Whytes Gully Landfill Annual Report 2018-2019

Environmental Protection Licence 5862

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Prepared for

Wollongong City Council

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1 Introduction

1.1 Background

Wollongong City Council (Council) owns and operates the Wollongong Waste and Resource Recovery Park (the site), which is located on Reddalls Road, Kembla Grange NSW. The site is situated at the foothills of the Illawarra Escarpment south west of the Wollongong central business district on approximately 50 hectares. The site is formally identified as Lots 50, 52 and 53 of Deposited Plan (DP) 1022266 and Lot 2 of DP 240557. The site location is shown on **Figure 1** of **Appendix A** and a site plan provided on **Figure 2** of **Appendix A**.

Council holds an Environmental Protection Licence (EPL) issued by the NSW Environment Protection Authority (EPA) under the *Protection of the Environment Operations Act 1997* (POEO Act). The Licence Number is 5862 and authorises the scheduled activity of waste disposal (application to land) at the Site with no limit on the scale of the activity.

A *Landfill Environmental Management Plan* (LEMP) was prepared in 2014 (Golder 2014) on behalf of Council to ensure that environmental compliance is maintained throughout site operations. The management measures provided in the LEMP were developed in consideration of the *NSW Environmental Guidelines: Solid Waste Landfills (*EPA, 1996*)* and also addressed the monitoring and reporting requirements of EPL 5862. The NSW *Environmental Guidelines: Solid Waste Landfills* (EPA 1996) were replaced with the *Environmental Guidelines: Solid Waste Landfills, Second edition* (EPA, 2016). As such Council are updating the site LEMP to ensure compliance with current legislative requirements.

1.2 Objectives

The objectives of this Annual Report are to provide the EPA with the following:

- A summary of compliance monitoring data gathered during the reporting period of the 29th of May 2018 to the 28th of May 2019.
- Interpretation of monitoring data to assess the environmental performance of the site considerate of the conditions of the EPL.

1.3 Scope

1.3.1 Fieldwork

To meet the objectives of the Annual Report, the following scope of works was undertaken during the reporting period in accordance with the requirement of EPL 5862:

- Surface gas monitoring at areas where intermediate or final cover has been placed;
- Subsurface gas monitoring of twelve (12) landfill gas monitoring wells;
- Gas accumulation monitoring within all buildings within 250 m of deposited waste;
- Water monitoring at three (3) stormwater monitoring points;
- Groundwater monitoring at thirteen (13) monitoring wells;
- Tracking of waste tyres received at the site; and
- Monitoring of trade wastewater at one (1) sampling point located at the pre-treatment discharge.

1.3.2 Reporting

Section 6 (R1) of EPL 5862 states that an Annual Return and an Annual Report must be prepared by the licence holder. In accordance with Section 6 (R1.8) of the EPL this Annual Report provides an assessment of environmental performance relevant to the licence conditions including:

- Tabulated results of all monitoring data required to be collected by this licence;
- A graphical presentation of data from at least the last three years in order to show variability and/or trends;
- An analysis and interpretation of all monitoring data;

- An analysis of and response to any complaints received;
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or incidents and of remedial action taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility.

This report has been prepared in accordance with the reporting conditions provided in Section 6 of the EPL and in consideration of the *Environmental Guidelines: Solid Waste Landfills, Second edition* (EPA, 2016) and *Requirements for publishing pollution monitoring data* (EPA, 2013). The Annual Return proforma for the 2017/2018 reporting period was provided to the NSW EPA via their online lodgement platform E-Connect.

1.4 Site History and Configuration

1.4.1 Site History

Whytes Gully was developed in the early 1980's as the principal landfill site for Wollongong's domestic and commercial waste streams. Initially, the 'western gully' section was landfilled. The western gully is unlined by modern standards and was used for waste deposition from 1982 to 1993. Initially coal wash refuse was used to provide daily cover, and later steel furnace slag was introduced around 1988 due to its stability in wet weather, as well as Council's inability to source local clean fill in sufficient quantities. The leachate collection network from the western gully passes through a series of rock drains at the centre of each lift. The rock drains connect with a riser and the leachate flows from riser to riser, and eventually to the leachate collection well at the base of the western gully. The western gully section of the landfill has been capped with clay with a thickness between 1 m and 4 m.

Development of the 'eastern gully' section received consent in approximately 1992, following extensive public consultation. The eastern gully section is lined with a single layer of HDPE smooth liner, over a subsoil drainage layer of 5 mm gravel and a corrugated groundwater drainage system. The eastern gully was excavated to rock and was developed in two stages, beginning with the first stage 80 to 100 m above the slope from the current toe of the landfill embankment. The leachate is drained from the first stage of the eastern gully via a 300mm corrugated drainage pipe at the base and a 300 mm thick sand layer above the liner.

The second stage of the eastern gully is situated in front and above the first stage, with extended leachate drains and HDPE liner. From 2014 to 2016, the eastern gully underwent extensive surface reshaping works in order to reduce rainwater infiltration, increase surface water diversion, to ensure consistent cover depths and to prepare the surface for the new landfill cell base liner.

Construction of Stage 3 of the landfill commenced during August 2013, with the first cell, Cell 1A, completed in 2014 which is situated below the eastern gully. Placement of waste commenced in Cell 1A around March 2015. Council has since constructed Cell 1B in 2015 and completed filling in January 2019. Cell 2 has recently been constructe and commenced filling in January 2019.

Leachate is collected from all landfilled areas at the site and treated in a 3 stage process. The leachate is initially collected in a primary holding pond that utilises biological process and aeration primarily to strip the leachate of ammonia. The leachate is then pumped to a smaller, shallower pond with a larger surface area to increase the speed of this process on a batch by batch basis. From the smaller pond the leachate is then pumped to a sequential batch reactor that, in conjunction with a filtration system, eliminates the residual contaminants in the leachate to a standard that is suitable for acceptance by sewer under the sites Trade Wastewater Agreement with Sydney Water.

The location of each cell and significant site features such as leachate ponds are shown on **Figure 2** of **Appendix A**.

2 Site Setting

2.1 Topography and Drainage

The site is situated on a south west facing slope, which is dominated by a roughly east-west directional ridgeline along the northern boundary. The landfill deposition areas are located within two historical gullies, the western gully landfill and the eastern gully landfill. The eastern gully landfill is operational and the current location of waste deposition with the western gully was historically filled until approximately 1993.

The topography of the site is subject to variability due to the nature of landfilling, however, in general the site is characterised by moderate to steep slopes. An elevation profile created utilising Nearmap for an aerial image captured on 21st of May 2019 shows that the lowest elevations of the site are located in the south western portion with an approximate relative level (RL) of 15 m Australian Height Datum (AHD), and the highest elevations are located in the north eastern portion with an approximate RL of 100 m AHD. Approximate contours are shown on **Figure 5** of **Appendix A**.

2.2 Soil and Geology

The *1:100,000 Geological Map 'Wollongong-Port Hacking'* (Department of Mineral Resources, 1985) shows that the site is on the boundary of two major geological formations. The southern portion of the site is underlain by fluvial sands, silts and clays associated with Dapto Creek, with sandstone of the Budgong formation underlying alluvial soils. The Budgong Sandstone formation typically comprises of red, brown and grey lithic sandstone. The northern portion of the site is underlain by interbedded lithic sandstone, coal, carbonaceous claystone, siltstone and claystone of the Pheasants Nest Formation. It is inferred that the Pheasants Nest formation would mainly be encountered on the ridgelines in the higher elevations of the site.

A geotechnical investigation completed by Golder Associates (Golder 2012) summarised the site geology into the following areas:

- **Pheasants Nest Formation**: The Pheasants Nest Formation was noted on the upper slopes across the northern portion the site. The material encountered was generally weathered sandstone that grades into fresh sandstone at depths typically less than 10 m below ground level (bgl). The residual soil is generally less than 2 m thick. Siltstone was encountered in zones throughout the sandstone at depths greater than about 15 m (based on the Maunsell 1992 investigation). Siltstone was not encountered in the Golder 2012 investigation.
- **Budgong Sandstone Formation**: The Budgong Sandstone Formation was located across the southern portion of the site. The sandstone generally had a weathering profile that extended to depths up to 15 m bgl. Zones of weathered siltstone had a maximum thickness of approximately 3m and were located intermittently throughout this formation.
- **Alluvial Soils**: Alluvial soils consisted of colluvial / alluvial soil material (silty clay and silt with some sands and sub angular gravels and cobbles) and was located across the middle and south west portion of the site. Zones of alluvial soil had a maximum thickness of approximately 11m. This geological unit was inferred to be underlain by Budgong Sandstone.
- **Capping Layer and Landfill**: Landfill and a capping layer are located across the completed areas of landfilling. The capping material consists of generally low to medium plasticity sandy clay and is typically has a thickness less than 1.5 m. Landfill waste is located beneath the capping layer consisting predominantly of domestic waste including paper, plastic, wood, rubble and other materials. The depth to the base of the general waste fill was not well defined, however, a review of historical topographic data suggests that the thickness of the fill could be up to 52 m within the eastern gully landfill. The landfilled areas were inferred to be underlain by the Pheasants Nest Formation.

2.3 Climate

Climate data for the site has been taken from the Albion Park (Wollongong Airport) Bureau of Meteorology (BOM) Weather Station (ID 068241). The weather station is located approximately 10 km south of the site and is considered an accurate representation of the conditions experienced at the landfill during the reporting period. **Table 2-1** summaries the key climatic data from the Albion Park weather station.

Table 2-1 Climatic Data – Albion Park Weather Station

	2018							2019				
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rainfall (mm)	79.6	4.6	19.0	36.4	107.0	91.2	49.2	102.6	30.6	157.2	37.2	12.8
Mean max temperature (°C)	17.3	19.3	18.6	20.4	21.2	24.3	26.3	28.9	27.4	26.4	24.2	21.2
Mean min temperature (°C)	7.0	4.5	6.4	7.1	12.5	13.6	16.0	19.9	16.5	16.7	11.9	8.1
Mean 9am wind speed (km/h)	16	13	18	13	13	16	10	9	9	9	6	12
Mean 3pm wind speed (km/h)	19	20	26	22	22	23	20	20	22	21	16	20
Mean 9am relative humidity (%)	75	62	57	58	74	63	74	76	71	77	71	68
Mean 3pm relative humidity (%)	63	40	43	56	69	63	67	70	59	62	62	54

Long-term averages for the Albion Park weather station are shown in **Table 2-2** and have been included for comparative purposes.

Table 2-2 Long Term Averages – Albion Park Weather Station

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rainfall (mm)[1]	93.7	49.0	53.5	42.4	66.7	83.5	66.1	74.4	135.0	124.1	72.0	55.8
Mean max temperature (°C)[1]	18.1	17.7	18.8	21.4	23.0	24.0	25.6	27.1	26.4	25.3	23.3	20.6
Mean min temperature (°C)[1]	7.2	6.2	6.5	8.5	10.8	13.4	15.3	17.0	17.1	15.6	12.2	8.8
Mean 9am wind speed (km/h) [2]	13.6	14.4	15.0	15.3	14.4	12.9	12.7	11.6	9.8	8.1	10.7	12.4
Mean 3pm wind speed (km/h)[2]	17.6	18.1	21.8	22.6	20.9	20.9	21.5	21.6	20.0	18.9	17.7	17.1
Mean 9am relative humidity (%)[2]	73	68	61	57	58	67	66	68	74	76	68	69
Mean 3pm relative humidity (%)[2]	57	54	49	53	58	63	61	63	67	64	61	58

[1] Data recorded from 1999 – 201

[2] Data recorded from 1999 - 2010

The climate data shows relatively dry weather during the current reporting period compared to the long term averages. Winter months were particularly dry as was the start of spring.

Average maximum and minimum temperatures were generally slightly higher than long term averages. Mean wind speeds were slightly increased but overall in-line with the long-term trends. Humidity results were in general accordance with long-term trends.

3 Field Investigations

3.1 Fieldwork Methodology

The subsections below describe the frequency of monitoring, monitoring method, monitoring locations and analytes for surface gas, subsurface gas, gas accumulation, stormwater and groundwater. The fieldwork methodologies implemented during the reporting period were developed in consideration of the guidance provided in the NSW EPA *Environmental Guidelines: Solid waste landfills (second edition)* (EPA 2016).

3.1.1 Surface Gas

Surface gas monitoring was completed during the reporting period to assess for potential surface gas emissions of methane emitting from the current and existing landfill areas at the site. Surface gas migration monitoring should demonstrate that the cover material and extraction system is controlling the emission of landfill gas.

The fieldwork methodology for surface gas monitoring is summarised below in **Table 3-1**. The location of each surface gas monitoring location is shown on **Figure 3** of **Appendix A**.

Table 3-1 Surface Gas Monitoring Methodology

Activity	Description
Frequency of Monitoring	Surface gas monitoring for methane was completed monthly during the reporting period in accordance with Section 5 (M2.2) of EPL 5862.
Monitoring Method	Methane was measured by a third party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Surface gas monitoring was achieved by testing the atmosphere approximately 5 centimetres above the ground surface in areas with intermediate or final cover where wastes have been placed. The monitoring was completed on calm days (winds below 10 km/hr) and on transects with an approximate spacing of 25 m.
Monitoring Locations	Surface gas monitoring for methane was undertaken at the following locations: ▪ The current active landfill cell: transects 2, 3, 5, 7 and 10 ▪ The former landfill cell to the north west of the current cell: transects A, C, D, E, F, G, H, and I ▪ Reddalls Road and Farmborough Road fence lines.

3.1.2 Subsurface Gas

Subsurface gas monitoring was completed during the reporting period to detect the potential presence of methane around the perimeter of the landfill cell to assess the potential for offsite migration of methane onto surrounding properties.

The fieldwork methodology for subsurface gas monitoring is summarised below in **Table 3-2**. The location of each subsurface gas monitoring location is shown on **Figure 5** of **Appendix A**.

Table 3-2 Subsurface Gas Monitoring Methodology

Activity	Description
Frequency	Subsurface gas monitoring for methane was completed monthly during the reporting period in accordance with Section 5 (M2.2) of EPL 5862.
Monitoring Method	Subsurface gas monitoring was measured by a third party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Subsurface gas monitoring was achieved by testing the methane concentration in twelve landfill gas monitoring wells (listed below) that are situated around the northern, eastern and southern perimeters of the landfill. The contents of each well was sampled and analysed prior to potential dilution by air.
Monitoring Locations	Subsurface gas monitoring for methane was undertaken at twelve landfill gas monitoring wells, Point 21 (LFG MW1) to Point 32 (LFG MW12), in accordance with Section 5 (M2.3).

3.1.3 Gas Accumulation

Gas accumulation monitoring was completed periodically during the reporting period to demonstrate that gas is not accumulating at dangerous levels in enclosed spaces on or near the landfill.

The fieldwork methodology for gas accumulation monitoring is summarised below in **Table 3-3**. The location of each gas accumulation monitoring location is shown on **Figure 5** of **Appendix A**.

Table 3-3 Gas Accumulation Monitoring Methodology

Activity	Description
Frequency of Monitoring	Gas accumulation monitoring for methane was completed monthly during the reporting period in accordance with Section 5 (M2.2) of EPL 5862.
Monitoring Method	Methane was measured by a third party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Gas accumulation monitoring was undertaken in all accessible buildings and other enclosed structures within 250 m of deposited waste or leachate storage. Some buildings and structures within 250 m were not assessed as they were inaccessible and/or the owner did not permit authority to access the building.
Monitoring Locations	Gas accumulation monitoring was undertaken at the following locations during the reporting period: ▪ Weighbridge ▪ Glengarry Cottage (administrative building)

3.1.4 Stormwater

Stormwater monitoring was completed periodically during the reporting period to detect excess sediment loads in stormwater leaving the site and/or potential cross-contamination of stormwater with landfill leachate.

The fieldwork methodology for stormwater monitoring is summarised below in **Table 3-4**. The location of each stormwater monitoring location is shown on **Figure 5** of **Appendix A**

Table 3-4 Stormwater Monitoring Methodology

Activity	Description
Frequency and Dates of Monitoring	Stormwater sampling was completed annually in accordance with Section 5 (M2.3) of EPL 5862. Sampling also occurred during an overflow event on the 11th of October 2018. The annual stormwater sampling event took place on the 11th of February 2019.
Monitoring Method	Stormwater monitoring was completed by a third party contractor, ALS Environmental. Grab samples of water were collected using a scoop at the nominated sampling points (summarised below). The instrument used to measure water quality parameters was calibrated prior to each monitoring event.
Monitoring Locations	Stormwater samples were collected from the following monitoring points in accordance with Section 2 (P1.2) of EPL 5862: ▪ 1 (outlet at Reddalls Road) ▪ 33 (downstream monitoring point) ▪ 34 (upstream monitoring point).
Analytes	In accordance with Section 5 (M2.3) of EPL 5862 each stormwater sample was analysed for: ▪ Alkalinity ▪ Calcium ▪ Conductivity ▪ Filterable iron ▪ Magnesium ▪ pH ▪ Sodium ▪ Temperature ▪ Total phenolics ▪ Ammonia ▪ Chloride ▪ Dissolved oxygen ▪ Fluoride ▪ Nitrate ▪ Potassium ▪ Sulfate ▪ Total organic carbon ▪ Total suspended solids

3.1.5 Groundwater

Groundwater monitoring was completed periodically during the reporting period to determine if groundwater was impacted by interactions with leachate.

The fieldwork methodology for groundwater monitoring is summarised below in **Table 3-5**. The location of each groundwater monitoring location is shown on **Figure 5** of **Appendix A**.

Table 3-5 Groundwater Monitoring Methodology

Activity	Description
Frequency and Dates of Monitoring	Groundwater monitoring was completed on a quarterly basis during the reporting period with sampling undertaken on ▪ August 2018 ▪ November 2018 ▪ February 2019 ▪ May 2019
Monitoring Method	Groundwater was sampled by a third party contractor, ALS Environmental, using bailer technique. A pre-calibrated water quality meter used to measure groundwater quality parameters during monitor well purging. The collected groundwater samples were submitted to ALS Environmental for analysis of contaminants and parameters of interest (summarised below). Ground water levels were recorded before purging.
Monitoring Locations	Groundwater bores monitored during the reporting period included EPL monitoring points: 5 (GABH02), 9 (GMW102), 10 (GM103), 11 (GM104), 12 (GM105), 13 (GM106), 14 (GMW108S), 15 (GMW108D), 16 (GMW109S), 17 (GMW110), 18 (GMW111), 19 (GMW109D) and 20 (BH6)
Analytes	In accordance with Section 5 (M2.3) of EPL 5862 groundwater monitoring points 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 and 20 were analysed for: <u>Annually</u> ▪ Metals (aluminium, arsenic, barium, cadmium, chromium (hexavalent and total), cobalt, copper, lead, manganese, mercury, zinc) ▪ Benzene, toluene, ethylbenzene, xylene (BTEX) ▪ Fluoride ▪ Nitrate and nitrite ▪ Organochlorine pesticides (OCP) ▪ Organophosphate pesticides (OPP) ▪ Polycyclic aromatic hydrocarbons (PAH) ▪ Total petroleum hydrocarbons (TPH) ▪ Total phenolics <u>Quarterly</u> ▪ Alkalinity ▪ Calcium, magnesium, potassium, sodium, chloride, sulfate ▪ pH and conductivity ▪ Standing water level ▪ Total dissolved solids (TDS) ▪ Total organic carbon (TOC) ▪ Nitrogen (ammonia) <u>Additional Analysis</u> The Annual Report for the 2016/2017 reporting period noted an upward trend in heavy metal concentrations in groundwater monitoring points 11 and 16 (WCC 2017), particularly barium, chromium, cobalt and lead. In response to the apparent trend, the monitoring frequency of heavy metals in points 11 and 16 was increased from annually to quarterly during the 2017/2018 reporting period to assess the trend more closely. Following elevated concentrations during the August groundwater monitoring event aluminium, barium, cadmium, calcium, chromium, cobalt, copper, lead, manganese, nickel and zinc were tested for total and dissolved concentrations during the September 2017 monitoring event to distinguish between contaminant concentrations in sediments and water.

3.1.6 Trade Wastewater

Monitoring of trade waste was completed periodically during the reporting period to assess waste water discharge and confirm that water quality parameters were within the acceptable criteria. Discharge of trade waste to sewer is undertaken in accordance with the *Consent to Discharge Industrial Trade Wastewater* (Sydney Water 2017).

The fieldwork methodology for trade wastewater monitoring is summarised below in **Table 3-6**. The trade waste monitoring location is shown on **Figure 5** of **Appendix A**.

Table 3-6 Trade Wastewater Monitoring Methodology

Activity	Description
Frequency	Trade wastewater sampling was undertaken on the 29th of May 2018 and at least once every month thereafter with the exception of May 2019. If trade wastewater was not discharged on the scheduled day, then the sample was taken on the next day that trade wastewater was discharged.
Monitoring Method	Trade wastewater was sampled by a third party contractor, ALS Environmental. Composite samples were collected over a 24 hour period using a Composite Auto-sampler, and pre and post monitoring samples were collected as grab samples. Composite samples were obtained over one full production day by combining equal volumes taken at 30 minute intervals. The volumes collected were at least 5,000 millilitres over the full day. The reading of the flowmeter was obtained at the commencement and conclusion of each sampling day. Discrete samples were collected and tested for pH and temperature at the start and finish of each sample day. The probe used to measure water quality parameters was calibrated prior to each monitoring event and the trade wastewater samples collected were submitted to ALS Environmental for analysis of parameters of interest (summarised below).
Monitoring Locations	In accordance with the *Consent* (Sydney Water, 2017) monitoring of trade wastewater was undertaken at a sampling point located at the pre-treatment discharge, excluding domestic sewage and prior to the point of connection to the Sewer. The specific monitoring location was on site leachate treatment plant which is shown on **Figure 4** of **Appendix A**.
Analytes	Composite samples were submitted to ALS Environmental for analysis of the following: ▪ Electrical conductivity; ▪ Ammonia (as Nitrogen); ▪ Biochemical oxygen demand; ▪ Suspended solids; and ▪ Total dissolved solids. Discrete samples were tested on site for pH, electrical conductivity and temperature using a calibrated water quality meter. Additionally, the volume of wastewater discharged was obtained from the reading of the total flow on the flow metering system.

3.1.7 Dust

Dust monitoring was completed on a continuous basis utilising dust deposition gauges to measure total dust and monthly to measure respirable dust for sensitive receptors.

The fieldwork methodology for dust monitoring is summarised below in **Table 3-7**. The location of each groundwater monitoring location is shown on **Figure 3** of **Appendix A**.

Table 3-7 Dust Monitoring Methodology

Activity	Description
Frequency of Monitoring	Total Dust monitoring was undertaken on a continuous basis with dust deposition gauges (DDGs) collected and analysed monthly. Respirable dust monitoring was conducted on or around the 20th of each month.
Monitoring Method	DDGs were installed and sampled by a third party contractor, ALS Environmental in accordance with AS 3580.10.1:2003. DDGs were placed around the site boundaries with DDG bottles collected and swapped out for analysis each month and the contents analysed as per below. Once a month respirable dust sampling was undertaken in two locations utilizing a PM_{10} sampler, sampling and analysis was undertaken by a third party contractor, ALS Environmental.
Monitoring Locations	Sampling locations DDG 1 to DDG 5 were located on the site perimeter with DDG 1 and DDG 2 located on the eastern side of the site while DDG 3 to DDG 5 are located on the western side of the site. DDG 1 and DDG 2 were selected for respirable dust monitoring due to the proximity to sensitive receptors.

Activity	Description
Analytes	DDG contents were analysed for ▪ Ash Content (g/m^2/month and mg); ▪ Combustible matter (g/m^2/month and mg); and, ▪ Total insoluble matter (g/m^2/month and mg). Respirable dust filters were analysed for: ▪ Total suspended particulates; and ▪ PM_{10}.

3.1.8 Waste Tyres

Waste tyres are received at the site from public drop off and from Council's On Call Household Cleanup service. All tyres received at the site are temporarily stored in a steel bin and subsequently removed for off-site recycling by a tyre recycling contractor (Tyrecycle Pty Ltd). Waste tyres are not disposed of or buried at the site.

Council display a NSW EPA Fixed QR2id Plate on the inbound weighbridge to enable inbound vehicles disposing waste tyres to exchange information regarding their load to the EPA under Clause 76 of the Waste Regulation. Any vehicles that fail to scan the QR2id plate at the entry to the landfill are reported by Council to the Waste Operations division of the EPA on a monthly basis (no later than 7 days following the end of each month).

Council follow a procedure (Procedure – Reporting un scanned inbound waste tyres to EPA, TRIM No. Z16/175510) developed to manage waste tyres in a manner that satisfies their obligations under the POEO (Waste) Regulation 2014. The procedure was prepared in consideration of the *Asbestos and Waste Tyre Guidelines* (EPA 2015).

4 Data Quality Objectives

The NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, which is endorsed by the NSW EPA under s105 of the *Contaminated Land Management Act 1997*, requires that Data Quality Objectives (DQOs) are to be adopted for all assessment and remediation programs. The DQO process as adopted by the NSW EPA is described within US EPA (2000) *Guidance for the Data Quality Objectives Process and Data Quality Objectives Process for Hazardous Waste Site Investigations*.

4.1 Data Quality Objectives

The DQO process has been used to establish a systematic planning approach to setting the type, quantity and quality of data required for making decisions based on the environmental condition of the site. The DQO process involves the following seven steps detailed in **Table 4-1**.

Table 4-1 Data Quality Objectives

Activity	Description
Step 1: State the Problem	An Annual Report is required as a condition of EPL 5862 to assess the environmental performance of the site during the 2018/2019 reporting period. The Annual Report will determine the type, concentrations, and extent of potential contamination / parameters in the matrices sampled including landfill gas (surface and subsurface), leachate, surface water and groundwater.
Step 2: Identify the decision / goal of the study	The NSW EPA requires an Annual Report to confirm if the environmental performance of the site meets the licence conditions and regulatory obligations of EPL 5862.
Step 3: Identify the information inputs	The primary inputs to the decisions described above are: ▪ Assessment of landfill gas, leachate, surface water and groundwater in accordance with direction of Section 5 (Monitoring and Recording Conditions) of EPL 5862. ▪ Assessment of management procedures for waste tyres. ▪ Laboratory analysis of samples for the contaminants and parameters of interest defined in Section 5 of EPL 5862. ▪ Assessment of analytical results against applicable performance criteria and Section 3 (Limit Conditions) of EPL 5862. ▪ Review of complaints recorded during the reporting period that relate to odour originating from the site. ▪ Aesthetic observations material encountered during sampling. Assessment of the suitability of the analytical data obtained, against the Data Quality Indicators (DQIs) outlined below.
Step 4: Define the boundaries of the study	The study site is located at Reddals Road, Kembla Grange NSW. The lateral extent of the study is the site boundaries, as shown on **Figure 2** of **Appendix A**. The vertical extent of the study extends into the landfill gas and groundwater monitoring wells installed during previous investigations. The temporal boundaries of the study are from the 29th of May 2018 to the 28th of May 2019 (i.e. the reporting period).
Step 5: Develop the analytical approach	The decision rules for the Annual Report include: ▪ The sampling points, contaminants and parameters of interest, frequency of sampling and sampling method will meet the requirements EPL 5862. ▪ Samples requiring laboratory analysis will be analysed at National Association of Testing Authorities (NATA) accredited laboratory. ▪ Laboratory QA/QC results will indicate reliability and representativeness of the data set. ▪ Laboratory Limits of Reporting (LORs) will be below the applicable guideline criteria for the analysed contaminants and parameters of interest, where possible. ▪ Applicable guideline criteria will be sourced from EPL 5862 and other NSW EPA endorsed guidelines (as necessary). If the concentration of a contaminant or parameter of interest is outside of the acceptable limit additional works may be required to assess the potential risk.

Activity	Description
Step 6: Specify performance or acceptance criteria	To ensure the results obtained are accurate and reliable, sampling and analysis was undertaken in accordance with the guidance provided in EPL 5862. DQIs are used to assess the reliability of field procedures and analytical results. In particular, the DQIs within NSW EPA (2017) are used to document and quantify compliance. DQIs are described below, and are presented in **Table 4-2**, below: ▪ Completeness – A measure of the amount of useable data (expressed as %) from a data collection activity. ▪ Comparability – The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event. ▪ Representativeness – The confidence (expressed qualitatively) that data are representative of each media present on the site. ▪ Precision – A quantitative measure of the variability (or reproducibility) of data. ▪ Accuracy (bias) – A quantitative measure of the closeness of reported data to the true value.
Step 7: Develop the Plan for Obtaining Data	Sampling and Analysis has been undertaken in compliance with EPL 5862 by qualified technical staff with analysis completed by a NATA accredited Laboratory. Results are discussed within this report.

4.2 Data Quality Indicators

The following DQIs referenced in Step 6 in **Table 4-1**, have been adopted in accordance with the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*. The DQIs outlined in **Table 4-2** assist with decisions regarding the contamination status of the site, including the quality of the laboratory data obtained.

Table 4-2 Summary of Data Quality Indicators

Data Quality Indicator	Frequency	Data Acceptance Criteria
Completeness		
Field documentation correct	Each sampling event	All samples
Suitably qualified and experience sampler	Each sampling event	All samples
Appropriate lab methods and limits of reporting (LORs)	Each sampling event	All samples
Chain of custodies (COCs) completed appropriately	Each sampling event	All samples
Compliance with all sample holding times	All samples	All samples
Comparability		
Consistent standard operating procedures for collection of each sample. Samples should be collected, preserved and handled in a consistent manner	All samples	All samples
Experienced sampler	All samples	All samples
Climatic conditions (temperature, rain, wind etc) recorded and influence on samples quantified (if required)	All samples	All samples
Consistent analytical methods, laboratories and units	All samples	All samples
Representativeness		
Sampling technique appropriate for each media and analytes (appropriate collection, handling and storage)	All samples	All Samples

Samples homogenous	All samples	All Samples
Detection of laboratory artefacts, e.g. contamination blanks	-	Laboratory artefacts detected and assessed
Samples extracted and analysed within holding times	All samples	All samples
Precision		
Laboratory duplicates	1 per 20 samples	<20% RPD Result > 20 × LOR <50% RPD Result 10-20 × LOR No Limit RPD Result <10 × LOR
Accuracy (Bias)		
Surrogate spikes	All organic samples	50-150%
Matrix spikes	1 per 20 samples	70-130%
Laboratory control samples	1 per 20 samples	70-130%
Method blanks	1 per 20 samples	<LOR

5 Performance Criteria

Environmental monitoring data gathered during the reporting period was screened against the applicable criteria for each sample type / matrix as summarised below.

5.1 Surface Gas

The results of surface gas monitoring were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold level for further investigation and potential action was detection of methane at any point of the landfill above 500 parts per million (ppm).

5.2 Subsurface Gas

The results of subsurface gas monitoring were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold levels for further investigation and corrective action were detection of methane at concentrations above 1% (volume/volume) and carbon dioxide at concentrations of 1.5% (v/v) above established natural background levels.

5.3 Gas Accumulation

The results of gas accumulation monitoring within enclosed buildings and structures were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold level for further investigation and corrective action was detection of methane at concentrations above 1% (v/v).

5.4 Water

5.4.1 Stormwater

In accordance with Section 3 (L1.2) of EPL 5862 the performance criteria for stormwater was no discharge of contaminated stormwater to waters under dry weather conditions (less than 10mm of rainfall within a 24hr period) or a storm event/s of less than 1:10 year, 24 hour recurrence interval (less than 297.4 mm of rainfall within a 24 hour time period).

The contaminants and parameters applicable to stormwater samples are provided in Section 5 (M2.3)

In addition, and in accordance with Section 3 (L2) of EPL 5862, the performance criteria for the stormwater monitoring and discharge point at Reddalls Road, known as Monitoring Point 1, include:

- pH: a 100 percentile concentration limit of 6.5 to 8.5
- Total Suspended Solids: a 100 percentile concentration limit of 50 mg/L

Samples were screened against the guidelines summarised below in **Section 5.4.3** and *South east Australia Lowland River Physical Characteristics* (ANZECC, 2000) were also used as a preliminary screen of ground and surface water physical parameters to identify potential impacts on offsite ecological receptors.

5.4.2 Leachate Discharge

In accordance with Section 3 (L1.3) of EPL 5862 the limit for leachate was no discharge of leachate to waters under dry weather conditions (less than 10 mm of rainfall within a 24 hr period) or a storm event/s of less than the 1:25 Average Return Interval (ARI), 24 hour recurrence interval (less than 371.5 mm of rainfall within a 24 hour time period). The performance criteria adopted for leachate discharges was based on records regarding the timing and nature of leachate discharges during the reporting period.

5.4.3 Groundwater

The selected performance criteria for groundwater samples were based on the recommendations of the *Environmental Guidelines: Solid Waste Landfills* (EPA 2016) and in consideration of the land use, site setting and the plausible interactions between potential contaminants and human and environmental receptors. A conceptual site model is provided in **Section 8.10** that further discusses these interactions.

The *Environmental Guidelines: Solid Waste Landfills* (EPA 2016) recommend screening groundwater analytical results against the *National Environment Protection (Assessment of Site Contamination) Measure* (National Environment Protection Council, 2013), specifically:

> Schedule B1, Table 1C Groundwater Investigation Levels, which summarises trigger values from

- *Australian Water Quality Guidelines* (ANZECC 2000) for the 95% protection level trigger values which apply to ecosystems that are slightly to moderately disturbed with a moderate conservation value.
- *Australian Drinking Water Guidelines* (National Health and Medical Research Council and the Natural Resource Management Ministerial Council, 2011, updated 2014) (ADWG). Whilst it is unlikely that surface and groundwater from the site are going to be consumed directly, the drinking water guidelines have been adopted as a conservative assessment of direct contact scenarios.

  NOTE: The ANZG (2018) notes the following with regards to the recently issued 2018 guidelines:

  "Several errors and inconsistencies in the toxicant DGVs database have been identified, and a process is underway to review and correct the information. In the meantime, it is advised that DGV search results are checked against Table 3.4.1 and Section 8.3.7 of the ANZECC/ARMCANZ (2000) Guidelines for Fresh and Marine Water Quality to ensure accuracy."

  As a result of:

  - The above recommendation to default to the previous guidelines in the event of a discrepancy; and
  - The recommendation to use the NEPM (2013) / ANZECC (2000) guidelines within the *NSW EPA Solid Waste Landfill Guidelines* (2016) and EPL 5862.

  The NEPM (2013) / ANZECC (2000) guidelines have been relied upon as the assessment criteria in the preparation of this report.

Assessment of water physical characteristics was also informed from *Australian Water Quality Guidelines* (ANZECC 2000) South East Australia Lowland River Physical Characteristics. To provide indicative threshold values for the suitability of site waters for discharge into nearby surface water systems.

5.4.4 Trade Wastewater

Trade wastewater analytical results were screened against the criteria provided in the *Consent* (Sydney Water, 2017). The *Consent* provides criteria for a variety of parameters for the long term average daily mass (LTADM) and the maximum daily mass (MDM).

In addition to analytical performance criteria, the *Consent* provides limits for aesthetic properties of trade wastewater including temperature, colour, pH, fibrous materials, gross solids and flammability, and limits to the rate of discharge of wastewater to sewer.

5.5 Dust

The results of dust monitoring were assessed against criteria provided within the *Environmental Guidelines: Solid Waste Landfills* (2016) which have been derived from Table 7.1 of *Approved methods for the modelling and Assessment of Air Pollutants in New South Wales* (NSW DEC, 2005).

5.6 Waste - Tyres

Section 3 (L3.2) of EPL 5862 states that the licensee must not dispose of any tyres on the premises which:

> Have a diameter of less than 1.2 metres;

> Are delivered at the premises in a load containing more than 5 whole tyres; and

> Became waste in the Sydney Metropolitan Area.

Section 3 (L3.3) states that tyres stockpiled on the premises must:

> Not exceed fifty tonnes of tyre at one time;

> Be located in a clearly defined area away from the tipping face;

> Be managed to control vermin; and

> Be managed to prevent any tyres from catching fire.

5.7 Odour

In accordance with Section 3 (L4) of EPL 5862 offensive odour must not emit beyond the boundary of the premises. The performance criteria adopted for potential offensive odour emissions was occurrences (if any) of complaints from members of the public relating to odour.

6 Results

Monitoring results gathered during the reporting period are provided in the data tables in **Appendix B** and are summarised in the relevant subsections below. Laboratory certificates of analysis and quality reports have not been appended to this report due to the large number of files, however, they can be provided upon request.

6.1 Gas

6.1.1 Surface Gas

The highest reported concentration of methane in surface gas was 36.9 ppm measured at transact 10 during the June 2018 monitoring event. This is well below the threshold level for further investigation and corrective action of 500 ppm.

Surface gas monitoring results from the reporting period are summarised in **Table 6** of **Appendix B.**

6.1.2 Subsurface Gas

The highest reported concentration of methane in subsurface gas was 0.1% (v/v), Therefore, all subsurface gas monitoring results were below the threshold level for further investigation and corrective action of 1% v/v. Monitoring points 30 (LFGMW10), 31 (LFGMW11) and 32 (LFGMW12) were inaccessible during the June and July 2018 monitoring events.

Carbon dioxide was also sampled incidentally as part of the monitoring though is not required by EPL 5862. All locations returned results above the threshold for further investigation of 1.5% (v/v) for at least one monitoring round during the reporting period. The highest continuous and peak results were from location 31 with 14.9% (v/v) continuous and 15% (v/v) peak on 22 February 2019 and 14.8% (v/v) continuous and 15% (v/v) peak on the 8 May 2019.

Subsurface gas monitoring results from the reporting period are summarised in **Table 5** of **Appendix B**.

6.1.3 Gas Accumulation

The highest reported concentration of methane was 0.00027 % (v/v), measured within the Glengarry Cottage front office during the June 2018 monitoring event, below the threshold level for further investigation and corrective action of 1 % (v/v).

Gas accumulation monitoring results from the reporting period are summarised in **Table 6** of **Appendix B.**

6.2 Stormwater

One controlled release (11 February 2019) and one overflow release (11 October 2018) of uncontaminated stormwater occurred during the reporting period with turbidity and pH measured and validated prior to each release.

Rainfall measured at Albion Park Weather Station for the month of October 2018 was 107.0 mm well above the long term average of 66.7 mm for this station however this is less than the 1 in 10 year, 24 hour event defined within EPL 5862 (297.4 mm / 24 hours)

pH and turbidity were measured using a water quality meter prior to each release and samples of stormwater were collected and submitted for laboratory analysis of TSS on 2 occasions to validate the accuracy of field turbidity measurements. Prior to each release, pH was measured between 6.5 to 8.5 and TSS was below 50 mg/L placing results within the discharge criteria nominated in EPL 5862.

Stormwater monitoring results from the annual sampling event are summarised in **Table 2** of **Appendix B** with the following notable results:

Table 6-1 Stormwater guideline exceedances

			Dissolved Oxygen Saturation #1	pH
			% Saturation	
ANZECC 2000 SE Australia Lowland River Physical Characteristics			85-110	6.5-8.0
EPL 5862 Discharge Point (Point 1) Criteria				6.5-8.5
EPA Designation	Locations ID	Sample Date		
1	Discharge Point	11/10/2018	87	8.3
		11/02/2019	71	7.8
33	Upstream	11/10/2018	88	7.5
		11/02/2019	59	7.1
34	Downstream	11/10/2018	115	8.3
		11/02/2019	47	7.4

6.3 Leachate

No uncontrolled off site discharges of leachate occurred during the reporting period under dry or wet weather. Leachate testing results are included in **Table 3** of **Appendix B** with comparison against adopted environmental protection criteria as a reference for leachate quality.

6.4 Groundwater

6.4.1 Groundwater Levels

Groundwater levels measured at the site during the reporting period are summarised in **Table 1** of **Appendix B a**nd ranged from 1.63 m below ground level (bgl) in groundwater monitoring Point 20 (BH6) to 8.06m bgl in groundwater monitoring point 11 (GMW104). Locations 9 (GMW102), 12 (GMW105) and 13 (GMW106) were reported as dry throughout the entire reporting period.

6.4.2 Laboratory Results

Measured exceedances against guideline criteria were identified for metals only and are summarised in **Table 6-2** below with full results summarised in **Table 1** of **Appendix B**. The closest surface water body is West Dapto Creek located adjacent to the south-western boundary of the site. Additionally, as stated above, groundwater is not used for drinking water purposes at or near the site which makes these screening values conservative. All metals results were recorded as total rather than dissolved metals. Interference between acid preservatives and sediment collected within sample containers may have resulted in higher recorded metals than exist dissolved and mobile within the water column.

Table 6-2 Groundwater guideline exceedances

			Aluminium	Cobalt	Copper	Lead	Manganese	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.01	0.001	0.001	0.001	0.001	0.005
		ADWG 2015 Health			**2**	**0.01**	**0.5**	
		ANZECC 2000 Fresh Water (95%)	0.055	0.0028	0.0014	0.0034	1.9	0.008
Metals Hardness Modified Trigger Values (HMTV)		**Very Hard (180-240 mg/L as $CaCO_3$)**				0.04012		0.0416
		Extremely Hard (>240 mg/L as $CaCO_3$)				0.09078		0.072
EPA Designation	Locations ID	Sample Date						
10	GMW103	11/02/2019	3.19	0.006				
11	GMW104	14/08/2018	7.56	0.005				
		11/02/2019	12.6	0.01			**0.624**	
15	GMW108D	11/02/2019	0.09					
14	GMW108S	11/02/2019	11.9	0.009	0.039	**0.047**		
16	GMW109S	14/08/2018	3.7	0.044	0.018	**0.017**	**4.62**	0.109
		8/11/2018	5.68	0.048	0.016	**0.012**	**3.93**	0.074
		11/02/2019	2.31	0.016			**1.33**	
19	GMW109D	11/02/2019	0.05					
17	GMW110	11/02/2019	2.29					
18	GMW111	11/02/2019	6.29	0.007	0.016			
5	GABH02	11/02/2019	6.61		0.015			
20	BH6	11/02/2019	0.65	0.008				

The analytes listed in **Table 6-3** were reported with results at the laboratory limits of reporting ((LOR) however the LOR is greater than at least one of the guideline criteria. As noted above, the adopted criteria are conservative within the current site scenario as waters are not intended for use as drinking waters as intended with the ADWG (2015) criteria; and are not being assessed at the point of discharge to the environment as intended with ANZECC (2000) Freshwater criteria. As a result, for these analytes and criteria it is not possible to make a statement of the quality of the groundwater or potential for impacts to receptors as a result of unidentified exceedances. However, it is unlikely that any analyte concentrations below the identified LOR will have a deleterious impact on receptors.

Table 6-3 Groundwater analytes with results above criteria levels

Analyte	LOR
Hexavalent Chromium	0.01 mg/L
Aldrin + Dieldrin	0.5 µg/L
Chlordane	0.5 µg/L
DDT	2 µg/L
Endrin	0.5 µg/L
g-BHC (Lindane)	0.5 µg/L
Heptachlor	0.5 µg/L
Azinophos methyl	0.5 µg/L
Chlorpyrifos	0.5 µg/L
Diazinon	0.5 µg/L

Analyte	LOR
Dimethoate	0.5 µg/L
Malathion	0.5 µg/L
Methyl parathion	2 µg/L
Parathion	2 µg/L
Anthracene	1 µg/L
Benzo(a)pyrene	0.5 µg/L

6.5 Trade Wastewater

A summary of trade wastewater monitoring is provided below and tabulated in **Table 4** of **Appendix B.**

Trade wastewater monitoring was undertaken 17 times during the reporting period. The results of monitoring showed that on each occasion volume discharge, total dissolved solids, suspended solids, ammonia as N, biochemical oxygen demand and temperature were within the acceptable criteria provided in the *Consent* (Sydney Water, 2017).

pH was measured at the commencement and completion of each monitoring event and no non-conformances with the Sydney Water criteria were recorded.

6.6 Dust

Dust monitoring results are summarised in **Table 7 and 8** of **Appendix B** while exceedances are summarised in **Table 6-4** below.

Table 6-4 Dust guideline exceedances

		Total Insoluble Matter
	Limit of Reporting (LOR)	0.1
	Unit	g/m² month
NSW EPA (2016) Solid Waste Landfills, Dust Generation	**Max. Increase in Dust Level**	**2**
	Max. Total Dust Level	**4**
Location	Date	
DDG 1	10/12/2018 - 08/01/2019	**5.7**
DDG 4	08/10/2018 - 08/11/2018	**4.6**
	08/11/2018 - 10/12/2018	**7.8**

The results from DDG 4 (8/11/18 – 10/12/18) appear to correlate in part with a recorded dust storm in November 2018. Other results have not been correlated with any other regional event.

6.7 Waste Tyres

Section 3 (L3.2) of the EPL provides limitations on the size and number of waste tyres that can be disposed at the premises. Council do not dispose of waste tyres on site but instead receives and temporarily stores them until they are collected by an external contractor (Tyrecycle Pty Ltd) for recycling. As such the license condition L3.2 does not apply to the site operations during the reporting period.

Section 3 (L3.3) of the EPL states a number of requirements relating to tyre stockpiles at the site. Stockpiles of typrs on site during the reporting period were compliant with L3.3, specifically:

- Tyre stockpiles did not exceed fifty tonnes at any one time. The tyre storage bin at the site has a capacity of 150 tyres, which when full equates to significantly less than fifty tonnes. Council's Operations team regularly scheduled outbound loads of waste tyres to ensure that the capacity of the bin is not exceeded;
- The tyre stockpile was clearly defined and situated approximately 450m from the tipping face during the reporting period; and
- The tyre stockpile was scheduled for frequent removal mitigating the potential for vermin impact and fire risk.

6.8 Odour

A total of twenty-two complaints were received by Council from members of the public during the reporting period relating to offensive odour detected at an offsite location. An Environmental Incident Form was completed for each complaint with the pertinent information summarised below in **Table 6-5**. The complaints received during the EPL reporting period were used to track the site's environmental performance for odour.

Table 6-5 Complaints Summary

Date of Complaint	Number of Complaints	Council Record ID	Nature of Complaint	Additional Information
29/11/2018	1	608448	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA on 29 November 2018. EPA forwarded the complaint to Wollongong City Council - Waste Services 30 November 2018. Reviewed weather station data and waste works diary to identify issues that may be responsible. Regular monitoring and inspection occurred at the site by Landfill Engineer on 29 November 2018. No odour was observed. Cover material was applied as per standard procedures. The deodouriser was in operation.
3/12/2018 & 4/12/2018	5	609643 609647 609640 609648 609652	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA five times on 5 and 6 December 2018 for the 3 and 4 December 2018. Wollongong City Council notified of initial complaint on 5 December 2018. Reviewed weather station data and waste works diary to identify issues that may be responsible. No unusual site activities or weather conditions.
28/12/2018	4	610329 610429 611605 611606	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA four times on 28 December 2018. EPA forwarded the complaint to Wollongong City Council - Waste Services. No further information available.
16/01/2019	7	612255 612256 612257 612258 612259 612260 612262	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA seven times on 16 January 2019. EPA forwarded the complaint to Wollongong City Council - Waste Services. Reviewed weather station data and waste works diary to identify issues that may be responsible. Weather was dry and warm (22 to 30°C) with predominately northerly winds. The deodouriser was in place and operational and landfill lids were removed between 7:20 and 7:30 am for days operations. No unusual activities or conditions were noted for the date.
24/1/2019	1	Not supplied	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA on 24 January 2019. EPA forwarded the complaint to Wollongong City Council - Waste Services 24 January 2019. Reviewed weather station data and waste works diary to identify issues that may be responsible. Landfill lids were removed at approximately 7.15am and preparation for daily landfill activites commenced. The deodouriser was located North east of the tip face. Deodouriser was in operation prior to removing the landfill lids.

Date of Complaint	Number of Complaints	Council Record ID	Nature of Complaint	Additional Information
4/2/2019	1	614223	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA on 24 January 2019. EPA forwarded the complaint to Wollongong City Council - Waste Services. Reviewed weather station data and waste works diary to identify issues that may be responsible. Landfill lids were removed at approximately 7.15am and preparation for daily landfill activites commenced. The deodouriser was located North east of the tip face. Deodouriser was in operation prior to removing the landfill lids.
18/2/2019	1	615779	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA on 18 February 2019. EPA forwarded the complaint to Wollongong City Council – Waste Services 21 February 2019. The complaint originated with a resident of Fairloch Avenue, Farmborough Heights. Reviewed weather station data and waste works diary to identify issues that may be responsible. No unusual site activities or weather conditions.
8/4/2019	1	621018	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA on 8 April 2019. EPA forwarded the complaint to Wollongong City Council - Waste Services 8 April 2019. Reviewed weather station data and waste works diary to identify issues that may be responsible. No unusual site activities or weather conditions, no odour noted by site staff.
9/4/2019	2	621234	Air Pollution – Commercial/Industrial: Offensive odour	Offensive odour reported to NSW EPA twice on 9 April 2019. EPA forwarded the complaint to Wollongong City Council - Waste Services 10 April 2019. Reviewed weather station data and waste works diary to identify issues that may be responsible. No unusual site activities or weather conditions, no odour noted by site staff.

7 Quality Assurance / Quality Control

A detailed overview of the QA/QC program including internal laboratory QA/QC is included in **Appendix C**. A summary of the results of the QA/QC performance are included in the following sections.

7.1 Laboratory QA/QC

The selected analytical laboratory, ALS Environmental, undertake internal QA/QC procedures which include the analysis of method blanks, internal duplicate samples, laboratory control samples, matrix spikes and surrogate recovery. Additionally, laboratory QA/QC measures include receipt, logging, storage, preservation, holding time and analysis of samples within the method specified.

A review of the laboratory QA/QC procedures indicates that laboratory QA/QC procedures were within specified ranges for all samples with the exception of those summarised in **Table C-2, Appendix D**.

Samples were received and stored appropriately and all samples were analysed within the specified holding time.

7.2 Data Useability

The data validation process of laboratory QA/QC data indicates that the reported analytical results are representative of the conditions at the sample locations and that the analytical data can be relied upon for the purpose of the Annual Report for EPL 5862.

8 Discussion

The data and information gathered during the reporting period is discussed below in consideration of the performance criteria. In addition, and in accordance with Section 6 (R1.8) of EPL 5862, historical laboratory results have been tabulated and presented in graphical format that compares data from at least three years (where available).

Trend graphs are provided in **Appendix D** and summarised below. Where there is insufficient data to establish trends (i.e. results predominately below LOR), then no trend graph has been prepared.

8.1 Surface Gas

Surface gas monitoring completed during the reporting period did not identify surface methane concentrations that exceeded the threshold level. As such, non-conformances of the EPL did not occur during the reporting period with respect to surface gas emissions.

8.2 Subsurface Gas

Subsurface gas monitoring completed during the reporting period did not identify subsurface methane at concentrations that exceeded the threshold level. As such, non-conformances of the EPL did not occur during the reporting period with respect to subsurface gas.

Subsurface CO_2 levels were found to generally exceed the threshold criteria within Environmental Guidelines: Solid Waste Landfills (NSW EPA, 2016). While not required to be assessed under the EPL, it is recommended that WCC consider the potential for impacts of these elevated levels.

8.3 Gas Accumulation

Gas accumulation monitoring completed during the reporting period did not identify methane at concentrations that exceeded the threshold level. As such, non-conformances of the EPL did not occur during the reporting period with respect to gas accumulation.

8.4 Stormwater

A single overflow event occurred on the 11th of October 2018 with measured results for TSS and pH within the designated EPL criteria. Based upon recorded rainfall for this month at Albion Park Weather Station this event is associated with an above average period of rainfall however the rainfall for this period was below the criteria defined in EPL 5862 for a 1 in 10 year, 24 hour storm event. As results for this event are within the EPL nominated discharge criteria and there is an absence of other indicators of contamination such as elevated ammonia or phenolics, a non-conformance of the EPL did not occur with respect to this release of stormwater, results are further discussed below.

pH levels in minor exceedance of the *Lowland River Physical Characteristics* (ANZECC, 2000) were identified in Point 1 and Point 34 during the October 2018 sampling round. These were within the nominated discharge criteria of EPL 5862 and within the long term average for this parameter.

Dissolved oxygen saturation level exceedances were also noted against *Lowland River Physical Characteristics* (ANZECC, 2000). All locations where below the guideline range in February 2019 and while the downstream location was above guidelines range in October 2018. This exceedance occurred during a recorded overflow event however is below the recorded level at the discharge point so is unlikely to be attributed to impacts caused by the discharge. These factors are further discussed in the recommendations in **Section 9.2**.

8.4.1 Trend Analysis

A series of graphs showing trends in stormwater contaminant and parameter levels are provided in **Appendix D** and are discussed below.

With the exception of a drop off in potassium levels measured at Point 1 and potential increase in alkalinity (as $CaCO_3$) at Point 34 all other results appear to have returned to long term average bands after some significant variability during the previous reporting period.

8.5 Groundwater

8.5.1 Groundwater Levels

Interpretation of groundwater levels across the site from the reporting period indicate that the inferred groundwater flow direction is from the north east to the south west, which is consistent with the local topography and is shown on **Figure 5** of **Appendix A**. With the exception of Point 10 (GMW103), all locations in the north eastern corner of the site were recorded as dry during this reporting period. The next highest location with respect to elevation, Point 11 (GMW104) along with Point 10 also shows a decrease in water levels (SWL) over this reporting period. All other locations in lower areas of the site show steady or slightly decreasing SWL for the reporting period. An anomalous result for SWL in both Point 10 and Point 11 for the 14 August 2018 monitoring round indicates a jump in SWL of 4 metres compared with recent and long term results. It is anticipated that this is a data collection error and does not reflect actual groundwater levels at the time.

8.5.1.1 Trend Analysis

A series of graphs showing groundwater level trends are provided in **Appendix D** and discussed below.

A review of trend results show SWL generally within a historical “normal” band for most locations with the exception of Point 10 and Point 11. Some correlation was noted in the reporting period between SWL and rainfall in the boreholes located at higher elevations, however without continuous monitoring data, particularly of SWL at these higher elevations, the strength of this correlation is difficult to ascertain.

8.5.2 Laboratory Results

Exceedances of guideline criteria were noted across the site for aluminium, cobalt, copper, lead, manganese and zinc. Wells installed targeting deeper aquifers showed minor exceedances for aluminium with no other exceedances.

The source of the exceedances is difficult to determine however are likely naturally occurring. The metal results for the current sampling period correlate with the long-term average observed in the sampling locations over the historically available data. The absence of impacts from any other contaminant indicators (i.e. hydrocarbons, pH, etc) and the long term average analyte results across the site suggest that there is a strong impact from the site geology. Reduced groundwater levels at the time of sampling has also potentially caused a slightly higher concentration of analytes in some locations.

The majority of exceedances were identified in Point 16 (GMW109S), which is located on the downgradient, south west boundary. Analyte concentration variability over the quarterly sampling results from this location is potentially the result of a flushing effect with a reduction in contaminant levels noted following increased rainfall in the previous quarter. Point 19 (GMW109D) is paired with Point 16 and targets deeper water sources. Comparable results from the annual monitoring round (11/02/2019) show a minor exceedance for aluminium only in the deeper well suggesting that any impacts identified in Point 16 are shallow in nature only.

The source of the exceedances is difficult to determine, the results for the current sampling period correlate with the long term “normal” observed in the sampling locations over the historically available data. The absence of impacts from any other contaminant indicators (i.e. hydrocarbons, pH, etc) and the long term normal of the site suggest that there is a strong impact from the site geology. Geology across the site is reflected by the topography with elevated areas underlain by the sedimentary units of the Pheasants Nest Formation and Budgong Sandstone while lower elevations are underlain by Quaternary sediments. In the absence of any other indicators of contamination impact, particularly in surface water results the potential for offsite environmental impacts from the groundwater guideline exceedances is considered low in the absence of a clearly identified source-pathway-receptor linkage.

8.5.2.1 Trend Analysis

A trend graph and discussion has not been provided for analytes with insufficient data to be able to establish a trend due to low numbers of results above laboratory LOR.

A series of graphs showing trends in groundwater contaminant and parameter levels are provided in **Appendix D**, and are discussed below.

The trend graphs from the annual groundwater monitoring event shows that contaminant and parameter concentrations have remained steady and relatively consistent with the three years prior, with a general decline in contaminant concentrations. It is noted that several monitoring wells were dry during the annual monitoring event and therefore trend analysis was unable to be completed for the entire well network.

Greatest variability within the sample locations over the reporting period and historically, appears to be within alkalinity, electrical conductivity, sulfate and cations (sodium, magnesium, potassium and calcium). The most notable location for this is Point 14 (GMW108S) which is centrally located within the facility. It is likely that the variability in this location and the lesser variability in its deeper partner Point 15 (GMW108D) is the result of the construction of the new landfill adjacent north east of the location disturbing shallow groundwater in the surrounding area. These impacts do not appear to have translated to the locations on the site boundaries.

8.6 Trade Wastewater

Trade wastewater was discharged into the sewer network in accordance with the Consent (Sydney Water 2017) with no non-conformances recorded during the reporting period. All recorded criteria where within the discharge criteria nominated by Sydney Water as part of the consent.

8.7 Dust

With the exception of the identified exceedances in **Table 6-4,** the results are generally well within the nominated acceptance criteria. Exceedances identified at DDG-4 appear to correlate with a statewide dust storm in November 2018, however the absence of increased results in other locations for such a regional event limits the likelihood of attributing the results to this event.

A review of site activities in the vicinity of DDG-1 and DDG-4 during the reported exceedances is recommended to identify potential causes of exceedances and the best approach to manage dust generation in future. It is anticipated by WCC that with the construction and use of the new cell in a central location within the site, that dust generation and dust levels leaving the site should be minimised.

8.8 Waste Tyres

Waste tyres received at the site are managed in accordance with a procedure that satisfies WCC's obligations under the POEO (Waste) Regulation 2014. Tyres are temporarily stored at the site before being collected by a third party contractor for recycling.

Non-conformances of the EPL did not occur during the reporting period with respect to waste tyres.

8.9 Odour

Section 3 (L4) of EPL 5862 states that offensive odour must not emit beyond the boundary of the premises. A total of twenty-two complaints relating to odour were received from members of the public during the reporting period. In each instance the individual making the complaint believed the subject odour was originating from the site.

The nearest sensitive receptor to the site is a residential dwelling located approximately 150m north of the current active tip face and the suburb of Farmborough Heights (predominantly low density residential) is located approximately 500m north east. WCC has advised undertakes regular proactive monitoring within Farmborough Heights to identify potential odour issues.

Given the relative close proximity of sensitive receptors (residences) to the site, and based on a review of the odour complaints received during the reporting period, it appears that odours thought to originate at the site occur predominantly when the wind is from the south, following rainfall and on hot days.

The recorded controls in place for mitigating the release of odour during the recorded events, included application of daily cover and the use of a deodouriser. Additionally, the Site Waste Coordinator visited the location of the complaint on numerous occasions to validate the complaint, however was unable to detect an offensive odour on any occasion.

8.10 Conceptual Site Model

Generally, a conceptual site model (CSM) provides an assessment of the fate and transport of contaminants of potential concern (CoPC) relative to site specific subsurface conditions in relation to their potential risk to human health and the environment. The CSM takes into account site-specific factors including:

- Source(s) of contamination;
- Identification of CoPC associated with past (and present) source(s);
- Vertical, lateral and temporal distribution of CoPC;

- Site specific lithologic information including soil type(s), depth to groundwater, effective porosity, and groundwater flow velocity; and
- Actual or potential receptors considering both current and future land use, both for the site and adjacent properties, and any sensitive ecological receptors.

Based on the results discussed in this report, a CSM has been developed and is outlined below in **Table 8-1**. Additional details are included in the sections that follow as necessary.

Table 8-1 Conceptual Site Model

CSM Element	Description
Contaminant Sources	Known contaminant sources at the site include: ▪ Historical site use as a landfill since the early 1980's for deposition of domestic and commercial waste streams. ▪ Leachate resulting from degradation of buried waste and interaction with groundwater. ▪ Landfill gases generated from the degradation of buried waste.
Site Current and Future Use	The site is an operational landfill that receives waste from the Wollongong City Council local government area. It is anticipated that the landfill will remain operational and continue to receive waste for the foreseeable future with a projected lifespan of at least 40 years based on current landfilling rates.
Site Geology	A geotechnical investigation (Golder 2012) indicates that the site is situated on two geological units. The Pheasants Nest Formation was noted on the upper slopes across the northern portion the site. The material encountered was generally weathered sandstone that grades into fresh sandstone at depths typically less than 10 m below ground level. The Budgong Sandstone Formation was located across the southern portion of the site. The sandstone generally had a weathering profile that extended to depths up to 15 m bgl. In addition to the natural geology the historical and current landfill cells have been covered with a capping layer typically comprising low to medium plasticity sandy clay with a thickness less than 1.5 m. Underlying the landfill cap is predominantly domestic waste including paper, plastic, wood, rubble and other materials.
Site Hydrology and Hydrogeology	The closest surface water body to the site is West Dapto Creek to adjacent south-west of the site and is the natural receiving body for the surrounding area. Site topography slopes towards the south-east and based on groundwater gauging results appears to be the strongest influence on groundwater flow direction.
CoPCs	The CoPC listed in EPL 5862 include heavy metals (aluminium, arsenic, barium, cadmium, chromium (hexavalent and total), cobalt, copper, lead, manganese, mercury, zinc), polycyclic aromatic hydrocarbon, total petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylenes, naphthalene, organochlorine pesticides, organophosphate pesticides and phenolics. In addition to CoPC the EPL identifies potentially hazardous landfill gasses including methane and carbon dioxide.
Extent of Impacts	The extent of potential contamination would primarily be located immediately below and down gradient of the tip face. Monitoring undertaken during the reporting period indicates that contaminants above the adopted criteria are limited to heavy metals, aluminium, cobalt, copper, lead, manganese and zinc. Other CoPC were reported below the laboratory limit of reporting or the adopted criteria, however, it is noted that several contaminants including PAHs, OCPs and OPPs were unable to be screened against the adopted criteria as the laboratory LORs were reported higher than the criteria. Methane was detected during the reporting period atop the current and previous tip face (surface gas), subsurface and within enclosed structures, however, the concentrations were below the threshold level for further investigation and corrective action.

CSM Element	Description
Potential Human Receptors	Potential human receptors include: ▪ Employees working at the tip face in earthworks plant and machinery; ▪ Employees working within enclosed structures including the weighbridge and office; ▪ Trespassers who illegally access the site; ▪ Contractors constructing the new landfill cell; ▪ Contractors undertaking scheduled environmental monitoring (surface water, groundwater and landfill gas); and ▪ Individuals working or living near the site.
Potential Ecological Receptors	Potential ecological receptors include: ▪ Dapto Creek which is the nearest offsite down gradient surface water body and the downstream surface water bodies including Mullet Creek and Lake Illawarra; ▪ Groundwater under the site being impacted as a result of the vertical migration of contaminants from leachate and buried waste; and ▪ Flora and fauna on the site interacting with contaminants in the soils including birds scavenging from the tip face.
Potential Contaminant Pathways	Potential contaminant pathways include: ▪ Dermal contact with contaminated materials including soil, waste and hazardous building materials; ▪ Dermal contact with contaminated media including surface water, groundwater and leachate; ▪ Inhalation of hazardous landfill gases emanating from buried waste and leachate; ▪ Inhalation of volatile contaminants and/or asbestos fibres; ▪ Ingestion of contaminant impacted materials including soil, waste and hazardous building materials; ▪ Potential contaminant uptake by vegetation; and ▪ Potential ingestion of contaminant impacted fresh produce (fruit and vegetables) grown down gradient of the site.

8.10.2 Data Gaps and Uncertainties

The assessment of potential contamination at the site was based on a site inspection and review of available historical reports and information. As such, the lateral and vertical extent of potential contamination in soil is unknown.

As noted in **Section 6.4.2** a number of analytes (see **Table 6-3**) were reported by the laboratory with LORs above applicable assessment criteria, at this stage it is not possible to make a statement in regard to exceedances and analyte impacts on receptors.

Field sampling sheets (in particular purging records and sampling notes) have not been supplied. As sampling was undertaken by a third party (ALS Environmental), it limits our capacity to make a statement on the impact of sampling approach on recorded results.

9 Conclusions and Recommendations

9.1 Conclusions

Based on the monitoring undertaken during the reporting period, Cardno concludes:

- Wollongong City Council implemented an environmental monitoring program during the 2018/2019 reporting period that satisfied the conditions and requirements of EPL 5862 and the *Consent to Discharge Industrial Trade Wastewater* (Sydney Water, 2017).
- Water contained in stormwater and leachate ponds at the site was managed such that uncontrolled releases of contaminated water did not occur during the reporting period.
- Monitoring results show that surface and subsurface methane ground gas was not present at concentrations that exceed the adopted performance criteria. Carbon dioxide, which is not required to be monitored as part of the EPL 5862, was monitored incidentally as part of the subsurface gas assessment and was recorded at levels in exceedance of adopted performance criteria for all locations during some monitoring rounds.
- Stormwater samples collected from surface water bodies down gradient of the site generally showed contaminant and parameter concentrations within the adopted acceptance criteria. Exceedances against SE Australia Lowland River Guidelines adopted from ANZECC (2000) were noted for pH and Dissolved Oxygen Saturation. DO results are considered to be the result of offsite impacts due to the consistency between upstream and downstream results. pH exceedances may be the result of discharge from the site, however the recorded pH at the discharge point is within the nominated criteria within EPL 5862. The results of future sampling events should be monitored closely to confirm the concentrations as discussed below in **Section 9.2**.
- Metals were detected above the performance criteria in groundwater at numerous monitoring wells. However, samples were submitted for analysis of total metals and therefore the elevated concentrations may be due to the presence of sediments. Overall, the absence of other indicators such as hydrocarbons, pH, etc and the long term “normal” of the analyte results suggests that there is no (or limited) impact from the landfill on these results. Future monitoring events should also assess dissolved concentrations of metals to determine if elevated metals are attributed to sediment or if they exist in the dissolved phase, as discussed below in **Section 9.2**.
- Exceedances were noted within dust deposition gauges DDG-1 and DDG-4. Due to the monthly basis of the sampling period for the DDGs, a specific cause (or causes) cannot be identified for these results. However, the absence of even elevated results in DDGs in other parts of the site suggest an onsite cause rather than a more regional one.
- Management and handling of waste tyres at the site was undertaken in a manner that was compliant with the EPL conditions.
- Contaminant detection at stormwater sampling Points 1 and 33 could be the result of interference from runoff originating at Reddalls Road as opposed to the site. Additionally, the surface water bodies were stagnant at the time of sampling and releases of stormwater and leachate did not occur during the reporting period.
- Complaints from the public relating to offensive odours originating from the site were received during the reporting period. Each complaint was investigated by Council to confirm the nature of the complaint and to identify suitable corrective actions.

9.2 Recommendations

Based on the conclusions of this report, the following actions are recommended:

- Sample collection point for Point 1 be relocated upstream to a point between Reddalls Road and the site boundary (if possible) to eliminate the risk of cross contamination.
- Given that an elevated concentration of ammonia was reported in Point 33 and a pH of 9.7 was measured at Point 1, the results should be monitored closely during future monitoring events to confirm if the unusual results were anomalous or indicative of potential leachate interaction with stormwater bodies.

- The laboratory limit of reporting was above the adopted screening criteria for several analytes including PAHs, OCPs and OPPs. Future analysis of these analytes should be undertaken with an LOR below the applicable guideline levels to allow for effective assessment of the impacts to on and offsite receptors.
- The status of groundwater bores in elevated areas along the northern boundaries should be assessed to determine ongoing suitability. Given the bulk of these wells were dry for this sampling round, with Point 13 having a history of being dry since 2012 the following should be completed:
  - Review well construction details against current gauged well depth to determine if the screened interval has been silted up or the well otherwise blocked above the screen.
  - If the well has been silted or blocked, then flushing and redevelopment options to open the well should be considered. These can include, but not be limited to, the use of compressed air to lift out any material blocking the well.
  - If the well has not been silted up or otherwise blocked, or remains dry after flushing then consideration should be made towards the NSW EPA EPL 5862 requirements and whether these locations should be replaced with new wells which intersect groundwater.
- Historically, water samples have been submitted for laboratory analysis of total heavy metals in accordance with EPL 5862. Water samples should also be analysed for dissolved metals (ie field filtered) to determine if elevated metals are attributed to sediment or if they exist in dissolved phase.
- Subsurface carbon dioxide results should be assessed to determine impacts on landfill gas management for the site. The assessment should consider whether these results are typical for a landfill of this composition and stage of life, and whether additional measures should be put in place to manage measured gas levels.

10 References

ANZECC (2000), Australian Water Quality Guidelines, 2000

Australian Standards (1999), AS 4482.2-1999 Guide to the Sampling and Investigation of Potentially Contaminated Soil - Volatile Substances, 1999

Golder Associates (2012), Geotechnical Investigation, Whytes Gully Landfill, 2012

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NEPC (2013), National Environment Protection (Assessment of Site Contamination) Measure, 2013

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NSW EPA (1996), NSW Environmental Guidelines: Solid Waste Landfills, 1996

NSW EPA (2013), Requirements for publishing pollution monitoring data, 2013

NSW EPA (2015), Asbestos and Waste Tyre Guidelines, 2015

NSW EPA (2016), Environmental Guidelines: Solid Waste Landfills (Second Edition), 2016

NSW EPA (2017), Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017

NSW DPI (1985), 1:100,000 geological map Wollongong-Port Hacking, 1985

Sydney Water (2017), Consent to Discharge Industrial Trade Wastewater, 2017

US EPA (2000), Guidance for the Data Quality Objectives Process and Data Quality Objectives Process for Hazardous Waste Site Investigations, 2000

APPENDIX A

SITE FIGURES

Location Plan

WHYTES GULLY WASTE DISPOSAL DEPOT

Legend

- Site Boundary
- Distance Buffer
- Major Watercourse (LPI)

Land Use (ABS, 2016)

- Other
- Commercial
- Education
- Hospital/Medical
- Industrial
- Parkland
- Primary Production
- Residential
- Water

FIGURE 1

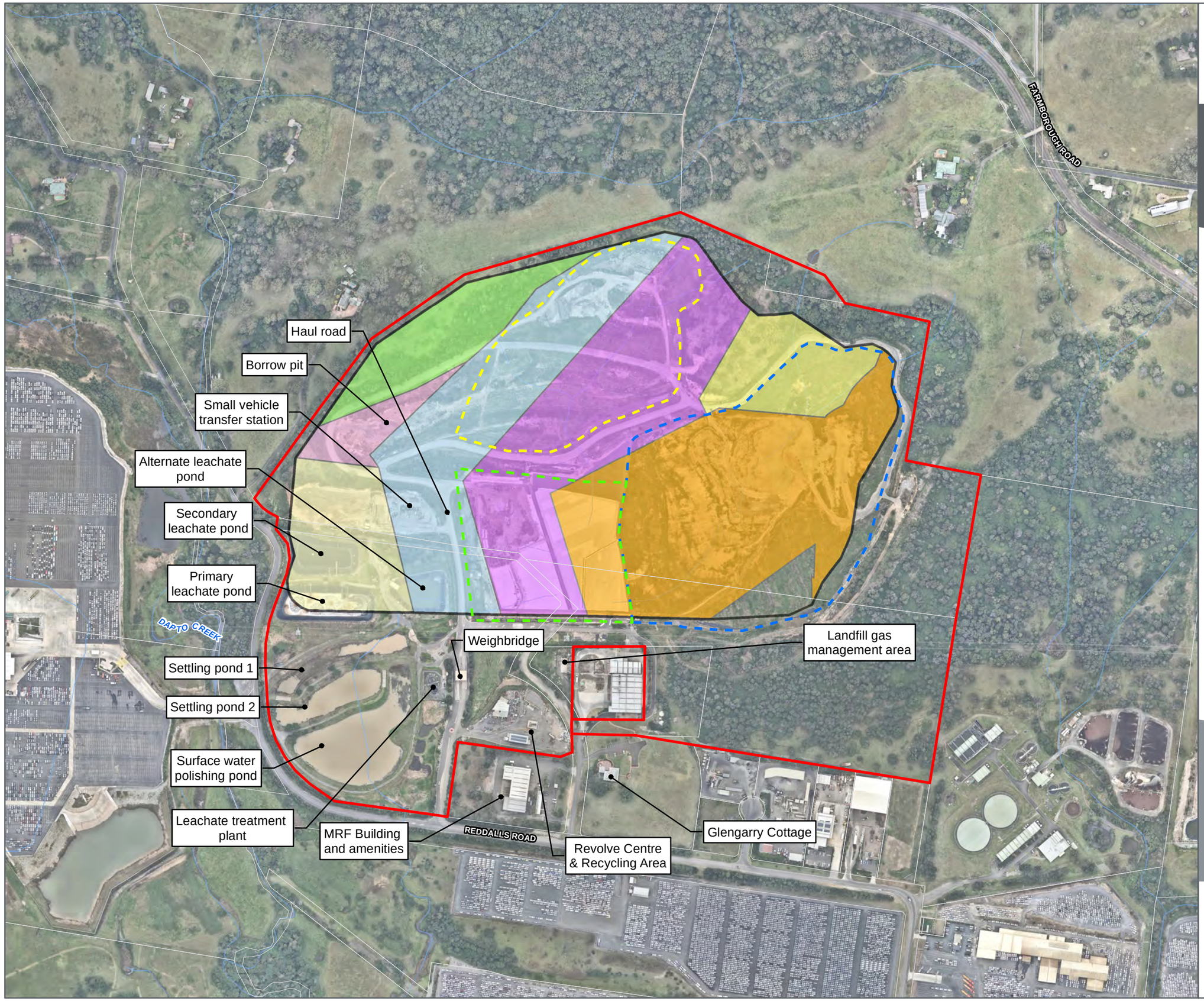
1:60,000 Scale at A3

km
0 0.5 1 1.5 2

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2019-06-17 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 8201927301-GS-001-WGLocationPlan.mxd 01



Site Plan

WHYTES GULLY WASTE DISPOSAL DEPOT

Legend

- Site Boundary
- Eastern Gully Landfill
- Western Gully Landfill
- New Landfill (Under Construction)
- Extent of Landform
- Stage 1
- Stage 2A
- Stage 2B
- Stage 3
- Stage 4-1
- Stage 4-2A
- Stage 4-2B
- Watercourse (LPI)
- Cadastre (DFSI-SS, 2018)

FIGURE 2

1:5,000 Scale at A3

m
0 50 100 150 200

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2019-06-17 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 8201927301-GS-002-WGSitePlan.mxd 01
Aerial imagery supplied by nearmap (March, 2019)

ID	Latitude	Longitude
1	-34.461282	150.798123
2	-34.461707	150.801046
3	-34.461173	150.798302
4	-34.461495	150.801312
5	-34.461167	150.797993
6	-34.460442	150.802531
7	-34.460744	150.799456
8	-34.460662	150.800985
9	-34.460543	150.79948
10	-34.460406	150.801562
11	-34.460363	150.79919
12	-34.460305	150.801931
13	-34.459877	150.799587
14	-34.460263	150.802198
15	-34.459746	150.799557
16	-34.46015	150.802252
17	-34.459633	150.799504
18	-34.460049	150.802359
19	-34.459466	150.800126
20	-34.459508	150.802163
21	-34.459317	150.800473
22	-34.459198	150.80202
23	-34.45887	150.800838
24	-34.459055	150.802454
25	-34.458568	150.801338
26	-34.458847	150.802561
27	-34.458401	150.801948
28	-34.458776	150.80268
29	-34.463136	150.802109
30	-34.462029	150.801591
31	-34.463059	150.802341
32	-34.461703	150.801685
33	-34.462976	150.802555
34	-34.461435	150.801757
35	-34.46328	150.803183
36	-34.46102	150.80182
37	-34.463113	150.803519
38	-34.460763	150.802258
39	-34.463006	150.803882
40	-34.460828	150.80296
41	-34.463095	150.804387
42	-34.46081	150.803324
43	-34.462768	150.804721
44	-34.460816	150.803691
45	-34.46244	150.805036
46	-34.460834	150.804042
47	-34.461257	150.804917
48	-34.460364	150.8034

Surface Gas Monitoring Locations

WHYTES GULLY WASTE DISPOSAL DEPOT

Legend

- Site Boundary
- Surface Gas Monitoring Transect
- Cadastre (DFSI-SS, 2018)

FIGURE 3

1:5,000 Scale at A3

m
0 50 100 150 200

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2019-06-17 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 8201927301-GS-004-WGSurfaceGas.mxd 01
Aerial imagery supplied by nearmap (March, 2019)

	Aluminium	Cobalt	Copper	Lead	Manganese	Zinc
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ADWG 2015 Health			2	0.01	0.5	
ANZECC 2000 Fresh Water (95%)	0.055	0.0028	0.0014	0.0034	1.9	0.008
Metals Hardness Modified Trigger Values (HMTV) – Very Hard (180-240 mg/L as $CaCO_3$)				0.04012		0.0416
Metals Hardness Modified Trigger Values (HMTV) – Extremely Hard (>240 mg/L as $CaCO_3$)				0.09078		0.072

Sample Date = 11/02/2019
Aluminium = 6.61
Copper = 0.015

Sample Date = 14/08/2018
Aluminium = 7.56
Cobalt = 0.005

Sample Date = 11/02/2019
Aluminium = 12.6
Cobalt = 0.01

Sample Date = 11/02/2019
Manganese = 0.624

Sample Date = 11/02/2019
Aluminium = 6.29
Cobalt = 0.007
Copper = 0.016

Sample Date = 14/08/2018
Aluminium = 3.7
Cobalt = 0.044
Copper = 0.018

Sample Date = 14/08/2018
Lead = 0.017
Manganese = 4.62

Sample Date = 14/08/2018
Zinc = 0.109

Sample Date = 8/11/2018
Aluminium = 5.68
Cobalt = 0.048
Copper = 0.016

Sample Date = 8/11/2018
Lead = 0.012
Manganese = 3.93

Sample Date = 8/11/2018
Zinc = 0.074

Sample Date = 11/02/2019
Aluminium = 2.31
Cobalt = 0.016

Sample Date = 11/02/2019
Zinc = 0.074

Sample Date = 11/02/2019
Aluminium = 11.6
Cobalt = 0.009
Copper = 0.039

Sample Date = 11/02/2019
Lead = 0.047

Sample Date = 11/02/2019
Aluminium = 3.19
Cobalt = 0.006

Sample Date = 11/02/2019
Aluminium = 0.09

Sample Date = 11/02/2019
Aluminium = 2.29

Sample Date = 11/02/2019
Aluminium = 2.29

Sample Date = 11/02/2019
Aluminium = 0.05

DAPTO CREEK

FARMBOROUGH ROAD

REDDALLS ROAD

KEEVERS PLACE

Leachate Treatment Plant

Weighbridge

Visy Building

Glengarry Cottage

EPL ID	Latitude	Longitude
1	-34.465788	150.798241
2	-34.461495	150.798117
5	-34.462361	150.798127
9	-34.458563	150.800373
10 / 28	-34.460495	150.805903
11	-34.461171	150.796442
12 / 25	-34.462304	150.805465
13 / 24	-34.463246	150.804627
14	-34.463322	150.799269
15	-34.463408	150.799345
16	-34.465054	150.796328
17	-34.463322	150.79609
18	-34.462247	150.79629
19	-34.465092	150.796432
20	-34.465292	150.798669
21	-34.463294	150.801753
22	-34.463579	150.802467
23	-34.463598	150.80419
26	-34.461599	150.806093
27	-34.460933	150.805969
29	-34.460077	150.805912
30	-34.459686	150.805817
31	-34.459629	150.805265
32	-34.459544	150.804713
33	-34.466937	150.796376
34	-34.460624	150.795442
Glengarry Cottage	-34.465023	150.801355
Leachate Treatment Plant	-34.463926	150.798743
Visy Building	-34.463935	150.801647
Weighbridge	-34.46375	150.799164

Groundwater, Surface Water and Subsurface Gas Monitoring Locations

WHYTES GULLY WASTE DISPOSAL DEPOT

Legend

- Site Boundary
- Dual Well (Groundwater and Gas)
- Gas Accumulation Monitoring Point
- Groundwater Monitoring Well
- Stormwater Monitoring Point
- Subsurface Gas Monitoring Well
- Trade Wastewater Monitoring Point
- Watercourse (LPI)
- Inferred Groundwater Flow Direction
- 5m Contours (LPI LiDAR, 2013)
- Cadastre (DFSI-SS, 2018)

FIGURE 4

1:5,500 Scale at A3

m
0 50 100 150 200

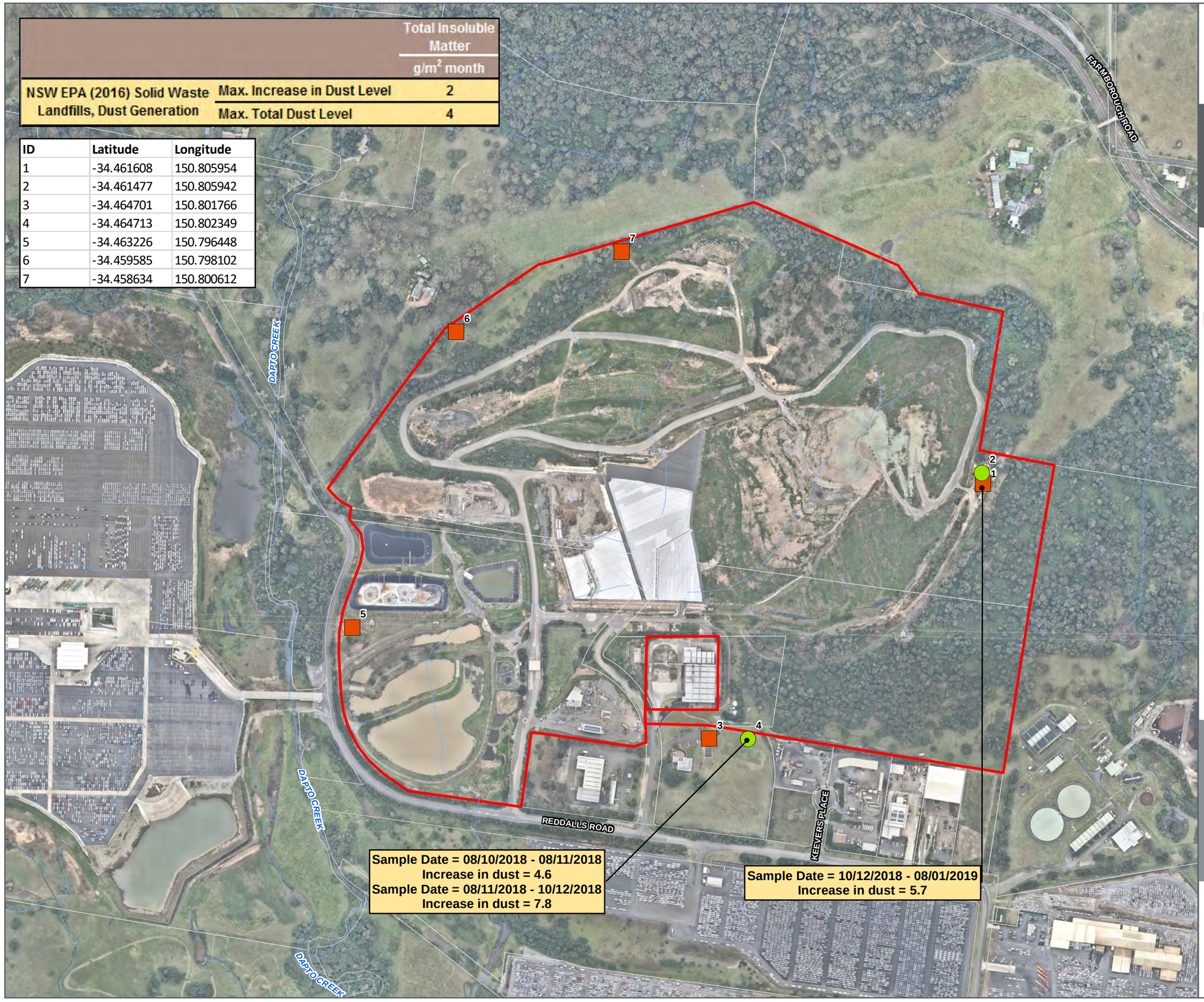
N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2019-06-24 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 8201927301-GS-005-WGGroundwater-SubsurfaceGas.mxd 01
Aerial imagery supplied by nearmap (March, 2019)

		Total Insoluble Matter
		g/m² month
NSW EPA (2016) Solid Waste Landfills, Dust Generation	Max. Increase in Dust Level	2
	Max. Total Dust Level	4

ID	Latitude	Longitude
1	-34.461608	150.805954
2	-34.461477	150.805942
3	-34.464701	150.801766
4	-34.464713	150.802349
5	-34.463226	150.796448
6	-34.459585	150.798102
7	-34.458634	150.800612



Dust Deposition Monitoring

WHYTES GULLY WASTE DISPOSAL DEPOT

Legend

- Site Boundary
- Watercourse (LPI)
- Cadastre (DFSI-SS, 2018)

Dust Deposition Monitoring Locations

- Dust Gauge Deposition Gauge Location
- High Volume Sampling Location

FIGURE 5

1:5,000 Scale at A3

m
0 50 100 150 200

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2019-07-05 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 8201927301-GS-003-WGDustDeposition.mxd 01
Aerial imagery supplied by nearmap (March, 2019)

APPENDIX

B

RESULTS SUMMARY TABLES

			Metals												BTEX						OCPs				
		Standing Water Level	Aluminium	Arsenic	Barium	Cadmium	Chromium (Hexavalent)	Chromium (Total)	Cobalt	Copper	Lead	Manganese	Mercury	Zinc	Benzene	Ethyl Benzene	Toluene	(m & p) Xylene	(o) Xylene	Total Xylene	Aldrin + Dieldrin	Chlordane	DDT	Endrin	g-BHC (Lindane)
		m	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			0.01	0.001	0.001	0.0001	0.01	0.0001	0.001	0.001	0.001	0.001	0.0001	0.005	1	2	2	2	2	2	0.5	0.5	2	0.5	0.5
ADWG 2015 Health				**0.01**	**2**	**0.002**	**0.05**			**2**	**0.01**	**0.5**	**0.001**		**1**	**300**	**800**			**600**	**0.3**	**2**	**9**		**10**
ANZECC 2000 Fresh Water (95%)			0.055[#4]	0.013[#2]		0.0002	0.001	0.0033[#5]	0.0028[#5]	0.0014	0.0034	1.9	0.0006	0.008	950			200[#1]	350			0.08	0.01	0.02	0.2
Metals Hardness Modified Trigger Values (HMTV)[#6]	**Very Hard (180-240 mg/L as $CaCO_3$)**					0.00114		0.01617			0.04012			0.0416											
	Extremely Hard (>240 mg/L as $CaCO_3$)					0.002		0.02772			0.09078			0.072											

EPA Designation	Locations ID	Sample Date																							
9	GMW102	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
10	GMW103	14/08/2018	3.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	7.87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	7.52	3.19	< 0.001	0.026	< 0.0001	*< 0.01*	0.004	0.006	0.011	0.006	0.141	< 0.0001	0.027	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	7.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	GMW104	14/08/2018	3.32	7.56	-	0.041	< 0.0001	-	0.005	0.01	0.004	0.392	-	0.023	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	8.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	7.95	12.6	< 0.001	0.038	< 0.0001	*< 0.01*	0.007	0.01	0.026	0.007	**0.624**	< 0.0001	0.044	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	7.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	GMW105	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
13	GMW106	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
15	GMW108D	14/08/2018	2.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	2.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	2.51	0.09	< 0.001	0.017	< 0.0001	*< 0.01*	< 0.001	< 0.001	< 0.001	< 0.001	0.031	< 0.0001	< 0.005	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	2.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	GMW108S	14/08/2018	3.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	2.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	2.94	11.9	0.001	0.209	< 0.0001	*< 0.01*	0.01	0.009	0.039	**0.047**	0.442	< 0.0001	0.047	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	GMW109S	14/08/2018	3.58	3.7	-	0.268	0.0002	-	-	0.044	0.018	**0.017**	**4.62**	-	0.109	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	3.29	5.68	-	0.188	< 0.0002	-	-	0.048	0.016	**0.012**	**3.93**	-	0.074	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	3.44	2.31	< 0.001	0.068	< 0.0001	*< 0.01*	0.003	0.016	0.009	0.004	**1.33**	< 0.0001	0.023	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	3.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	GMW109D	14/08/2018	3.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	3.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	3.25	0.05	< 0.001	0.146	< 0.0001	*< 0.01*	< 0.01	< 0.001	0.003	< 0.001	0.053	< 0.0001	0.006	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	3.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	GMW110	14/08/2018	4.47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	4.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	4.25	2.29	< 0.001	0.008	< 0.0001	*< 0.01*	0.002	0.002	0.011	0.003	0.098	< 0.0001	0.021	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	4.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	GMW111	14/08/2018	5.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	6.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	6.45	6.29	< 0.001	0.031	< 0.0001	*< 0.01*	0.004	0.007	0.016	0.007	0.369	< 0.0001	0.036	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	6.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	GABH01	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	GABH02	14/08/2018	5.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	5.54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	5.37	6.61	< 0.001	0.015	< 0.0001	*< 0.01*	0.005	0.002	0.015	0.004	0.082	< 0.0001	0.035	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	5.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	GABH03	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	GABH06D	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	GABH06S	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	BH6	14/08/2018	2.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	1.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	1.63	0.65	0.005	0.09	< 0.0001	*< 0.01*	0.002	0.008	0.011	0.009	0.87	< 0.0001	0.017	< 1	< 2	< 2	< 2	< 2	< 2	*< 0.5*	*< 0.5*	*< 2*	*< 0.5*	*< 0.5*
		20/05/2019	1.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

#1 As (p) Xylene
#2 As As(V)
#3 As Phenol
#4 For pH>6.5
#5 Low Reliability Trigger Value, See ANZECC 2000, Section 8.3.7
#6 Values derived utilising factors within Table 3.4.4, ANZECC 2000
Italics LOR above applicable guidelines

			OPPs													Pesticides			PAHs				Hydrocarbons	
		Heptachlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Fenamiphos	Parathion	Pirimphos-ethyl	Anthracene	Benzo(a)pyrene	Naphthalene	Polycyclic Aromatic Hydrocarbons (Total)	Total Phenolics	Total Petroleum Hydrocarbons
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
LOR		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	0.5	2	0.5	1	0.5	1	1	0.05	50
ADWG 2015 Health		**0.3**	**30**	**10**	**0.5**	**2**	**10**	**4**	**5**	**7**	**4**	**7**	**70**	**0.7**	**2**	**0.5**	**20**	**0.5**		**0.01**				
ANZECC 2000 Fresh Water (95%)		0.09	0.02				0.01	0.01		0.15			0.05				0.004		0.4		16		0.32[#3]	
Metals Hardness Modified Trigger Values (HMTV)[#6]	**Very Hard (180-240 mg/L as $CaCO_3$)**																							
	Extremely Hard (>240 mg/L as $CaCO_3$)																							
EPA Designation	Locations ID	Sample Date																						
9	GMW102	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
10	GMW103	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	GMW104	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	GMW105	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
13	GMW106	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
15	GMW108D	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	GMW108S	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	GMW109S	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	GMW109D	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	GMW110	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	GMW111	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	GABH01	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	GABH02	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	GABH03	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	GABH06D	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	GABH06S	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	BH6	14/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/11/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		11/02/2019	*< 0.5*	*< 0.5*	< 0.5	< 0.5	< 0.5	*< 0.5*	*< 0.5*	< 0.5	*< 0.5*	< 0.5	< 0.5	*< 0.5*	*< 2*	< 2	< 0.5	*< 2*	< 0.5	*< 1*	*< 0.5*	< 1	< 1	< 0.05	< 50
		20/05/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

#1 As (p) Xylene
#2 As As(V)
#3 As Phenol
#4 For pH>6.5
#5 Low Reliability Trigger Value, See ANZECC 2000, Section 8.3.7
#6 Values derived utilising factors within Table 3.4.4, ANZECC 2000
Italics LOR above applicable guidelines

		Inorganics											Physical Characteristics			
		Alkalinity (as Calcium Carbonate)	Calcium	Magnesium	Potassium	Sodium	Chloride	Fluoride	Sulfate	Nitrate	Nitrite	Nitrogen (Ammonia)	Total Dissolved Solids	Total Organic Carbon	pH	Electrical Conductivity
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH	µS/cm
LOR		1	1	1	1	1	1	0.1	1	0.01	0.01	0.01	1	1	0.01	1
ADWG 2015 Health								**1.5**	**500**	**50**	**3**					
ANZECC 2000 Fresh Water (95%)										7.2		0.9				
Metals Hardness Modified Trigger Values (HMTV)[#6]	**Very Hard (180-240 mg/L as $CaCO_3$)**															
	Extremely Hard (>240 mg/L as $CaCO_3$)															
EPA Designation	Locations ID	Sample Date														
9	GMW102	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
10	GMW103	14/08/2018	430	194	63	< 1	162	482	-	139	-	-	0.06	1280	2	7.1	2160
		8/11/2018	372	172	58	< 1	165	372	-	136	-	-	0.04	1230	2	7.2	1970
		11/02/2019	462	164	0.141	-	163	305	0.4	76	0.26	< 0.01	0.03	978	1	7.1	1820
		20/05/2019	399	166	55	< 1	160	313	-	158	-	-	0.02	1040	1	7.4	1920
11	GMW104	14/08/2018	481	63	38	< 1	162	120	-	65	-	-	0.03	774	2	7.4	1360
		8/11/2018	372	172	58	< 1	165	372	-	136	-	-	0.04	1230	2	7.2	1970
		11/02/2019	468	73	46	-	167	113	0.8	67	0.03	< 0.01	0.03	-	3	7.2	1260
		20/05/2019	399	166	55	< 1	160	313	-	158	-	-	0.02	1040	1	7.4	1920
12	GMW105	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
13	GMW106	14/08/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		8/11/2018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		11/02/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
		20/05/2019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
15	GMW108D	14/08/2018	470	128	82	2	405	673	-	189	-	-	0.02	1670	3	7	3160
		8/11/2018	424	130	86	1	416	739	-	199	-	-	0.34	1870	< 1	6.8	3250
		11/02/2019	490	129	88	<1	408	729	0.7	197	0.01	< 0.01	0.03	1810	2	6.9	3170
		20/05/2019	408	130	83	< 2	396	661	-	247	-	-	0.05	1820	1	7	3380
14	GMW108S	14/08/2018	447	112	75	2	313	577	-	165	-	-	0.16	1380	4	7	2770
		8/11/2018	319	88	52	5	211	331	-	107	-	-	0.08	1610	5	7	1790
		11/02/2019	379	89	54	6	203	350	0.4	99	< 0.01	< 0.01	0.12	982	12	6.9	1800
		20/05/2019	260	70	39	5	170	242	-	68	-	-	0.21	836	4	7	1460
16	GMW109S	14/08/2018	211	77	49	2	157	368	-	95	-	-	0.55	886	5	6.2	1630
		8/11/2018	254	78	51	2	168	353	-	115	-	-	0.34	974	< 1	6.3	1590
		11/02/2019	223	28	18	1	61	299	< 0.1	109	< 0.01	< 0.01	0.38	814	8	6.3	1460
		20/05/2019	195	77	48	2	159	320	-	135	-	-	0.66	853	2	6.5	1570
19	GMW109D	14/08/2018	234	92	48	1	186	359	-	25	-	-	0.09	1040	< 1	6.9	1820
		8/11/2018	207	98	49	1	190	492	-	23	-	-	0.11	1260	< 1	6.9	1830
		11/02/2019	233	95	50	1	188	485	0.4	24	0.71	< 0.01	0.03	994	< 1	6.9	1840
		20/05/2019	200	98	50	1	188	466	-	21	-	-	0.11	1170	< 1	7.1	1830
17	GMW110	14/08/2018	610	204	153	1	454	1910	-	324	-	-	0.02	2460	2	6.8	4370
		8/11/2018	506	208	162	2	480	1050	-	329	-	-	0.02	2820	< 1	6.9	4340
		11/02/2019	618	211	160	2	466	996	0.5	286	0.57	< 0.01	0.02	2350	7	6.8	4380
		20/05/2019	508	212	155	2	457	942	-	400	-	-	0.01	2720	1	6.9	4710
18	GMW111	14/08/2018	610	126	99	1	420	800	-	217	-	-	0.02	1930	1	7	3490
		8/11/2018	466	114	93	< 1	418	708	-	180	-	-	0.02	1920	< 1	7.1	3210
		11/02/2019	560	125	99	< 1	409	700	0.5	108	0.01	< 0.01	0.03	1650	2	6.8	3230
		20/05/2019	450	134	101	< 1	416	727	-	246	-	-	0.01	1820	1	7.1	3670
2	GABH01	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	GABH02	14/08/2018	1100	295	181	2	583	1180	-	166	-	-	0.02	2830	6	6.8	5420
		8/11/2018	983	303	196	2	645	1270	-	163	-	-	0.02	3380	2	6.6	5490
		11/02/2019	1130	310	188	3	584	1220	0.6	174	< 0.01	< 0.01	0.04	2870	8	6.6	5430
		20/05/2019	870	310	188	3	599	1180	-	211	-	-	0.03	3030	1	6.9	5940
6	GABH03	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	GABH06D	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	GABH06S	Decomissioned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	BH6	14/08/2018	728	118	119	< 1	747	1120	-	270	-	-	0.2	2520	6	6.9	5060
		8/11/2018	650	118	65	4	312	361	-	315	-	-	0.44	1560	31	7	2440
		11/02/2019	426	101	33	9	119	66	0.6	117	0.02	0.02	0.28	744	28	7	1180
		20/05/2019	473	73	51	3	290	331	-	146	-	-	0.23	1110	13	7.1	1910

#1 As (p) Xylene
#2 As As(V)
#3 As Phenol
#4 For pH>6.5
#5 Low Reliability Trigger Value, See ANZECC 2000, Section 8.3.7
#6 Values derived utilising factors within Table 3.4.4, ANZECC 2000
Italics LOR above applicable guidelines

Results Table 2: Stormwater Results
2018-2019 Reporting Period

	Alkalinity (as Calcium Carbonate)	Ammonia	Calcium	Chloride	Conductivity	Dissolved Oxygen	Dissolved Oxygen Saturation #1	Filterable Iron	Fluoride	Magnesium	Nitrate	Potassium	Sodium	Sulfate	Temperature	Total Phenolics	Total Organic Carbon	Total Suspended Solids	pH
	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	% Saturation	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	oC	mg/L	mg/L	mg/L	pH
LOR	1	0.01	1	1	1	0.01		0.05	0.1	1	0.01	1	1	1	1	0.05	1	1	0.01
ADWG 2015 Health									**1.5**		**50**			**500**					
ANZECC 2000 Fresh Water (95%)											0.7					0.32 #2			
ANZECC 2000 SE Australia Lowland River Physical Characteristics					125-2200		85-110												6.5-8.0
EPL 5862 Discharge Point (Point 1) Criteria																		50	6.5-8.5

EPA Designation	Locations ID	Sample Date																	
1	Discharge Point	11/10/2018	211	0.08	40	181	973	8.43	87	1.28	0.4	26	0.34	10	132	67	17	< 0.05	26	27	8.3
		11/02/2019	208	0.11	49	102.00	719	6.41	71	0.12	0.4	22	0.11	3	73	18	20.1	< 0.05	11	21	7.8
33	Upstream	11/10/2018	88	0.06	22	26	277	8.46	88	0.8	0.1	7	0.06	2	26	17	17.4	< 0.05	4	< 5	7.5
		11/02/2019	92	0.05	15	19	201	5.2	59	0.27	0.1	4	0.03	2	21	12	21.1	< 0.05	6	10	7.1
34	Downstream	11/10/2018	164	0.04	46	55	554	11	115	0.24	0.1	19	0.02	4	42	34	17.4	< 0.05	3	5	8.3
		11/02/2019	202	0.02	48	49	551	4.31	47	0.09	0.2	21	< 0.01	4	42	23	19.7	< 0.05	7	9	7.4

#1 Calculated assuming elevation of 20mAHD
#2 As Phenol

		Total Dissolved Solids	Suspended Solids (SS)	Ammonia as N	pH	Temperature
LOR		1	1	0.01	0.01	1
ANZECC 2000 Fresh Water (95%)				0.9		
ANZECC 2000 SE Australia Lowland River Physical Characteristics				0.02	6.5-8.0	
Locations ID	Sample Date					
Balance Tank	19/06/2018	7630	163	0.3	8.6	14.5
Balance Tank	25/06/2018	4690	385	7.7	8.1	14.1
Balance Tank	2/07/2018	8.9	110	< 0.1	8.9	16.5
Balance Tank	9/07/2018	6660	100	< 0.1	8.8	15.2
Balance Tank	16/07/2018	6510	143	< 0.1	9	13
Balance Tank	23/07/2018	8040	180	0.3	9	11.2
Balance Tank	30/07/2018	466	93	46.6	7.3	14.2
Balance Tank	6/08/2018	7370	139	1.5	8.8	13.8
Balance Tank	20/08/2018	5950	165	< 0.1	8.6	12.2
Balance Tank	27/08/2018	6830	101	2.8	8.6	14.2
Balance Tank	3/09/2018	7940	111	0.6	8.3	14.5
Balance Tank	10/09/2018	6660	125	0.6	8.6	19.1
Balance Tank	24/09/2018	7920	99	< 0.1	8.5	17
Balance Tank	4/10/2018	7720	62	< 0.1	8.4	18
Balance Tank	8/10/2018	6030	111	10.4	8.4	19.2
Balance Tank	15/10/2018	7310	88	3.6	8.1	18.9
Balance Tank	22/10/2018	3830	183	0.9	8.4	20.6
Balance Tank	29/10/2018	5250	47	0.6	8.8	20.8
Balance Tank	5/11/2018	6660	80	0.6	8.7	25.6
Balance Tank	12/11/2018	5400	49	1.5	1.5	25
Balance Tank	19/11/2018	7060	64	0.6	8.7	20.8
Balance Tank	26/11/2018	7020	107	< 0.1	8.7	21
Balance Tank	3/12/2018	6110	215	< 0.1	7.8	23.7
Balance Tank	10/12/2018	4060	80	1.8	8.2	26.7
Balance Tank	17/12/2018	6330	48	2	7.9	25.4
Balance Tank	7/01/2019	7400	164	< 0.1	8.4	26.3
Balance Tank	14/01/2019	7180	56	0.3	8.2	-
Balance Tank	4/02/2019	7030	30	< 0.1	8.2	30.2
Balance Tank	11/02/2019	6710	51	< 0.1	8.7	30.3
Balance Tank	18/02/2019	6940	26	< 0.1	8.4	25.2
Balance Tank	25/02/2019	7430	46	< 0.1	8.3	22.8
Balance Tank	1/03/2019	9010	19	< 0.1	8.2	38.2
Balance Tank	11/03/2019	8340	30	< 0.1	8.1	24.9
Balance Tank	18/03/2019	7230	47	< 0.1	8	22.7
Balance Tank	25/03/2019	5870	43	< 0.1	8.2	23.3
Balance Tank	1/04/2019	4700	28	0.3	8.6	18.4
Balance Tank	9/04/2019	5600	19	< 0.1	8.9	25.1
Balance Tank	15/04/2019	5720	24	< 0.1	7.5	20.2
Balance Tank	23/04/2019	5730	26	< 0.1	9	22.6
Balance Tank	30/04/2019	6280	23	0.3	9.1	18.5
Balance Tank	6/05/2019	6270	36	< 0.1	8.4	17.1
Balance Tank	13/05/2019	6770	40	< 0.1	8.3	16.1
Balance Tank	20/05/2019	6890	29	4	9.1	4
Eastern Arm Collection Well	19/06/2018	9250	731	1730	8.4	34.6
Eastern Arm Collection Well	25/06/2018	8010	190	1700	8.1	32.3
Eastern Arm Collection Well	2/07/2018	8.1	310	1760	8.1	33.1
Eastern Arm Collection Well	9/07/2018	5720	264	1740	8.2	30.8
Eastern Arm Collection Well	16/07/2018	7240	226	1820	8.4	34.2
Eastern Arm Collection Well	23/07/2018	9880	166	1740	8.1	30.4
Eastern Arm Collection Well	30/07/2018	9430	925	1630	8.1	26.2
Eastern Arm Collection Well	6/08/2018	9080	334	1780	8.3	28
Eastern Arm Collection Well	20/08/2018	7390	20	1750	8.1	32.2
Eastern Arm Collection Well	27/08/2018	6050	131	1920	8.2	32.2
Eastern Arm Collection Well	3/09/2018	8980	26	1850	8.2	29.8
Eastern Arm Collection Well	10/09/2018	9260	75	1860	8.1	34
Eastern Arm Collection Well	24/09/2018	9020	187	1930	8.1	34.7
Eastern Arm Collection Well	4/10/2018	7550	432	1780	8.1	35.2
Eastern Arm Collection Well	8/10/2018	7300	13	1830	8.1	32.8
Eastern Arm Collection Well	15/10/2018	9620	11	1790	8	37
Eastern Arm Collection Well	22/10/2018	8270	10	1620	8.1	30.4
Eastern Arm Collection Well	29/10/2018	8010	12	1630	8.1	32.8
Eastern Arm Collection Well	29/10/2018	8010	12	1630	8.1	32.8
Eastern Arm Collection Well	5/11/2018	5230	5	1680	8	35.3
Eastern Arm Collection Well	12/11/2018	7450	6	1680	-	37.3
Eastern Arm Collection Well	19/11/2018	8940	10	1590	8	37.8

	Total Dissolved Solids	Suspended Solids (SS)	Ammonia as N	pH	Temperature
LOR	1	1	0.01	0.01	1
ANZECC 2000 Fresh Water (95%)			0.9		
ANZECC 2000 SE Australia Lowland River Physical Characteristics			0.02	6.5-8.0	

Locations ID	Sample Date					
Eastern Arm Collection Well	26/11/2018	10200	5	1710	8.2	32
Eastern Arm Collection Well	3/12/2018	7930	138	1720	8	32.4
Eastern Arm Collection Well	10/12/2018	7670	14	1540	8	36.1
Eastern Arm Collection Well	17/12/2018	8630	9	1610	8	34.8
Eastern Arm Collection Well	7/01/2019	7550	26	1760	8.1	37.8
Eastern Arm Collection Well	14/01/2019	8700	85	1720	8.2	-
Eastern Arm Collection Well	4/02/2019	9110	<5	1750	8	35.9
Eastern Arm Collection Well	11/02/2019	8570	45	1790	7.9	30.3
Eastern Arm Collection Well	18/02/2019	8800	37	1620	8.2	38.5
Eastern Arm Collection Well	25/02/2019	8750	22	1760	8.2	37.8
Eastern Arm Collection Well	1/03/2019	7500	<5	1730	8	24.8
Eastern Arm Collection Well	11/03/2019	8960	20	1820	8	38.4
Eastern Arm Collection Well	18/03/2019	9280	10	1770	8.1	37.3
Eastern Arm Collection Well	25/03/2019	8230	9	1730	8.1	35.6
Eastern Arm Collection Well	1/04/2019	7190	14	1730	8.2	36.7
Eastern Arm Collection Well	9/04/2019	8470	110	1770	8.1	35.3
Eastern Arm Collection Well	15/04/2019	8670	87	1740	8.5	36.2
Eastern Arm Collection Well	23/04/2019	8060	54	1760	8.3	31.4
Eastern Arm Collection Well	30/04/2019	8280	14	1730	8.1	33.6
Eastern Arm Collection Well	6/05/2019	6690	14	1540	8.2	32.5
Eastern Arm Collection Well	13/05/2019	8790	39	1640	8.5	27
Eastern Arm Collection Well	20/05/2019	8220	<5	1670	8.2	33
Pond P1	19/06/2018	5800	508	157	6.6	11.9
Pond P1	25/06/2018	4710	424	151	6.4	12.4
Pond P1	2/07/2018	7.7	273	174	7.7	14
Pond P1	9/07/2018	3960	314	143	6.4	13.4
Pond P1	16/07/2018	5280	260	145	6.7	13
Pond P1	23/07/2018	5850	288	175	6.5	9.2
Pond P1	30/07/2018	5650	260	175	6	12
Pond P1	6/08/2018	5500	243	190	6.4	12.4
Pond P1	20/08/2018	5560	230	208	6.4	13.8
Pond P1	27/08/2018	6130	182	235	6.6	13.6
Pond P1	3/09/2018	5280	151	235	6.3	13.8
Pond P1	10/09/2018	6130	109	202	6	18.3
Pond P1	17/09/2018	-	-	-	-	-
Pond P1	24/09/2018	6620	218	204	6	17
Pond P1	4/10/2018	7160	220	207	5.8	19.3
Pond P1	8/10/2018	5160	232	174	6.7	18.5
Pond P1	15/10/2018	5120	190	134	5.6	17.1
Pond P1	22/10/2018	3390	175	119	5.5	21.1
Pond P1	29/10/2018	4100	162	119	5	21.7
Pond P1	5/11/2018	4680	111	134	5.1	25.9
Pond P1	12/11/2018	3830	184	128	128	24.1
Pond P1	19/11/2018	6210	234	136	5.2	20.5
Pond P1	26/11/2018	6730	394	142	5.1	20.1
Pond P1	3/12/2018	5350	212	113	5.5	22.8
Pond P1	10/12/2018	4000	168	120	5.1	26
Pond P1	17/12/2018	5640	93	127	5.2	26.2
Pond P1	7/01/2019	6310	63	145	5.8	24.7
Pond P1	14/01/2019	5960	58	130	5.6	-
Pond P1	4/02/2019	5200	50	130	5.9	27.7
Pond P1	11/02/2019	5760	67	134	5.7	27.3
Pond P1	18/02/2019	6780	83	122	5.5	25.9
Pond P1	25/02/2019	7180	47	143	5.9	22.5
Pond P1	1/03/2019	6630	47	148	5.6	24.7
Pond P1	11/03/2019	7010	86	154	5	24.7
Pond P1	18/03/2019	6090	77	100	6.6	23.1
Pond P1	25/03/2019	4370	46	97.1	7.4	23.8
Pond P1	1/04/2019	4760	72	43.3	5.9	18.6
Pond P1	9/04/2019	4760	79	46.1	6.2	22.7
Pond P1	15/04/2019	4820	84	51.9	7.5	20
Pond P1	23/04/2019	4960	86	69.2	6	23.1
Pond P1	30/04/2019	5360	50	75	6.1	18.3
Pond P1	6/05/2019	4370	81	89.4	6.2	17.2
Pond P1	13/05/2019	4950	115	98	6.2	15.8

		Total Dissolved Solids	Suspended Solids (SS)	Ammonia as N	pH	Temperature
LOR		1	1	0.01	0.01	1
ANZECC 2000 Fresh Water (95%)				0.9		
ANZECC 2000 SE Australia Lowland River Physical Characteristics				0.02	6.5-8.0	
Locations ID	Sample Date					
Pond P1	20/05/2019	5560	102	110	6.3	17.7
Pond S1	19/06/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	25/06/2018	1400	8	2	7	10.2
Pond S1	2/07/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	9/07/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	16/07/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	23/07/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	30/07/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	6/08/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	20/08/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	27/08/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	3/09/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	10/09/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	24/09/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	4/10/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	8/10/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	15/10/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	22/10/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	29/10/2018	Dry	Dry	Dry	Dry	Dry
Pond S1	5/11/2018	3530	74	113	6	26.6
Pond S1	12/11/2018	4520	30	104	104	24.8
Pond S1	19/11/2018	4570	14	113	6.3	20.3
Pond S1	26/11/2018	3440	108	101	7.2	20.4
Pond S1	3/12/2018	4060	25	83.1	7.4	23.3
Pond S1	10/12/2018	3790	61	88.4	5.3	24.9
Pond S1	17/12/2018	4410	35	85.8	5.2	25.2
Pond S1	7/01/2019	4490	8	59.4	6.8	24.5
Pond S1	14/01/2019	3470	10	74.2	7	-
Pond S1	4/02/2019	3940	32	62.3	5.6	28.7
Pond S1	11/02/2019	3780	37	61.2	5.7	29.4
Pond S1	18/02/2019	4280	15	58.2	6.1	25.8
Pond S1	25/02/2019	4270	14	67	6.5	22.5
Pond S1	1/03/2019	3840	13	55.3	5.9	25
Pond S1	11/03/2019	4510	21	69.6	5.3	24.7
Pond S1	18/03/2019	3740	14	38.6	5.7	21.4
Pond S1	25/03/2019	2860	7	48.6	5.2	22.5
Pond S1	1/04/2019	2960	40	47.6	5.2	17.8
Pond S1	9/04/2019	4440	14	49	5.2	22.2
Pond S1	15/04/2019	3600	5	44.7	5.2	20.9
Pond S1	23/04/2019	3060	8	44.7	4.7	22.7
Pond S1	30/04/2019	3490	10	43.3	5.1	18.1
Pond S1	6/05/2019	3140	6	44.7	4.9	17.6
Pond S1	13/05/2019	3260	48	41.8	4.6	15.8
Pond S1	20/05/2019	3250	15	41.8	4.9	18.5

Results Table 4: Trade Waste Results 2018-2019 Reporting Period

	Discharge Measurements			Samples								Maximum Daily Mass (Calculated)			
	Meter Reading (start)	Meter Reading (finish)	Volume Dishcharged	Discrete Start pH (start)	Ammonia as N	Suspended Solids (SS)	Total Dissolved Solids	Biochemical oxygen Demand	Electrical Conductivty	pH Finish	Temperature.	Ammonia	Suspended Solids	Total Dissolved Solids	Biochemical Oxygen Demand
	L	L	L	pH unit	mg/L	mg/L	mg/L	mg/L	µS/cm	pH unit	°C	kg/day	kg/day	kg/day	kg/day
Acceptance Standard			605kL / day	7.0-10.0	100	600	10,000			7.0-10.0	< 38				
MDM												36	150	2,500	80
LTADM												3.98	19.5	683.1	7.2

Location	Date															
Trade Waste Discharge Point	29/05/2018	280810	280873	63.00	8.5	0.6	34	6160	27	9480	8.6	17	0.04	2.14	388.08	1.7010000
	13/06/2018	282265	282318	53.00	8.8	0.6	78	4580	46	7050	8.3	16	0.03	4.91	288.54	2.8980000
	5/07/2018	284430	284480	50.00	8.4	0.1	77	6310	38	9710	8.46	12	0.01	4.85	397.53	2.3940000
	27/07/2018	285664	285711	47.00	8.6	0.1	239	6820	25	10500	8.8	10	0.00	15.06	429.66	1.5750000
	28/08/2018	286864	286870	6.00	8.6	24.6	82	3560	54	5470	8.6	13	0.15	5.17	224.28	3.4020000
	12/09/2018	287937	287998	61.00	8.4	0.6	119	7670	22	11800	8.4	18	0.04	7.50	483.21	1.3860000
	4/10/2018	289092	289186	94.00	8.4	0.1	176	8380	31	12900	8.5	18	0.01	11.09	527.94	1.9530000
	22/10/2018	291803	291848	45.00	8.5	0.1	82	6760	2	10400	8.6	21	0.00	5.17	425.88	0.1260000
	14/11/2018	292885	292944	59.00	9.2	0.6	39	7080	2	10900	9	22	0.04	2.46	446.04	0.1260000
	14/12/2018	295440	295525	85.00	8.3	0.3	39	5490	8	8440	8.3	27	0.03	2.46	345.87	0.5040000
	7/01/2019	296673	296733	60.00	8.3	0.1	34	6890	5	10600	8.1	26	0.01	2.14	434.07	0.3150000
	29/01/2019	298532	298591	59.00	8	0.9	19	6440	14	9910	8	29	0.05	1.20	405.72	0.8820000
	19/02/2019	299881	299913	32.00	8.6	0.1	16	6440	2	9910	8.3	26	0.00	1.01	405.72	0.1260000
	12/03/2019	300556	300596	40.00	8.3	0.1	23	7740	3	11900	8.3	25	0.00	1.45	487.62	0.1890000
	5/04/2019	304306	304385	79.00	8.5	0.3	14	5230	4	8050	8.2	19	0.02	0.88	329.49	0.2520000
	29/04/2019	305521	305570	49.00	9.1	0.1	59	5540	15	8520	9	18	0.00	3.72	349.02	0.9450000
	20/05/2018	306343	306367	24.00	9.1	0.9	38	6760	29	10400	8.6	21	0.02	2.39	425.88	1.8270000
	2018/2019 LTADM			-	-	-	-	-	-	-	-		0.03	4.33	399.68	1.21

MDM Maximum Daily Mass — Equal to the average daily concentration (mg/L) multiplied by the total discharge (kL) and converted to kilograms

LTADM Long Term Average Daily Mass — Arithmetic average of all daily mass discharges

	CH4	CH4 Peak	CO2	CO2 peak	Bal	Int Flow	Baro	Relative Pressure	SWL	Well Depth
	% v/v	% v/v	% v/v	% v/v	%	l/h	mb	mb	metres	metres
NSW EPA (2016) Solid Waste Landfills	1 % v/v	1 % v/v	1.5 % v/v	1.5 % v/v						

EPA Designation	Location ID	Date									
21	LFGMW1	12/06/2018	0.0003	-	-	-	-	-	-	-	-
		18/07/2018	0.0003	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	0.1	6.3	6.5	77.4	0.2	1016	0.03	4.5	10.17
		14/08/2018	< 0.1	< 0.1	6.3	6.3	77	0.3	1018	0.02	4.76	10.18
		12/09/2018	< 0.1	< 0.1	8.8	8.8	77.3	0.04	1018	0.03	4.63	10.16
		16/10/2018	< 0.1	< 0.1	8.8	8.8	79.2	0.5	1020	0.07	4.75	10.18
		26/11/2018	0	0	4.1	4.1	80	0.6	1004	0.02	4.6	10.17
		5/12/2018	< 0.1	< 0.1	-	10.5	80.6	0	1007	0.03	4.06	10.2
		16/01/2019	0	0	8.6	8.6	79.6	0.2	1007	0.04	4.1	10.3
		22/02/2019	< 0.1	< 0.1	7.3	7.3	78.9	0.2	1.19	0.03	4.45	10.18
		28/03/2019	< 0.1	< 0.1	7.8	7.8	81.6	0	1007	-0.02	5.54	10.18
		16/04/2019	< 0.1	< 0.1	8.4	8.4	80.7	0	1007	-0.02	5.54	10.18
		8/05/2019	< 0.1	< 0.1	8.7	11.8	79.1	0	1009	-0.02	5.6	10.18
22	LFGMW2	12/06/2018	0.0003	-	-	-	-	-	-	-	-	-
		18/07/2018	0.0003	-	-	-	-	-	-	-	-	-
		1/08/2018	0.1	0.1	0.1	0.1	79.1	0.3	1013	-0.05	Dry	10.37
		14/08/2018	< 0.1	< 0.1	0.2	0.2	79.4	0.5	1017	0	Dry	10.37
		12/09/2018	< 0.1	< 0.1	0.1	0.1	79.3	0.1	1016	-0.05	Dry	10.36
		16/10/2018	< 0.1	< 0.1	4.1	4.1	83.2	0.4	10180	0.1	Dry	10.7
		26/11/2018	0	0	0.4	0.4	79.5	0.6	1003	0.07	Dry	0.1
		5/12/2018	< 0.1	< 0.1	6.4	6.4	82.1	0.3	1005	0.03	Dry	10.35
		16/01/2019	0	0	6.5	6.5	82.8	0	1006	0	Dry	10.35
		22/02/2019	0.1	0.1	2.6	2.6	811	0.3	1017	0.05	Dry	10.36
		28/03/2019	0.1	0.1	7.6	7.6	81.9	0.2	1009	0.05	Dry	10.36
		16/04/2019	0.1	0.1	6.1	6.1	81.7	0.2	1009	0.05	Dry	10.36
		8/05/2019	0.1	0.1	7.8	7.8	80.6	0.2	1006	0	Dry	10.36
23	LFGMW3	12/06/2018	0.0003	-	-	-	-	-	-	-	-	-
		18/07/2018	0.0004	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	0.1	2	2.1	79.4	0.2	1010	0	5.85	10.54
		14/08/2018	< 0.1	0.1	2.1	2.3	79.9	0.1	1014	0.07	6.04	10.54
		12/09/2018	< 0.1	< 0.1	2.4	2.4	79.5	0.2	1012	-0.05	6.16	10.54
		16/10/2018	< 0.1	< 0.1	3.6	3.6	80.4	0.04	1015	0.05	6.33	10.55
		26/11/2018	0	0	3.1	3.1	79.7	0.5	999	0.05	6.15	10.54
		5/12/2018	< 0.1	< 0.1	3.6	3.5	79.1	0.2	1005	0.05	6.45	10.52
		16/01/2019	0	0	4.2	4.2	81.9	0	1002	0.03	6.72	10.55
		22/02/2019	0.1	0.1	2.2	2.2	79.3	0.2	1014	0.03	7.98	10.52
		28/03/2019	0.1	0.1	5	5	80.5	0.1	1006	-0.02	5.8	10.52
		16/04/2019	0.1	0.1	3.9	4	79.9	0.1	1006	0.02	5.8	10.52
		8/05/2019	0.1	0.1	4	6.2	79.1	0.1	1007	0.01	5.86	10.52
24	LFGMW4	12/06/2018	0.0003	-	-	-	-	-	-	-	-	-
		18/07/2018	0.0006	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	< 0.1	4.6	4.6	79.1	0.2	1009	-0.03	Dry	9.26
		14/08/2018	< 0.1	< 0.1	4.7	4.7	80	0	1013	-0.01	Dry	9.26
		12/09/2018	< 0.1	< 0.1	5.2	5.2	79.1	0.2	1012	0.07	Dry	9.26
		16/10/2018	< 0.1	< 0.1	4.5	4.5	79.6	0.4	1014	0	Dry	9.25
		26/11/2018	0	0	4.7	4.7	80.8	0.5	999	0.02	Dry	9.24
		5/12/2018	< 0.1	< 0.1	5.7	5.7	79.8	0.2	1001	0.02	Dry	9.23
		16/01/2019	0	0	3.4	3.4	81.9	-0.1	1001	-0.05	Dry	9.24
		22/02/2019	0.1	0.1	0.3	0.3	79.6	0.1	1013	0.02	Dry	9.27
		28/03/2019	0.1	0.1	6.2	6.2	80	0.2	1006	0.07	Dry	9.27
		16/04/2019	0.1	0.1	4.6	4.6	79.9	0.2	1006	0.07	Dry	9.27
		8/05/2019	0.1	0.01	9.6	9.8	79.6	0.1	1004	0.03	Dry	9.27
25	LFGMW5	12/06/2018	0.0005	-	-	-	-	-	-	-	-	-
		18/07/2018	0.0005	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	< 0.1	0.1	0.1	79.7	0	1009	0	11.9	12
		14/08/2018	< 0.1	< 0.1	5.4	5.4	80.6	0	1012	0.05	11.9	12
		12/09/2018	< 0.1	< 0.1	3.6	3.7	80.7	0.2	1011	0.05	Dry	12.04
		16/10/2018	< 0.1	< 0.1	3.4	3.4	80.6	0.4	1013	0	11.84	12.04
		26/11/2018	0	0	2.8	2.8	80.6	0.6	998	0.02	Dry	12.56
		5/12/2018	< 0.1	< 0.1	2.1	2.1	80.3	0.2	1000	0.07	Dry	12.03
		16/01/2019	0	0	2.5	2.5	81.9	0	1001	-0.03	Dry	12.03
		22/02/2019	0.1	0.1	0.3	0.3	79.8	0.2	1013	0.03	Dry	12.02
		28/03/2019	0.1	0.1	2.7	2.7	80.9	0.1	6	-0.03	Dry	12.02
		16/04/2019	0.1	0.1	2	2	80.5	0.1	1006	-0.03	Dry	12.02
		8/05/2019	0.1	0.1	4.8	4.9	81.1	0.1	1002	-0.03	Dry	12.02

	CH4	CH4 Peak	CO2	CO2 peak	Bal	Int Flow	Baro	Relative Pressure	SWL	Well Depth
	% v/v	% v/v	% v/v	% v/v	%	l/h	mb	mb	metres	metres
NSW EPA (2016) Solid Waste Landfills	1 % v/v	1 % v/v	1.5 % v/v	1.5 % v/v						

EPA Designation	Location ID	Date									
26	LFGMW6	12/06/2018	0.0003	-	-	-	-	-	-	-	-
		18/07/2018	0.0006	-	-	-	-	-	-	-	-
		1/08/2018	0.1	0.1	0.1	0.1	79.3	0.2	1008	0.02	Dry	10.85
		14/08/2018	0.1	0.1	0.3	0.3	79.9	0	1012	0.07	Dry	10.85
		12/09/2018	0.1	0.1	0.4	0.4	80.1	0.2	1011	0.05	Dry	10.86
		16/10/2018	0.1	0.1	3.7	3.7	80.7	0.1	1013	0.03	Dry	10.87
		26/11/2018	0	0	1.9	1.9	80.6	0.6	997	0.03	Dry	10.86
		5/12/2018	0.1	0.1	0.1	0.1	79.7	0.2	1000	0.03	Dry	10.84
		16/01/2019	0	0	1.6	1.6	81.3	0	1001	-0.05	Dry	10.86
		22/02/2019	0.1	0.1	0.4	0.4	79.9	0	1013	0.03	Dry	10.85
		28/03/2019	0.1	0.1	4.5	4.5	80.4	0.2	1005	-0.03	Dry	10.85
		16/04/2019	0.1	0.1	2.4	2.4	80.1	0.2	1005	-0.03	Dry	10.85
		8/05/2019	0.1	0.1	0.1	1.6	80.4	0	1002	0.02	Dry	10.85
27	LFGMW7	12/06/2018	0.0023	-	-	-	-	-	-	-	-	-
		18/07/2018	0.0007	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	< 0.1	0.2	0.8	79.4	0.3	1009	0	8.87	12.3
		14/08/2018	< 0.1	< 0.1	0.2	1.2	80.1	0	1013	0	8.66	12.3
		12/09/2018	< 0.1	< 0.1	0.4	2.2	79.9	0.3	1011	0.07	8.67	12.32
		16/10/2018	< 0.1	< 0.1	1.3	2.6	80.1	0.1	1014	0.05	8.71	12.3
		26/11/2018	0	0	0.5	1.8	80.5	0.6	998	0.02	8.47	12.33
		5/12/2018	< 0.1	< 0.1	0.2	1.3	79.5	0.2	1000	0.1	8.56	12.3
		16/01/2019	0	0	0.3	2.4	81.3	0	1002	0.01	8.44	12.33
		22/02/2019	0.1	0.1	0.1	0.1	80	0.3	1014	0.02	8.63	12.33
		28/03/2019	0.1	0.1	1	2.5	80.4	0.1	1005	-0.02	8.61	12.33
		16/04/2019	0.1	0.1	0.6	1.6	80.1	0.1	1005	-0.02	8.61	12.35
		8/05/2019	0.1	0.1	0.6	1.1	80.1	0.1	1003	0.02	8.7	12.33
28	LFGMW8	12/06/2018	0.0011	-	-	-	-	-	-	-	-	-
		18/07/2018	0.0009	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	< 0.1	0.3	0.5	79.9	0.3	1009	-0.03	7.85	10.3
		14/08/2018	< 0.1	< 0.1	0.3	0.4	79.9	0.1	1013	0.03	7.81	10.3
		12/09/2018	0.1	0.1	0.3	0.4	80.5	4.5	1012	0.1	9.4	10.4
		16/10/2018	< 0.1	< 0.1	2.3	2.3	80.5	8.5	1014	0	7.7	10.4
		26/11/2018	0	0	0.3	0.7	80.5	0.1	998	0.02	8.89	10.39
		5/12/2018	< 0.1	< 0.1	1.2	1.6	79.9	6.6	1001	0.12	7.72	10.37
		16/01/2019	0	0	1.6	1.6	80.4	-0.3	1002	0	7.63	10.5
		22/02/2019	0.1	0.1	0.1	0.1	79.6	4.1	1013	-0.02	8.97	10.37
		28/03/2019	0.1	0.1	1	1.8	80.6	-1.6	1006	-0.05	7.67	10.37
		16/04/2019	0.1	0.1	0.8	1.3	80.2	-1.6	1006	-0.05	7.67	10.37
		8/05/2019	0.1	0.1	0.9	1	80	0.1	1003	0	7.73	10.37
29	LFGMW9	12/06/2018	0.0012	-	-	-	-	-	-	-	-	-
		18/07/2018	0.0004	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	< 0.1	1.5	1.5	80	0.4	1010	0	6.59	10.72
		14/08/2018	< 0.1	< 0.1	0.1	1.1	79.9	0.2	1013	0.02	6.78	10.72
		12/09/2018	< 0.1	< 0.1	1.8	1.9	81.1	0.2	1012	0.09	5.45	10.74
		16/10/2018	< 0.1	< 0.1	2.6	2.6	82.9	10.1	1014	0	1.26	10.75
		26/11/2018	0	0	3.4	3.4	79.8	0.4	998	0.02	6.42	10.75
		5/12/2018	< 0.1	< 0.1	5.3	5.3	80.9	0.1	1001	0.03	6.2	10.7
		16/01/2019	0	0	5	5	82.7	0.2	1002	0.02	5.67	10.7
		22/02/2019	0.1	0.1	6.5	6.6	78.1	0.3	1014	0.03	6.63	10.7
		28/03/2019	0.1	0.1	5.8	5.8	83	0	1006	-0.03	6.44	10.7
		16/04/2019	0.1	0.1	5.9	5.9	81.3	0	1006	-0.03	6.44	10.7
		8/05/2019	0.1	0.1	4	4.1	79.1	0.1	1004	0.02	6.51	10.7
30	LFGMW10	12/06/2018	No Access	-	-	-	-	-	-	-	-	-
		18/07/2018	No Access	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	< 0.1	1.1	1.2	79	0.3	1010	0.02	10.87	12.39
		14/08/2018	< 0.1	< 0.1	1.4	2.1	79.8	0.3	1012	0.01	11.05	12.38
		12/09/2018	< 0.1	< 0.1	0.8	0.8	80.3	0.2	1012	0.07	10.68	12.4
		16/10/2018	< 0.1	< 0.1	1.9	1.9	80.5	0.1	1014	0.02	10.82	12.4
		26/11/2018	0	0	3.5	3.5	81.4	6	999	0.02	10.61	12.39
		5/12/2018	< 0.1	< 0.1	5.3	3.3		0.1	1001	0.07	10.32	12.38
		16/01/2019	0	0	4.3	4.3	82.3	0.1	1003	0.02	10.9	12.68
		22/02/2019	0.1	0.1	3.8	3.9	78.5	0.1	1014	0.05	10.85	12.38
		28/03/2019	0.1	0.1	2.2	3.2	80.9	0	1006	0.02	10.68	12.38
		16/04/2019	0.1	0.1	3.4	3.4	80.1	0	1006	0.02	10.68	12.38
		8/05/2019	0.1	0.1	2.3	2.4	79.9	0	1004	-0.03	10.7	12.38

	CH4	CH4 Peak	CO2	CO2 peak	Bal	Int Flow	Baro	Relative Pressure	SWL	Well Depth
	% v/v	% v/v	% v/v	% v/v	%	l/h	mb	mb	metres	metres
NSW EPA (2016) Solid Waste Landfills	1 % v/v	1 % v/v	1.5 % v/v	1.5 % v/v						

EPA Designation	Location ID	Date										
31	LFGMW11	12/06/2018	No Access	-	-	-	-	-	-	-	-	-
		18/07/2018	No Access	-	-	-	-	-	-	-	-	-
		1/08/2018	< 0.1	< 0.1	4.4	4.9	80.4	0.3	1010	-0.02	6.2	9.4
		14/08/2018	< 0.1	< 0.1	8	8.2	82.9	0.3	1013	0.02	6.32	9.4
		12/09/2018	< 0.1	< 0.1	10.8	10.8	84.6	0.2	1013	0.03	5.58	9.4
		16/10/2018	< 0.1	< 0.1	9.3	9.3	81.1	0.1	1013	0.03	4.96	9.43
		26/11/2018	0	0	7.3	7.3	82.9	0.6	999	0.02	5.89	9.41
		5/12/2018	< 0.1	< 0.1	8.7	8.7	84.7	0.2	1001	0.03	5.39	9.4
		16/01/2019	0	0	9.8	9.8	85.3	0.2	999	-0.05	5.12	9.42
		22/02/2019	0.1	0.1	14.9	15	83.5	0.1	1015	0	6.03	9.36
		28/03/2019	0.1	0.1	13.7	13.7	81.6	0	1006	-0.05	5.28	9.36
		16/04/2019	0.1	0.1	12.8	12.8	82.9	0	1006	-0.05	5.28	9.36
		8/05/2019	0.1	0.1	14.8	15	81.3	0.1	1004	0.07	5.3	9.36
32	LFGMW12	12/06/2018	No Access	-	-	-	-	-	-	-	-	-
		18/07/2018	No Access	-	-	-	-	-	-	-	-	-
		1/08/2018	0.1	0.1	10.6	10.7	82.5	0.3	1011	-0.02	5.36	10.84
		14/08/2018	0.1	0.1	10.6	10.6	84.6	0.2	1013	0.05	5.27	10.85
		12/09/2018	0.1	0.1	8.6	8.6	87.6	0.3	1013	0	5.39	10.83
		16/10/2018	0.1	0.1	7.3	7.3	91.3	0.4	1013	0.09	4.82	10.86
		26/11/2018	0	0	12.3	12.3	84	0.5	999	0.02	5.35	10.84
		5/12/2018	0.1	0.1	9.2	9.2	84	0.2	1002	0.07	5.25	10.7
		16/01/2019	0	0	10.4	10.4	84.7	0.2	1002	0.03	4.95	10.82
		22/02/2019	0.1	0.1	13.5	13.5	81.7	0.1	1015	0.03	5.2	10.46
		28/03/2019	0.1	0.1	10.6	10.6	85.9	0.1	1006	0.03	5.08	10.46
		16/04/2019	0.1	0.1	11	11	84.4	0.1	1006	0.03	5.08	10.46
		8/05/2019	0.1	0.1	13.9	13.9	82	0.2	1004	-0.02	5.21	10.46

		Methane						
		ppm						
NSW EPA (2016) Solid Waste Landfills, Surface Emissions		500						
		Transect Date						
Transect	Location	12/06/2018	18/07/2018	14/08/2018	13/09/2018	16/10/2018	27/11/2018	19/12/2018
1	1	2.2	3.3	2	-	-	2.5	-
	2	2.9	2.8	1.7	-	-	2.5	-
	3	4	3.5	1.6	-	-	2.5	-
2	1	-	-	-	2	No Access	No Access	-
	2	-	-	-	2	No Access	No Access	-
	3	-	-	-	2.1	No Access	No Access	-
	4	-	-	-	2.2	No Access	No Access	-
3	1	2.1	4.8	2.7	2.1	No Access	2.5	-
	2	2.7	4.4	2.4	2.1	No Access	2.5	-
	3	2.3	3.4	2.2	2.1	No Access	2.5	-
	4	7.3	3	2.2	2	No Access	2.5	-
	5	-	3.2	2.4	2.1	No Access	2.5	-
4	No Results For Reporting Period							
5	1	12.5	7.9	2.6	2.3	No Access	2.6	-
	2	9.6	5.8	1.9	2.6	No Access	26	-
	3	6.6	4.5	2	2.2	No Access	2.7	-
	4	10.6	5.3	2.8	2.3	No Access	2.6	-
	5	-	6.2	2.4	2.3	No Access	3.3	-
	6	-	4.4	2.2	2.2	No Access	4.4	-
6	1	-	-	-	-	-	No Access	-
7	1	10.9	6.9	3.2	2.1	No Access	2.6	-
	2	7.8	4.8	2.8	2.3	No Access	2.6	-
	3	11.5	10.9	1.8	2.1	No Access	2.9	-
	4	8.3	6.4	3.5	2.3	No Access	2.7	-
	5	5.4	3.8	4.1	2.3	No Access	2.6	-
	6	-	4.3	-	2.5	No Access	-	-
8	1	-	-	8.6	-	-	-	-
	2	-	-	7.3	-	-	-	-
	3	-	-	4.3	-	-	-	-
	4	-	-	3.1	-	-	-	-
	5	-	-	3	-	-	-	-
	6	-	-	2.1	-	-	-	-
9	1	-	-	-	-	-	2.4	2.6
	2	-	-	-	-	-	2.4	2.1
	3	-	-	-	-	-	2.6	2.3
	4	-	-	-	-	-	2.8	2.2
	5	-	-	-	-	-	2.4	2.2
	6	-	-	-	-	-	2.3	3
10	1	9.2	2.6	2	11	9.1	5.7	2
	2	6	3.4	1.9	9.9	11.1	2.8	2.1
	3	2.8	8.2	2.3	11.4	5.9	7.3	1
	4	32	6.9	3.7	2.7	4.3	15.2	1.9
	5	21.3	9.6	1.7	2.7	6.3	4.8	15.8
	6	17.2	8.1	2.3	11.6	4.7	24.8	5.2
	7	13.1	6.4	2.8	5.5	4.1	17.8	6.4
	8	36.9	6.3	3.9	13	9	12.3	4.5
	9	14.8	5.2	11.8	3	3.5	3.7	2
	10	-	3.2	10.6	4.7	3.9	-	2.3
	11	-	2.3	11.2	2.7	-	-	2.9
	12	-	2.3	10.7	4.3	-	-	2.7
	13	-	2.5	11.4	2.8	-	-	-
	14	-	2.2	13.2	3.9	-	-	-
	15	-	5	12.4	-	-	-	-
	16	-	-	10.9	-	-	-	-
	17	-	-	6.4	-	-	-	-
11	No Results For Reporting Period							
A	1	2	1.4	1.8	1.6	2.1	2.9	28
	2	2.4	1.5	2	1.5	2.2	2.5	2.1
	3	2	1.9	1.9	1.4	2.2	2.5	2.1
	4	5.3	2	1.9	1.4	2.3	2.6	2.1
	5	2.3	1.6	1.9	1.3	-	2.8	2
B	1	No Access	-	-	-	-	-	-
C	1	1.9	-	1.8	1.6	2.3	2.4	2.2
	2	2	-	1.8	1.7	2.4	2.4	2.7
	3	2	-	1.8	1.6	2.4	2.6	2.5
	4	2.3	-	1.5	1.4	2.4	2.7	2
	5	2.3	-	1.7	1.4	2.5	-	1.8
	6	3	-	1.6	1.5	2.5	2.5	2.1
	7	3	-	1.4	1.4	2.3	3.9	8.4
	8	2.6	-	1.4	1.4	2.2	2.5	8.6
	9	4.2	-	1.7	1.3	2.1	-	3.6
	10	3.7	-	1.5	2	2.6	-	9.6
	11	-	-	1.3	2	2.1	-	-
	12	-	-	-	2.4	-	-	-
	13	-	-	-	4.4	-	-	-

		Methane						
		ppm						
NSW EPA (2016) Solid Waste Landfills, Surface Emissions		500						
		Transect Date						
Transect	Location	12/06/2018	18/07/2018	14/08/2018	13/09/2018	16/10/2018	27/11/2018	19/12/2018
D	1	2.1	2.3	1.5	2.3	2.1	2.5	2
	2	2.3	2.3	1.2	2.3	2.2	2.4	2.1
	3	2.1	2.5	1.4	2.3	2.4	2.5	2.3
	4	2	2.4	1.3	2.3	2.6	3.5	2.8
	5	2.1	2.4	1.2	2.3	2.4	2.5	2.4
	6	-	2.3	1.5	-	-	-	2.7
	7	-	-	1.3	-	-	-	2.7
E	1	8.2	2.2	1.6	2.9	2.4	2.5	5.5
	2	3.2	2.3	1.5	2.8	2.4	2.5	5.1
	3	2.7	2.5	1.6	2.5	2.3	2.5	6
E- Methane cage	4	2.5	2.4	1.4	2.5	2.2	2.5	2.4
E	5	2.5	2.5	1.4	2.5	2.2	2.6	2.1
	6	2.6	2.5	1.4	2.5	2.2	2.4	1.9
	7	2.3	2.6	1.5	2.3	-	2.4	1.9
F - Methane cage	1	2	2	1.4	2.1	2.4	2.3	2.7
F	2	2.3	2	1.2	2.1	2.5	2.3	2.7
	3	2.1	2	1.6	2.1	2.5	2.3	2.4
	4	2.5	2.1	1.5	2.1	2.5	2.7	2.7
	5	2.5	2.1	1.4	2.1	2.4	2.6	2.5
	6	2.3	2.3	1.4	2.1	2.4	4.4	5.2
	7	3.2	2.2	1.4	2.1	2.4	3.1	3.5
F- Methane cage	8	3.2	2.4	1.4	2.4	-	3.3	5
G	1	2.4	1.9	1.5	2.1	2.4	2.3	2.5
	2	2.3	2	1.6	2.2	2.5	2.3	2.6
G - Methane cage	3	2.3	2	1.6	2.2	2.5	2.3	2.5
G - Methane cage	4	2.4	1.8	1.9	2.1	2.5	2.7	2.7
G	5	2.5	2.6	1.7	2.1	-	2.6	2.2
	6	2.3	2.4	1.5	2.3	-	4.4	2.5
	7	2.5	2.2	1.5	2.2	-	3.1	2.1
	8	-	-	1.5	2.2	-	3.3	-
	9	-	-	1.4	-	-	-	-
H- Methane cage	1	2.2	1.8	0.8	2	2.6	4.4	2.4
H	2	2.8	1.6	1.1	2.1	2.1	5.4	3.3
	3	4.8	1.9	1.2	2.2	2.3	5.3	2.6
H- Methane cage	4	3.5	2.1	1.3	2.2	2.2	3.2	2.7
H	5	2.3	2	1.7	2.3	2.2	3	2.8
	6	2.3	2	1.7	2.7	2.3	4.1	2.3
	7	-	1.9	-	-	-	-	-
I	1	2.5	2.3	1.3	2.3	2	2.9	2.8
	2	2.4	2.5	1.5	2.3	2.1	3.3	3.2
	3	1.9	2.5	1.5	2.3	2.1	4.3	3.3
	4	2	2.6	1.5	2.5	2.1	3.1	3
	5	1.8	2.4	1.6	2.5	10.5	3.3	2.9
	6	2.2	2.3	1.1	2.4	2.8	3.3	5
	7	-	-	0.8	-	-	-	-
J	1	No Access	2.4	1.4	2.4	2.1	3	2.8
	2	No Access	2.4	1.3	2.4	2.4	2.4	2.9
	3	No Access	2.5	1.2	2.6	2.6	2.3	2.9
	4	No Access	2.4	-	2.6	2.6	2.4	5
	5	No Access	-	-	2.7	-	2.4	3.1
K	1	No Access	2.2	1.6	-	2.4	2.5	No Access
	2	No Access	2.3	1.7	-	2.6	2.5	No Access
	3	No Access	2.3	1.9	-	2.5	2.4	No Access
	4	No Access	2.4	1.5	-	2.5	-	No Access
	5	No Access	2.7	1.6	-	2.6	-	No Access
	6	No Access	2.2	1.7	-	2.6	-	No Access
	7	No Access	-	1.6	-	2.5	-	No Access
	8	No Access	-	1.5	-	2.2	-	No Access
L	1	No Access	2.3	-	3.3	-	2.6	No Access
	2	No Access	-	-	3.5	-	2.5	No Access
	3	No Access	-	-	2.7	-	4.5	No Access
	4	No Access	-	-	3.6	-	3	No Access
	5	No Access	-	-	3.5	-	2.5	No Access
	6	No Access	-	-	6.2	-	2.6	No Access
	7	No Access	-	-	2.6	-	-	No Access
M	1	No Access	-	-	No Access	-	No Access	2.8
	2	No Access	-	-	No Access	-	No Access	2.8
	3	No Access	-	-	No Access	-	No Access	3.5
	4	No Access	-	-	No Access	-	No Access	2.6
	5	No Access	-	-	No Access	-	No Access	2.6
	6	No Access	-	-	No Access	-	No Access	5.3
N	1	No Access	-	-	-	-	No Access	2.7
	2	No Access	-	-	-	-	No Access	2.7
	3	No Access	-	-	-	-	No Access	2.6
	4	No Access	-	-	-	-	No Access	2.3
	5	No Access	-	-	-	-	No Access	2.5
	6	No Access	-	-	-	-	No Access	2.5

		Methane						
		ppm						
NSW EPA (2016) Solid Waste Landfills, Surface Emissions		500						
		Transect Date						
Transect	Location	12/06/2018	18/07/2018	14/08/2018	13/09/2018	16/10/2018	27/11/2018	19/12/2018
SWERF	1	No Access	-	1.4	1.9	2.3	No Access	No Access
	1	No Access	-	1.5	2	2.4	No Access	No Access
Recycle/Revolve East	-	-	-	1.4	2.4	2.6	-	2.1
Recycle/Revolve West	-	-	-	1.2	2.4	2.4	-	2
Weighbridge	1	1.9	1.8	1.6	2.4	2.6	2.4	2.1
Crib Room	1	-	-	-	-	-	-	Demolished
Glengarry Cottage	Manager office	2.5	2.1	1.9	2.5	2.4	2.6	2.1
	Front Office	2.7	2.3	2.1	2.5	2.4	2.5	2.1
	Meeting Room	2.3	1.8	2.2	2.5	2.4	2.5	2.1
	Operations Room	2.4	1.8	2.2	2.5	2.4	2.4	2.1
Glengarry Cottage	Kitchen	2.2	2.1	2.1	2.5	2.4	2.5	2.1
	hallway	2.3	2.1	2.2	2.5	2.4	2.5	2.1
	Store	2.3	1.8	2.2	2.5	2.4	2.5	2.1
	Max reading gardens	2.1	2.5	2.1	2.5	2.4	2.2	2.2
181 Reddalls Rd Fenceline	1	1.9	1.9	1.1	2.5	2.5	2.5	2.3
	2	2.1	1.9	1	2.4	2.6	2.6	2.1
	3	2.1	2	0.8	2.4	2.4	2.7	2
	4	2.2	1.92	1.3	2.4	2.6	2.6	1.8
	5	2.2	2	1.4	2.5	2.5	2.7	1.8
	6	2.1	2	1.5	2.4	2.5	2.8	1.8
	7	2.4	2	1.2	2.4	2.6	2.7	1.8
	8	-	2	1.1	2.5	2.6	2.6	1.8
181 Reddalls Rd- Garden	1	2.1	2.4	1.2	-	-	2.5	1.8
Lot 1 Farmborough Fenceline	1	2.3	2.4	1.3	2.6	No Access	-	2.2
	2	2.1	1.8	1.3	2.7	No Access	-	2.2
	3	2.1	1.8	1.1	2.7	No Access	-	2.3
	4	2.1	2.1	1.4	2.5	No Access	-	2.5
	5	1.9	2.1	1.2	2.3	No Access	-	2.1
	6	2.2	2.4	1.3	2.3	No Access	-	2.1
	7	2.1	2.5	1.4	2.3	No Access	-	2.1
	8	2.2	-	1.5	2.1	No Access	-	2.1
Lot 1 Farmborough Gardens	1	1.9	-	-	2	No Access	-	2.1

Results Table 7: Respirable Dust Results
2018-2019 Reporting Period

		Total Suspended Particulates	PM10	Total Suspended Particulates (mass per filter)	PM10 (mass per filter)
		µg/m3	µg/m3	mg/filter	mg/filter
LOR		0.1	0.1	0.1	0.1
EPL 5862 Dust Generation Criteria	Annual Average	90	30		
	24hr Average		50		

Sample Location	Sample Date				
DDG-1 - Whytes Gully	20/06/2018	8.7	4.3	13.7	6.6
	19/07/2018	36.3	15.6	55.9	23.7
	21/08/2018	102.0	35.9	157.0	54.4
	17/09/2018	45.0	26.3	67.9	39.1
	15/10/2018	15.7	9.8	24.1	14.8
	27/11/2018	35.7	16.7	52.8	24.4
	17/12/2018	21.7	44.2	31.9	63.2
	15/01/2019	92.9	39.2	137.0	57.0
	20/02/2019	36.5	8.4	54.4	12.3
	20/03/2019	20.4	12.7	30.2	18.4
	13/05/2019	97.2	33.4	143.0	48.7
	Annual Average	46.6	-	-	-
DDG-2 - Glengarry Cottage	20/06/2018	28.2	11.5	44.5	17.8
	19/07/2018	65.7	39.8	101.0	60.1
	20/08/2018	31.4	11.8	47.7	17.5
	17/09/2018	67.2	25.0	103.0	37.7
	16/10/2018	33.0	19.1	50.0	28.5
	28/11/2018	7.1	4.2	10.7	6.2
	17/12/2018	80.2	39.7	119.0	58.1
	15/01/2019	77.5	40.6	114.0	58.9
	18/02/2019	89.0	42.9	132.0	63.4
	19/03/2019	16.8	15.2	25.3	22.5
	14/05/2019	43.8	17.7	68.3	27.1
	Annual Average	49.1	-	-	-

		Ash Content g/m2 month	Ash Content (mg)	Combustible Matter	Combustible Matter (mg)	Total insoluable matter	Total insoluable matter (mg)
		g/m2 month	mg	g/m2 month	mg	g/m2 month	mg
	LOR	0.1	1	0.1	1	0.1	1
EPL 5862 Dust Generation Criteria	Max. Increase in Dust Level					**2**	
	Max. Total Dust Level					4	

Location	Date						
DDG 1	09/04/2018 - 07/05/2018	1	17	1	17	2	34
	07/05/2018 - 07/06/2018	0.5	10	0.4	6	0.9	16
	07/06/2018 - 06/07/2018	0.6	11	0.4	7	1	18
	06/07/2018 - 06/08/2018	0.7	13	0.4	8	1.1	21
	06/08/2018 - 07/09/2018	0.7	13	0.3	6	1	19
	07/09/2018 - 08/10/2018	0.6	11	0.2	4	0.8	15
	08/10/2018 - 08/11/2018	0.7	13	0.5	9	1.2	22
	08/11/2018 - 10/12/2018	0.7	14	0.3	5	1	19
	10/12/2018 - 08/01/2019	4.5	78	1.2	20	**5.7**	98
	08/02/2019- 08/03/2019	2.5	41	0.6	11	3.1	52
	08/03/2019 - 08/04/2019	0.7	12	0.3	6	1	18
	08/04/2019 - 08/05/2019	0.8	15	0.6	9	1.4	24
DDG 2	09/04/2018 - 07/05/2018	1.2	20	0.5	8	1.7	28
	07/05/2018 - 07/06/2018	0.6	11	0.3	6	0.9	17
	07/06/2018 - 06/07/2018	0.7	12	0.2	3	0.9	15
	06/07/2018 - 06/08/2018	0.4	7	0.1	3	0.5	10
	06/08/2018 - 07/09/2018	1	20	0.5	8	1.5	28
	07/09/2018 - 08/10/2018	1	19	0.5	9	1.5	28
	08/10/2018 - 08/11/2018	1.2	23	0.6	11	1.8	34
	08/11/2018 - 10/12/2018	0.9	18	0.4	7	1.3	25
	10/12/2018 - 08/01/2019	1.8	31	0.6	11	2.4	42
	08/01/2019 - 08/02/2019	1.7	31	0.5	10	2.2	41
	08/02/2019- 08/03/2019	1.7	28	1.6	27	3.3	55
	08/03/2019 - 08/04/2019	1.4	25	0.2	5	1.6	30
	08/04/2019 - 08/05/2019	1	17	0.1	2	1.1	19
DDG 3	09/04/2018 - 07/05/2018	0.4	6	0.4	8	0.8	14
	07/05/2018 - 07/06/2018	0.4	7	0.4	8	0.8	15
	07/06/2018 - 06/07/2018	0.1	2	< 0.1	< 1	0.1	2
	06/07/2018 - 06/08/2018	0.4	7	0.2	4	0.6	11
	06/08/2018 - 07/09/2018	0.3	6	0.5	9	0.8	15
	07/09/2018 - 08/10/2018	0.3	6	0.2	4	0.5	10
	08/10/2018 - 08/11/2018	0.5	9	0.7	14	1.2	23
	08/11/2018 - 10/12/2018	0.4	8	0.5	10	0.9	18
	10/12/2018 - 08/01/2019	0.7	13	0.4	6	1.1	19
	08/01/2019 - 08/02/2019	0.7	13	1.2	22	1.9	35
	08/02/2019- 08/03/2019	1.9	32	0.4	6	2.3	38
	08/03/2019 - 08/04/2019	0.8	14	0.4	8	1.2	22
	08/04/2019 - 08/05/2019	0.4	7	0.2	4	0.6	11

		Ash Content g/m2 month	Ash Content (mg)	Combustible Matter	Combustible Matter (mg)	Total insoluable matter	Total insoluable matter (mg)
		g/m2 month	mg	g/m2 month	mg	g/m2 month	mg
	LOR	0.1	1	0.1	1	0.1	1
EPL 5862 Dust Generation Criteria	Max. Increase in Dust Level					**2**	
	Max. Total Dust Level					4	

Location	Date						
DDG 4	09/04/2018 - 07/05/2018	0.6	9	0.5	9	1.1	18
	07/05/2018 - 07/06/2018	0.2	3	0.4	8	0.6	11
	07/06/2018 - 06/07/2018	0.2	3	< 0.1	< 1	0.2	3
	06/07/2018 - 06/08/2018	0.3	5	0.1	3	0.4	8
	06/08/2018 - 07/09/2018	0.4	8	0.4	7	0.8	15
	07/09/2018 - 08/10/2018	0.5	10	0.5	9	1	19
	08/10/2018 - 08/11/2018	1.5	27	3.1	55	**4.6**	82
	08/11/2018 - 10/12/2018	1.5	27	6.3	119	**7.8**	146
	10/12/2018 - 08/01/2019	1.3	22	1.5	25	2.8	47
	08/01/2019 - 08/02/2019	1.1	20	1.7	30	2.8	50
	08/02/2019- 08/03/2019	1.7	28	0.9	14	2.6	42
	08/03/2019 - 08/04/2019	0.4	7	0.1	2	0.5	9
	08/04/2019 - 08/05/2019	0.5	8	0.3	6	0.8	14
DDG 5	09/04/2018 - 07/05/2018	0.4	6	0.3	6	0.7	12
	07/05/2018 - 07/06/2018	0.2	3	0.3	6	0.5	9
	07/06/2018 - 06/07/2018	0.1	2	< 0.1	< 1	0.1	2
	06/07/2018 - 06/08/2018	0.2	3	0.2	4	0.4	7
	06/08/2018 - 07/09/2018	0.2	4	0.2	4	0.4	8
	07/09/2018 - 08/10/2018	0.3	5	0.2	4	0.5	9
	08/10/2018 - 08/11/2018	0.5	9	0.2	4	0.7	13
	08/11/2018 - 10/12/2018	0.4	8	0.4	7	0.8	15
	10/12/2018 - 08/01/2019	0.8	14	0.1	2	0.9	16
	08/01/2019 - 08/02/2019	1.3	24	0.9	16	2.2	40
	08/02/2019- 08/03/2019	0.6	10	0.2	4	0.8	14
	08/03/2019 - 08/04/2019	0.4	7	0.2	4	0.6	11
	08/04/2019 - 08/05/2019	0.2	3	0.2	4	0.4	7

APPENDIX

C

LABORATORY QA/QC ASSESSMENT

Quality Assurance/Quality Control (QA/QC) procedures were implemented to ensure the precision accuracy, representativeness, completeness and comparability of all data gathered. The QA/QC procedures included:

- Equipment calibration to ensure field measurements obtained are accurate;
- Equipment decontamination to prevent cross contamination;
- The completion of a field form for each monitoring point;
- Use of appropriate measures (i.e. gloves) to prevent cross contamination;
- Appropriate sample identification;
- Correct sample preservation;
- Sample transport with Chain of Custody (CoC) documentation; and
- Laboratory analysis in accordance with NATA accredited methods.

Table C-1 details the QA/QC procedures and sample collection details undertaken during monitoring and sample collection. **Table C-2** summarises the number of QA/QC samples collected during this investigation. CoC, Sample Receipt Notifications (SRNs), laboratory certificates and Interpretive QA/QC Reports can be provided upon request. These documents are typically appended to the report but due to the quantity of documents they have been omitted.

Table C1: Field QAQC Method Validation

Requirement	Yes/No	Comments
Equipment calibration	Yes	Each field instrument was calibrated prior to use. Calibration certificates can be provided by ALS Environmental upon request.
Equipment decontamination	Yes	Decontamination of sampling equipment (interface probe) was undertaken by washing with phosphate free detergent (Decon 90) followed by a rinse with potable water.
Sampling and monitoring documentation	Yes	Water sampling and gas monitoring was documented by ALS Environmental during each sampling event. Copies of sampling and monitoring documentation can be provided upon request.
Sample collection	Yes	Samples were collected using laboratory provided sampling containers and a clean pair of gloves was used for each new sampling point to limit the potential for cross-contamination.
Sample identification	Yes	All samples were marked with a unique identifier including the sampling point and date.
Sample preservation	Yes	Following collection water samples were placed in an esky that contained bricks. Samples were kept chilled from sample collection until laboratory receipt.
COC documentation	Yes	A COC form was completed by ALS Environmental detailing the sample identification, collection date, sampler and laboratory analysis required. COC forms and SRN can be provided upon request. The SRN indicates that the samples were received at the laboratory intact and chilled and within the required holding times.
NATA accredited methods	Yes	ALS Environmental are a NATA accredited laboratory for the required analysis, which was completed in accordance with NATA accredited methods.

Laboratory QC and QCI Report Summary

The laboratory selected to undertake laboratory testing, ALS Environmental, is NATA accredited for the analysis required. ALS Environmental undertook internal QA/QC measures to demonstrate the suitability of the data. The laboratory is required to undertake and report internal laboratory Quality Control procedures for all chemical analysis undertaken, including:

- Laboratory duplicate sample analysis at the rate of one duplicate analysis per ten samples;
- Method blank at the rate of one method blank analysis per 20 samples;
- Laboratory control sample at the rate of one laboratory control sample analysis per 20 samples; and

> Spike recovery analysis at the rate of one spike recovery analysis per 20 samples.

Compliance with the internal laboratory QA/QC requirements is provided within the QC and QCI reports provided by ALS Environmental, which can be provided upon request and are discussed below.

The QC and QCI reports received from ALS Environmental highlight outliers of QA/QC standards including holding time breaches and internal QC results. Review of the QC and QCI documentation provided by ALS Environmental indicates that several outliers existed which are summarised below in **Table C-2**.

Table C-2: Laboratory QA/QC Outlier Summary

Report	Outlier Type	Analyte	Justification
EW1801825	No QA/QC outliers		
EW1801876	No QA/QC outliers		
EW1801877	No QA/QC outliers		
EW1801967	No QA/QC outliers		
EW1802067	No QA/QC outliers		
EW1802068	No QA/QC outliers		
EW1802085	Matrix Spike	Sulfate as SO4	MS recovery not determined, background level greater than or equal to 4x spike level
		Total Organic Carbon	MS recovery not determined, background level greater than or equal to 4x spike level
EW1802168	No QA/QC outliers		
EW1802256	No QA/QC outliers		
EW1802296	No QA/QC outliers		
EW1802319	No QA/QC outliers		
EW1802373	No QA/QC outliers		
EW1802376	No QA/QC outliers		
EW1802461	No QA/QC outliers		
EW1802511	No QA/QC outliers		
EW1802531	No QA/QC outliers		
EW1802543	No QA/QC outliers		
EW1802550	No QA/QC outliers		
EW1802571	No QA/QC outliers		
EW1802602	No QA/QC outliers		
EW1802916	No QA/QC outliers		
EW1802946	No QA/QC outliers		
EW1802983	No QA/QC outliers		
EW1803107	No QA/QC outliers		
EW1803108	No QA/QC outliers		
EW1803225	No QA/QC outliers		
EW1803260	No QA/QC outliers		
EW1803261	Matrix Spike	Sulfate as SO4	MS recovery not determined, background level greater than or equal to 4x spike level
EW1803322	No QA/QC outliers		
EW1803407	Matrix Spike	Ammonia as N	MS recovery not determined, background level greater than or equal to 4x spike level
EW1803496	No QA/QC outliers		
EW1803535	No QA/QC outliers		

Report	Outlier Type	Analyte	Justification
EW1803624	No QA/QC outliers		
EW1803678	No QA/QC outliers		
EW1803714	No QA/QC outliers		
EW1803845	No QA/QC outliers		
EW1803945	No QA/QC outliers		
EW1804045	No QA/QC outliers		
EW1804055	No QA/QC outliers		
EW1804056	No QA/QC outliers		
EW1804152	Matrix Spike	Sulfate as SO4	MS recovery not determined, background level greater than or equal to 4x spike level
		Chloride	
EW1804178	Matrix Spike	Ammonia as N	MS recovery not determined, background level greater than or equal to 4x spike level
EW1804274	No QA/QC outliers		
EW1804275	Laboratory Control Spike	Conductivity	Recovery greater than upper control limit
EW1804403	No QA/QC outliers		
EW1804466	No QA/QC outliers		
EW1804610	No QA/QC outliers		
EW1804611	Matrix Spike	Sulfate as SO4	MS recovery not determined, background level greater than or equal to 4x spike level
EW1804652	No QA/QC outliers		
EW1804744	No QA/QC outliers		
EW1804752	No QA/QC outliers		
EW1804879	No QA/QC outliers		
EW1804999	No QA/QC outliers		
EW1805138	No QA/QC outliers		
EW1805139	Matrix Spike	Ammonia as N	MS recovery not determined, background level greater than or equal to 4x spike level
EW1805218	No QA/QC outliers		
EW1805259	No QA/QC outliers		
EW1805266	Laboratory Control Spike	Conductivity	Recovery less than upper control limit
	Matrix Spike	Ammonia as N	MS recovery not determined, background level greater than or equal to 4x spike level
EW1805280	Matrix Spike	Ammonia as N	MS recovery not determined, background level greater than or equal to 4x spike level
EW1805388	No QA/QC outliers		
EW1900021	No QA/QC outliers		
EW1900026	No QA/QC outliers		
EW1900131	No QA/QC outliers		
EW1900161	No QA/QC outliers		
EW1900176	No QA/QC outliers		
EW1900368	No QA/QC outliers		
EW1900443	No QA/QC outliers		

Report	Outlier Type	Analyte	Justification
EW1900547	No QA/QC outliers		
EW1900559	Laboratory Control Spike	Total Phenol	Recovery greater than upper control limit
	Matrix Spike	Sulfate as SO4	MS recovery not determined, background level greater than or equal to 4x spike level
		Total Phenol	Recovery less than lower data quality objectives
EW1900560	Laboratory Control Spike	Total Phenol	Recovery greater than upper control limit
	Matrix Spike	Sulfate as SO4	MS recovery not determined, background level greater than or equal to 4x spike level
		Total Phenol	Recovery less than lower data quality objectives
EW1900561	No QA/QC outliers		
EW1900649	No QA/QC outliers		
EW1900695	Laboratory Control Spike	Conductivity	Recovery less than lower control limit
EW1900747	No QA/QC outliers		
EW1900858	No QA/QC outliers		
EW1900991	No QA/QC outliers		
EW1901005	No QA/QC outliers		
EW1901033	Laboratory Control Spike	Conductivity	Recovery less than lower control limit
EW1901122	No QA/QC outliers		
EW1901211	No QA/QC outliers		
EW1901280	No QA/QC outliers		
EW1901347	No QA/QC outliers		
EW1901451	No QA/QC outliers		
EW1901492	No QA/QC outliers		
EW1901493	No QA/QC outliers		
EW1901576	No QA/QC outliers		
EW1901623	No QA/QC outliers		
EW1901676	No QA/QC outliers		
EW1901720	No QA/QC outliers		
EW1901727	No QA/QC outliers		
EW1901728	Laboratory Control Spike	Conductivity	Recovery less than lower control limit
EW1901781	No QA/QC outliers		
EW1901915	No QA/QC outliers		
EW1901957	No QA/QC outliers		
EW1902012	No QA/QC outliers		
EW1902045	No QA/QC outliers		
EW1902152	No QA/QC outliers		
EW1902153	Laboratory Control Spike	Total Alkalinity as CaCO3	Recovery less than lower control limit
	Matrix Spike	Sulfate as SO4	MS recovery not determined, background level greater than or equal to 4x spike level

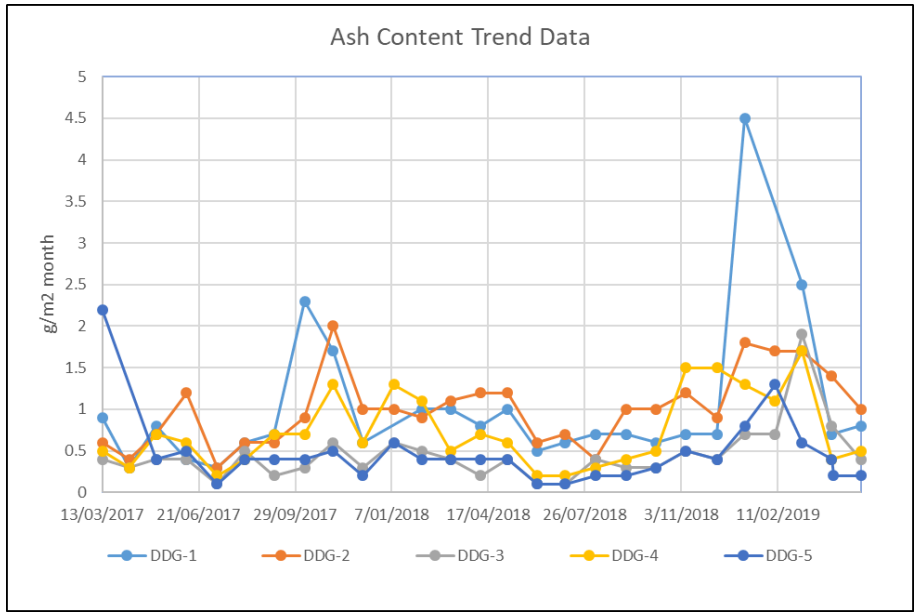
Report	Outlier Type	Analyte	Justification
EW1902168	No QA/QC outliers		
EW1902255	No QA/QC outliers		
EW1902653	No QA/QC outliers		

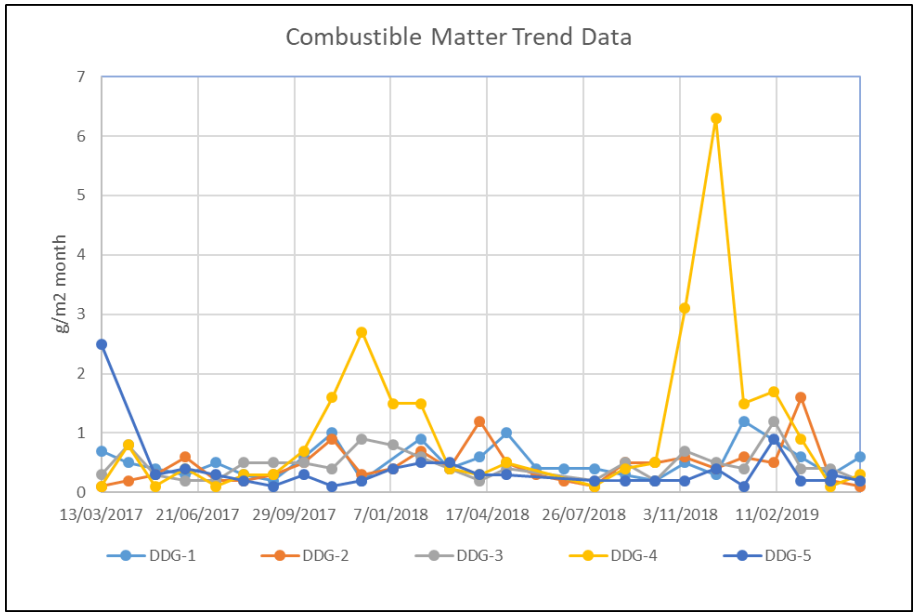
Cardno concludes that the data reported by ALS Environmental as presented in this Annual Report is suitable for interpretative to assess the environmental performance and compliance with EPL 5862.

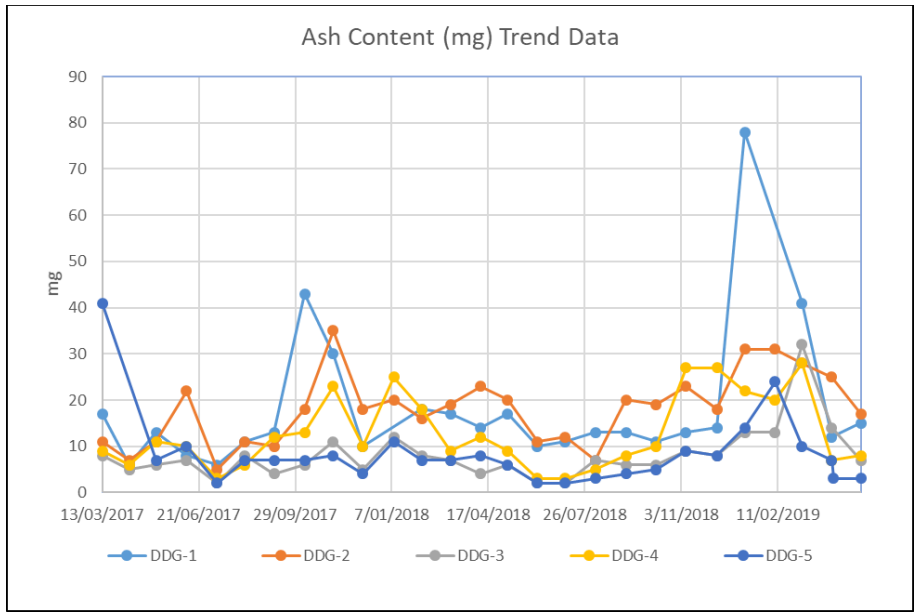
APPENDIX D

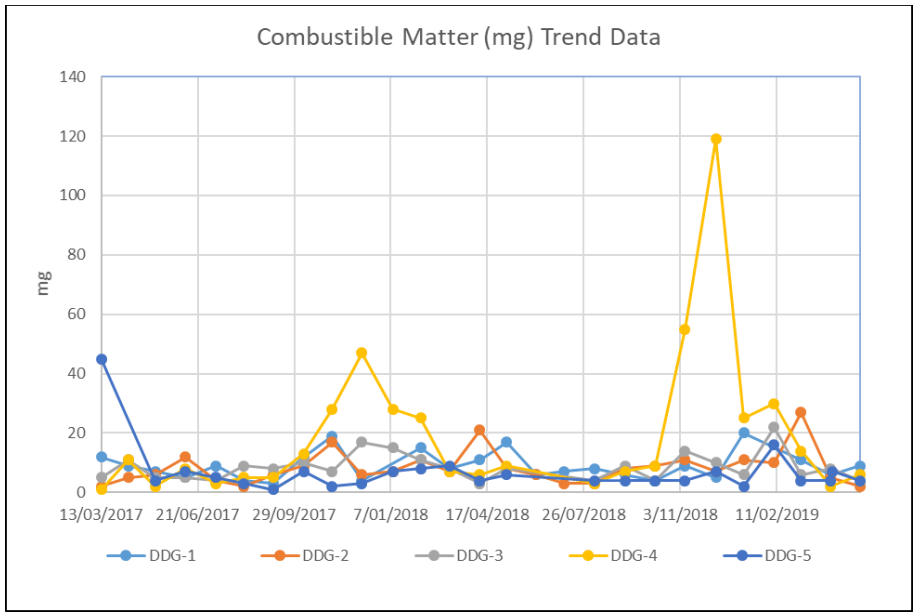
TREND GRAPHS

Whytes Gully Landfill Dust Monitoring Results Graphs

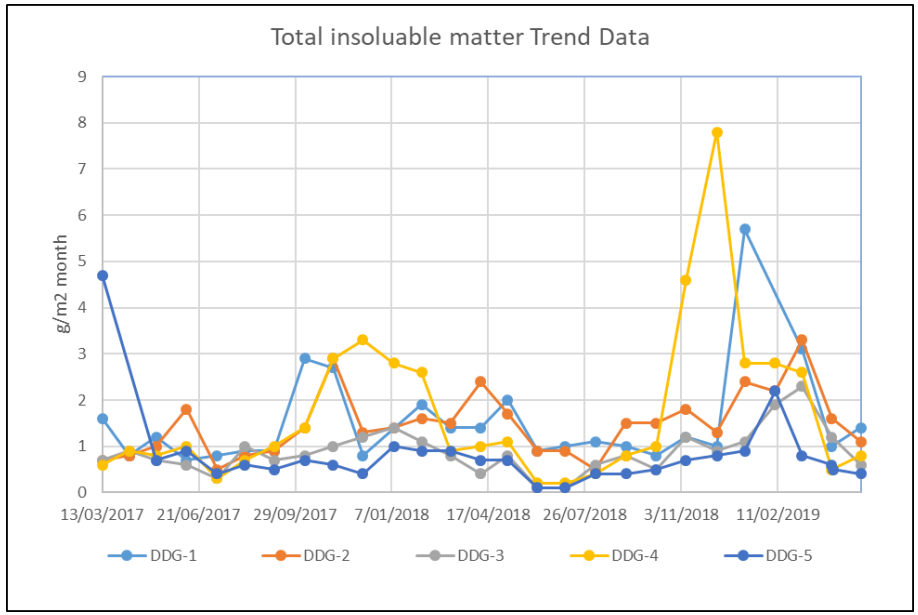


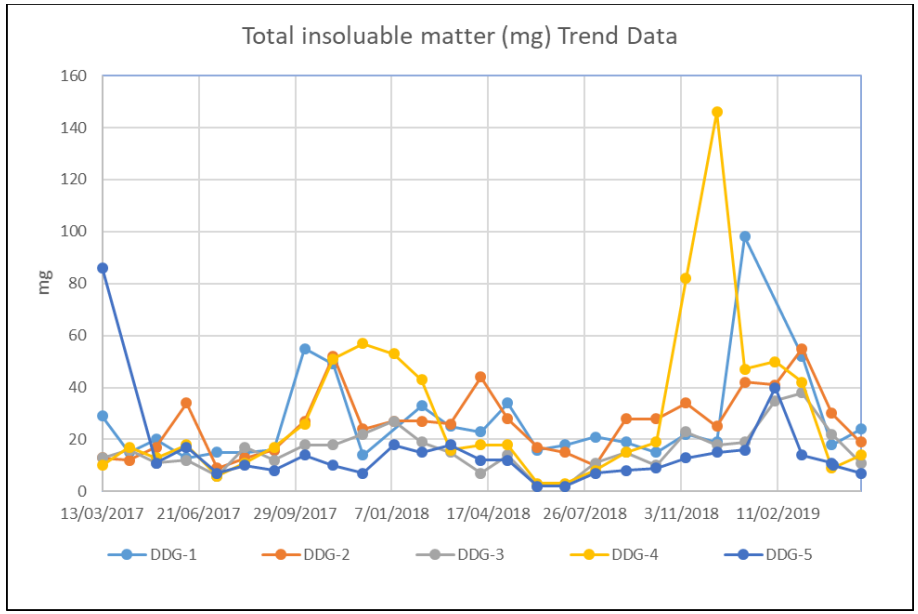




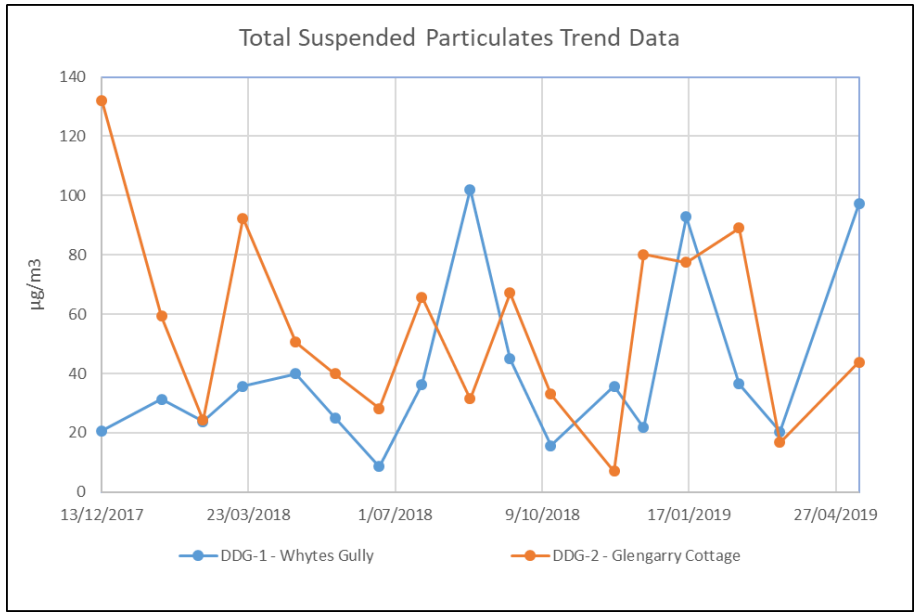


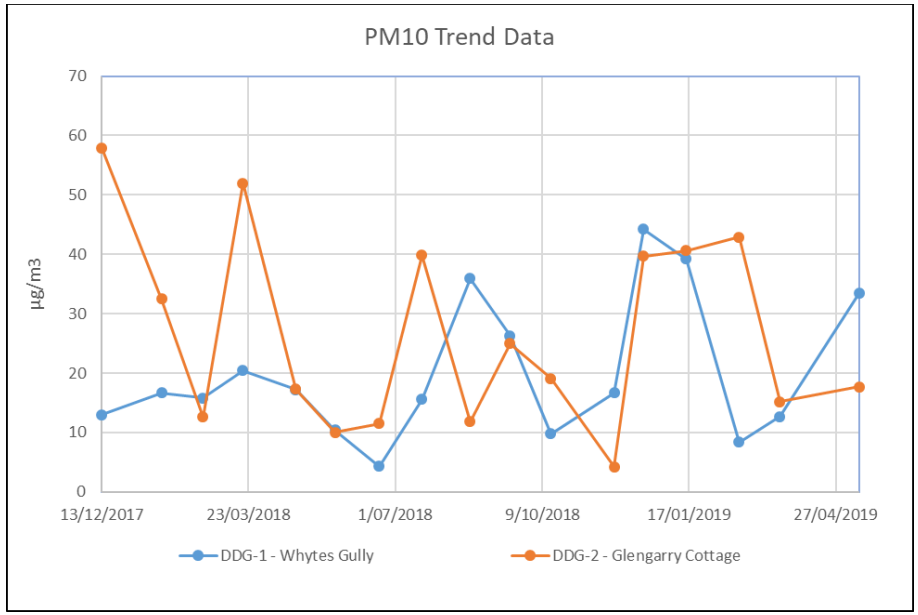
Whytes Gully Landfill Dust Monitoring Results Graphs



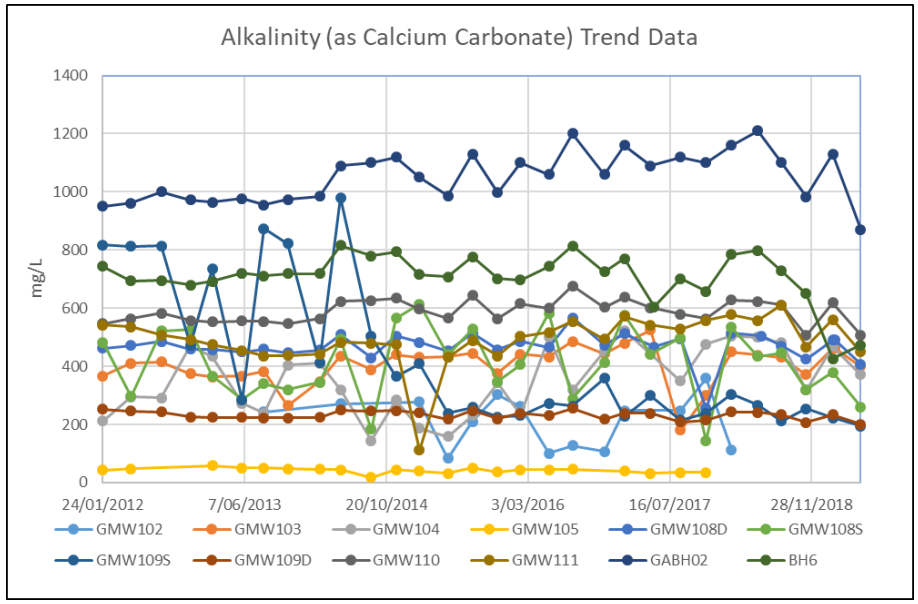


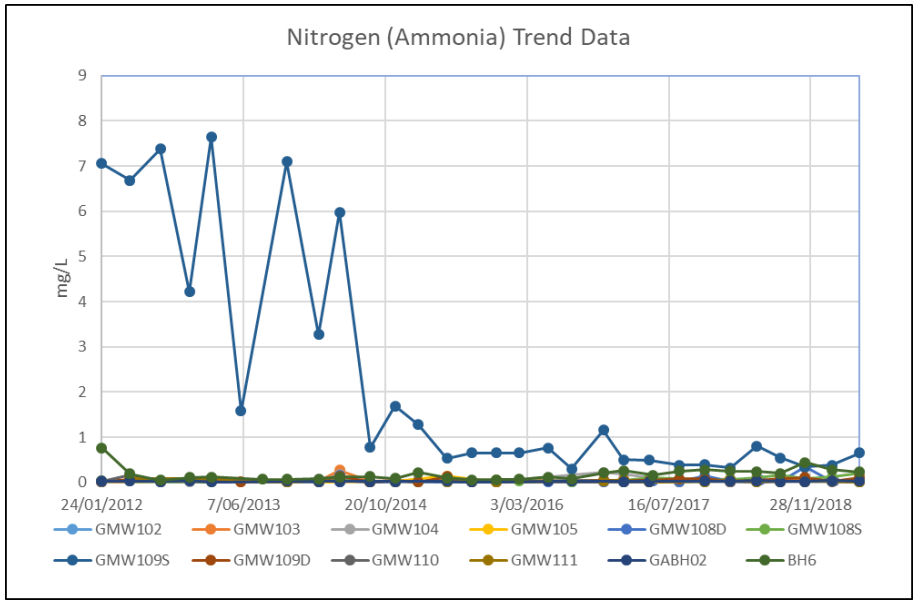
Whytes Gully Landfill Dust Monitoring Results Graphs

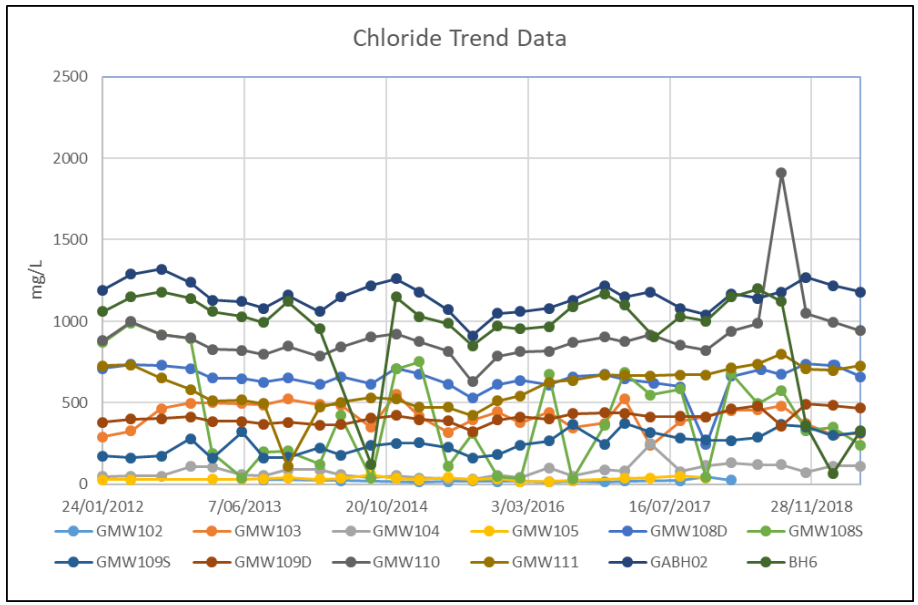


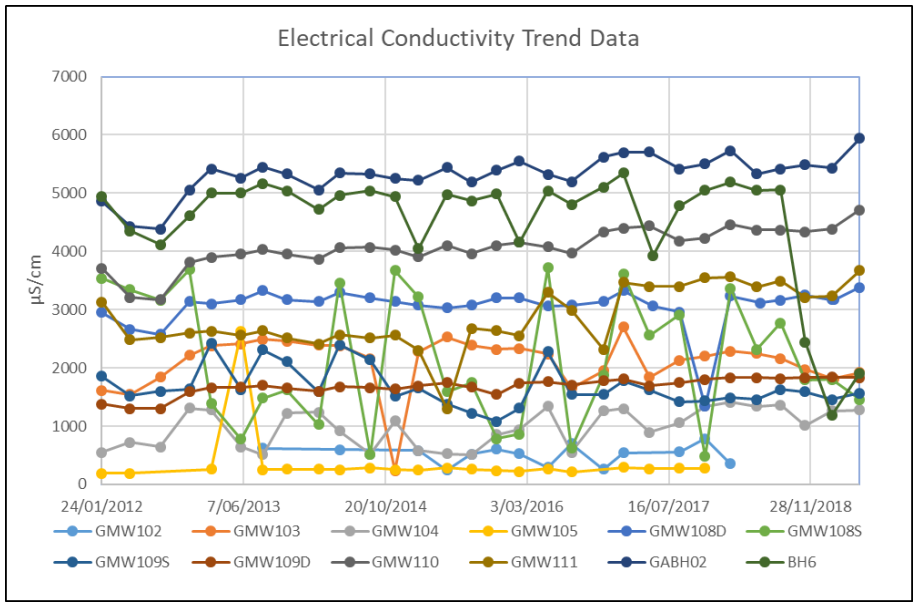


Whytes Gully Groundwater Monitoring Results Graphs

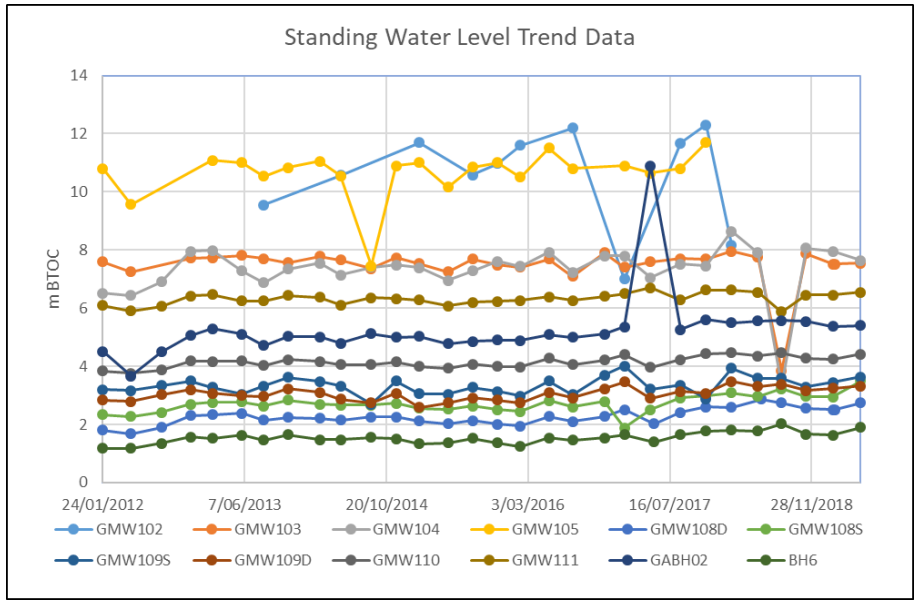


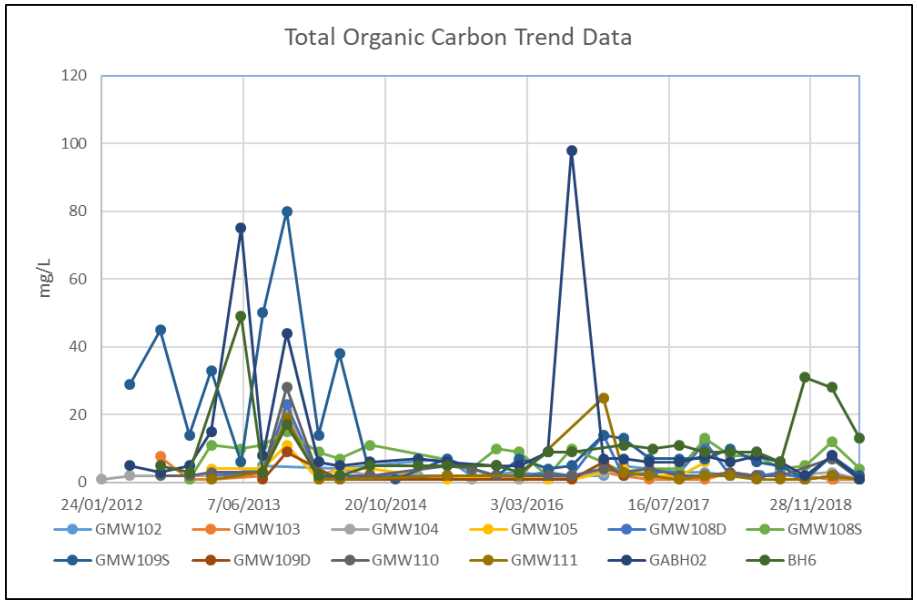


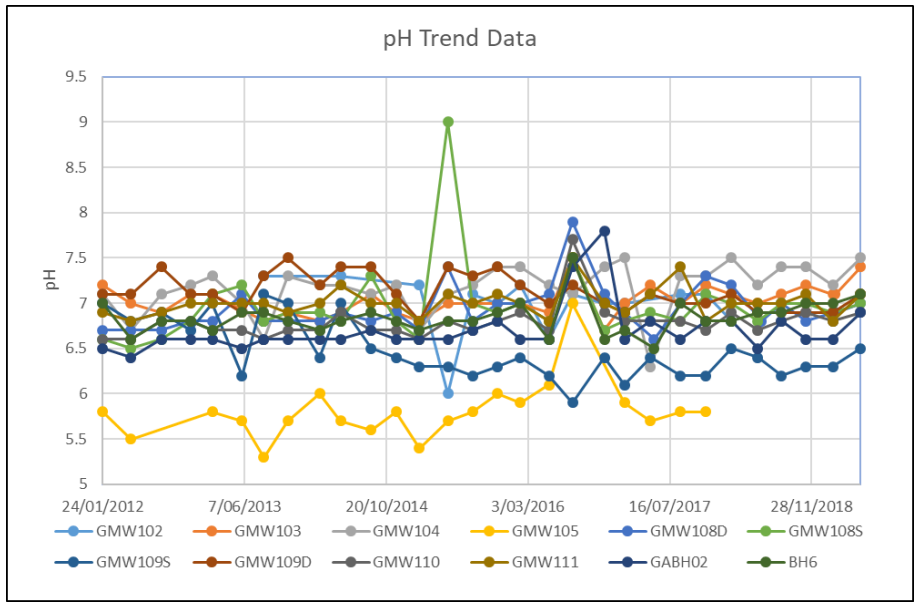


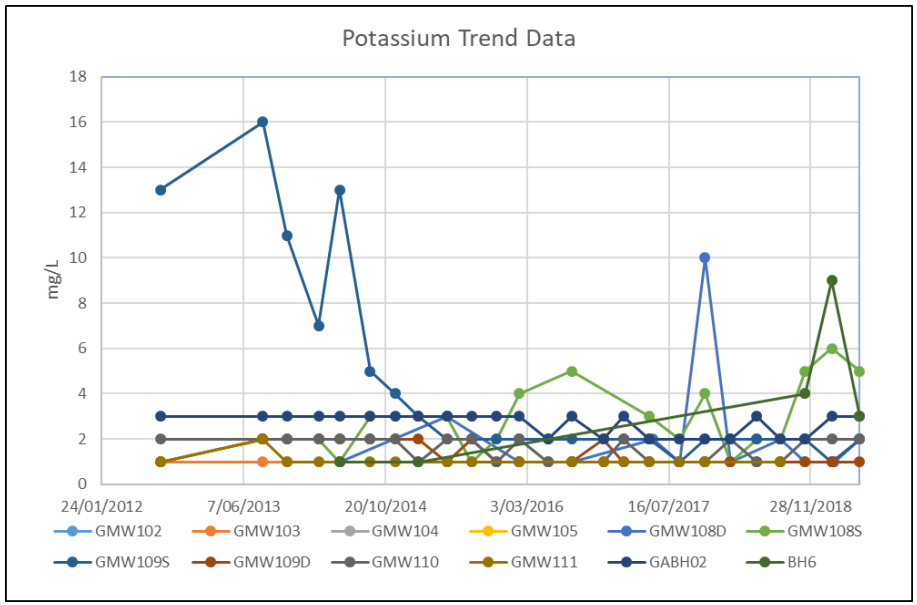


Whytes Gully Groundwater Monitoring Results Graphs

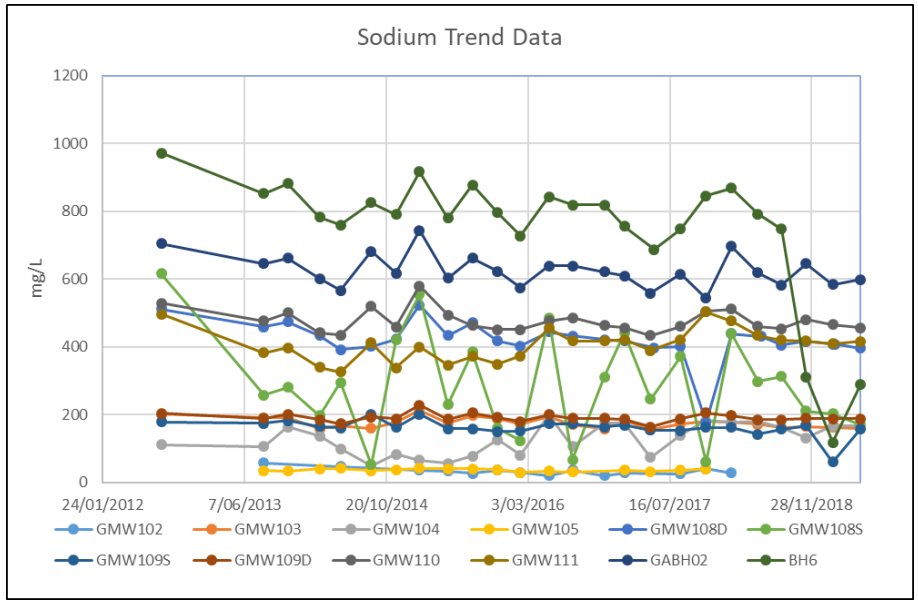


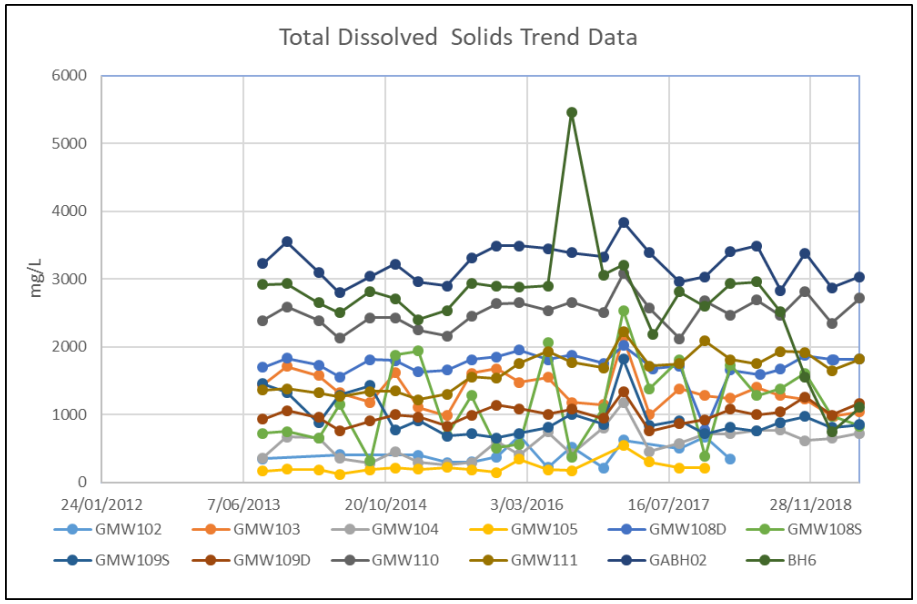


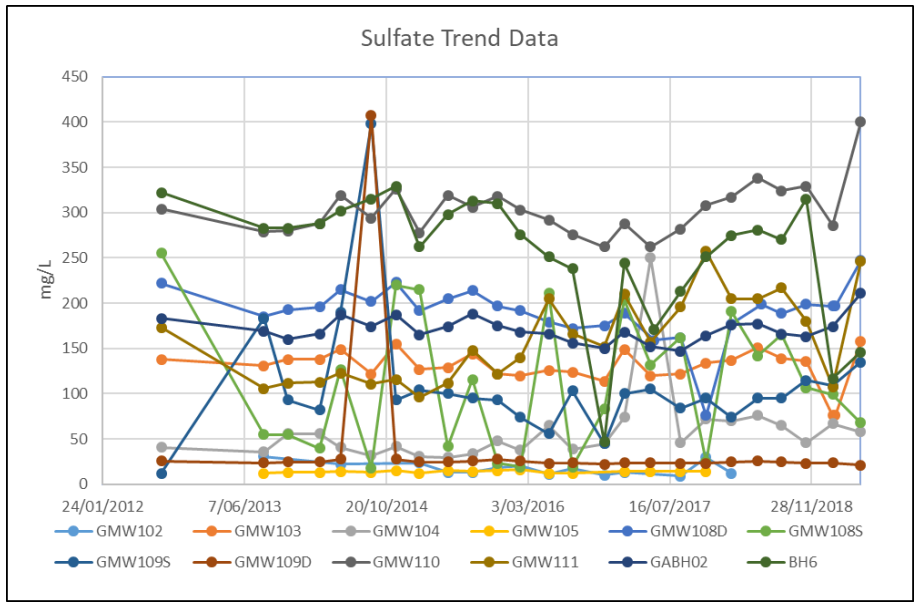


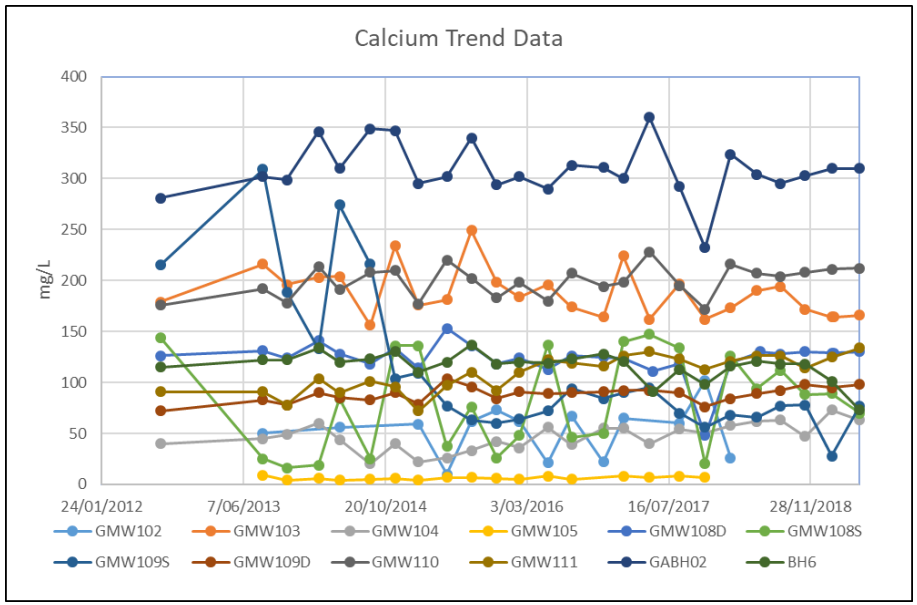


Whytes Gully Groundwater Monitoring Results Graphs

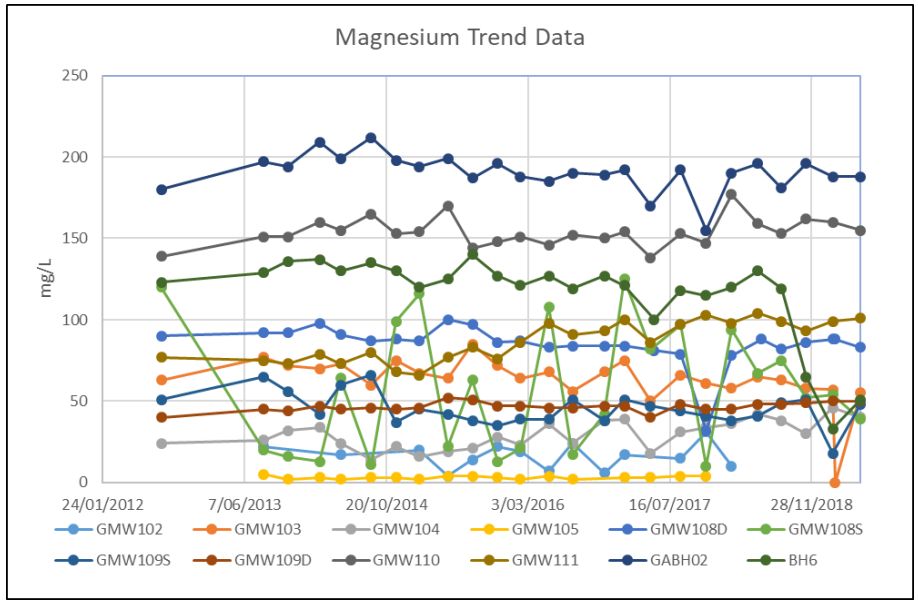


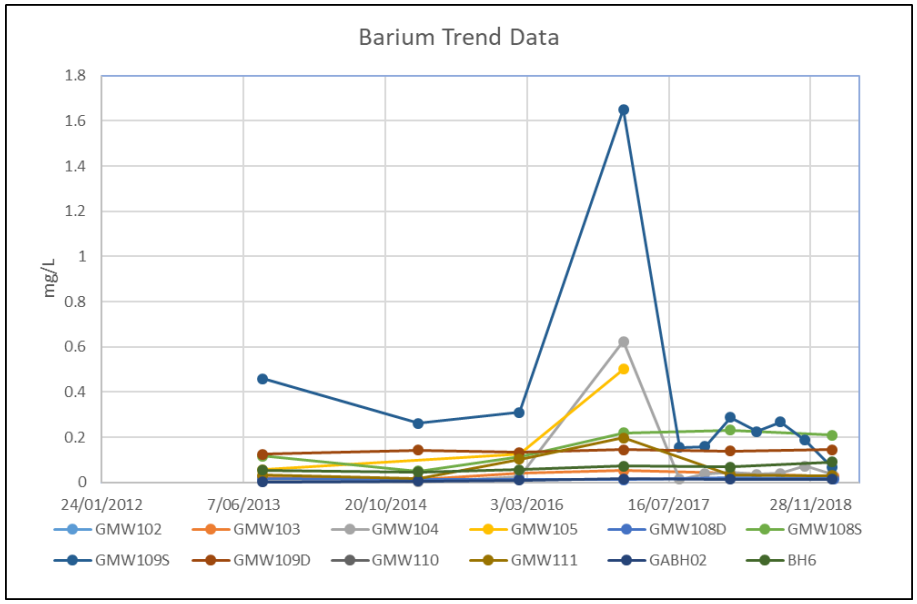


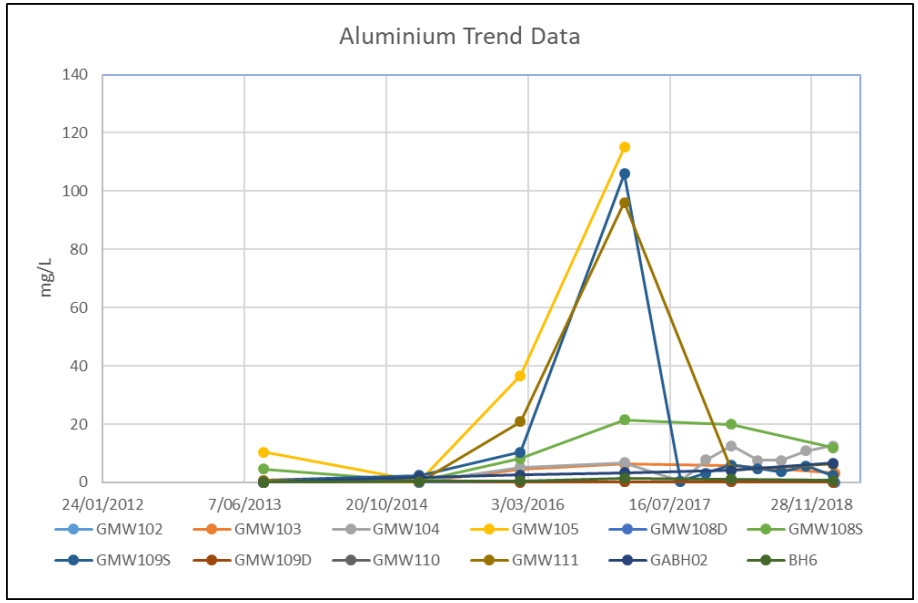


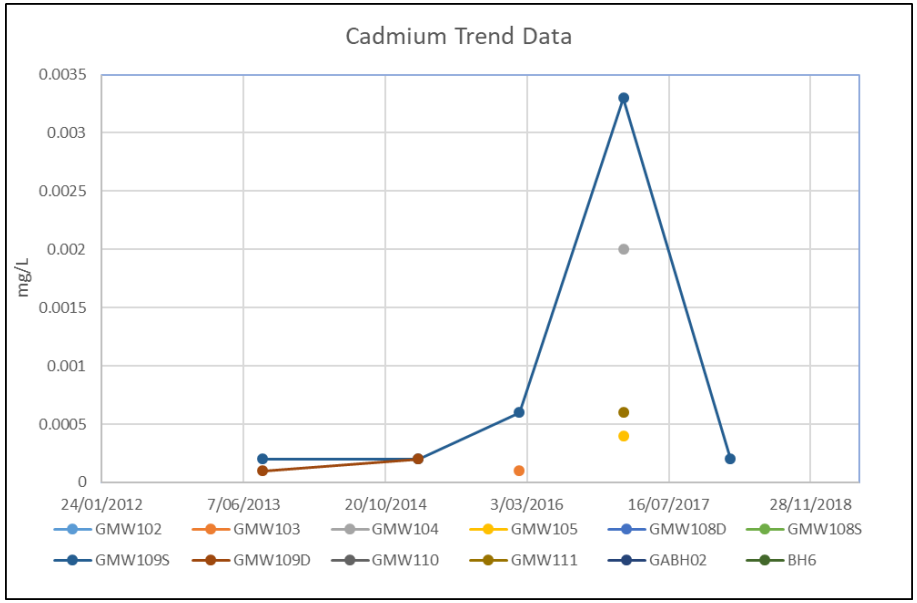


Whytes Gully Groundwater Monitoring Results Graphs

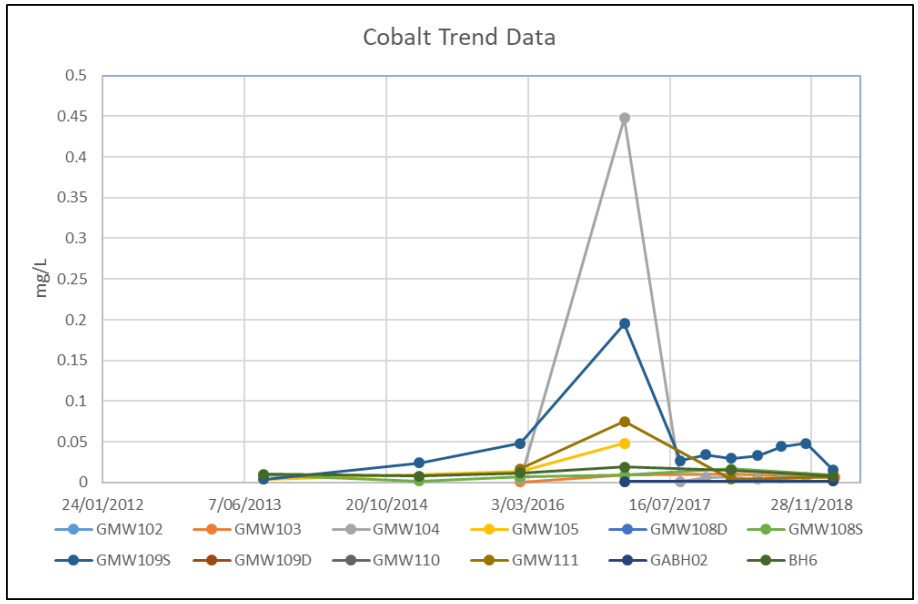


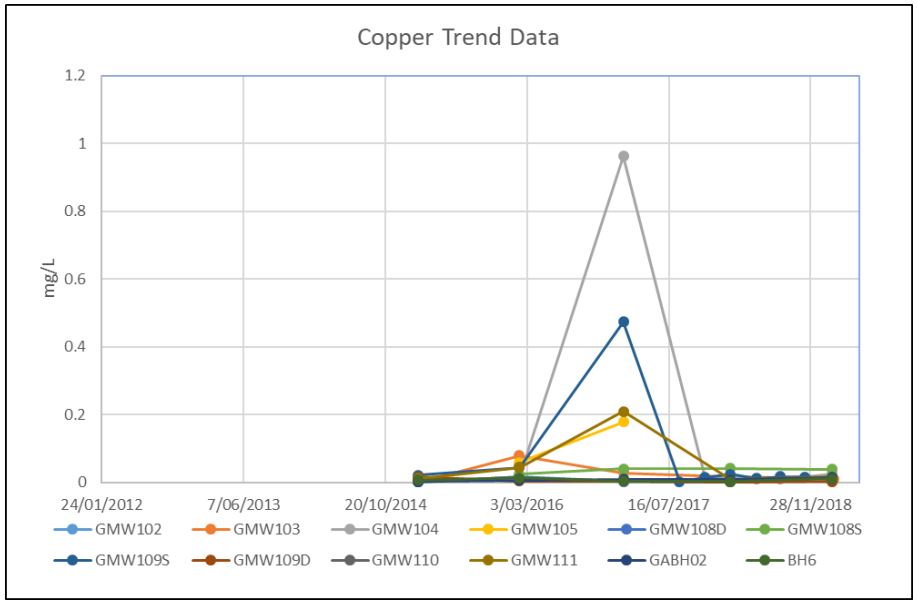


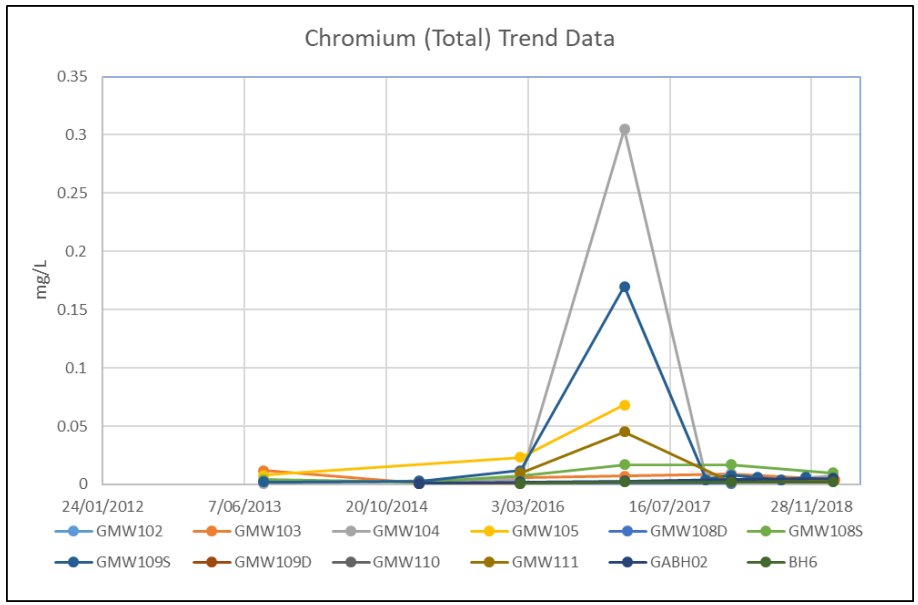


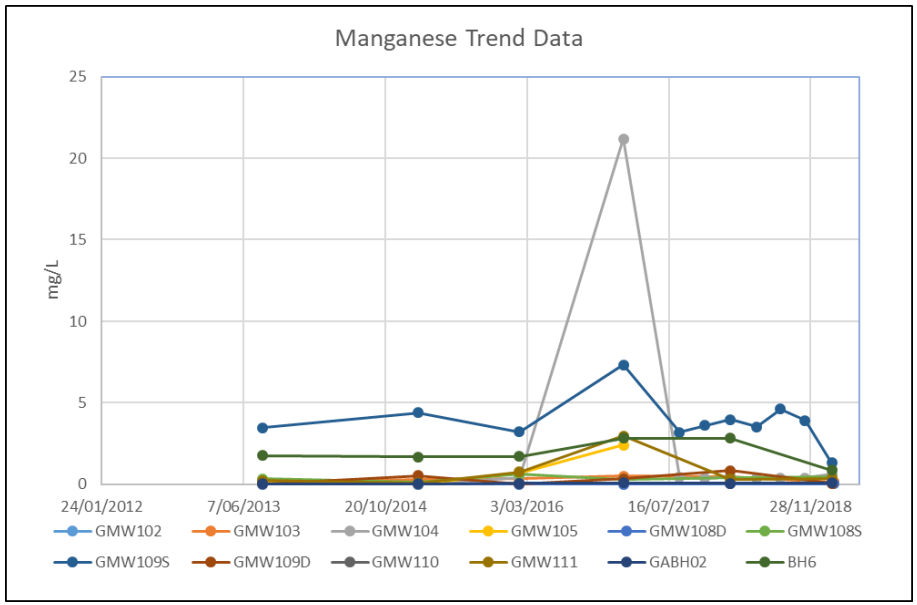


Whytes Gully Groundwater Monitoring Results Graphs









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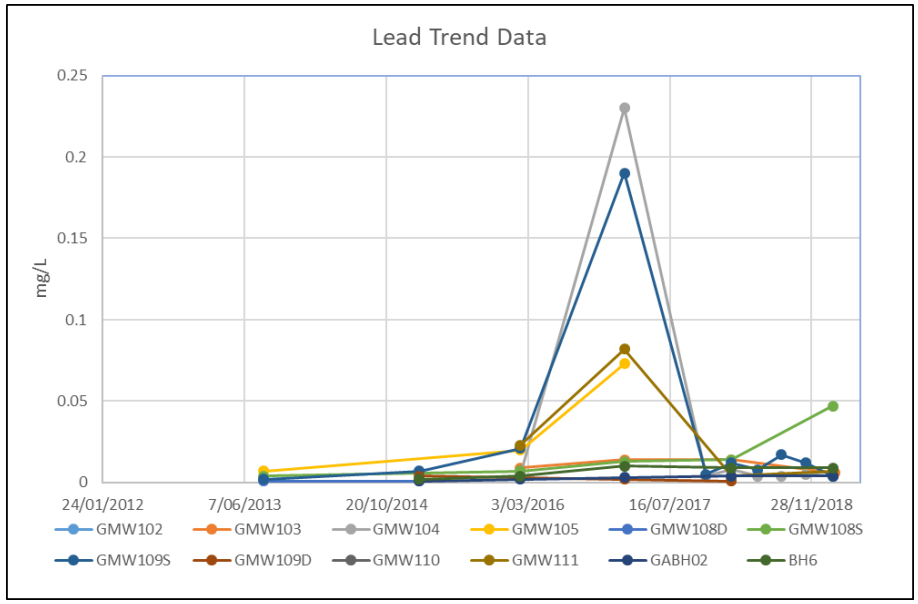
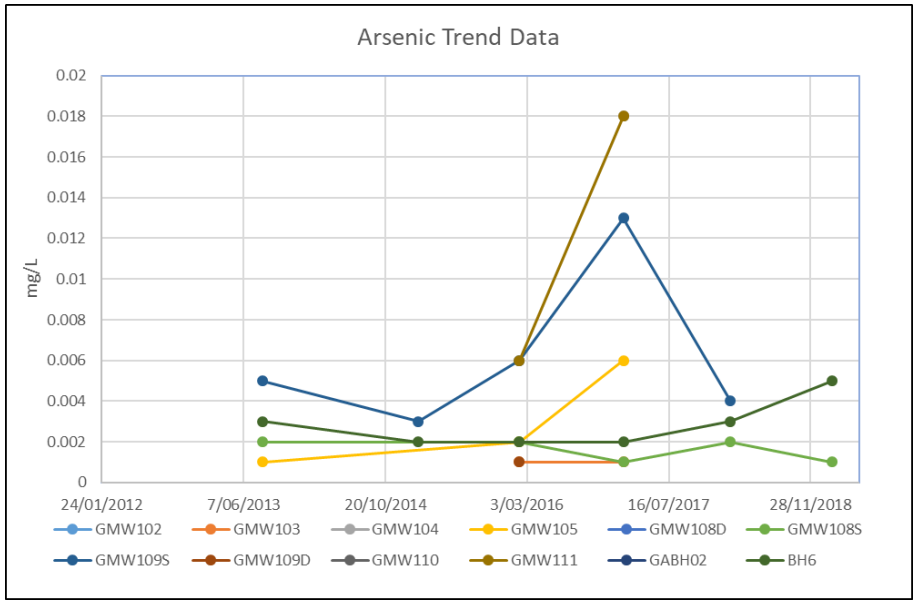
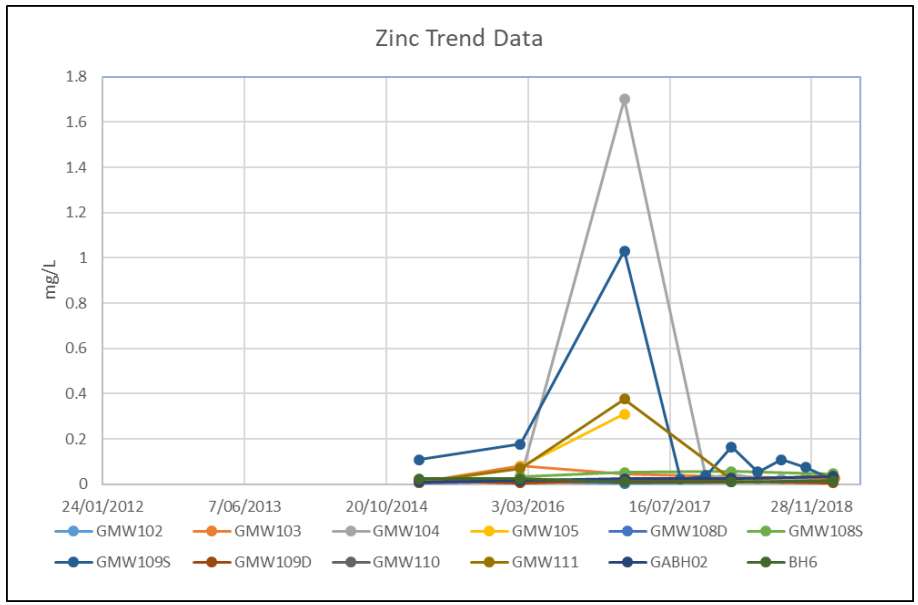
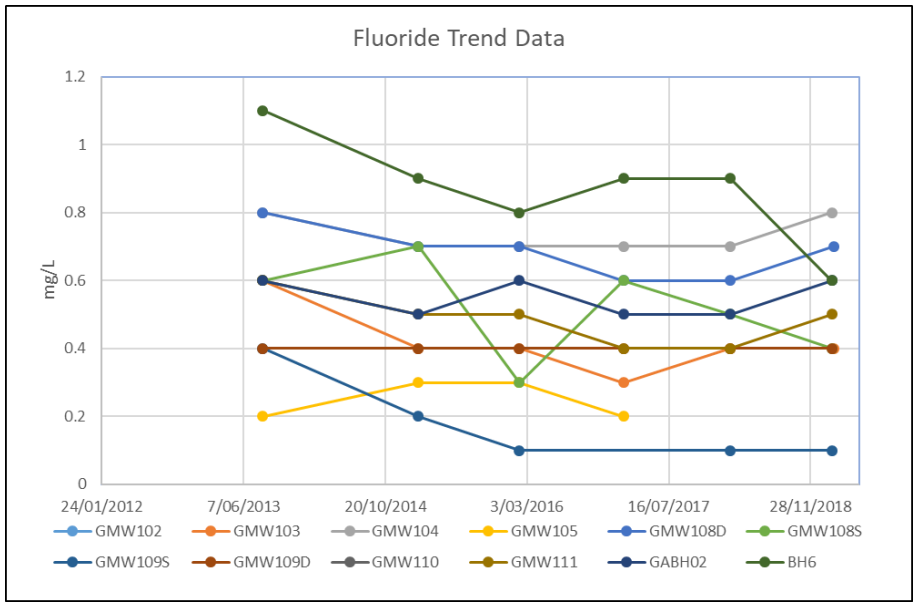
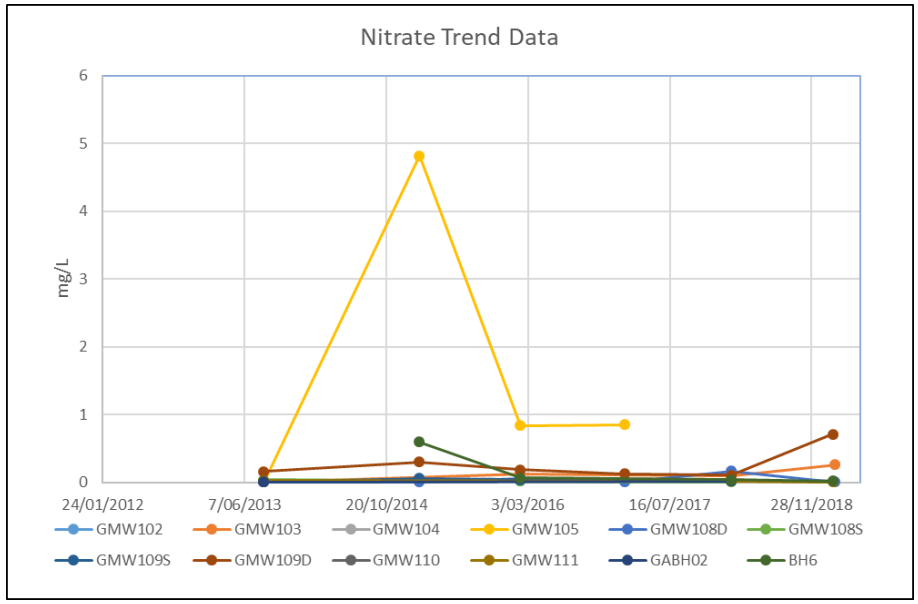


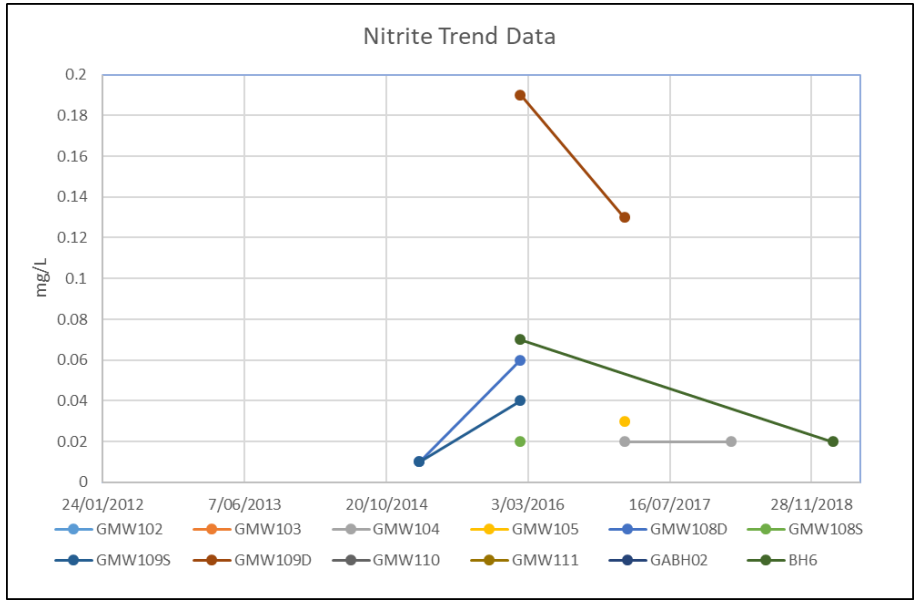




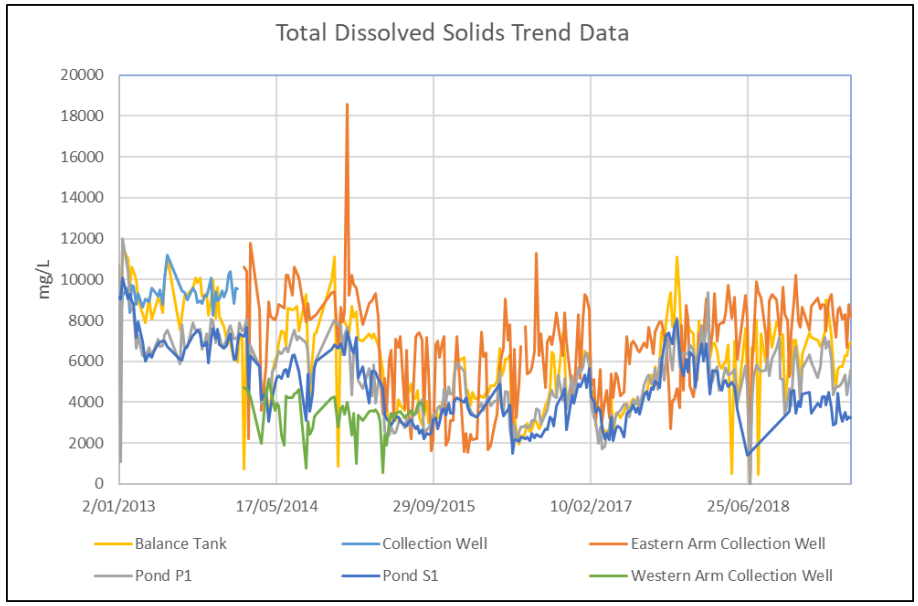


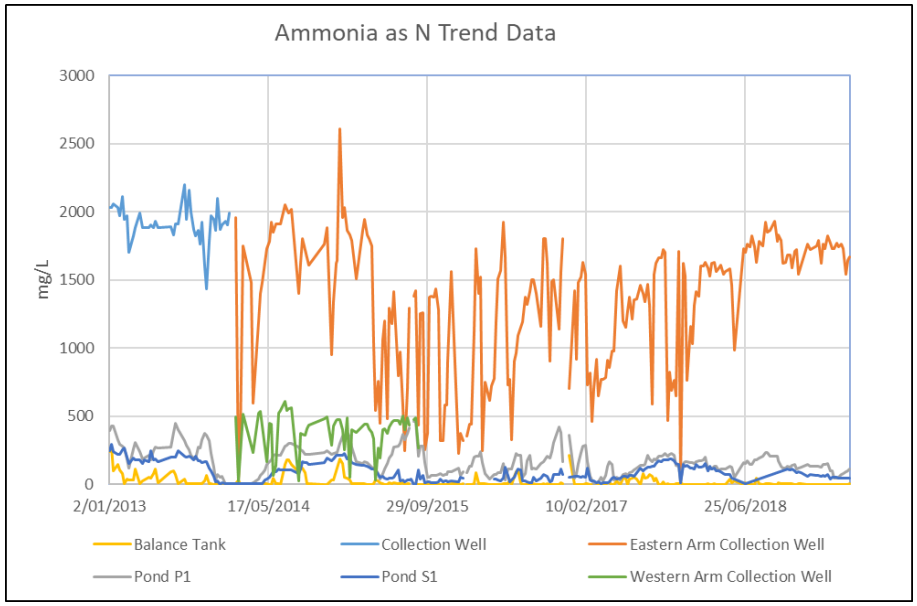
Whytes Gully Groundwater Monitoring Results Graphs

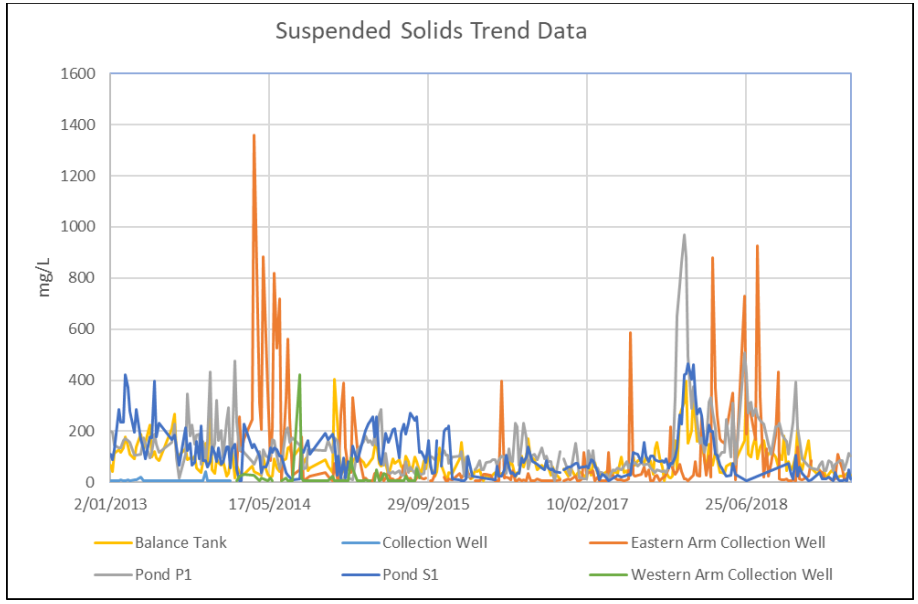


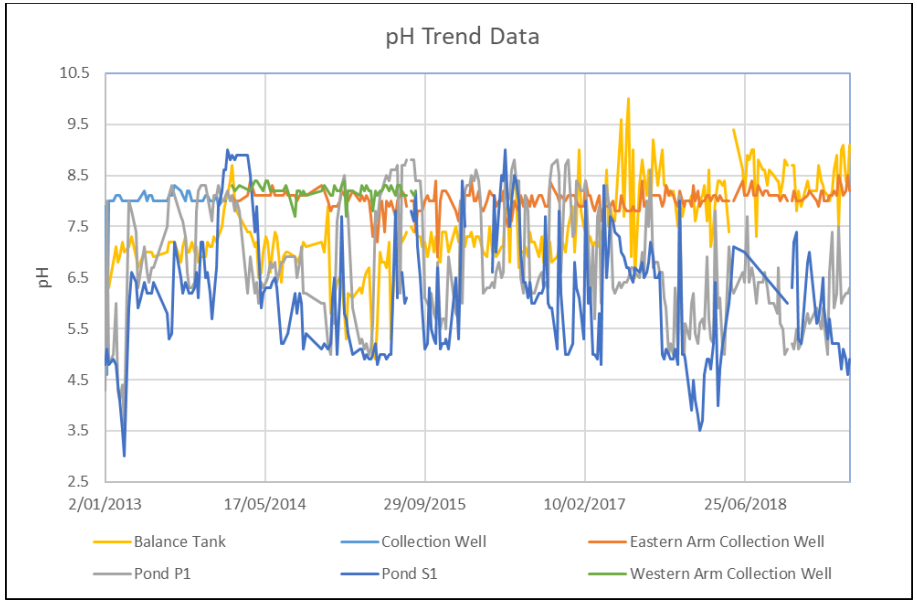


Whytes Gully Leachate Monitoring Results Graphs









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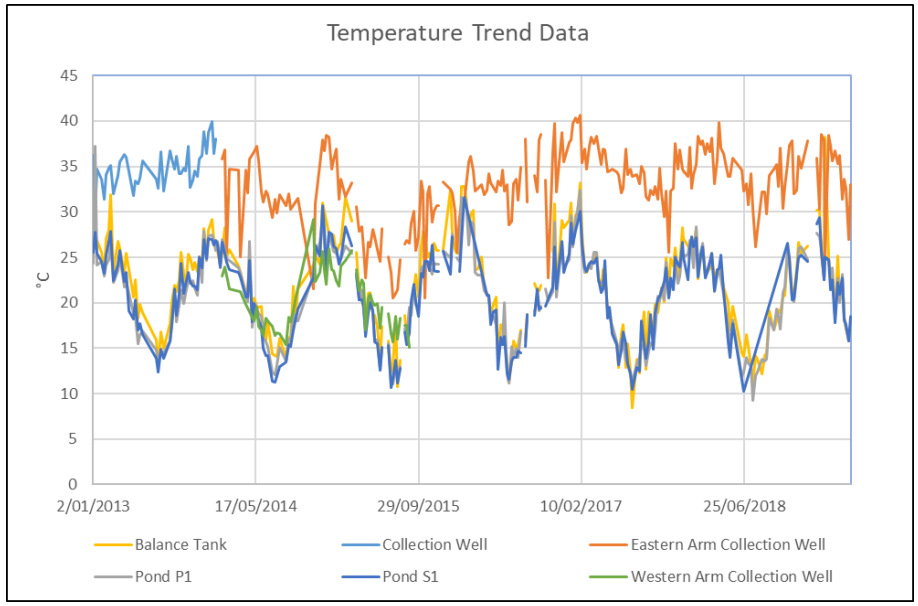
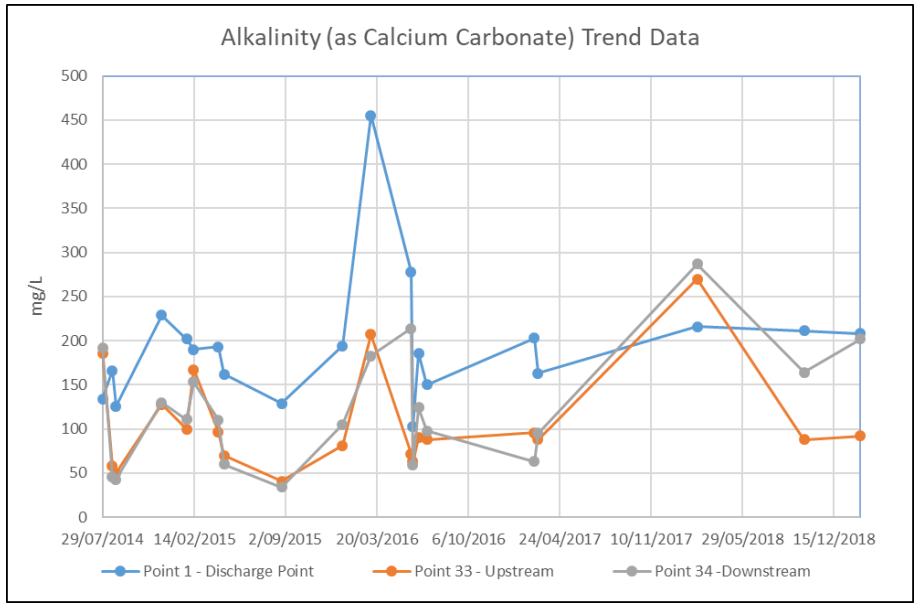
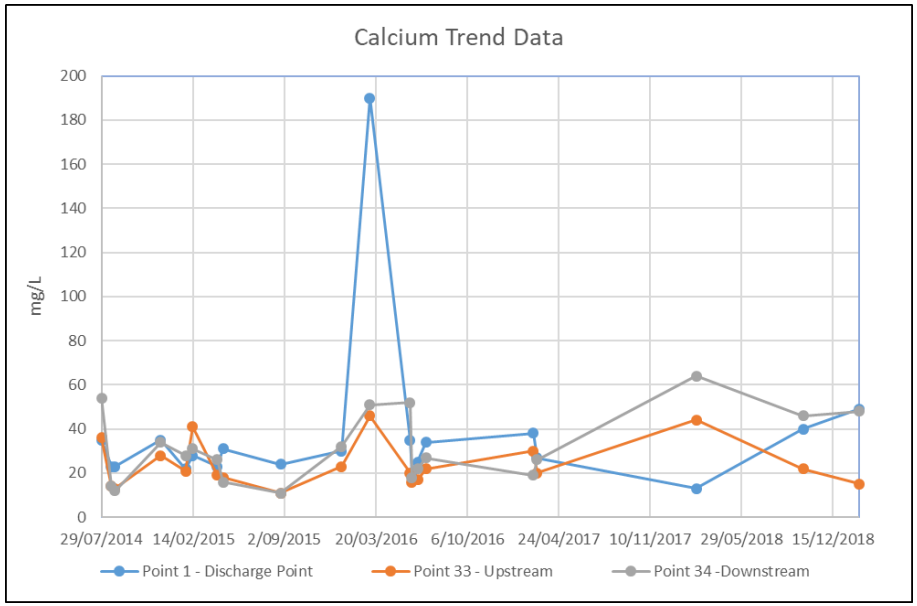
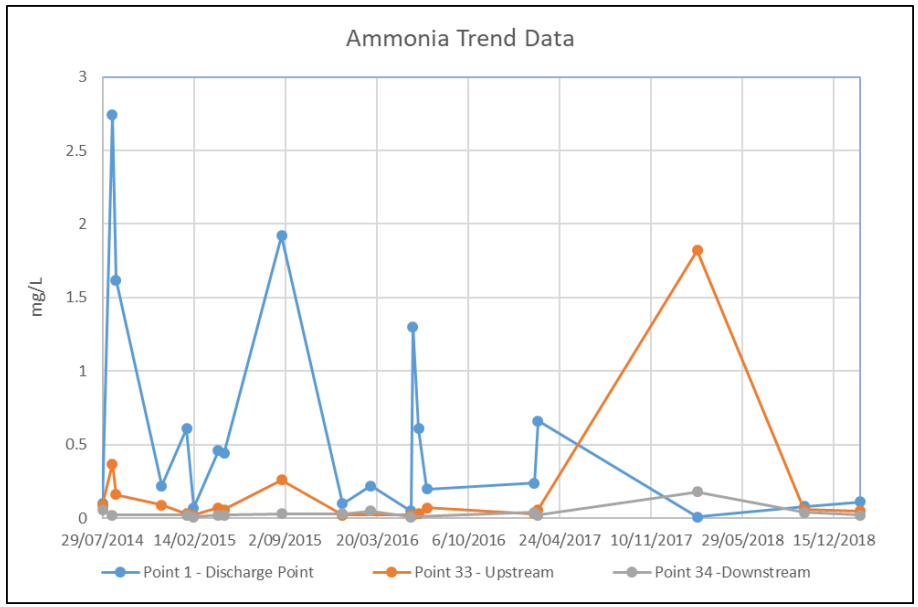
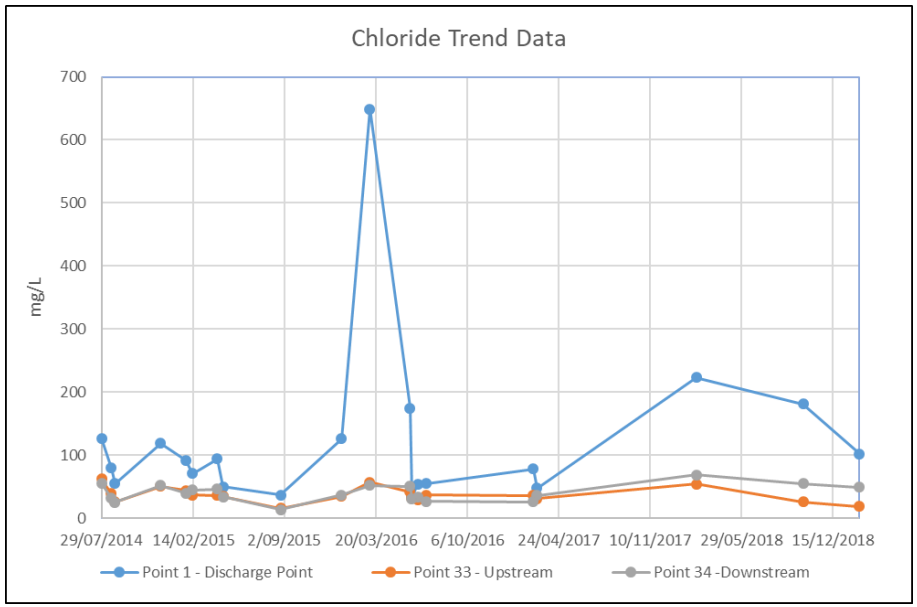


Whytes Gully Stormwater Monitoring Results Graphs









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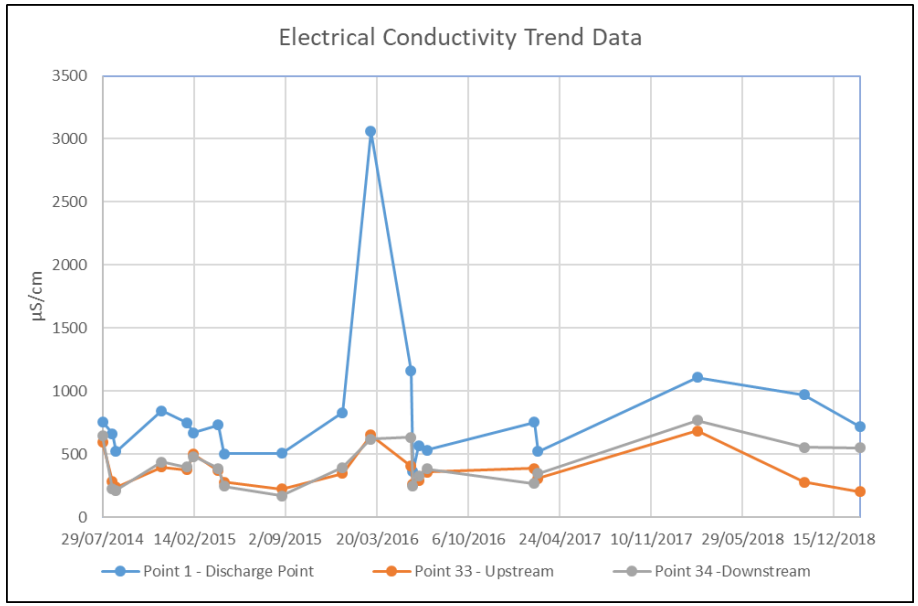

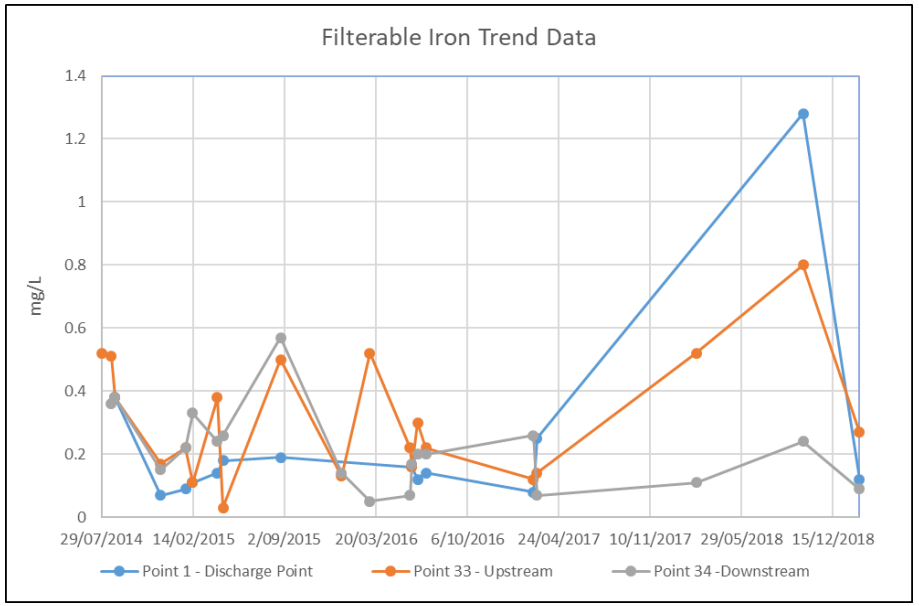

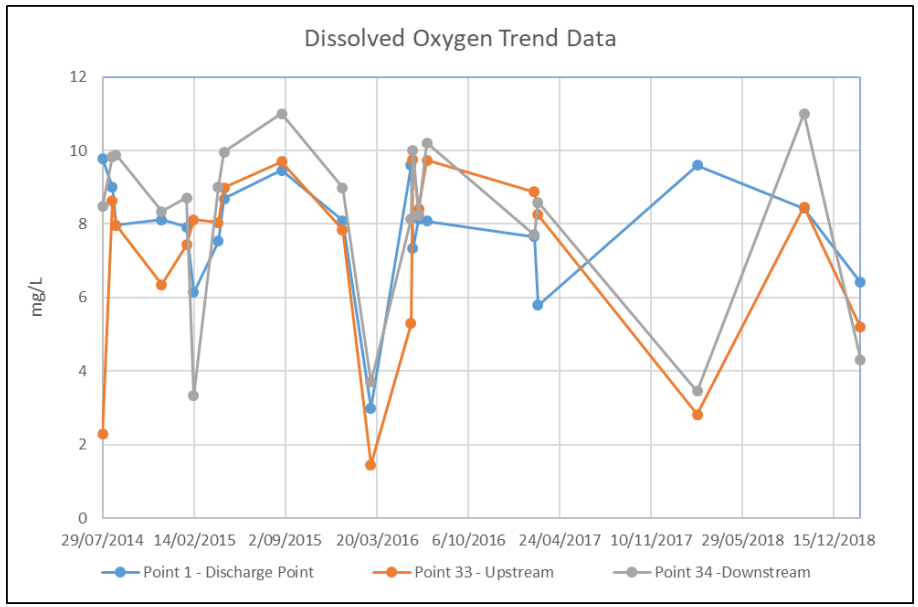

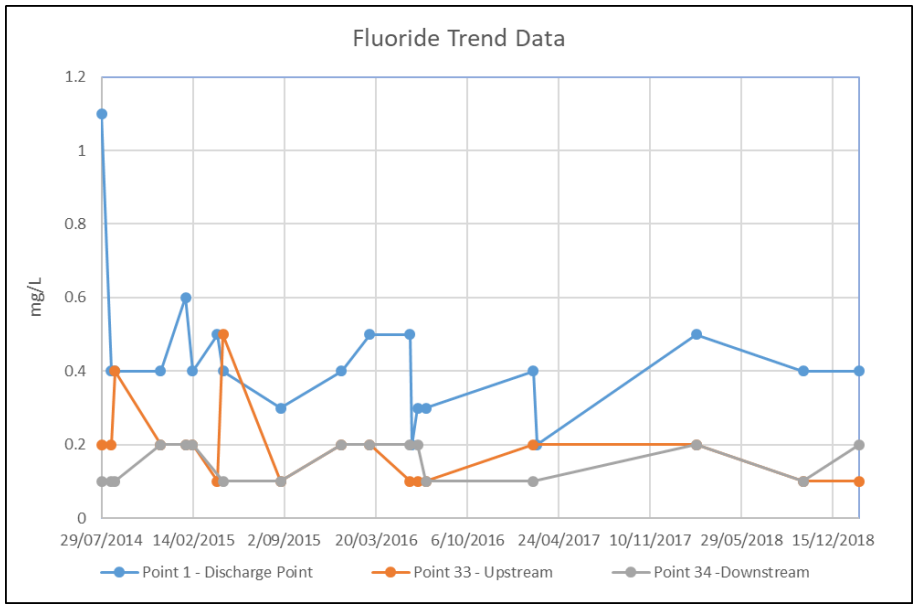

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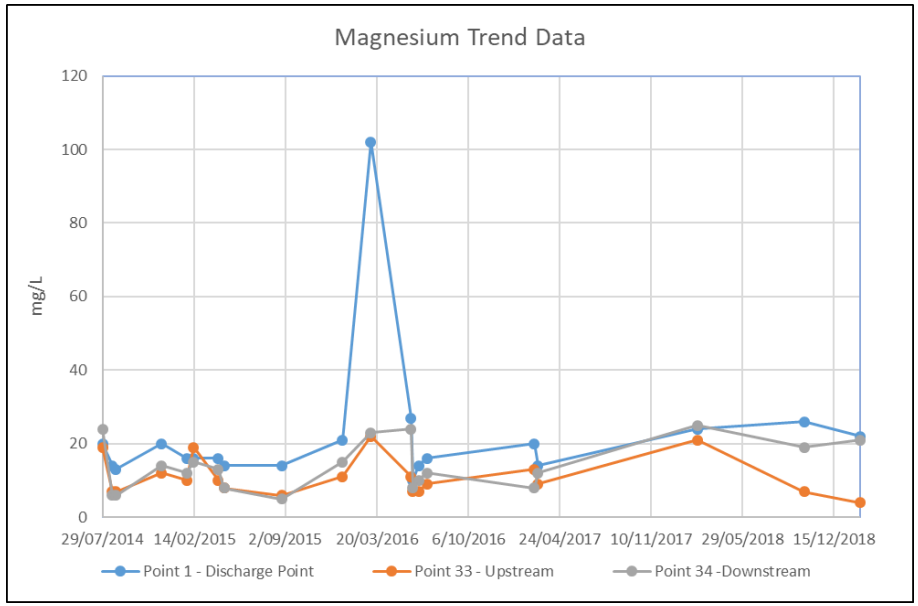

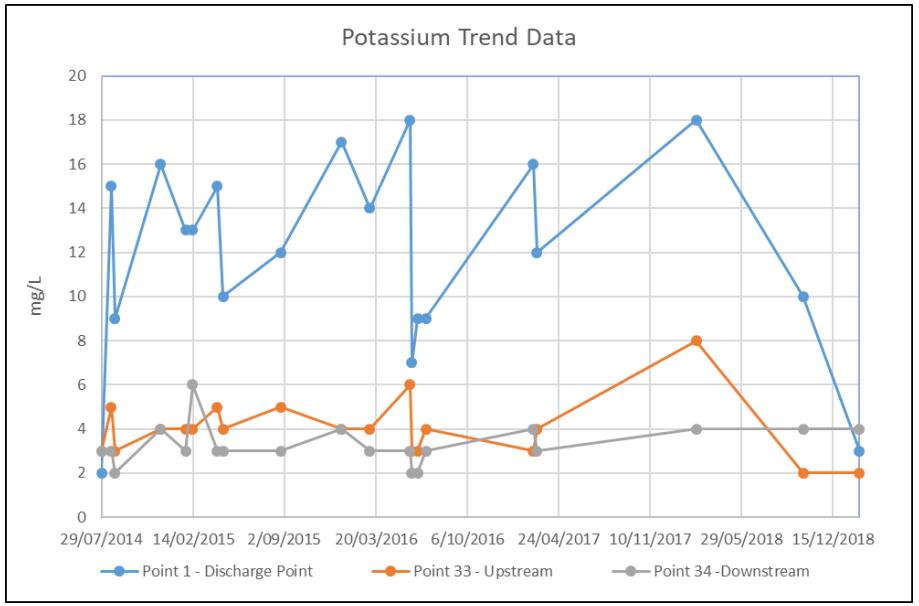

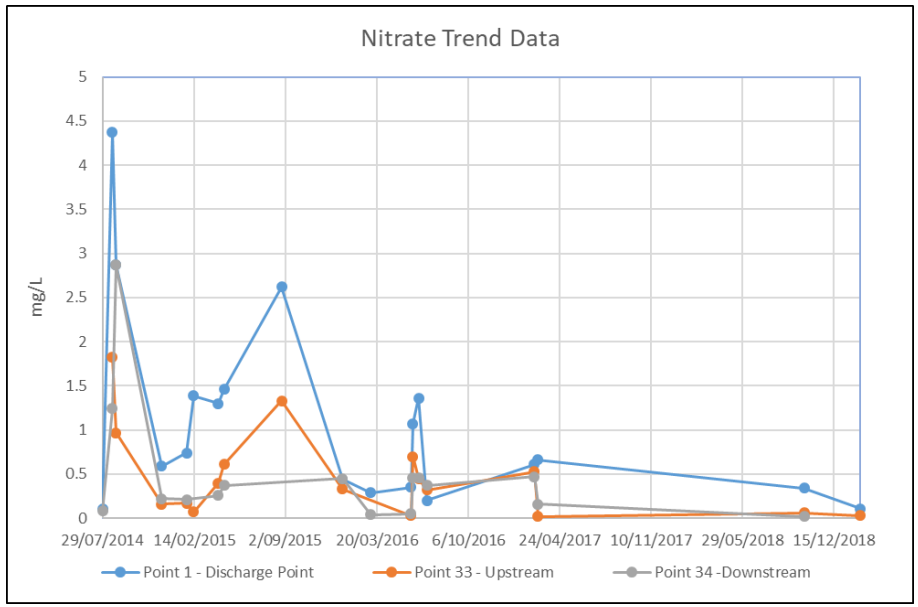

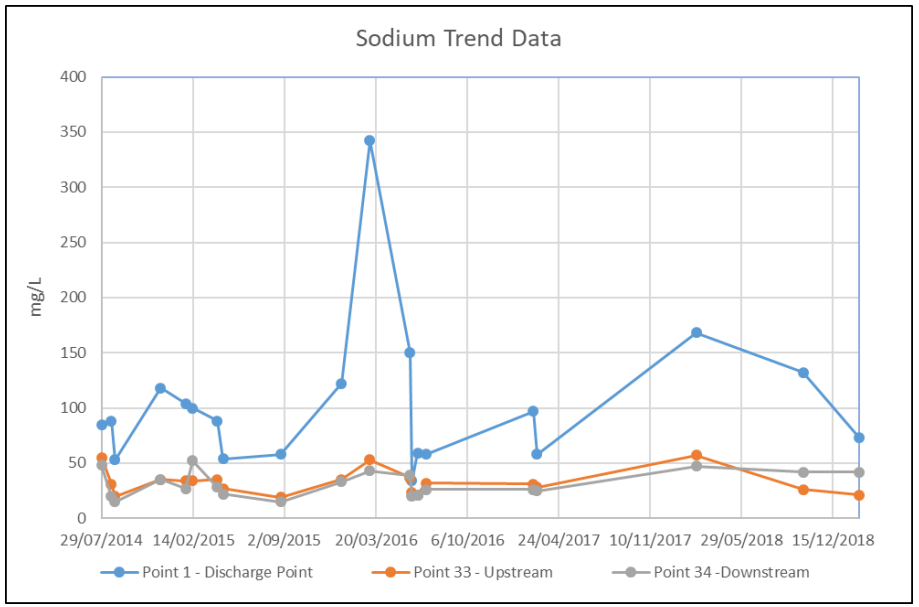

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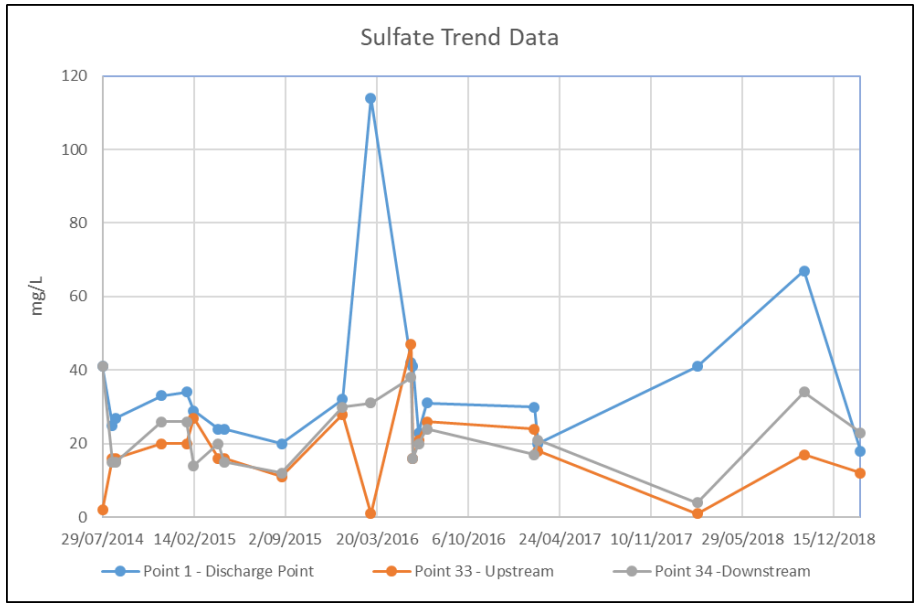

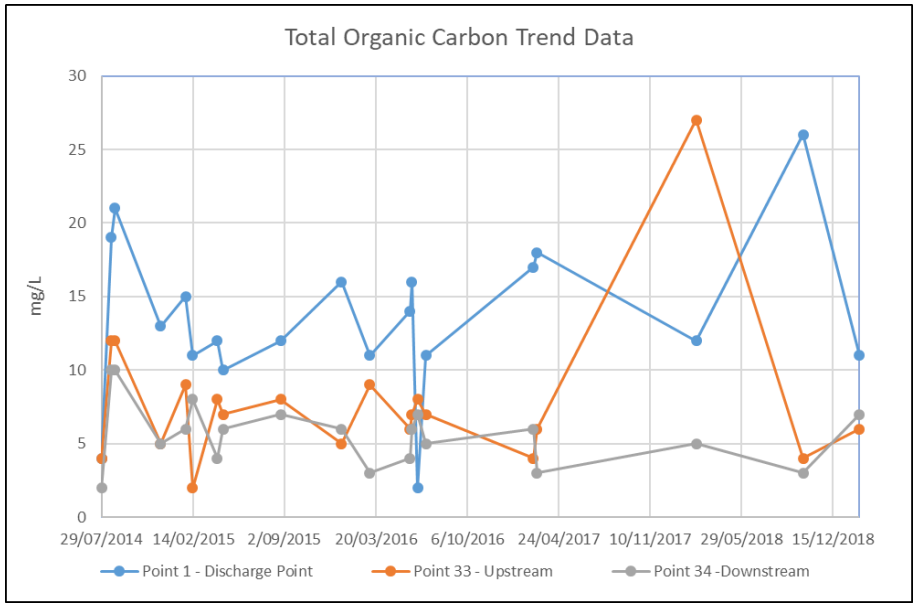

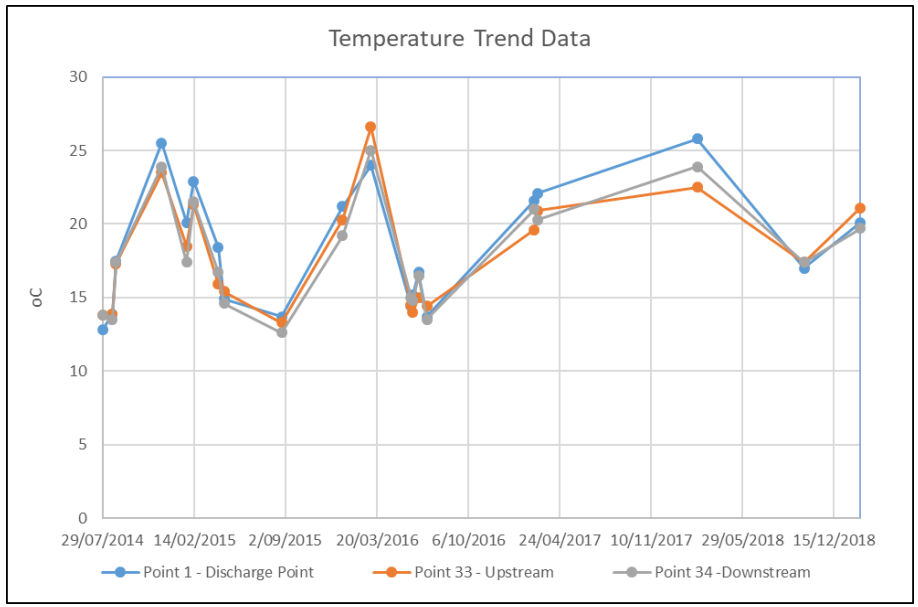

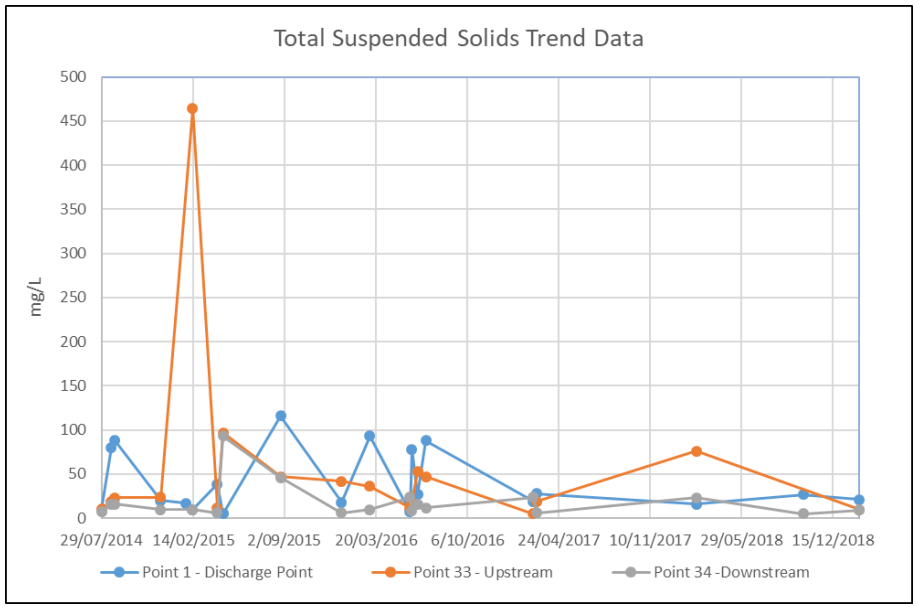

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