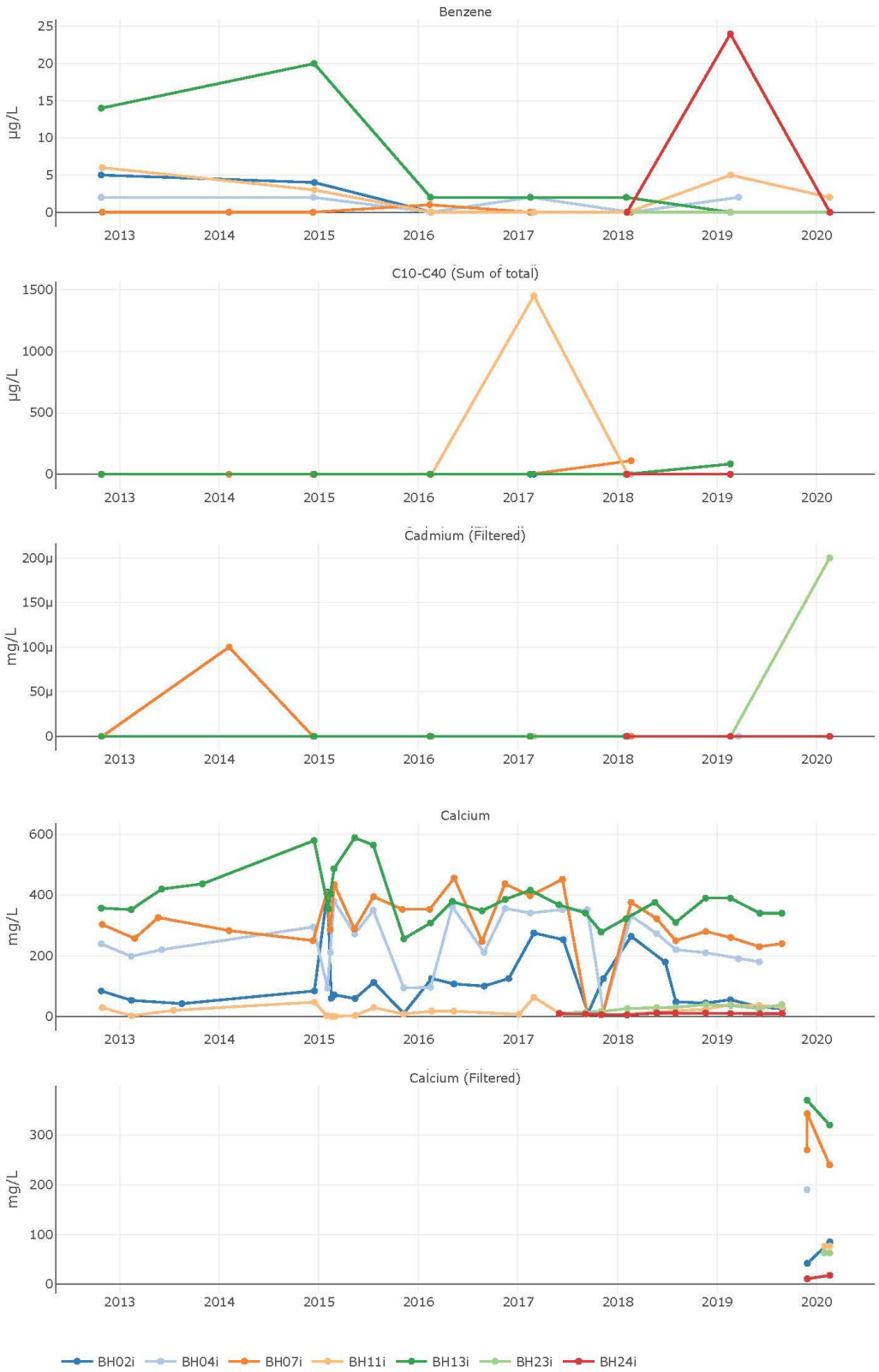

Potassium
mg/L
1000
500
0
2013
2014
2015
2016
2017
2018
2019
2020
Potassium (Filtered)
mg/L
30
20
10
0
Reactive Phosphorus as P
mg/L
0.3
0.2
0.1
0
Redox Potential (Field)
mV
200
0
−200
−400
−600
−800
Sodium
mg/L
5000
4000
3000
2000
1000
0
BH05s
BH08s
BH09s
BH14s
BH15As
BH15s
BH16s
BH19s
BH20s
BH21s
BH22s

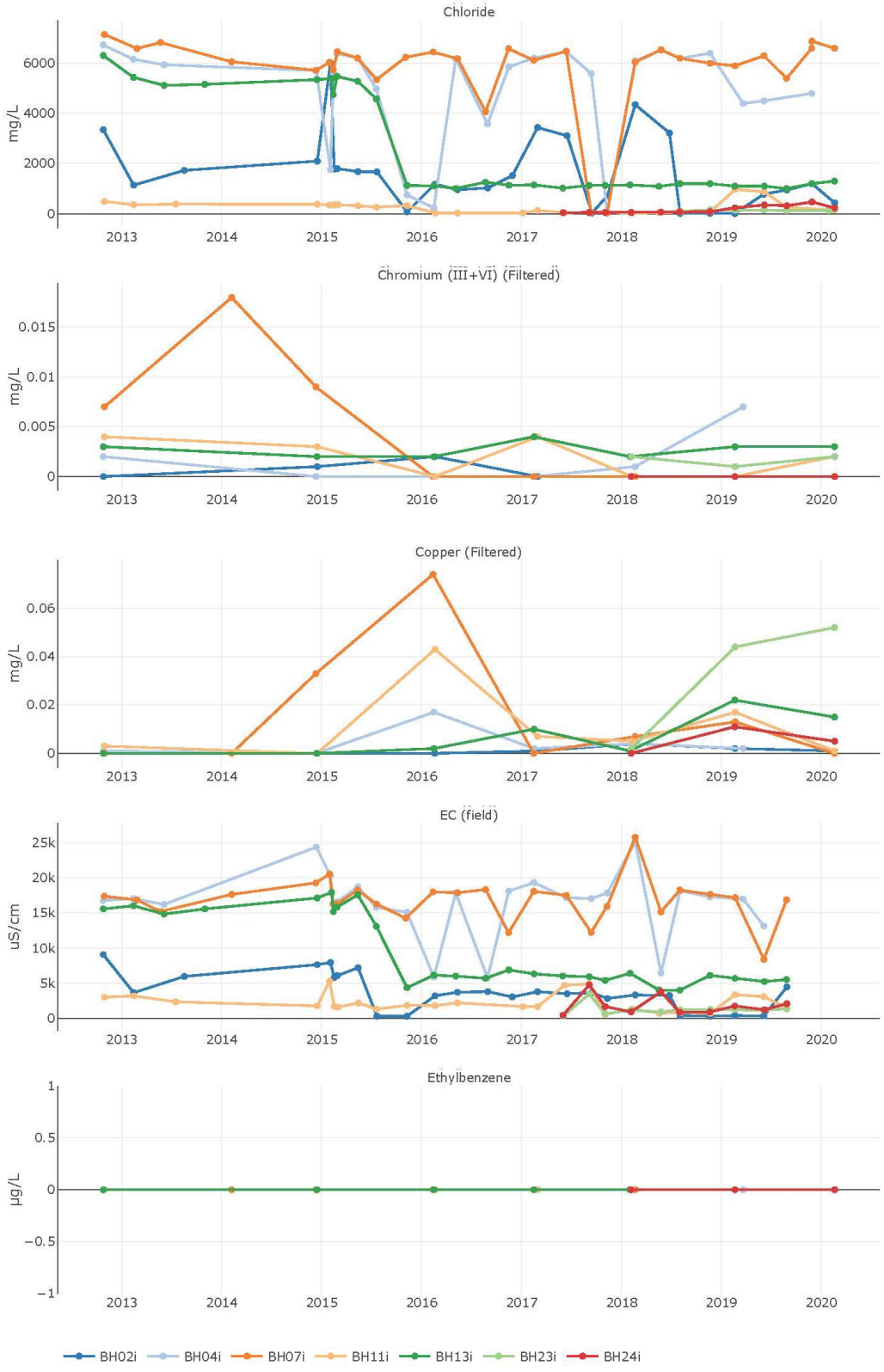

Sodium (Filtered)
mg/L
2000
1500
1000
500
2013
2014
2015
2016
2017
2018
2019
2020
Sulphate
mg/L
1000
500
0
TOC
mg/L
25
20
15
10
5
0
Toluene
µg/L
8
6
4
2
0
Total BTEX
mg/L
1
0.5
0
−0.5
−1
BH05s
BH08s
BH09s
BH14s
BH15As
BH15s
BH16s
BH19s
BH20s
BH21s
BH22s

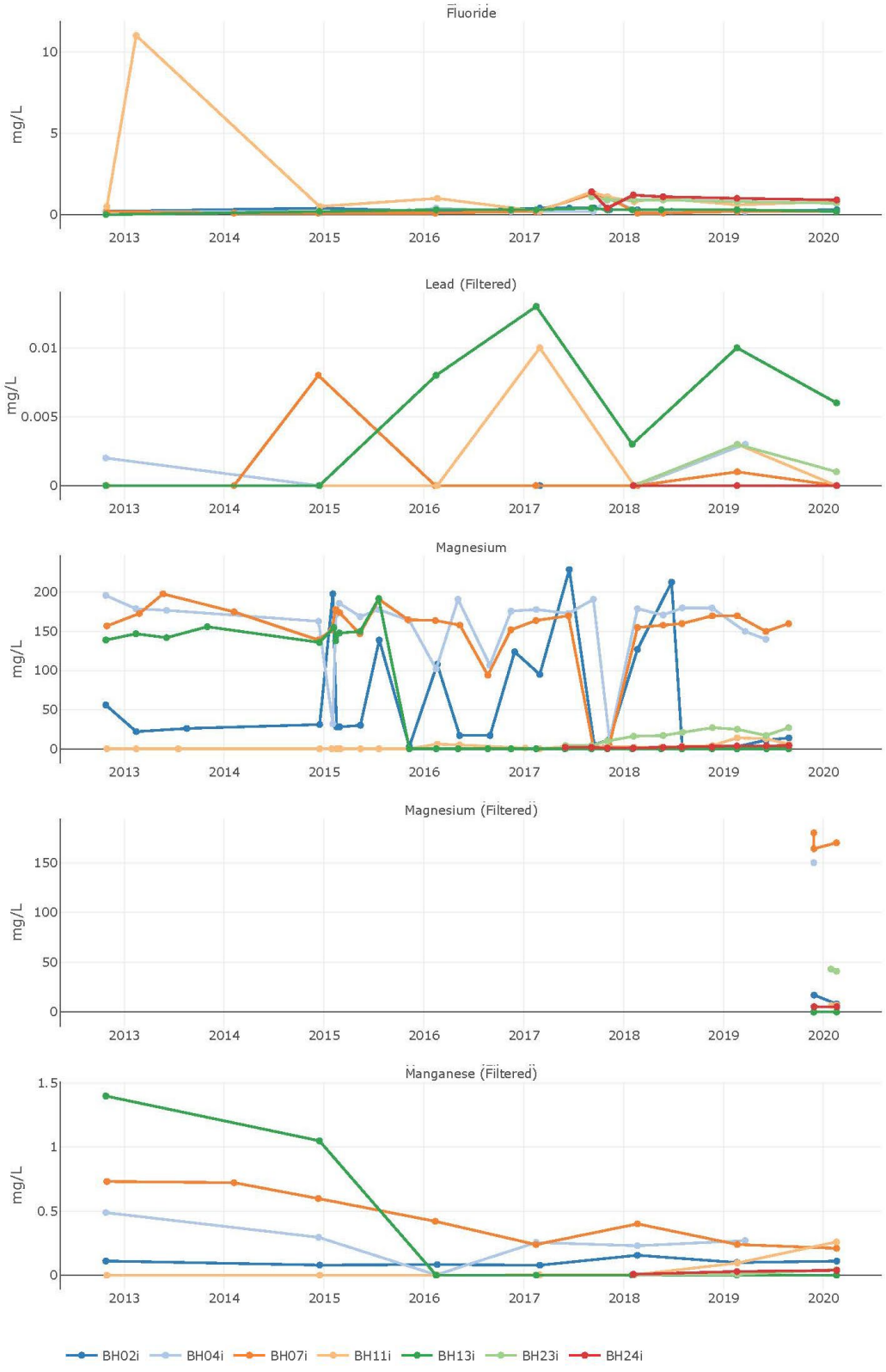

Xylene Total
µg/L
1
0.5
0
−0.5
−1
2013
2014
2015
2016
2017
2018
2019
2020
Zinc (Filtered)
mg/L
0.4
0.3
0.2
0.1
0
BH05s
BH08s
BH09s
BH14s
BH15As
BH15s
BH16s
BH19s
BH20s
BH21s
BH22s

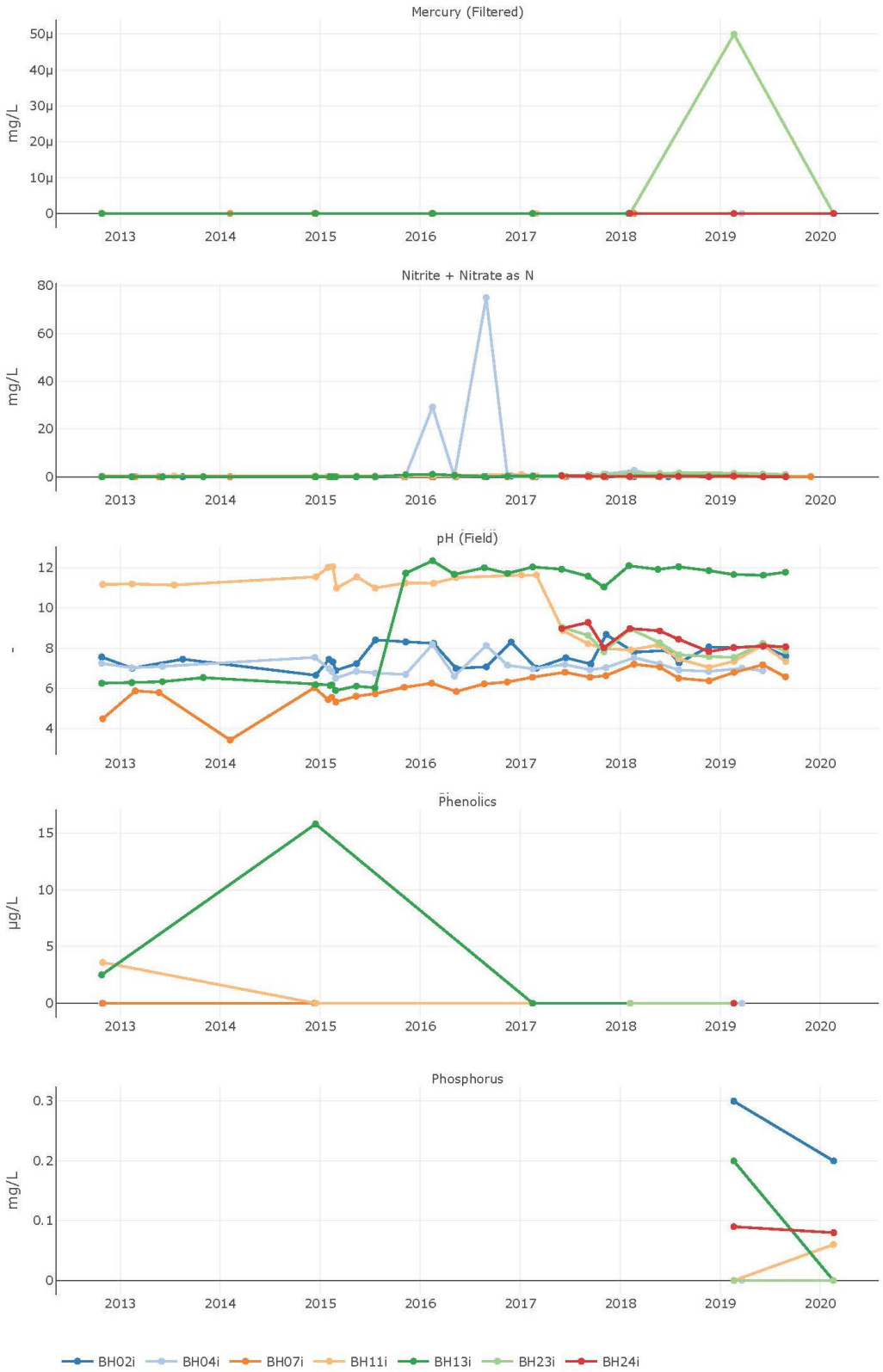
A2.2.2 Intermediate Bores



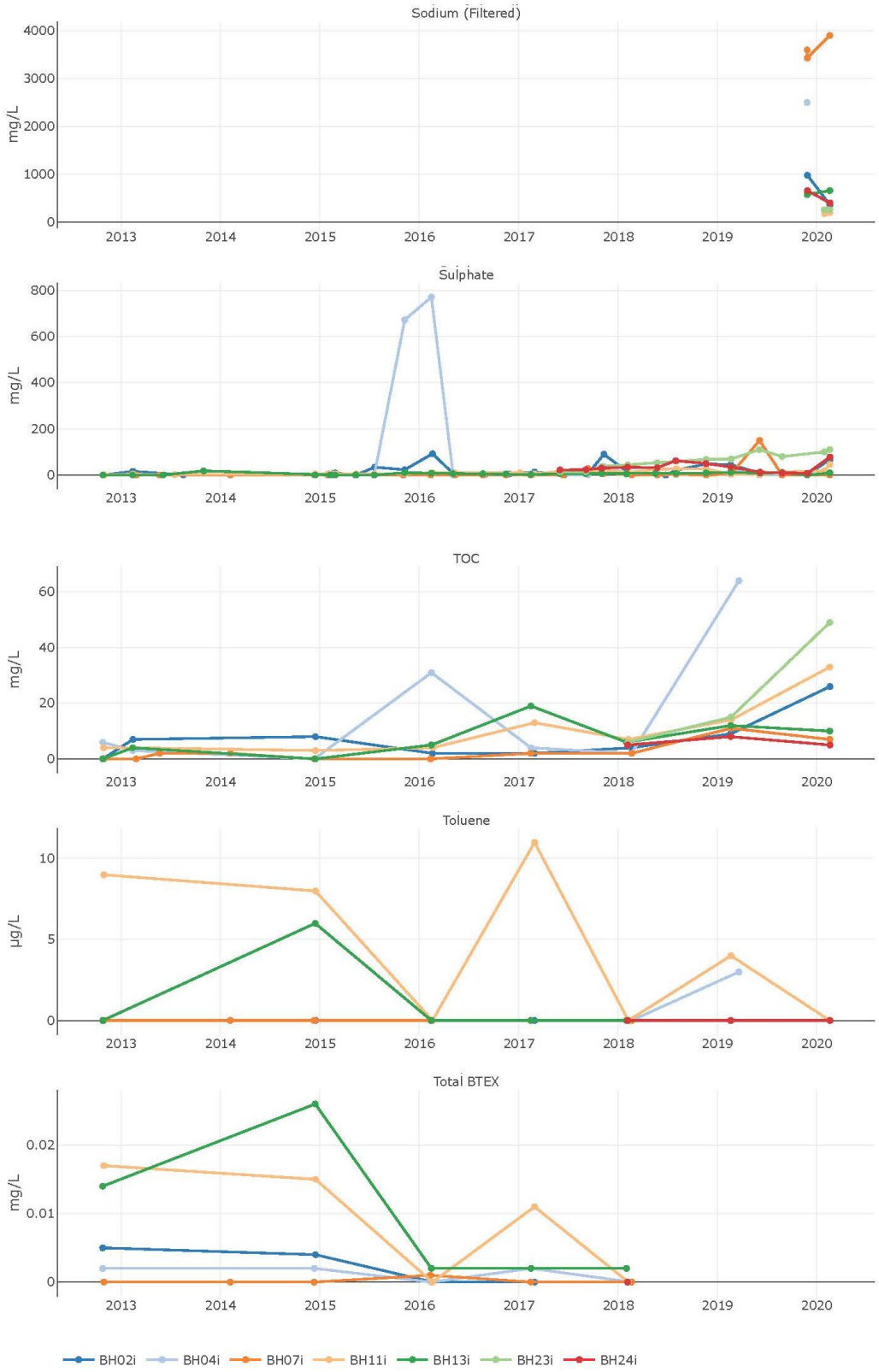

Benzene
µg/L
25
20
15
10
5
0
2013
2014
2015
2016
2017
2018
2019
2020
C10-C40 (Sum of total)
µg/L
1500
1000
500
0
Cadmium (Filtered)
mg/L
200µ
150µ
100µ
50µ
0
Calcium
mg/L
600
400
200
0
Calcium (Filtered)
mg/L
300
200
100
0
BH02i
BH04i
BH07i
BH11i
BH13i
BH23i
BH24i

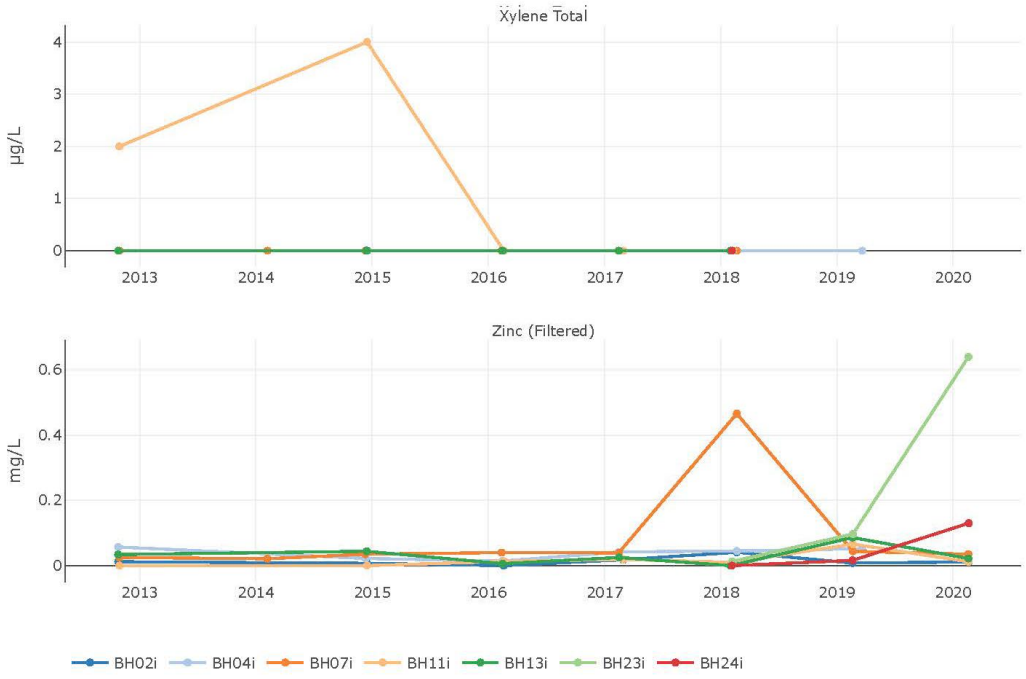

Chloride
mg/L
6000
4000
2000
0
2013
2014
2015
2016
2017
2018
2019
2020
Chromium (III+VI) (Filtered)
mg/L
0.015
0.01
0.005
0
Copper (Filtered)
mg/L
0.06
0.04
0.02
0
EC (field)
uS/cm
25k
20k
15k
10k
5k
0
Ethylbenzene
µg/L
1
0.5
0
−0.5
−1
BH02i
BH04i
BH07i
BH11i
BH13i
BH23i
BH24i


Fluoride
mg/L
10
5
0
2013
2014
2015
2016
2017
2018
2019
2020
Lead (Filtered)
mg/L
0.01
0.005
0
Magnesium
mg/L
200
150
100
50
Magnesium (Filtered)
Manganese (Filtered)
1.5
1
0.5
BH02i
BH04i
BH07i
BH11i
BH13i
BH23i
BH24i

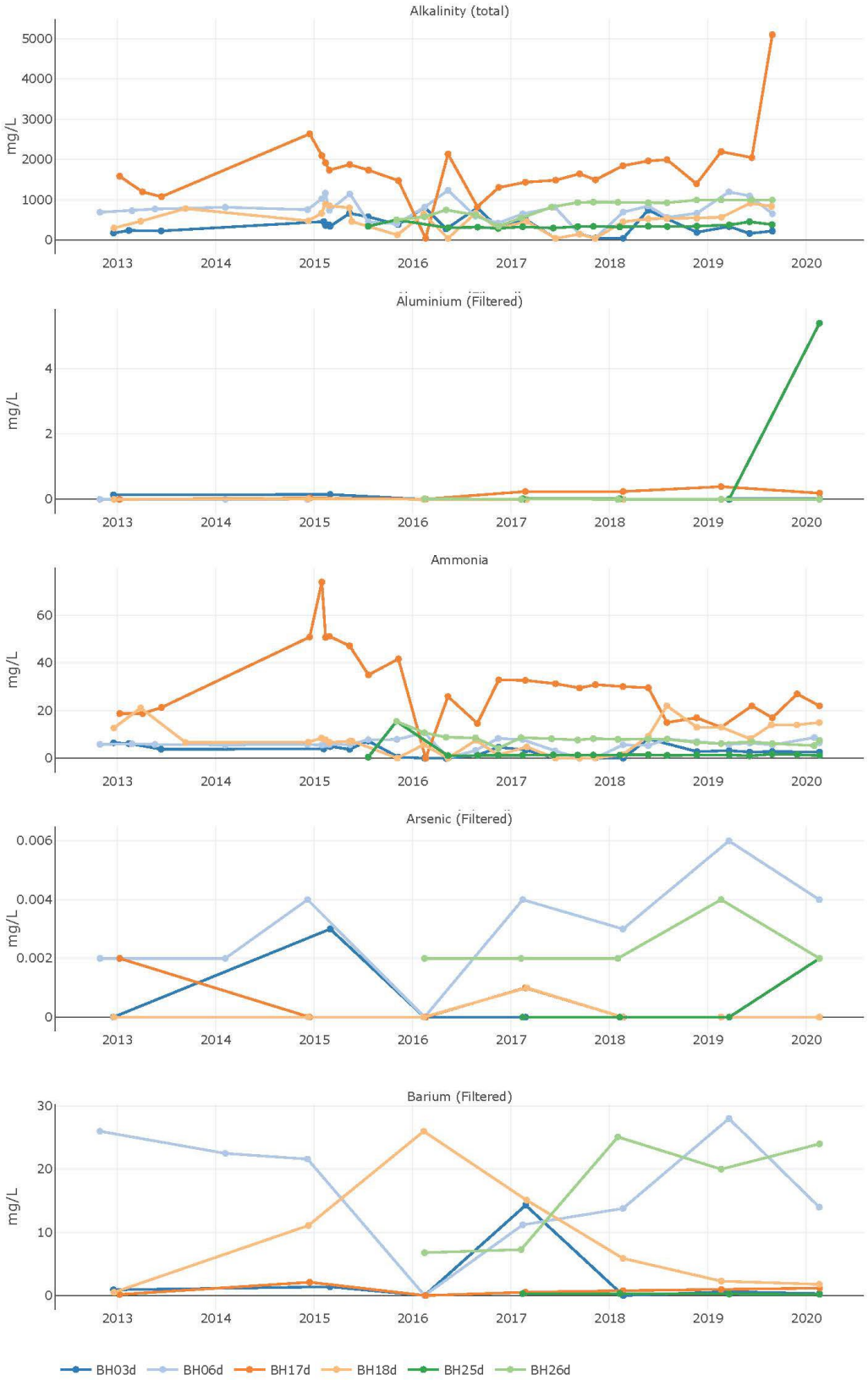

Mercury (Filtered)
50µ
40µ
30µ
20µ
10µ
0
mg/L
2013
2014
2015
2016
2017
2018
2019
2020
Nitrite + Nitrate as N
80
60
40
20
0
mg/L
pH (Field)
12
10
8
6
4
-
Phenolics
15
10
5
0
µg/L
Phosphorus
0.3
0.2
0.1
0
mg/L
BH02i
BH04i
BH07i
BH11i
BH13i
BH23i
BH24i

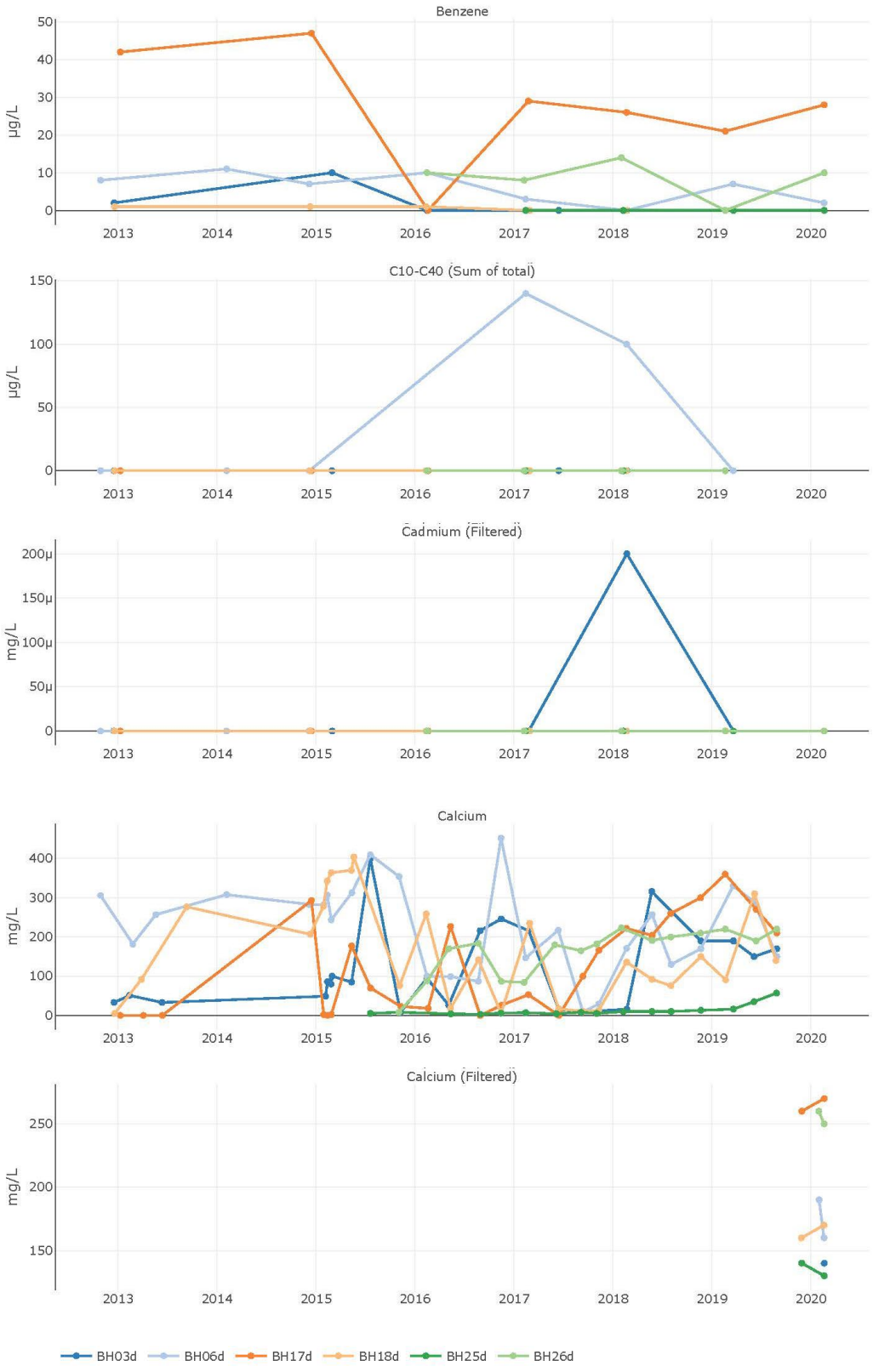

Potassium
mg/L
100
80
60
40
20
0
2013
2014
2015
2016
2017
2018
2019
2020
Potassium (Filtered)
mg/L
40
30
20
10
Reactive Phosphorus as P
mg/L
0.4
0.3
0.2
0.1
0
Redox Potential (Field)
mV
200
0
−200
−400
Sodium
mg/L
8000
6000
4000
2000
0
BH02i
BH04i
BH07i
BH11i
BH13i
BH23i
BH24i

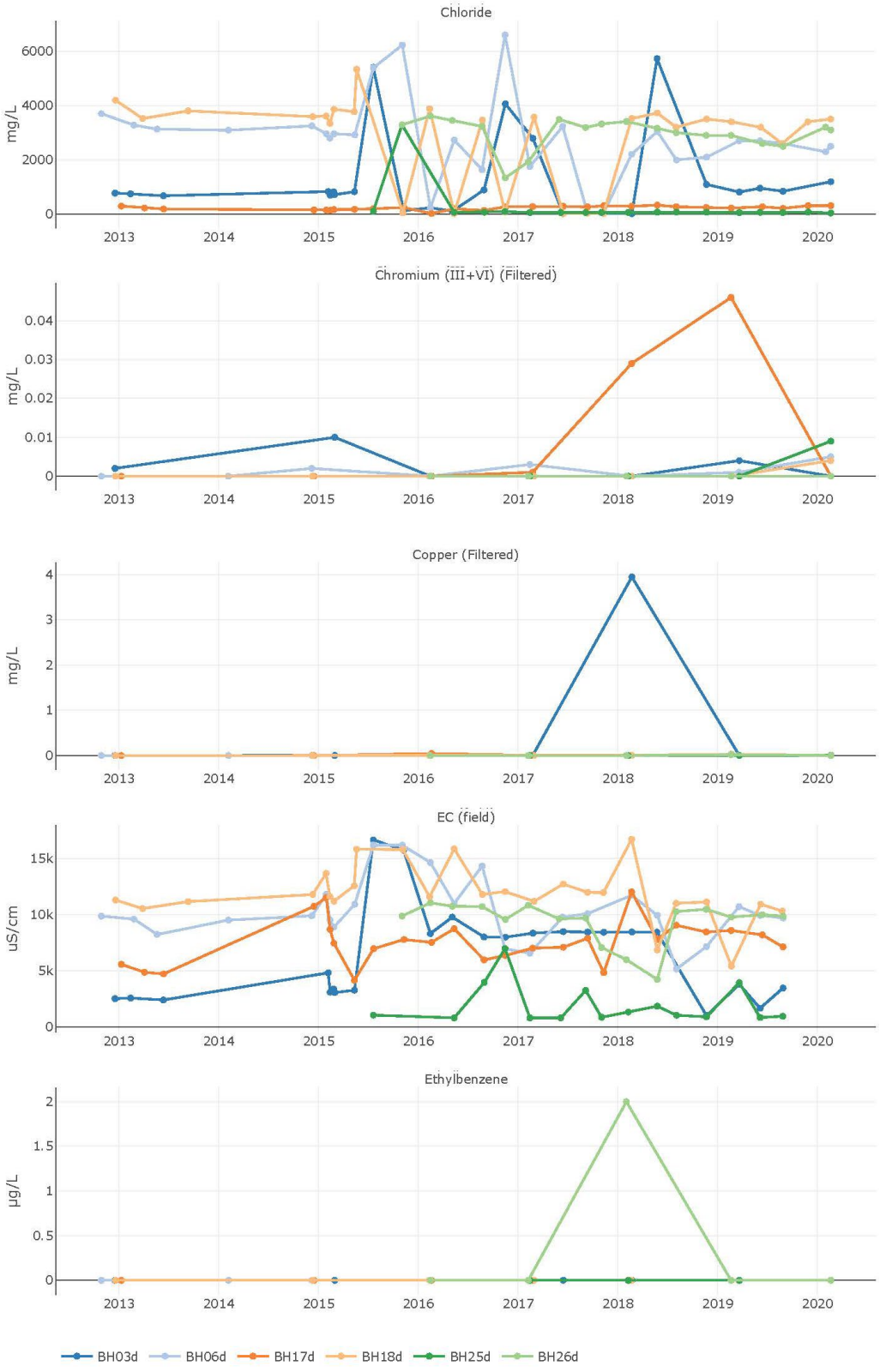

Sodium (Filtered)
mg/L
4000
3000
2000
1000
0
2013
2014
2015
2016
2017
2018
2019
2020
Sulphate
mg/L
800
600
400
200
0
TOC
mg/L
60
40
20
0
Toluene
µg/L
10
5
0
Total BTEX
mg/L
0.02
0.01
0
BH02i
BH04i
BH07i
BH11i
BH13i
BH23i
BH24i

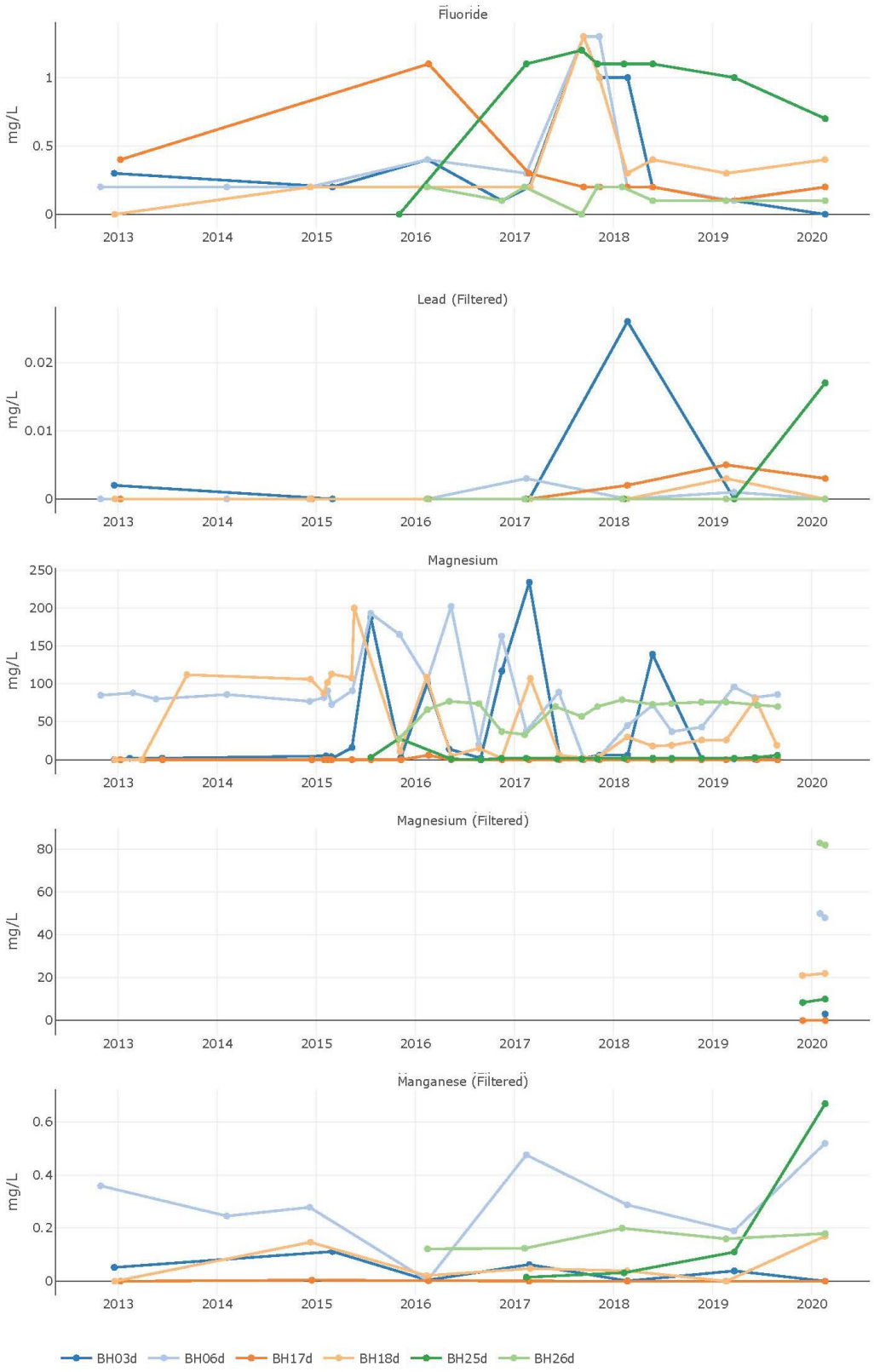

Xylene Total
µg/L
4
3
2
1
0
2013
2014
2015
2016
2017
2018
2019
2020
Zinc (Filtered)
mg/L
0.6
0.4
0.2
0
2013
2014
2015
2016
2017
2018
2019
2020
BH02i
BH04i
BH07i
BH11i
BH13i
BH23i
BH24i

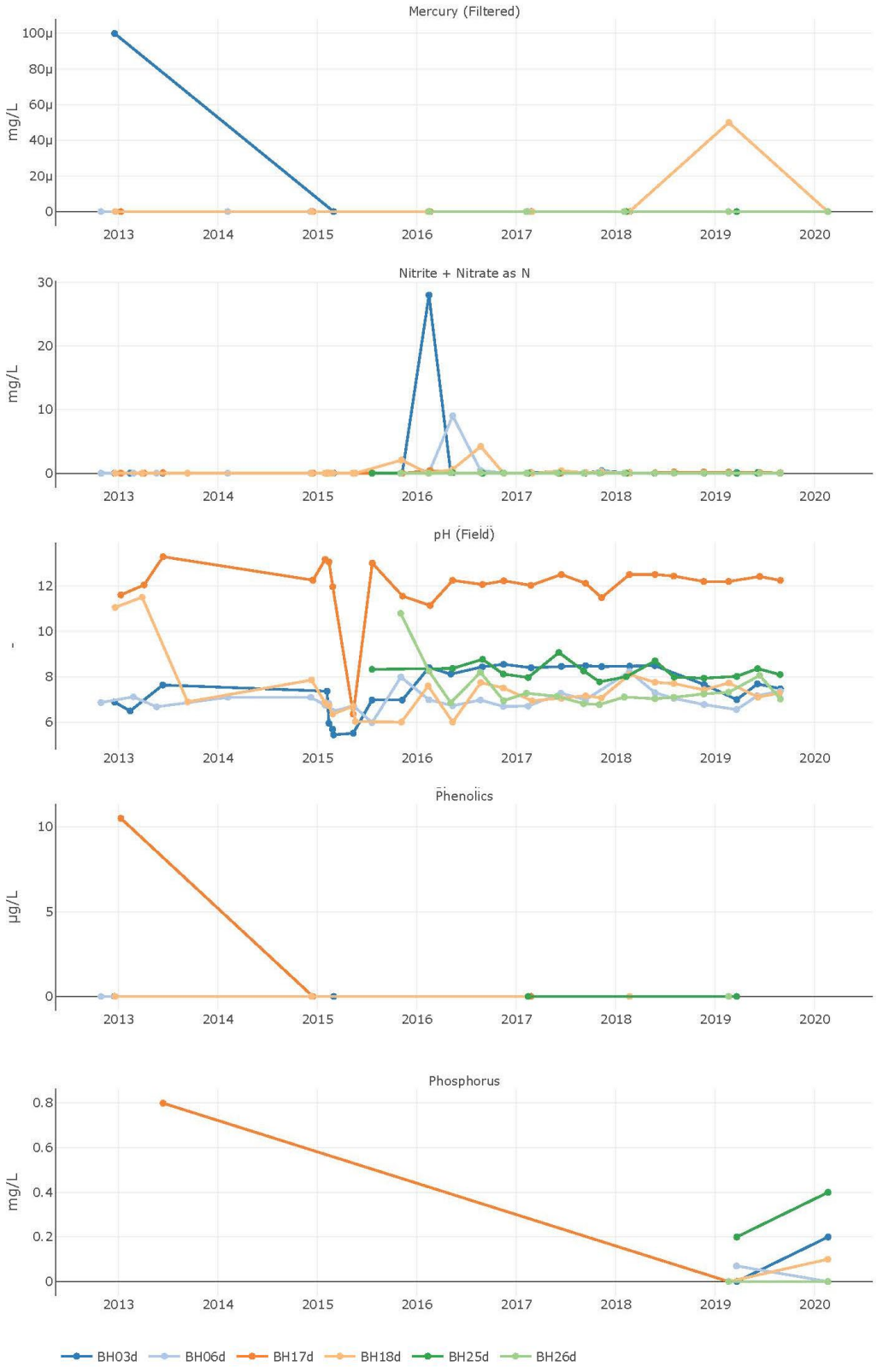
A2.2.3 Deep Bores



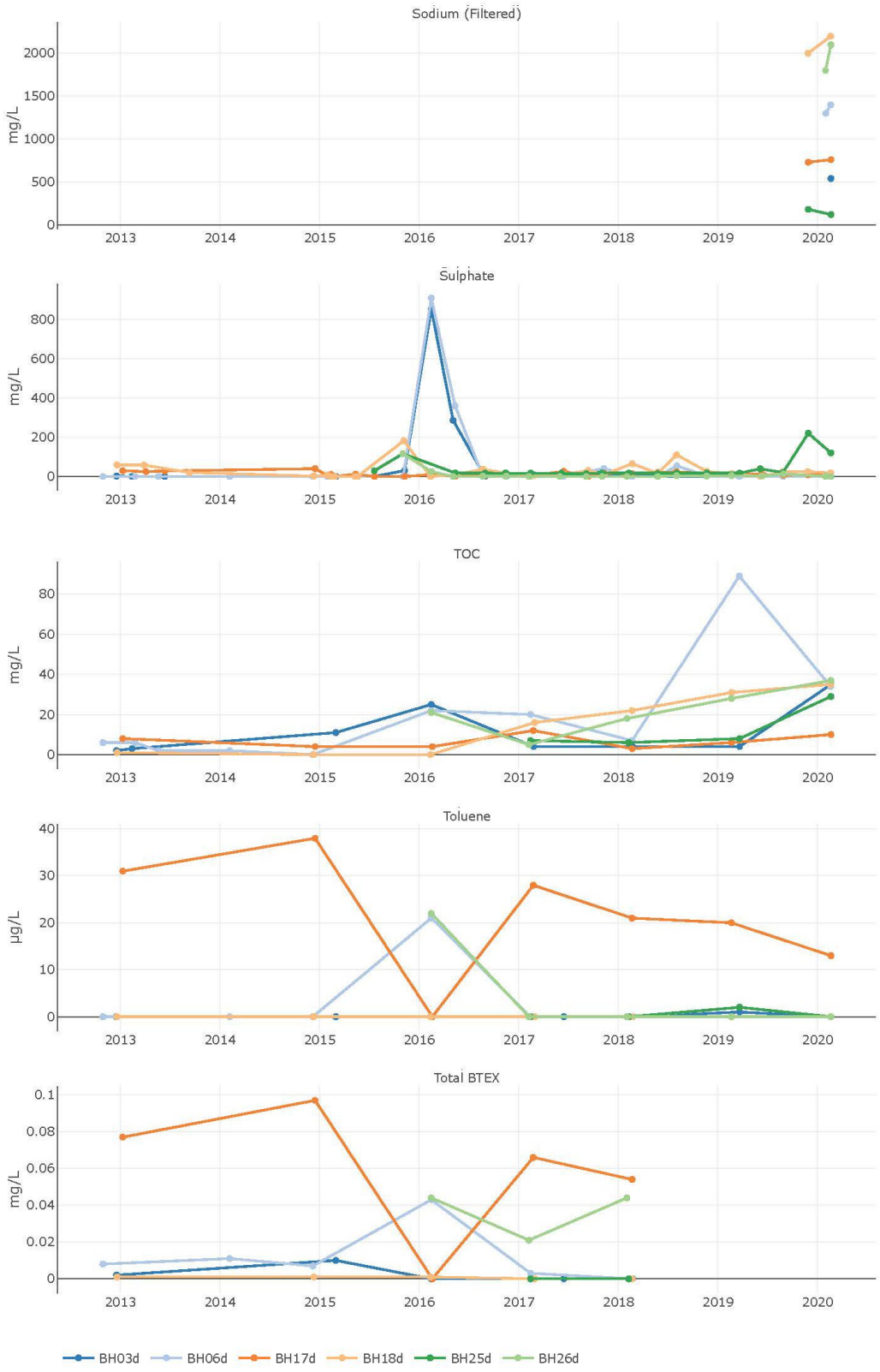

Benzene
µg/L
50
40
30
20
10
0
2013
2014
2015
2016
2017
2018
2019
2020
C10-C40 (Sum of total)
µg/L
150
100
50
0
Cadmium (Filtered)
mg/L
200µ
150µ
100µ
50µ
0
Calcium
mg/L
400
300
200
100
0
Calcium (Filtered)
mg/L
250
200
150
BH03d
BH06d
BH17d
BH18d
BH25d
BH26d

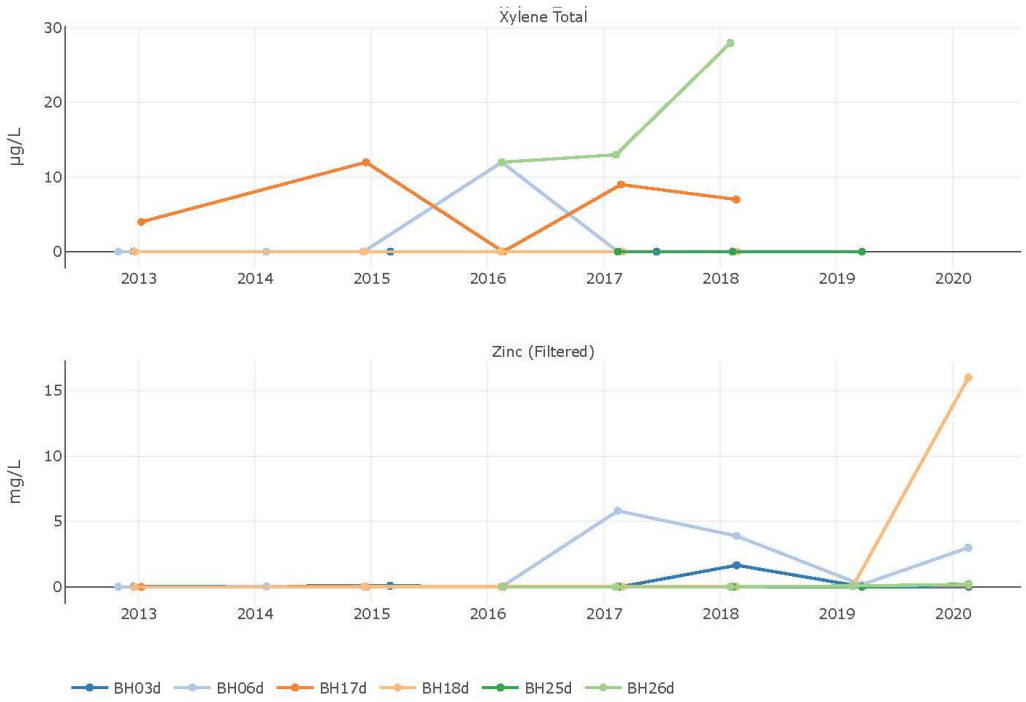

Chloride
mg/L
6000
4000
2000
0
2013
2014
2015
2016
2017
2018
2019
2020
Chromium (III+VI) (Filtered)
mg/L
0.04
0.03
0.02
0.01
0
Copper (Filtered)
mg/L
4
3
2
1
0
EC (field)
uS/cm
15k
10k
5k
0
Ethylbenzene
µg/L
2
1.5
1
0.5
0
BH03d
BH06d
BH17d
BH18d
BH25d
BH26d


Fluoride
mg/L
1
0.5
0
2013
2014
2015
2016
2017
2018
2019
2020
Lead (Filtered)
mg/L
0.02
0.01
0
Magnesium
mg/L
250
200
150
100
50
Magnesium (Filtered)
mg/L
80
60
40
20
Manganese (Filtered)
mg/L
0.6
0.4
0.2
BH03d
BH06d
BH17d
BH18d
BH25d
BH26d


Mercury (Filtered)
100µ
80µ
60µ
40µ
20µ
0
mg/L
2013
2014
2015
2016
2017
2018
2019
2020
Nitrite + Nitrate as N
30
20
10
0
mg/L
pH (Field)
12
10
8
6
-
Phenolics
10
5
0
µg/L
Phosphorus
0.8
0.6
0.4
0.2
0
mg/L
BH03d
BH06d
BH17d
BH18d
BH25d
BH26d


Potassium
mg/L
300
200
100
0
2013
2014
2015
2016
2017
2018
2019
2020
Potassium (Filtered)
mg/L
150
100
50
Reactive Phosphorus as P
mg/L
0.1
0.05
0
Redox Potential (Field)
mV
200
0
−200
−400
Sodium
mg/L
4000
2000
0
BH03d
BH06d
BH17d
BH18d
BH25d
BH26d


Sodium (Filtered)
mg/L
2000
1500
1000
500
0
2013
2014
2015
2016
2017
2018
2019
2020
Sulphate
mg/L
800
600
400
200
0
TOC
mg/L
80
60
40
20
0
Toluene
µg/L
40
30
20
10
0
Total BTEX
mg/L
0.1
0.08
0.06
0.04
0.02
0
BH03d
BH06d
BH17d
BH18d
BH25d
BH26d


Xylene Total
µg/L
30
20
10
0
2013
2014
2015
2016
2017
2018
2019
2020
Zinc (Filtered)
mg/L
15
10
5
0
2013
2014
2015
2016
2017
2018
2019
2020
BH03d
BH06d
BH17d
BH18d
BH25d
BH26d

A3 Leachate Quality Monitoring

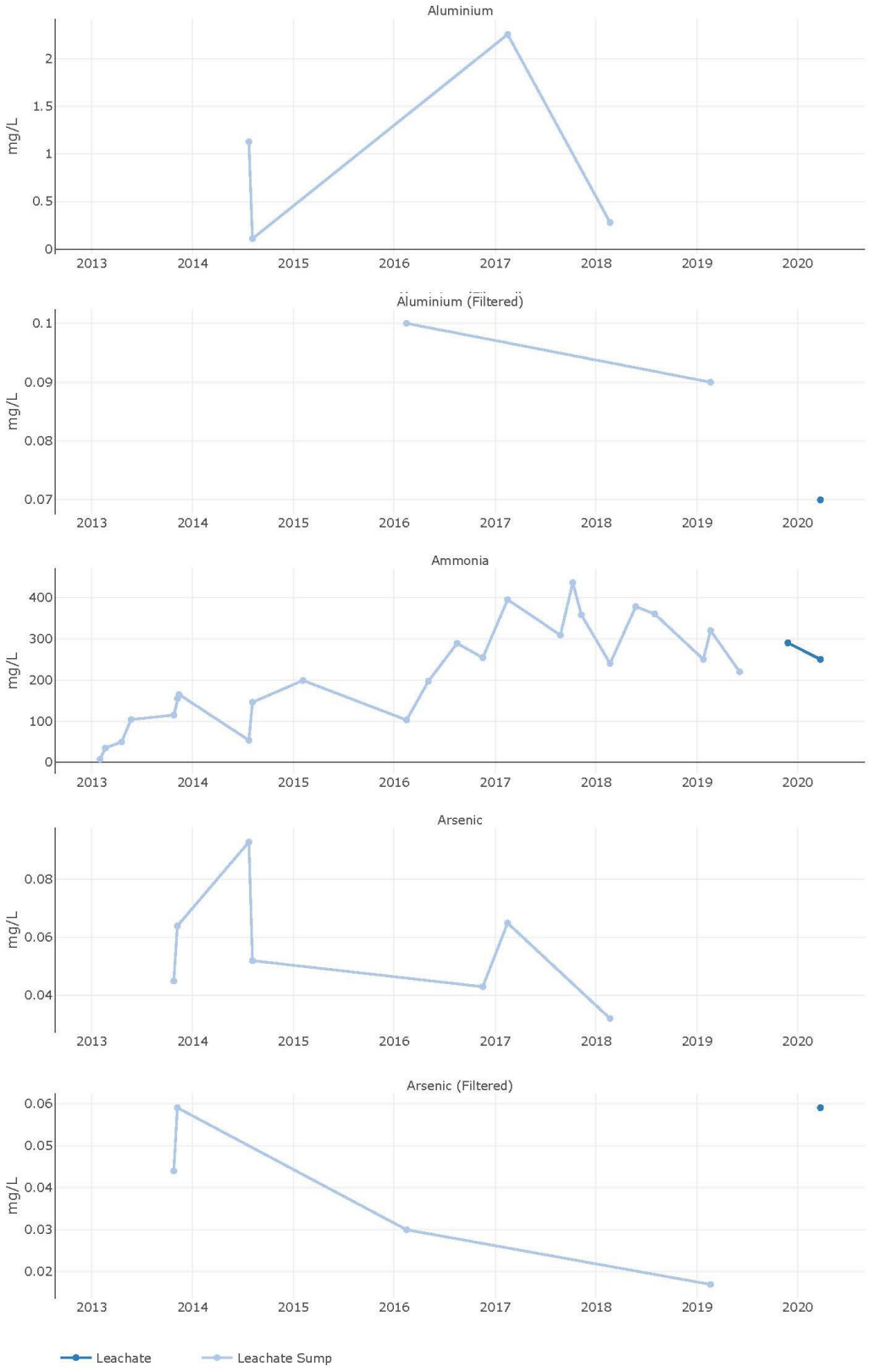
A3.1 2019 Leachate Quality Monitoring Results

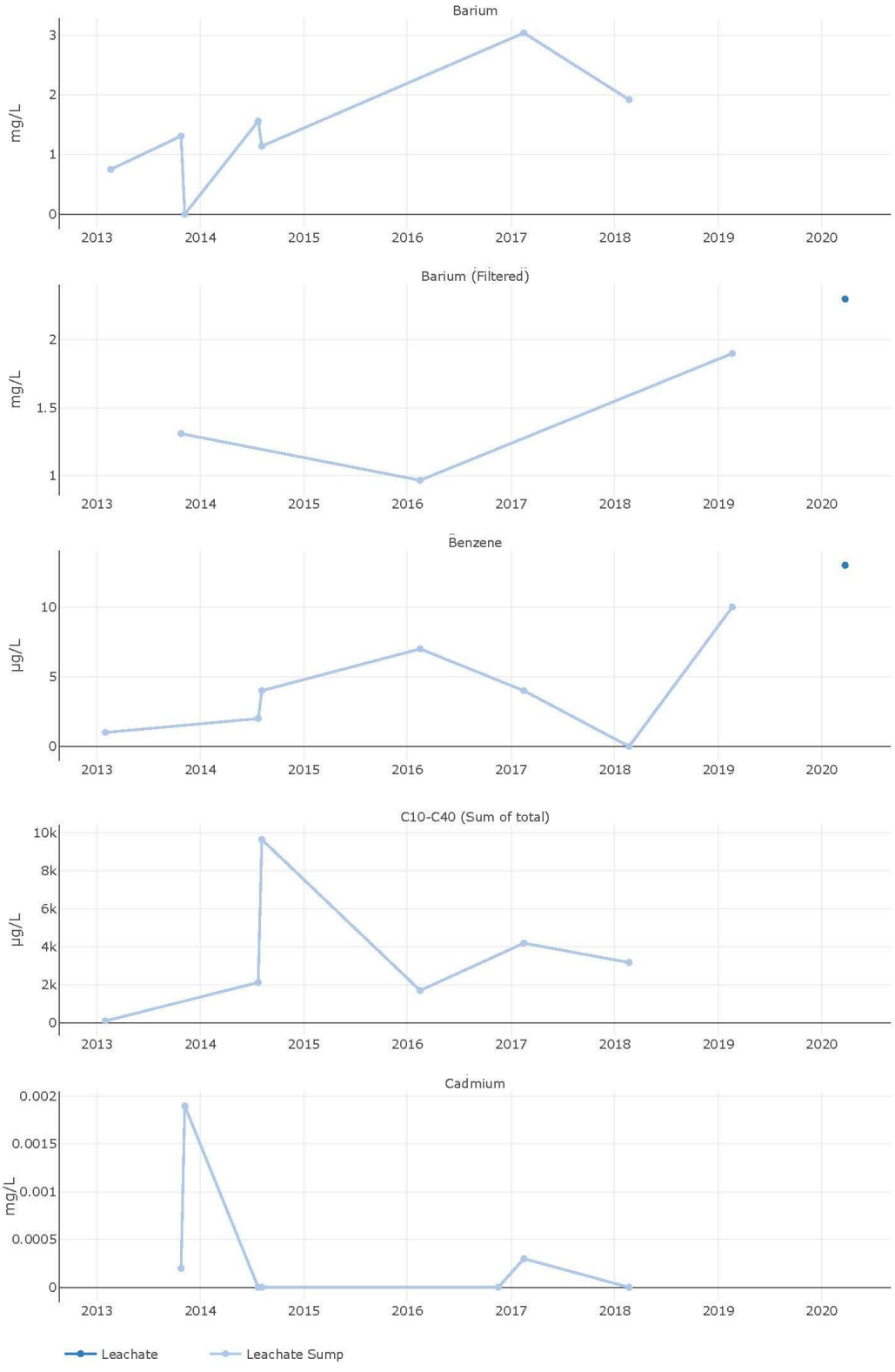
Parameter	Unit	Leachate				Minimum	Average [i]	Maximum
		Q1	Q2	Q3	Q4			
Alkalinity (total) as CaCO3	mg/L	3,700	3,400	3,600	3,800	3,400	3,625	3,800
Aluminium (filtered)	mg/L	0.09				0.09	0.09	0.09
Arsenic (filtered)	mg/L	0.017				0.017	0.017	0.017
Barium (filtered)	mg/L	1.9				1.9	1.9	1.9
Benzene	µg/L	10				10	10	10
Cadmium (filtered)	mg/L	<0.0001				<0.0001	0.00005	<0.0001
Calcium	mg/L	100	69	82	82	69	83	100
Chloride	mg/L	500	430	490	480	430	475	500
Chromium (III+VI) (filtered)	mg/L	0.12				0.12	0.12	0.12
Cobalt (filtered)	mg/L	0.007				0.007	0.007	0.007
Copper (filtered)	mg/L	0.006				0.006	0.006	0.006
EC (field)	uS/cm	9,275	5,524	8,716	7,550	5,524	7,766	9,275
Ethylbenzene	µg/L	16				16	16	16
Fluoride	mg/L	0.7	0.6	0.6	0.6	0.6	0.6	0.7
Lead (filtered)	mg/L	<0.001				<0.001	0.0005	<0.001
Magnesium	mg/L	70	55	67	71	55	66	71
Manganese (filtered)	mg/L	0.24	0.21	0.28	0.29	0.21	0.26	0.29
Mercury (filtered)	mg/L	<0.00005				<0.00005	0.000025	<0.00005
Nitrate (as N)	mg/L	<0.005	<0.005	<0.050	<0.050	<0.005	0.014	<0.05
Nitrite (as N)	mg/L	<0.005	<0.005	0.13	<0.050	<0.005	0.04	0.13
Nitrogen (Ammonia)	mg/L	320	220	220	290	220	263	320
Organochlorine Pesticides								
4,4-DDE	µg/L	<0.2				<0.2	0.1	<0.2
a-BHC	µg/L	<0.2				<0.2	0.1	<0.2
Aldrin	µg/L	<0.2				<0.2	0.1	<0.2
Aldrin + Dieldrin	µg/L	<0.2				<0.2	0.1	<0.2
b-BHC	µg/L	<0.2				<0.2	0.1	<0.2
d-BHC	µg/L	<0.2				<0.2	0.1	<0.2
DDD	µg/L	<0.2				<0.2	0.1	<0.2
DDT	µg/L	<0.2				<0.2	0.1	<0.2
Dieldrin	µg/L	<0.2				<0.2	0.1	<0.2

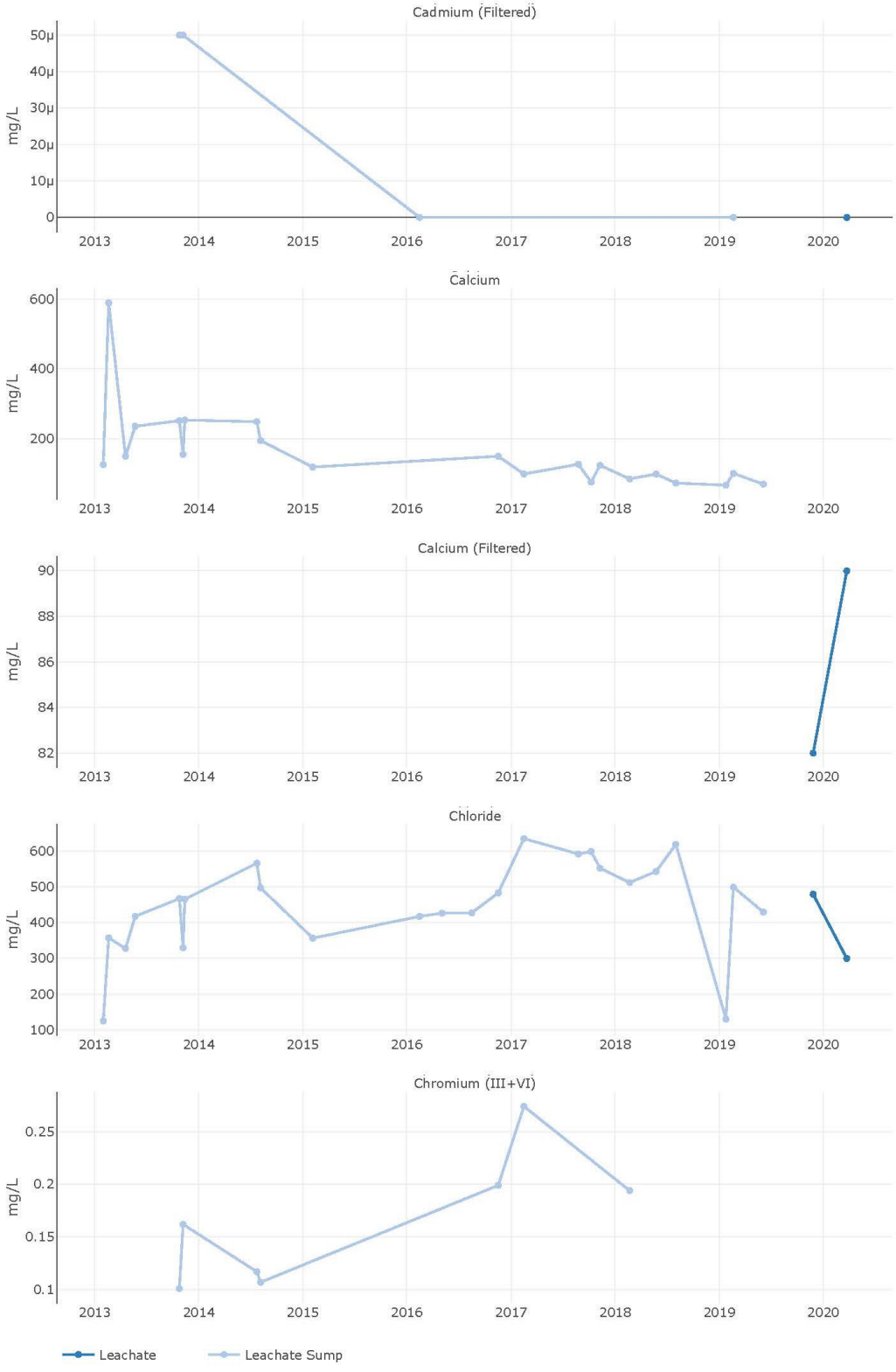
Parameter	Unit	Leachate				Minimum	Average [i]	Maximum
		Q1	Q2	Q3	Q4			
Endosulfan I	µg/L	<0.2				<0.2	0.1	<0.2
Endosulfan II	µg/L	<0.2				<0.2	0.1	<0.2
Endosulfan sulphate	µg/L	<0.2				<0.2	0.1	<0.2
Endrin	µg/L	<0.2				<0.2	0.1	<0.2
Endrin aldehyde	µg/L	<0.2				<0.2	0.1	<0.2
g-BHC (Lindane)	µg/L	<0.2				<0.2	0.1	<0.2
Heptachlor	µg/L	<0.2				<0.2	0.1	<0.2
Heptachlor epoxide	µg/L	<0.2				<0.2	0.1	<0.2
Methoxychlor	µg/L	<0.2				<0.2	0.1	<0.2
Organophosphorous Pesticides								
Azinophos methyl	µg/L	<0.2				<0.2	0.1	<0.2
Bromophos-ethyl	µg/L	<0.2				<0.2	0.1	<0.2
Chlorpyrifos	µg/L	<0.2				<0.2	0.1	<0.2
Chlorpyrifos-methyl	mg/L	<0.0002				<0.0002	0.0001	<0.0002
Diazinon	µg/L	<0.2				<0.2	0.1	<0.2
Dichlorvos	µg/L	<0.2				<0.2	0.1	<0.2
Dimethoate	µg/L	<0.2				<0.2	0.1	<0.2
Ethion	µg/L	<0.2				<0.2	0.1	<0.2
Malathion	µg/L	<0.2				<0.2	0.1	<0.2
pH (Field)	-	7.09	7.42	7.05	7.09	7.05	7.16	7.42
Phenol	µg/L	<0.05				<0.05	0.025	<0.05
Phosphorus	mg/L	1.3	1.3	1.1	1.1	1.1	1.2	1.3
PAHs (Sum of total)	µg/L	31				31	31	31
Potassium	mg/L	84	83	86	81	81	84	86
Sodium	mg/L	1,100	1,000	1,200	1,100	1,000	1,100	1,200
Sulphate	mg/L	93	3	7	4	3	5	7
Toluene	µg/L	<10				<10	5	<10
Total Dissolved Solids	mg/L	4,100	4,200	4,800	3,500	3,500	4,150	4,800
TOC	mg/L	360				360	360	360
Total Petroleum Hydrocarbons	µg/L	4,790				4,790	4,790	4,790
Total Suspended Solids	mg/L	5	6	8	6	5	6	8
Xylene Total	µg/L	<10				<10	5	<10
Zinc (filtered)	mg/L	0.021				0.021	0.021	0.021

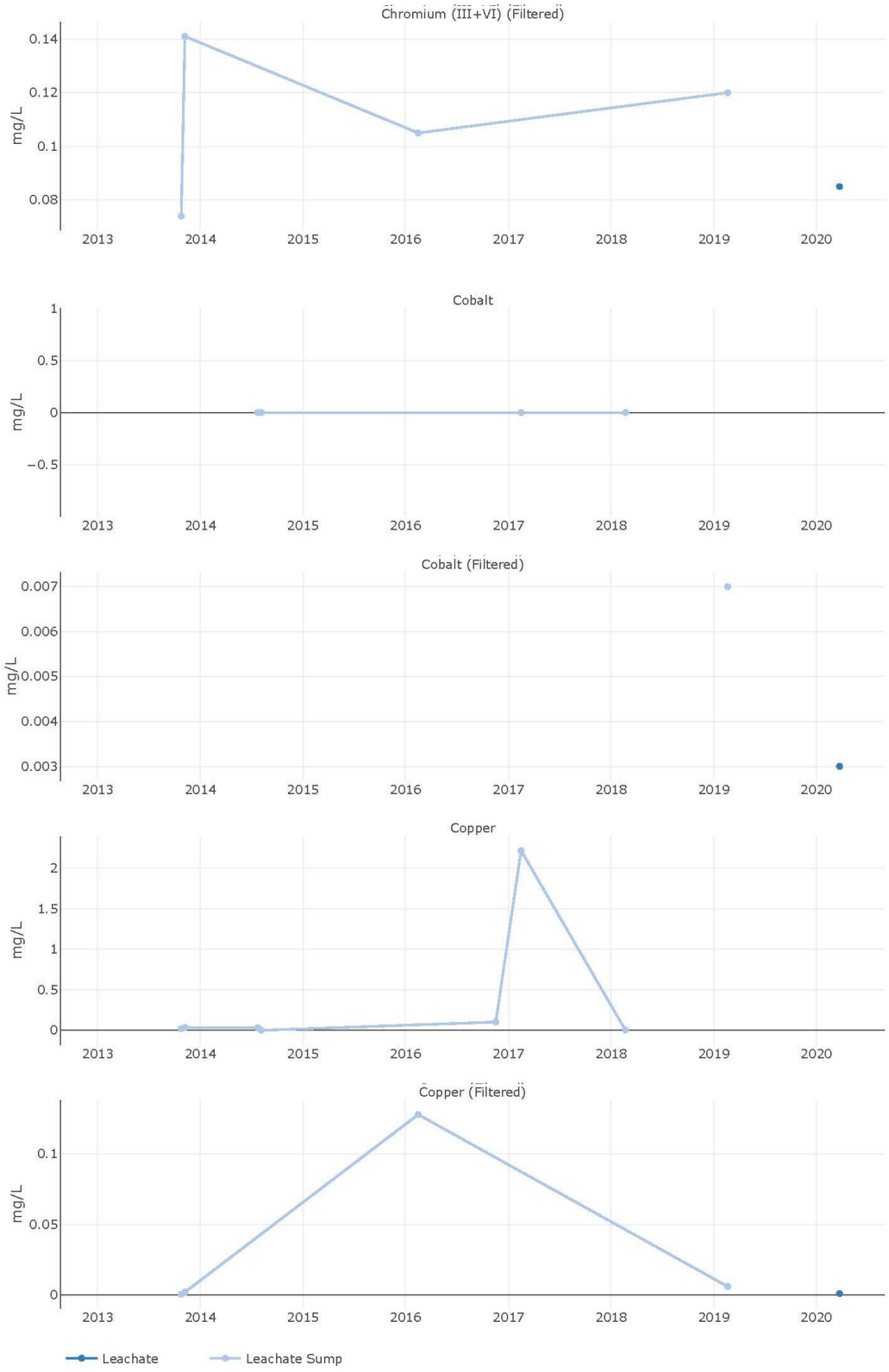
i A Non Detect Multiplier of 0.5 has been applied

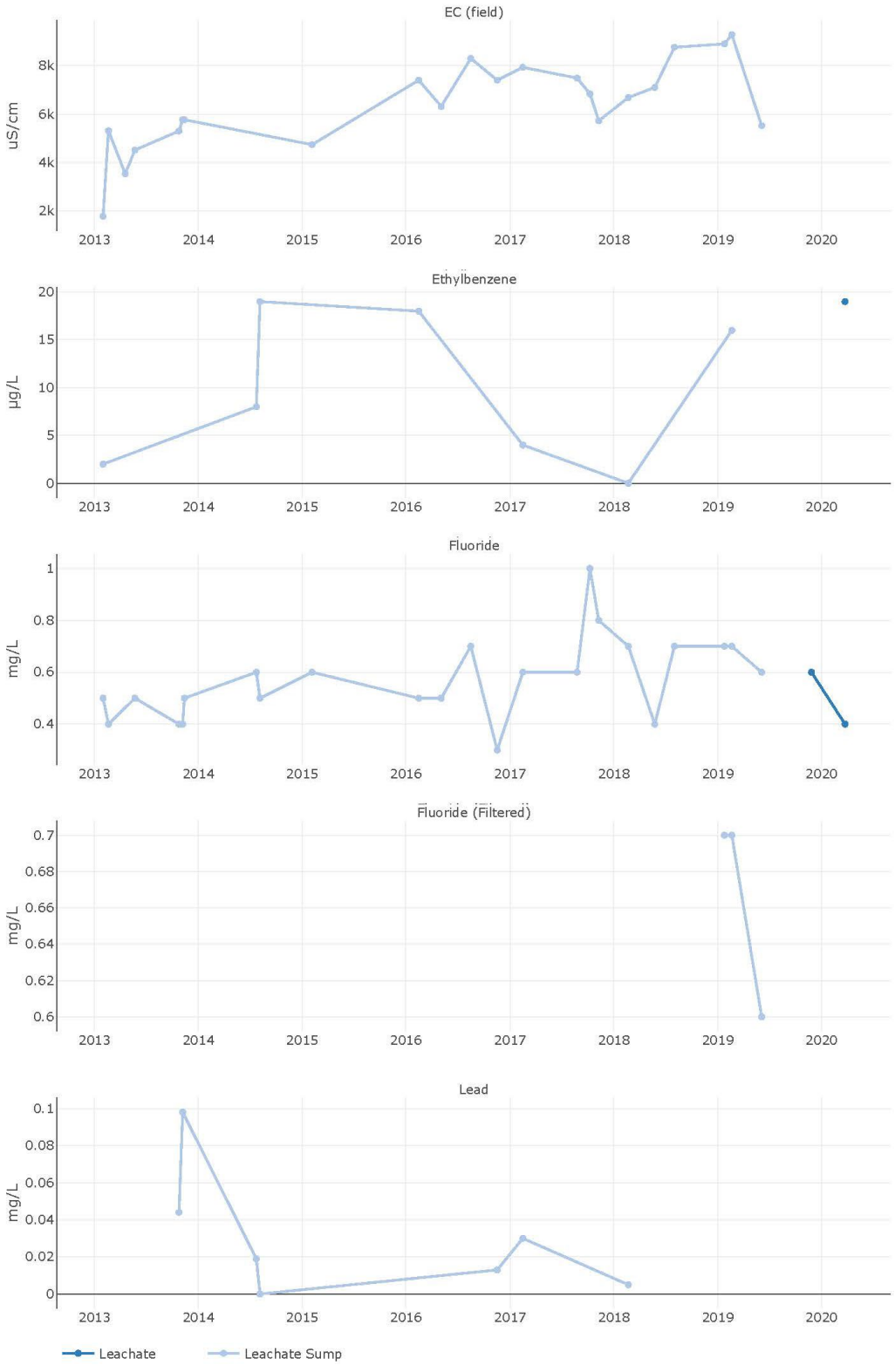
A3.2 Long-term Leachate Quality Monitoring Graphs

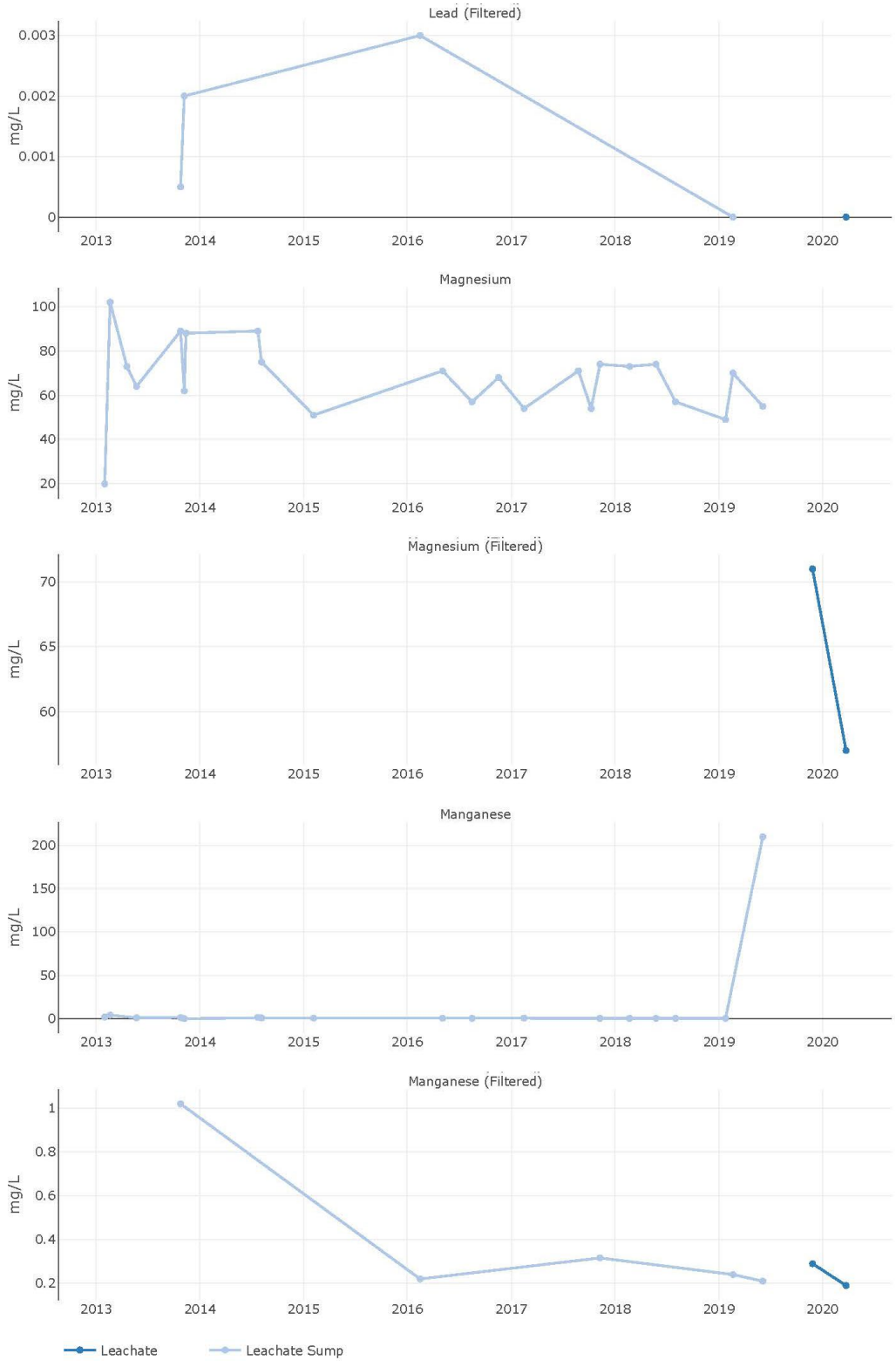


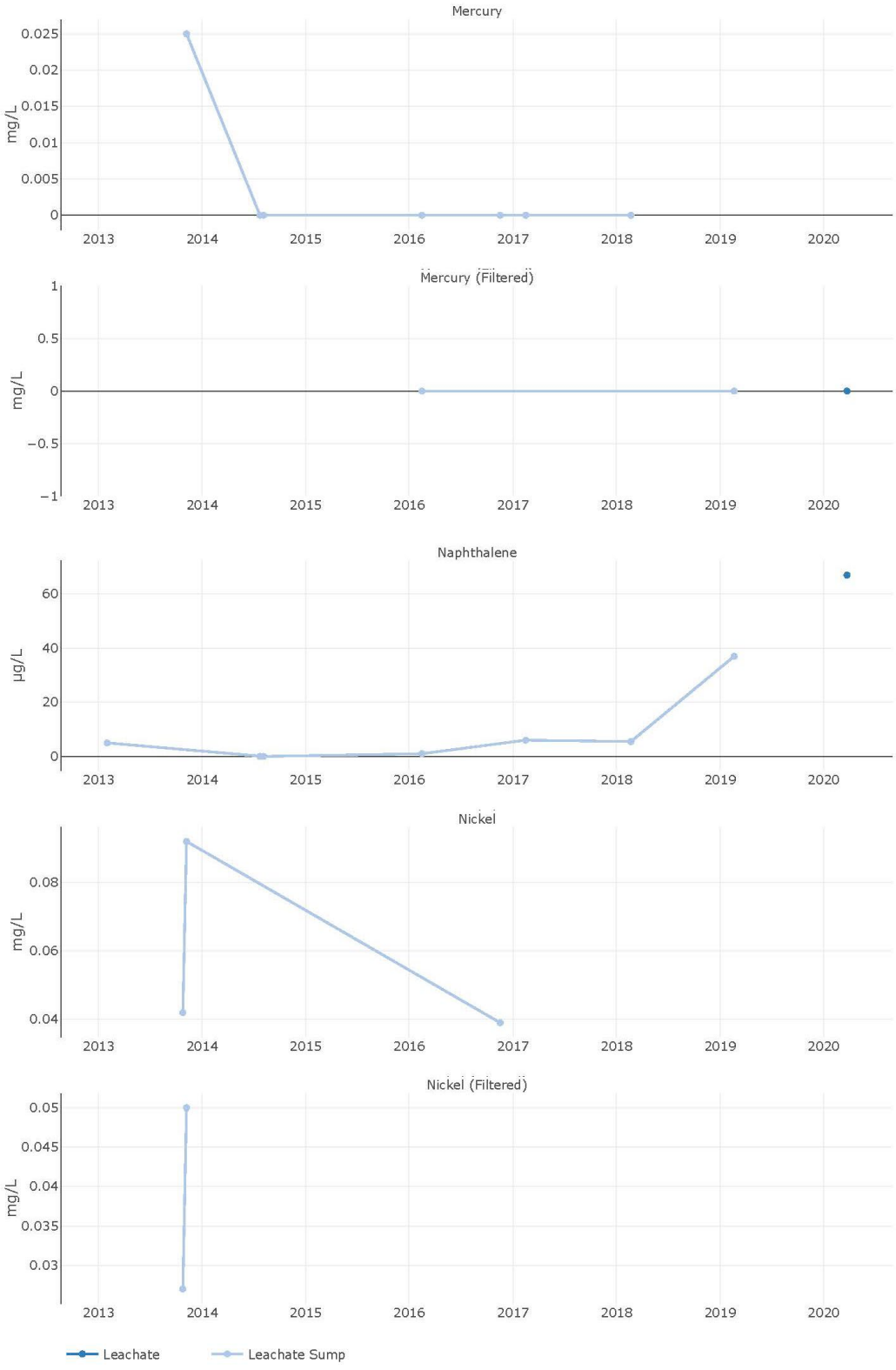

Barium
mg/L
3
2
1
0
2013
2014
2015
2016
2017
2018
2019
2020
Barium (Filtered)
mg/L
2
1.5
1
Benzene
µg/L
10
5
0
C10-C40 (Sum of total)
µg/L
10k
8k
6k
4k
2k
0
Cadmium
mg/L
0.002
0.0015
0.001
0.0005
0
Leachate
Leachate Sump

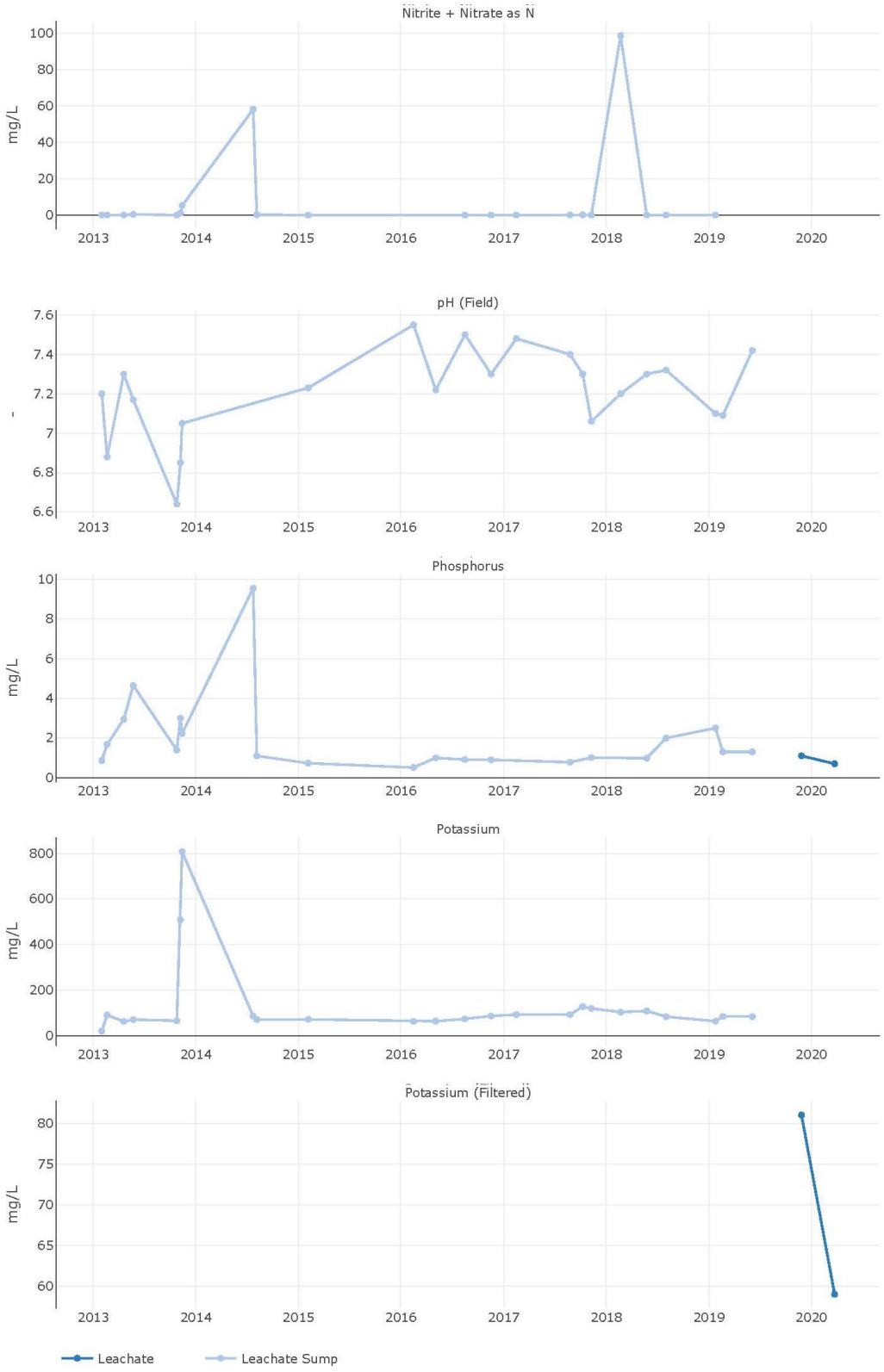

Cadmium (Filtered)
50µ
40µ
30µ
20µ
10µ
0
mg/L
2013
2014
2015
2016
2017
2018
2019
2020
Calcium
600
400
200
mg/L
Calcium (Filtered)
90
88
86
84
82
Chloride
600
500
400
300
200
100
Chromium (III+VI)
0.25
0.2
0.15
0.1
Leachate
Leachate Sump

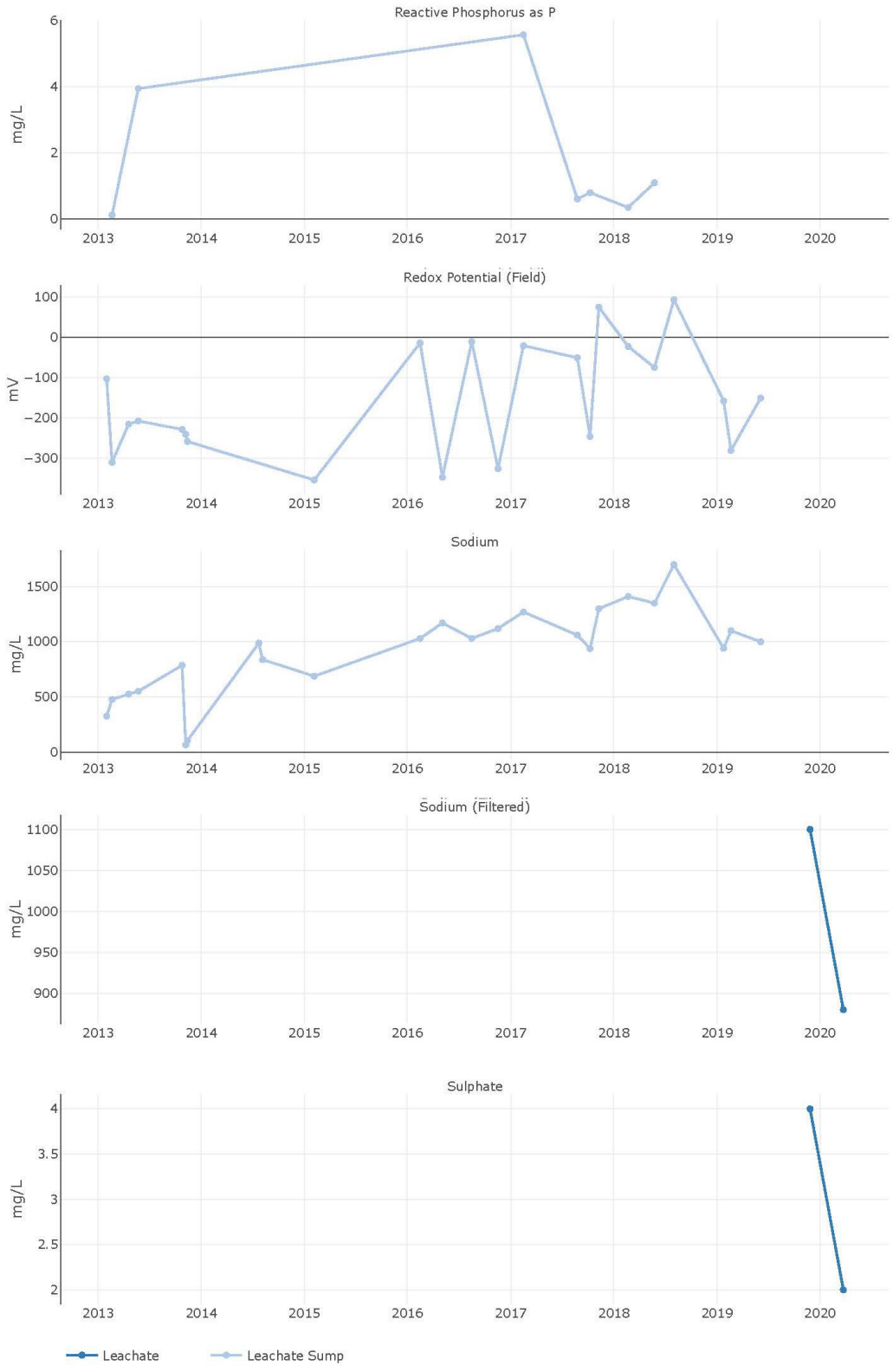

Chromium (III+VI) (Filtered)
0.14
0.12
0.1
0.08
mg/L
2013
2014
2015
2016
2017
2018
2019
2020
Cobalt
1
0.5
0
−0.5
mg/L
Cobalt (Filtered)
0.007
0.006
0.005
0.004
0.003
Copper
2
1.5
1
0.5
0
Copper (Filtered)
0.1
0.05
Leachate
Leachate Sump

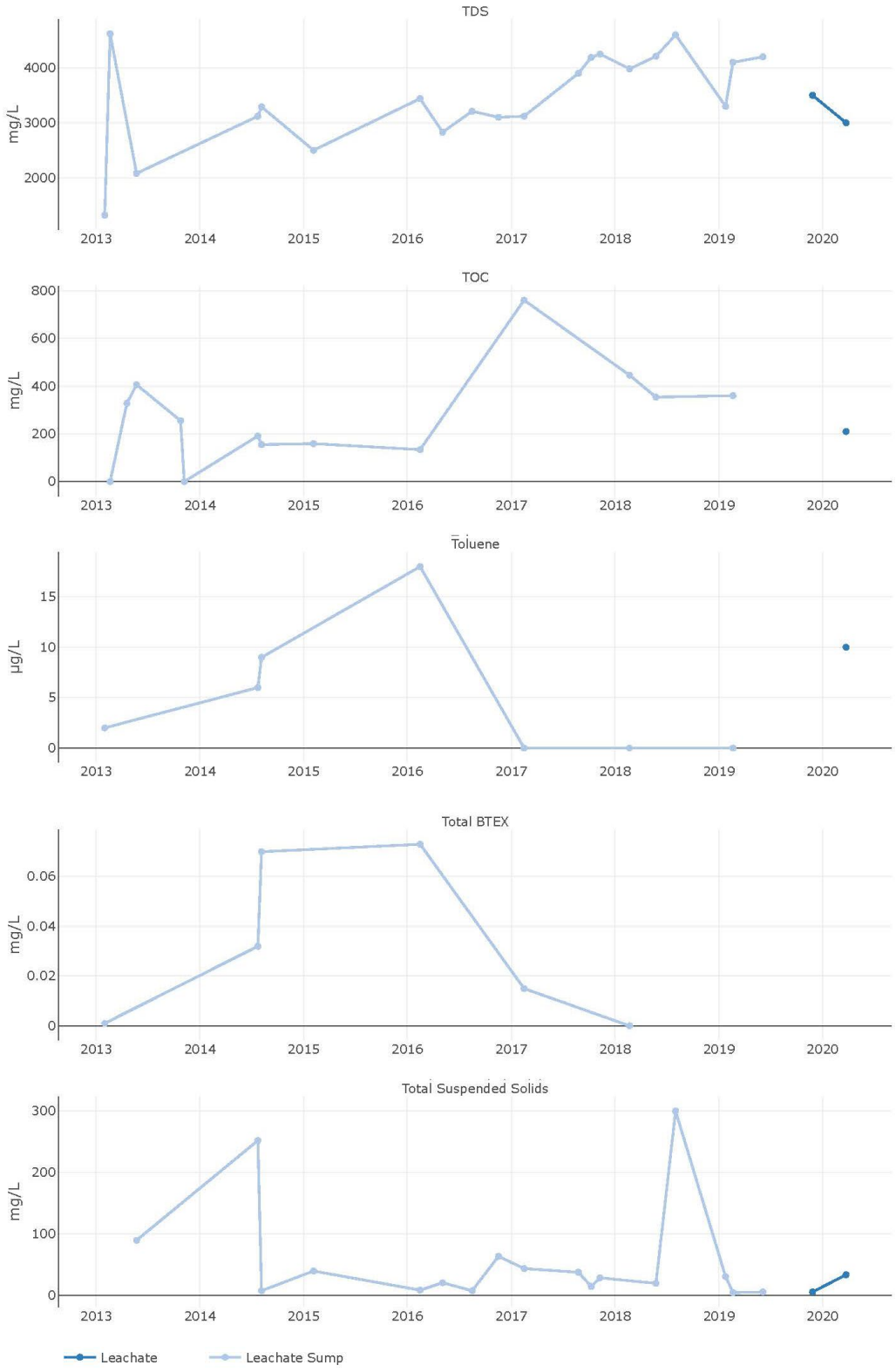

EC (field)
uS/cm
8k
6k
4k
2k
2013
2014
2015
2016
2017
2018
2019
2020
Ethylbenzene
µg/L
20
15
10
5
0
Fluoride
mg/L
1
0.8
0.6
0.4
Fluoride (Filtered)
mg/L
0.7
0.68
0.66
0.64
0.62
0.6
Lead
mg/L
0.1
0.08
0.06
0.04
0.02
0
Leachate
Leachate Sump

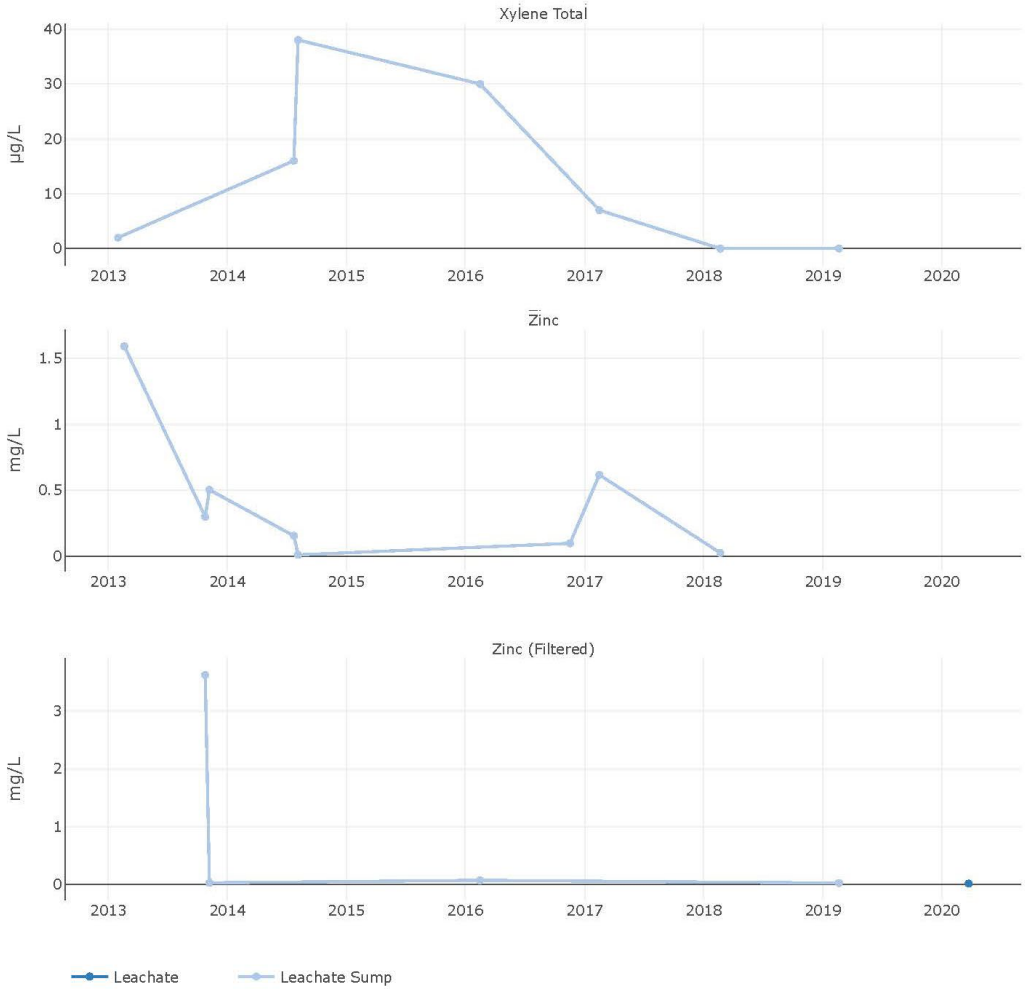

Lead (Filtered)
0.003
0.002
0.001
0
mg/L
2013
2014
2015
2016
2017
2018
2019
2020
Magnesium
100
80
60
40
20
mg/L
Magnesium (Filtered)
70
65
60
mg/L
Manganese
200
150
100
50
0
mg/L
Manganese (Filtered)
1
0.8
0.6
0.4
0.2
mg/L
Leachate
Leachate Sump


Mercury
mg/L
0.025
0.02
0.015
0.01
0.005
0
2013
2014
2015
2016
2017
2018
2019
2020
Mercury (Filtered)
mg/L
1
0.5
0
−0.5
−1
Naphthalene
µg/L
60
40
20
Nickel
mg/L
0.08
0.06
0.04
Nickel (Filtered)
mg/L
0.05
0.045
0.04
0.035
0.03
Leachate
Leachate Sump


Nitrite + Nitrate as N
mg/L
100
80
60
40
20
0
2013
2014
2015
2016
2017
2018
2019
2020
pH (Field)
7.6
7.4
7.2
7
6.8
6.6
Phosphorus
mg/L
10
8
6
4
2
0
Potassium
mg/L
800
600
400
200
0
Potassium (Filtered)
mg/L
80
75
70
65
60
Leachate
Leachate Sump

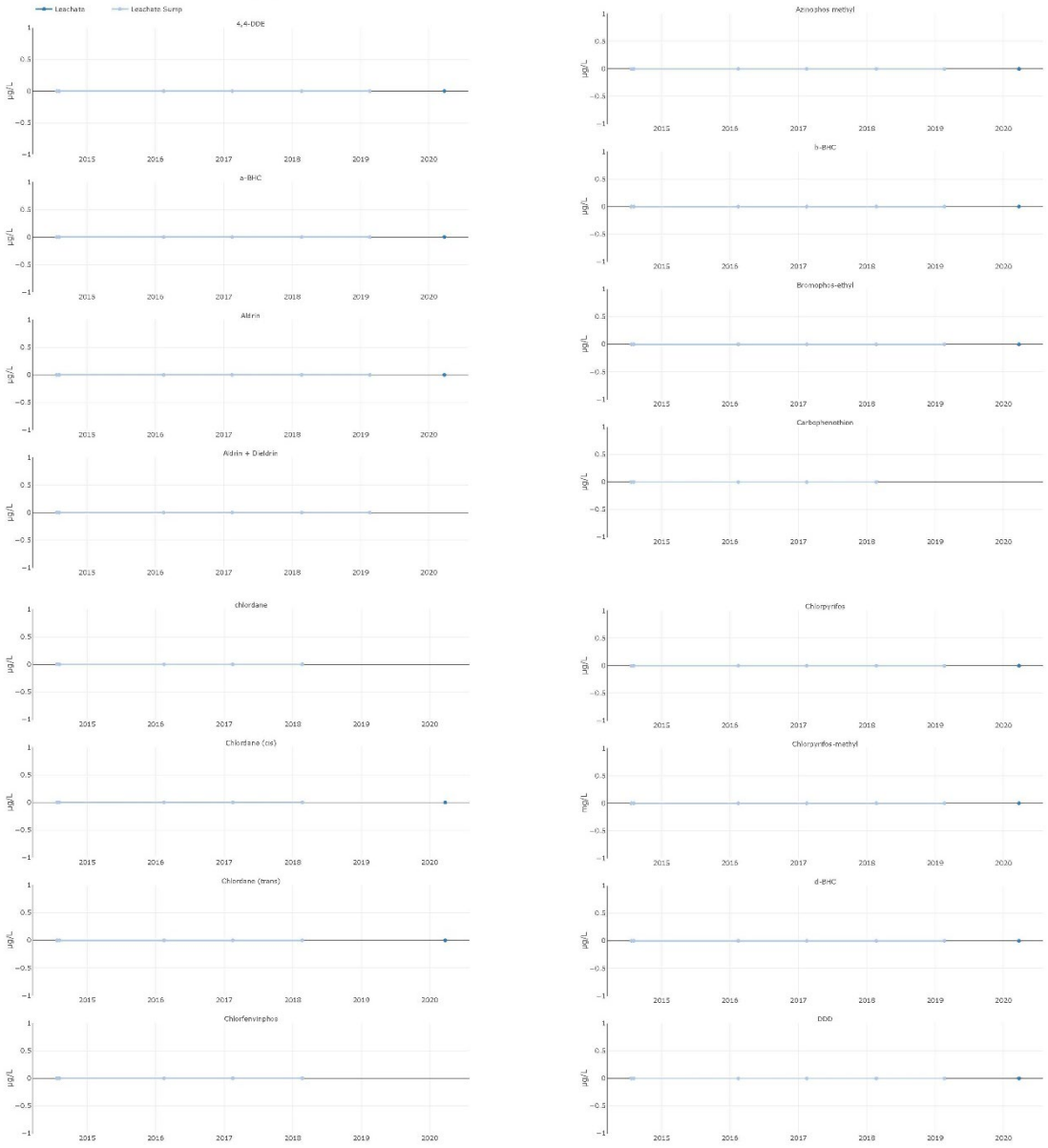

Reactive Phosphorus as P
mg/L
6
4
2
0
2013
2014
2015
2016
2017
2018
2019
2020
Redox Potential (Field)
mV
100
0
−100
−200
−300
Sodium
mg/L
1500
1000
500
0
Sodium (Filtered)
mg/L
1100
1050
1000
950
900
Sulphate
mg/L
4
3.5
3
2.5
2
Leachate
Leachate Sump

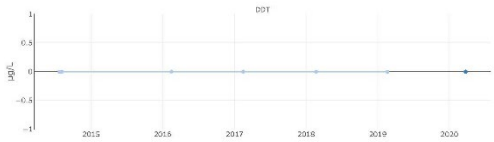

TDS
mg/L
4000
3000
2000
2013
2014
2015
2016
2017
2018
2019
2020
TOC
mg/L
800
600
400
200
0
Toluene
µg/L
15
10
5
0
Total BTEX
mg/L
0.06
0.04
0.02
0
Total Suspended Solids
mg/L
300
200
100
0
Leachate
Leachate Sump

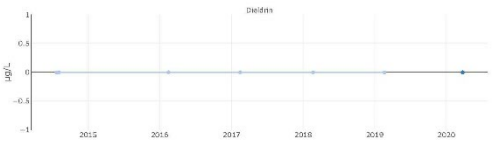

Xylene Total
µg/L
40
30
20
10
0
2013
2014
2015
2016
2017
2018
2019
2020
Zinc
mg/L
1.5
1
0.5
0
Zinc (Filtered)
3
2
1
Leachate
Leachate Sump

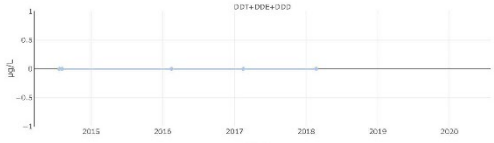
Organochlorine and Organophosphorous Pesticides

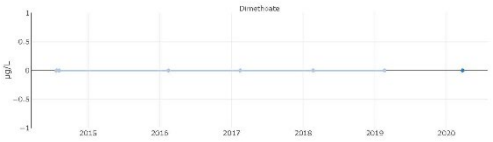
Note these has been no detection of pesticides to date.

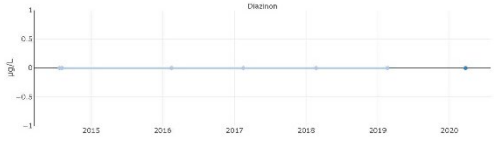


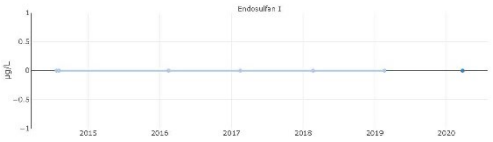

DDT
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

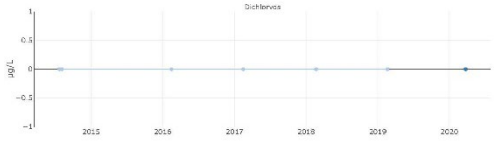

Dieldrin
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

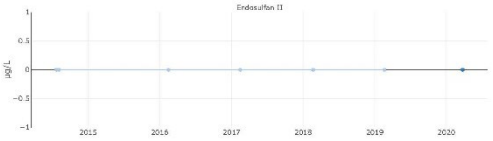

DDT+DDE+DDD
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

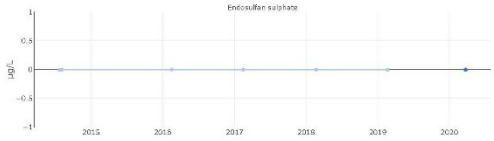

Dimethoate
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

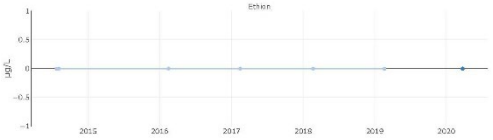

Diazinon
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

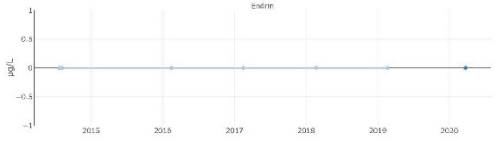

Endosulfan I
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020


Dichlorvos
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

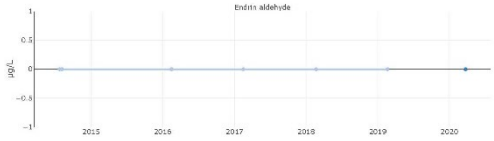

Endosulfan II
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

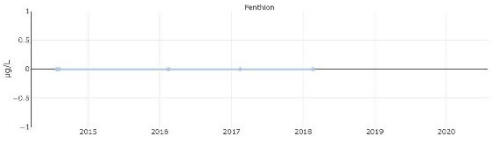

Endosulfan sulphate
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

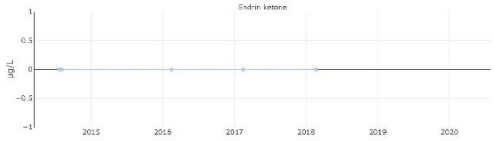

Ethion
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

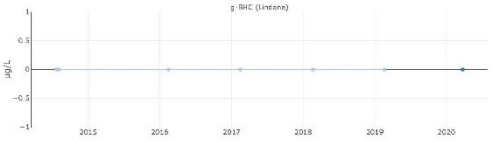

Endrin
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

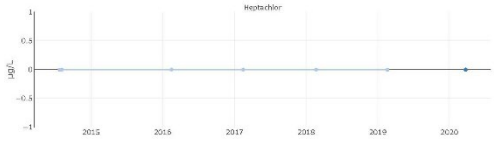

Fenitrothion
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

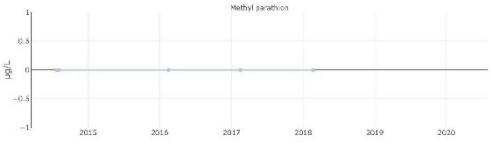

Endrin aldehyde
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

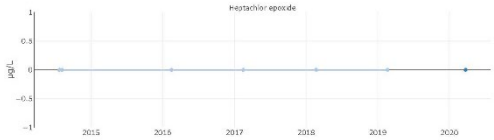

Fenthion
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

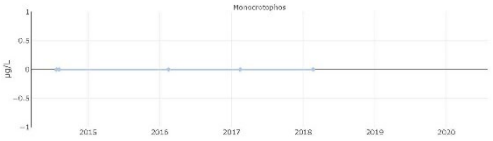

Endrin ketone
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020


g-BHC (Lindane)
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

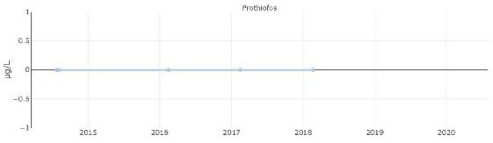

Heptachlor
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

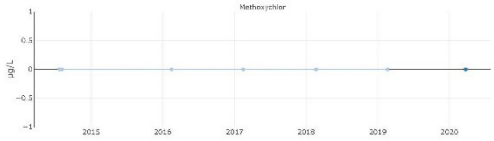

Methyl parathion
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020

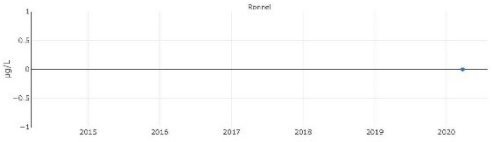

Heptachlor epoxide
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020


Monocrotophos
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020


Malathion
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020


Prothiofos
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020


Methoxychlor
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020


Resmel
µg/L
1
0.5
0
−0.5
−1
2015
2016
2017
2018
2019
2020