Douglas PARTNERS

GROUNDED EXPERTISE

Annual Report on Water and Gas Monitoring 2023 - 2024

Kempsey Landfill Water and Gas Monitoring

638 Crescent Head Road, Kempsey NSW

Prepared for Kempsey Shire Council

Project 89781.24

23 August 2024

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Signature		Date
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Report on Water and Gas Monitoring 2023 - 2024
Kempsey Landfill Water and Gas Monitoring
638 Crescent Head Road, Kempsey NSW

1. Introduction

1.1 Overview

This annual report presents the results of groundwater, surface water and gas monitoring for the period October 2023 to July 2024 at the Kempsey Landfill Site located at 638 Crescent Head Road, South Kempsey New South Wales (NSW). Monitoring was commissioned by Kempsey Shire Council (KSC).

The Kempsey landfill site is located at 638 Crescent Head Road, South Kempsey (Part Lot 7008 DP96356).

The site is licensed by the Environment Protection Authority under Environmental Protection Licence (EPL) 6269. The EPL notice specifies requirements for surface water, groundwater, leachate and gas monitoring including test locations, analytes and threshold concentrations. Monitoring was conducted with reference to EPL 6269 requirements.

The site is located within undeveloped land adjacent to the Maria National Park approximately 10 km southwest of Kempsey.

1.2 Background and Objectives

The KSC Environmental Protection Licence (EPL 6269) authorises the scheduled activity of Waste Disposal (application to land) at the Kempsey Landfill site on Crescent Head Road South Kempsey. KSC is required to undertake compliance monitoring as part of the licence conditions that allow the site to operate.

Conditions M2.2 and M2.3 of the EPL outline air emissions monitoring and water/ leachate monitoring requirements. Conditions M2.4, M2.5 and M2.6 of the EPL outline the groundwater, surface water and leachate reporting requirements.

The objective of this report is to meet the ELP requirements related to groundwater, surface water and gas monitoring for the 2022-2023 reporting period, specifically conditions M2.2, M2.3, M2.4, M2.5 and M2.6.

1.3 Scope of work

This report presents the results of the groundwater, surface water / leachate and gas monitoring program undertaken from September 2023 to July 2024. The following work tasks were undertaken:

- Q1 - First quarterly monitoring event, September 2023:

  - Manual water level gauging, purging and sampling of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location; and
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Q2 - Second quarterly monitoring event, January 2024:
  - Manual water level gauging of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location;
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Q3 – Third quarterly monitoring event, April 2024:
  - Manual water level gauging, purging and sampling of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location;
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Q4 - Fourth quarterly monitoring event, July 2024:
  - Manual water level gauging of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location;
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Assessment of the results of monitoring against the EPL 6269; and
- Preparation of this report.

The locations of the groundwater / gas monitoring wells, surface water and gas monitoring area are shown on Drawing 1 in Appendix A.

2. Site description

Table 1: Site identification

Item	Details
Allotment Identification	Part Lot 7008 DP96356
Street Address	638 Crescent Head Road, Kempsey NSW 2440
Site Area	Approx. 12 Ha
Elevation	Approx. 16 to 50 mAHD
Local Government Area	Kempsey Shire Council
Zoning	1(a1) Rural "A1" Zone
Current Land use	Landfill and waste management facility
Surrounding Uses	Crown Reserve

3. Environmental Setting (ERM 2020)

3.1 Topography

The original topography of the site has been disrupted by the former quarry operation and by the landfill operation. Despite this, the original landform is evident to some degree. The site is located on the slope of a ridge with southwest aspect. The highest natural elevation at the site is on the ridge in the northern portion of the site at approximately 49 m Australian Height Datum.

3.2 Hydrology

The landform of the site slopes to the southwest providing natural drainage to the lower end of the site, in the vicinity of the sediment retention dam (S7). A small, unnamed ephemeral watercourse is located adjacent to the western portion of the site, upon which the surface water monitoring location S4, S5 and S6 are located (see Drawing 1 in Appendix A). The unnamed ephemeral watercourse adjacent to the west of the site drainage only has flow during and immediately following high rainfall events. Another first order ephemeral watercourse meets with the unnamed ephemeral watercourse adjacent to the western portion of the site and this watercourse is sourced from within the rural residential area west of the site. The site catchment drains to Reedy Creek approximately two kilometres to the southwest of the site. Reedy Creek flows directly into the Maria River approximately five kilometres south of the landfill.

Surface water flow from capped areas of the site is directed into a perimeter spoon drain into the sediment retention dam (S7) sediment retention dam prior to being reused at the site (irrigation or dust suppression), evaporated or flowing on from the site to the unnamed ephemeral watercourse during overflow events or via active discharge.

Leachate from the landfill cells is managed within the leachate dam (L8) for on-site irrigation and evaporation.

3.3 Hydrogeology

Previous drilling activities conducted by RCA (2000) encountered the groundwater between 12 m and 17 m below the existing ground surface. RCA (2000) indicated that the groundwater beneath the site is confined by clay and weathered mudstone layers above the groundwater and bedrock below, particularly beneath the southern portion of the site. The groundwater is present in the less weathered mudstone, siltstone and sandstone layers.

Regional groundwater flow direction in the vicinity of the site is generally to the south / south-west, which is the same as the catchment area draining and existing landforms. This is consistent with field observations of the five groundwater monitoring wells (BH1, BH1/02, BH2, BH3 and BH4) at the site conducted over previous reporting periods.

3.4 Geology

Reference to the NSW Seamless Geology dataset, made available by the NSW Government Department of Regional New South Wales the site is underlain by Kempsey Beds which typically comprises sandstone, mudstone, siltstone, and conglomerate.

Reference to the Kempsey 1:100,000 scale Soil Landscape Sheet indicates the site is mapped as comprising residual soils of the Kundabung landscape.

The Kundabung landscape is characterised by “undulating rises with broad crests, extensive foot slopes and drainage plains on Permian mudstones of the Kempsey and Beechwood beds”. The soils within this landscape are characterised as “water erosion hazard, foundation hazards, shallow soils, erodible, sodic, acidic soils with low wet bearing strength and low permeability”.

Reference to the NSW Acid Sulfate Soil Risk Map indicates the site is not mapped within an acid sulfate soils area.

4. Site History and Use

The site was originally a clay quarry, in 1985 it was granted Development Consent to become a landfill and occupy approximately four hectares. Further Development Consents were granted in August of 2002 for an additional 0.5 hectares and December of 2003 for up to a total of 12 hectares.

The existing Kempsey landfill site is located within Lot 7008 DP96356, 638 Crescent Head Road, South Kempsey. The landfill area is generally positioned centrally within the lot and is surrounded by undeveloped rural land and mature trees as can be seen in Figure 1 below.

The Site consists of an operational landfill area, a completed landfill area and an area designated for future use. The current on-site buildings consist of a machinery shed, a pump shed, a heavy vehicle weighbridge and site office, truck wheel wash, a waste transfer station, and an area for recyclables materials and off-site processing materials.

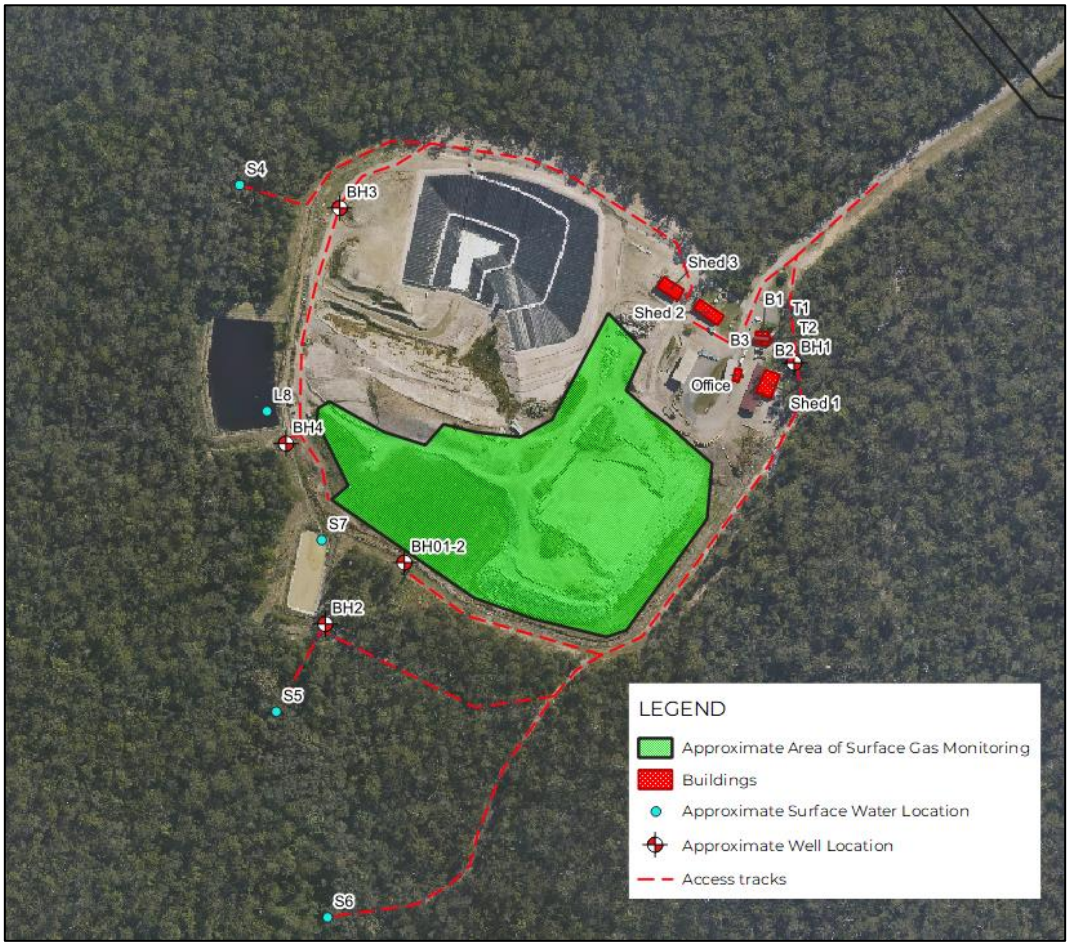

Figure 1: Site Plan and Monitoring Locations (source: MetroMap 2023)

5. Site Specific Trigger Levels

The site-specific trigger levels applied for the ground and surface water monitoring are provided in the EPL 6269 and are shown in Table 2 below.

Table 2: EPL 6269 Site Specific Trigger Levels

Pollutant	Units of measure	Groundwater Trigger Level	Surface Water Trigger Level
Ammonia	mg/L	0.9	0.9
Conductivity	µS/cm	1065	1065
Magnesium	mg/L	10.05	10.05
Nitrate	mg/L	0.7	0.7
pH	pH	6.5-8.0	6.5-8.0
Calcium	mg/L	NA	2.05
Chloride	mg/L	NA	54.49
Iron	mg/L	NA	1.84
Manganese	mg/L	NA	1.9
Sodium	mg/L	NA	34
Sulfate	mg/L	NA	3.1
TOC	mg/L	NA	33.1
Total Phenolics	mg/L	NA	0.32
Alkalinity (as CaCo3)	mg/L	NA	12.283
Potassium	mg/L	NA	2.282
TSS	mg/L	NA	33.415
DO	mg/L	NA	12.057

The criteria for the surface and ground gas monitoring are in reference to the Environmental Guidelines for Solid waste landfills (NSW EPA, 2016) as follows:

- Subsurface methane criteria – 1 % (v/v); and
- Surface methane – 500 ppm.

6. Field work methods

6.1 Overview and Schedule

Groundwater, surface water and gas monitoring was conducted with reference to the EPL as presented in Table 3 below.

Table 3: Quarterly Monitoring Tasks

Quarterly Round	Sampling Date	Description	Comment
Q1 1st Quarter monitoring event	26 September 2023	Groundwater gauging	No rainfall on the day of monitoring. No rainfall recorded in the preceding week.
		Methane gas monitoring (building, bores and surface)	
	27 September 2023	Surface water sampling and laboratory analysis	No rainfall on the day of monitoring.
		Groundwater sampling and laboratory analysis	
Q2 2nd Quarter monitoring event	16 January 2024	Surface water sampling and laboratory analysis	Approximately 21.2 mm of rainfall on the day of monitoring. Approximately 6.4 mm of rainfall in the preceding week.
		Methane gas monitoring (building, and surface)	
	17 January	Groundwater gauging	Approximately 4.4 mm of rainfall on the day of monitoring.
		Methane gas monitoring (bores)	
Q3 3rd Quarter monitoring event	8 April 2024	Methane gas monitoring (building, bores and surface)	Approximately 1.4 mm of rainfall on the day of monitoring. Approximately 181.2 mm of rainfall in the preceding week.
	9 April 2024	Surface water sampling and laboratory analysis	Approximately 0 mm of rainfall on the day of monitoring.
		Groundwater gauging	
		Groundwater sampling and laboratory analysis	
Q4 4th Quarter monitoring event	1 July 2023	Groundwater gauging	Approximately 2 mm rainfall on the day of monitoring. Approximately 3.2 mm of rainfall recorded in the preceding week.
		Methane gas monitoring (building, bores and surface)	
		Surface water sampling and laboratory analysis	

Notes:
Rainfall data obtained from BOM

6.2 Groundwater

6.2.1 Groundwater Monitoring Locations

A summary of groundwater bore/well monitoring locations is presented below:

- BH1 (EPL Point 1):
  - Located up-hydraulic gradient of the site and is intended to be representative of background groundwater conditions.
- BH2 (EPL Point 2):
  - Located down gradient and to the south of the landfill, near the sediment retention dam.
- BH3 (EPL Point 3):
  - Located on the western side of the site within the landfill fence-line, near an existing storm water spoon drain.
- BH4 (EPL Point 12):
  - The western-most monitoring well outside the landfill fence-line, located between the sediment retention pond and leachate dam.
- BH1-02 (EPL Point 14):
  - Located to the south of the landfill boundary.

Refer to Drawing 1 in Appendix A for approximate well locations.

6.2.2 Groundwater Well Gauging, Purging and Sampling

Prior to purging and sampling of wells (BH1, BH1/02, BH2, BH3 and BH4), an oil-water interface meter was used to measure the depth to groundwater and assess the possible presence of a floating product within each well. Refer to Drawing 1 in Appendix A for approximate well locations.

Prior to sampling, the wells were purged using a MP10 MicroPurge low-flow water sampler or Clearview disposal single-check valve bailers until steady pH, EC, turbidity and temperature readings were achieved. Field parameters were measured using a calibrated portable meter.

The groundwater level was allowed to recover from the effects of purging prior to sampling. Groundwater samples were collected under strict QA/QC protocols and placed directly into laboratory prepared containers for analysis. The samples were delivered to the laboratory within the recommended holding times for analysis.

The headspace at the top of each well was also screened for the presence of volatile organic compounds (VOCs) using a calibrated Photo-ionisation detector (PID).

The process of obtaining samples and their transportation, storage and delivery to laboratories for analysis was documented on a DP standard Chain-of-Custody (COC) form. Copies of completed forms are contained in Appendix F.

Gauging, groundwater purging and sampling were undertaken by a geo-environmental engineer from DP.

6.2.3 Groundwater Analysis

Laboratory testing for groundwater samples was undertaken by Envirolab Services Pty Ltd (Envirolab), a National Association of Testing Authorities, Australia (NATA) registered laboratory. The analytical methods used are shown on the laboratory sheets in Appendix E.

Groundwater analysis was undertaken bi-annually (Q1 and Q3) at locations BH1, BH2, BH3, BH4, BH01-2 for the following parameters as per the EPL:

- Ammonia, Electrical Conductivity, Magnesium, Nitrate, pH, Standing water level, Temperature;
- Monitoring for dissolved oxygen (DO) was also conducted, together with screening of groundwater headspace for volatile organic compounds using a Photo-ionisation detector (PID).

6.3 Surface Water

6.3.1 Surface Water Monitoring Locations

A summary of surface water sampling locations is presented below:

- S4 (EPL Point 4):
  - Located upstream from the site and is considered to be representative of background surface water conditions.
- S5 (EPL Point 5):
  - Located directly downstream from the site and sediment retention dam overflow. S5 is also located downstream from input from the first order stream that meets with the unnamed ephemeral watercourse located adjacent to the western portion of the site.
- S6 (EPL Point 6):
  - Located further downstream of the site than S5.
- S7 (EPL Point 7):
  - Located at the outlet of the site sediment retention pond.
- L8 (EPL Point 8):
  - Located within the leachate dam and utilised to monitor the composition of leachate and allow comparisons with the other surface water locations on and offsite, to assess potential impacts associated with the operation of the landfill.

Refer to Drawing 1 in Appendix A for approximate sampling locations.

6.3.2 Surface Water Sampling

Surface water samples (S4, S5, S6, S7 and S8) were collected using a long-handled 'swing sampler', directly into new laboratory prepared sampling bottles for each sampling event. Sampling was undertaken to minimise the disturbance of surface water sediments. Refer to Drawing 1 in Appendix A for approximate surface water sample locations.

In-situ measurements of pH, electrical conductivity (EC), oxidation-reduction potential (ORP), dissolved oxygen (DO), turbidity and temperature were taken using a calibrated multi-parameter meter following collection of each surface water sample. The headspace of surface water collected was also screened for the presence of VOCs using a calibrated PID.

Samples were collected under strict QA/QC protocols and delivered to the laboratory within the recommended holding times for analysis. The process of obtaining samples and their transportation, storage and delivery to laboratories for analysis was documented on a DP standard Chain-of-Custody (COC) form. Copies of completed forms are contained in Appendix C.

6.3.3 Surface Water Analysis

Laboratory testing for groundwater and surface water samples was undertaken by Envirolab Services Pty Ltd (Envirolab), a National Association of Testing Authorities, Australia (NATA) registered laboratory. The analytical methods used are shown on the laboratory sheets in Appendix E.

Surface water analysis was undertaken quarterly (Q1, Q2, Q3 and Q4) at locations S4, S5, S6, S7, L8 for the following parameters as per the EPL:

- Alkalinity, Ammonia, Calcium, Chloride, Electrical Conductivity, Dissolved Oxygen, Fluoride, Iron, Magnesium, Manganese, Nitrate, pH, Potassium, Sodium, Sulfate, Temperature, Total organic carbon, Total Phenolics, Total suspended solids.

6.4 Gas Monitoring

6.4.1 Monitoring Wells

Landfill gas monitoring was carried out in wells BH1, BH1/02, BH2, BH3 and BH4, with reference to DP standard operating procedures and NSW EPA (2020). The monitoring method is described as follows:

- Record the barometric pressure;
- Connect the tube on the calibrated landfill gas analyser (GA5000) to the quick connect gas fitting on the well cap; and
- Set the analyser pump on and record concentrations of methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide, generally at 30 second intervals, until concentrations have generally stabilised.

The general weather conditions and atmospheric pressure were recorded during the monitoring event.

6.4.2 Landfill Surface and Enclosed Spaces (Buildings)

Surface gas monitoring comprised traversing the southern portion of the landfill surface on foot, taking measurements of methane concentrations close to the ground surface and client nominated buildings.

Methane measurements were made within buildings (i.e. Site Office, Shed 1, Shed 2 and Shed 3, Staff Office, Breakroom and Toilet facilities) as instructed by the client. Refer to Drawing 1 in Appendix A for approximate building locations.

Surface landfill gas monitoring was carried out in accordance with DP standard operating procedures and (NSW EPA, 2020). The monitoring method is described as follows:

- Methane was measured in the atmosphere approximately 5 cm above the landfill surface;
- Transects were generally conducted at 25 m spacings where accessible and methane was measured at approximately 25 m intervals along each transect;
- Further monitoring was undertaken at client nominated enclosed structures / buildings, as shown in Drawing 1;
- The monitoring was performed on a calm day (where possible) during a period of relatively low and stable atmospheric pressure and where wind speed was estimated less than 10 km/h;
- Measurements were taken either using a Huberg Laser or TDL-500 Laser Methane Detector subject to availability capable of detecting concentrations of methane between 0 and 10,000 ppm;
- The methane detector was calibrated prior to use (undertaken by equipment supplier).

6.5 Quality Assurance / Quality Control

6.5.1 Field QA/QC

Quality assurance and quality control (QA/QC) procedures were adopted throughout the field sampling programme and comprised the following:

- Following standard operating procedures;
- Storage of samples under secure, temperature-controlled conditions; and
- Use of chain of custody documentation for the handling, transport and delivery of samples to the selected laboratory.

The overall assessment of QA/QC presented in Appendix C.

6.5.2 Laboratory QA/QC

The NATA accredited chemical laboratory undertook in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks; and
- Statistical analysis of QC data.

An assessment of the laboratory QA/QC data quality is presented in Appendix C

7. Field Work Results

7.1 Groundwater Level Monitoring

The results of water level gauging for each monitoring round are shown in Table D1 Appendix D. Historic groundwater levels for the last four years of monitoring are plotted against rainfall (Kempsey Airport) in Figure G1 in Appendix G. It is noted that there was significant rainfall in the 2020-2021 and 2021-2022 monitoring periods (i.e. 2023.4 mm and 1575.8 mm respectfully for a 12 month period), compared to the 2022-2023 and 2023 – 2024 monitoring periods (985.2 mm and 995.6 mm).

Prior to 2019 there was a general trend of slowly dropping water levels with the exception of BH1. Previous gauging in BH1 indicated sporadic levels with significant response to rainfall suggesting that the well is compromised and is not providing accurate water levels within the formation, currently the Bore is obstructed and as such groundwater level cannot be accurately monitored at this monitoring point (refer to Table D1 and Figure G1).

Groundwater levels have generally decreased over the 2023-2024 reporting period by up to about 1.0m.

Groundwater levels in BH1 continue to be sporadic and are not believed to provide accurate groundwater levels at this location.

Groundwater flow is inferred to be flowing to the southwest which is consistent with the southwest orientated land formation.

7.2 Groundwater Quality Monitoring – Field

The groundwater field parameters measured during purging and sampling for Q1 and Q3 monitoring events are shown in Table D2 Appendix D.

The field parameters indicated the following:

- pH ranging from 5.2 – 6.6 pH indicating generally neutral to slightly acidic conditions;
- Electrical Conductivity ranging from 1.46 to 1.91 mS/cm indicating generally fresh to brackish conditions;
- Both oxidative and reductive water conditions; and
- Generally minimal to slight turbidity, clear, grey and brown groundwater.

The results of PID screening on headspace at the top of each well also suggested the absence of gross volatile organic compounds (i.e. <1 ppm) as indicated in Tables F1 and F4 in Appendix F.

Observations made during purging and sampling generally indicated the absence of visual or olfactory evidence of gross contamination to groundwater at the locations sampled (i.e. general absence of staining, odours, free product etc). A minor hydrogen sulfide odour was noted in BH1-2 and BH2 during the Q3 monitoring round.

Graphed representation of historical field observations (EC and pH) is presented Appendix G.

7.3 Surface Water Quality Monitoring - Field

The surface water field parameters measured during sampling for each monitoring round are shown in Table D2 Appendix D.

The field parameters indicated the following for surface waters (excluding L8 leachate dam):

- pH ranging from 5.5 – 8.4 pH indicating generally acidic to alkaline conditions;
- Electrical Conductivity ranging from 0.07 to 2.63 mS/cm indicating generally fresh to brackish conditions;
- Generally oxidative water conditions with high dissolved oxygen; and
- A range of slight to moderate turbidity, clear, and brown surface water.

The field parameters for L8 (Leachate Dam) indicated the following:

- pH ranging from 7.2 – 8.4 pH indicating generally acidic to alkaline conditions;
- Electrical Conductivity ranging from 0.66 to 3.16 mS/cm indicating generally fresh to brackish conditions;
- Generally oxidative water conditions with high dissolved oxygen; and
- Slightly turbid brown water.

Observations made during surface water sampling generally indicated the absence of visual or olfactory evidence of gross contamination to the surface water bodies at the locations sampled (i.e. general absence of staining, odours, free product etc).

Graphed representation of historical field observations (EC and pH) is presented Appendix G.

7.4 Gas Monitoring

7.4.1 Monitoring Wells

The results of gas monitoring within the monitoring wells are shown in Table D3, Appendix D. The results of monitoring in indicated the general absence of methane concentrations within groundwater wells (i.e. <1ppm), which is consistent with gas monitoring in the previous year.

7.4.2 **Landfill Surface**

The summary results of methane monitoring across the landfill surface are shown in Table D4, Appendix D. The results indicated a total of five exceedances of the monitoring criteria (500 ppm) in Q1 through to Q4 during the monitoring period October 2023 to July 2024. The approximate locations of the exceedances are shown in Figure 1 below (E1 to E14).

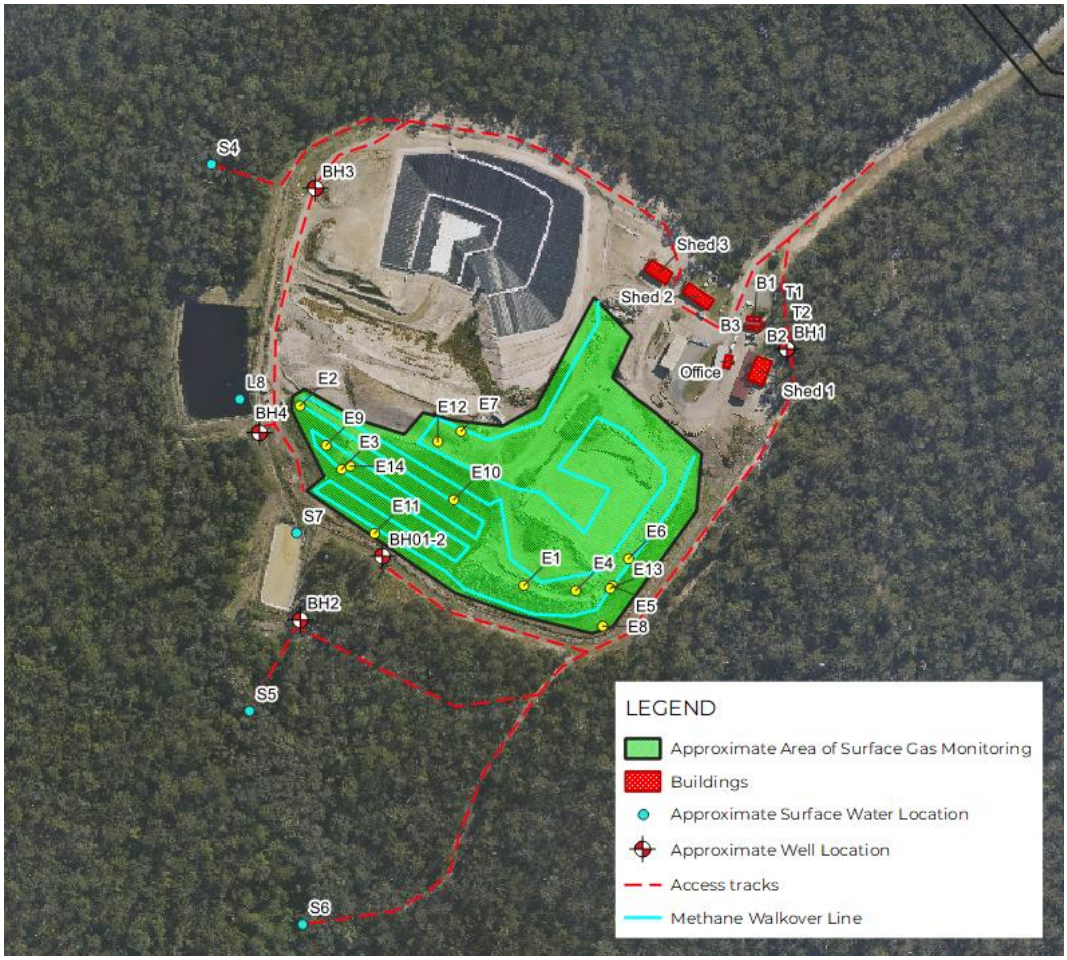

Figure 2: Approximate locations of methane monitoring (Q4, 2024)

The results of surface methane monitoring are summarised in Table 4 below.

Table 4: Summary of Methane Monitoring Exceedances – September 2023 to July 2024

Location			Methane (ppm)			
			Q1	Q2	Q3	Q4
ID	Easting	Nothing	26/09/2024	16/01/2024	8/04/2024	1/07/2024
E1	488395	6555797	N/A	N/A	N/A	N/A
E2	488218	6555940	4 - 6	5 - 10	5 - 10	20 - 50
E3	488251	6555889	6 - 10	80 - 100	5 - 10	15 - 25
E4	488436	6555793	-	N/A	N/A	N/A
E5	488465	6555797	-	N/A	N/A	N/A
E6	488478	6555818	675 - 990	N/A	500 - 750	N/A
E7	488345	6555919	2 - 6	4 - 6	10 - 30	2 - 5
E8	488457	6555765	670 to 1110	100 - 140	100 - 250	20 - 40
E9	488238	6555908	5 - 8	60 - 80	20 - 70	2 - 3
E10	488339	6555865	5 - 10	5 - 10	100 - 150	2 - 3
E11	488277	6555839	1000 - 1100	5 - 10	5 - 10	2 - 5
E12	488327	6555911	5 - 10	20 - 30	10 - 20	2 - 5
E13	488463	6555796	545 - 3290	130 - 280	10 - 20	15 - 25
E14	488257	6555892	5 -10	50 - 150	20 - 70	15 - 25

Notes to Table 4:
Exceedance of 500 ppm criteria
N/A not accessible
* Datapoint found in future monitoring round

The results of surface methane monitoring indicated the presence of localised elevated methane at the following locations; E6, E8, E11, and E13. Surface vegetation generally comprised grasses with some localised bare areas. Additional targeted monitoring of surface methane was conducted within selected bare areas. Monitoring generally suggested that there was no direct correlation between bare vegetation areas and elevated methane concentrations.

In summary, a total of five exceedances of the surface methane monitoring criteria were observed (four in Q1 and one in Q3).

A number of previous locations containing elevated surface methane concentration were not accessible due to the presence of a fill stockpile (i.e., locations E1, E4, E5 and E6). We understand that the stockpile is temporary and contains natural soils that will be progressively used as day cover for future landfill activities. The fill stockpile may therefore be present over this area for an extended period.

The results of monitoring generally suggests the presence of elevated methane concentrations within the western portion of the monitoring area (in the vicinity of former location E3), and the south eastern portion of the monitoring area (in the vicinity of former location E5).

7.4.3 Buildings (Enclosed Spaces)

The results of methane monitoring within nominated buildings for each event are shown in Table D5, Appendix D. The results indicated the general absence of significant methane concentrations within buildings (i.e < 10 ppm). A methane concentration of 50.7ppm was identified within one of the drains in the Office building on 8 April 2024. The significance (if any) of this result will be further assessed during future monitoring.

7.4.4 Discussions with Site Personnel

The following information regarding site activities/operations was provided during each round of monitoring by site personnel.

September 2023 – Q1

It is understood that there were no changes to landfill operations regarding waste placement, surface water management, or irrigation. There were no discharge events since the last round (Q4 2022-2023).

January 2024 – Q2

It is understood that there were two separate discharge events since the previous September 2023 (Q1) monitoring round. It is understood that these events were directly reported to the EPA by KSC.

April 2024 – Q3

It is understood that there was one discharge event since the previous January 2024 (Q2) monitoring round. It is understood that this event was directly reported to the EPA by KSC.

July 2024 – Q4

It is understood that there was a discharge event since the previous April 2024 (Q3) monitoring round. It is understood that this event was directly reported to the EPA by KSC.

It is further understood that KSC had undertaken and were undertaking works relating to stormwater and leachate controls on-site, including:

- Decommissioning of the perimeter drain along the southern portion of the landfill formerly containing leachate;
- Additional material placed on Cell 3 stockpile from perimeter drain excavations (drain formerly containing leachate);
- Installation of a new leachate treatment plant near the leachate pond; and
- Commencement of remediation works along the southern boundary of Cell 3, including excavation and repairs to the current Cell 3 cap liner (ie area containing observed leachate seepage).

Council indicated that the works were being works are conducted in accordance with the EPL and relevant regulatory requirements.

8. Discussion

8.1 Groundwater

8.1.1 Field Observations

The groundwater field parameters measured during purging and sampling for Q2 and Q4 monitoring events are shown in Table D2 Appendix D and were discussed in Section 7.1 above.

Observations made during purging and sampling generally indicated the absence of visual or olfactory evidence of gross contamination to groundwater at the locations sampled (i.e. general absence of staining, odours, free product etc). A minor hydrogen sulfide odour was noted in BH1-2 and BH2 during the Q1 monitoring round.

During the 2023-2024 annual monitoring period, BH1 was blocked by obstruction and sampling was not able to be completed.

8.1.2 Groundwater Analytical Results

The results of analytical testing of groundwater are included in the laboratory report sheets in Appendix E. The results of testing are summarised in Tables F1 and F4 against the adopted site criteria in Appendix F. Graphical representation of historical analytical results for selected parameters are presented in Appendix G. Laboratory analytical reports are in Appendix E.

A summary of the analytical results, together with comments on EPL criteria exceedances and historical trends are provided in Annual Reporting Tables H1, H2, H3, H12 and H13 in Appendix H.

Exceedances of EPL trigger levels for each bore and quarterly monitoring round are summarised in Table 5 below.

Table 5: Exceedances of the EPL 6269 Tigger Levels - Groundwater

Groundwater Well I.D	Analytes Exceeding the EPL Groundwater Trigger Levels	
	Q1 - September 2023	**Q3 - April 2024**
BH01-2	EC, pH, Mg, Ammonia	EC, pH, Mg
BH1	-	-
BH2	EC, Mg, Ammonia	EC, Mg
BH3	EC, pH, Mg, Ammonia	EC, pH, Mg
BH4	EC, pH, Mg, Ammonia	EC, pH, Mg

During the September 2023 to July 2024 monitoring period, BH1 was blocked by an obstruction in the groundwater well and sampling was not able to be completed. Groundwater monitoring concentrations were generally within the range of historical data. An elevated nitrate concentration was found in BH3 during the 2019 to 2020 annual monitoring round. It is noted that sporadic elevated nitrate concentrations have been observed historically for a number of bores, however, the elevated results were not in subsequent monitoring events (refer to Figure G2 in Appendix G). The previous elevated sporadic nitrate concentrations may therefore be spurious.

8.2 Surface Water

8.2.1 Field Observations

The surface water field parameters measured during sampling for Q1, Q2, Q3 and Q4 monitoring events are shown in Table D2 Appendix D and were discussed in Section 7.2 above.

The following observations were made during the 2023 to 2024 monitoring period:

- Surface water locations S4, S5 and S7 were dry during Q1 – September 2023 monitoring round;
- Localised migration of potential leachate from the capped landfill area south east of the leachate dam was visible during Q3 – April 2024 monitoring round (risk of possible migration toward the Sediment Dam S7 via surface drains (see Figure 1 and Figure 2)); and
- Overflow/discharge observed from Sediment Dam S7 during 8 and 9 April 2024, during Q3 monitoring round (see Figure 3).

Further observations made during surface water sampling generally indicated the absence of visual or olfactory evidence of gross contamination to the surface water bodies at the locations sampled (i.e. general absence of staining, odours, free product etc).

Figure 3: Figure 1: Potential Leachate migrating from capped landfill area - south east of the leachate dam (8 April 2024)

Figure 4: Potential Leachate flow towards stormwater drain catchment (which discharges to Sediment Dam S7) (8 April 2024)

Figure 5: Overflow of Sediment Dam (S7) (8 April 2024)

8.2.2 Surface Water Analytical Results

The results of analytical testing of surface water are included in the laboratory report sheets in Appendix E. The results of testing are summarised in Tables F2, F3, F5 and F6 against the adopted site criteria in Appendix F. Graphical representation of historical analytical results for selected parameters are presented in Appendix G. Laboratory analytical reports are in Appendix E.

A summary of the analytical results, together with comments on EPL criteria exceedances and historical trends are provided in Annual Reporting Tables H4, H5, H6, H7 and H8 in Appendix H.

Exceedances of EPL trigger levels for each location and quarterly monitoring round are summarised in Table 6 below.

Table 6: Exceedances of the EPL 6269 Tigger Levels – Surface Water

Sampling Location	Analytes Exceeding the Surface Water Trigger Levels			
	Q1 – September 2023	**Q2 – January 2024**	**Q3 - April 2024**	**Q4 – July 2024**
L8 (Leachate Dam)	pH, Fe, Alkalinity (total), Ca, Cl, MG, K, Na, Sulphate, Ammonia, TOC, TSS	EC, pH, Fe, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulphate, Ammonia, TOC	EC, PH, Fe, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulphate, Ammonia, TOC	EC, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulphate, Ammonia, Nitrate, TOC
S4	*	Alkalinity (total), K, TOC	pH	pH
S5	EC, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulphate, TOC, TSS	pH, Fe, Alkalinity (total), Ca, Cl, K, Na, Sulphate, TOC	pH, Fe, Sulfate	pH, Fe, Alkalinity (total), Ca, Cl, K, Sulphate
S6	*	pH, Fe, Alkalinity (total), Cl, K, Na, Sulphate, TOC	pH, Fe, Sulfate	pH, Fe, Alkalinity (total), Ca, Cl, K, Sulphate
S7	*	Fe, Alkalinity (total), Ca, Cl, K, Na, Sulphate, TOC, TSS	Fe, Alkalinity (total), Ca, K, Sulphate, Ammonia, TSS	pH, Fe, Alkalinity (total), Ca, Cl, K, Na, Sulphate, Nitrate, TSS

Notes to table:
* Sample location was dry

Various exceedances of the EPL trigger levels have been found for surface waters as presented in the table above. As expected, the leachate dam (L8) exceeded the EPL trigger levels consistently during the annual monitoring period. Surface water monitoring concentrations were generally within the range of historical data (refer to Appendix G (graphs) and Appendix H (Annual Return). Some elevated results were found for some parameters as shown on the graphs in Appendix G. Locations S5, S6 and S7 had several exceedances, namely alkalinity, cations, anions, and sulphate. Analytes such as ammonia, nitrate, TOC and TSS sporadically exceeded the trigger levels.

Monitoring of surface waters during any discharge events from the sediment retention dam (i.e., S7) or leachate dam (L8) should be conducted by KSC. KSC personnel indicated that there were four discharge monitoring events in the 2023 to 2024 monitoring period, and that these were directly reported to the EPA by KSC.

Recorded rainfall (Kempsey Airport) for the last two years of monitoring are presented in Figure G1 in Appendix G. It is noted that there was slightly more rainfall in the 2023 – 2024 monitoring period (i.e., 995.6 mm) compared to the 2022 – 2023 monitoring period (i.e., 985.2 mm). However, there was significantly less rainfall that compared historical data from the 2020-2021 and 2021-2022 monitoring periods (i.e., 2023.4 mm and 1575.8 mm respectfully for a 12-month period). The months which recorded elevated rainfall during the current 2023/2024 monitoring period are presented below:

- November 2023 – 112.8 mm,;
- January 2024 – 133.8 mm;
- February 2024 – 136.6 mm; and
- April 2024 – 245.6 mm.

8.3 Gas Monitoring

The results of gas monitoring are summarised below:

- Monitoring Wells:
  - The results of monitoring indicated the general absence of methane concentrations within groundwater wells (i.e. <1ppm). All results were below the acceptance criteria.
- Buildings (Enclosed Spaces):
  - The results indicated the general absence of significant methane concentrations within buildings. All results were below the acceptance criteria.
- Landfill Surface:
  - In summary, a total of five exceedances of the surface methane monitoring criteria were observed (four in Q1, and one in Q3);
  - Exceedances were generally found to be localised and not associated with areas with sparse vegetation;
  - Based on a number of quarterly monitoring events, elevated methane concentrations were generally observed within the western portion of the monitoring area (in the vicinity of former location E3), and the southeastern portion of the monitoring area (in the vicinity of former location E5); and

- A number of previous locations containing elevated surface methane concentrations (i.e. locations E1, E4, E5 and E6) were not accessible due to the presence of a temporary fill stockpile.

Surface methane monitoring has indicated some elevated results and localised exceedances.

Future surface gas monitoring should be conducted with due consideration to ongoing site activities and operations including cell construction, modifications and drainage works.

9. Conclusion

9.1 Groundwater

Groundwater monitoring data from the current 2023-2024 reporting period is generally consistent with historical monitoring data, although various parameters continue to be reported outside the EPL defined trigger levels.

Previous assessment by ERM indicated that BH1 is not well connected to the same regional water bearing zone as the other groundwater monitoring locations. This is supported by the observed fluctuating groundwater levels at BH1 previous monitoring events. On this basis ERM indicated that groundwater quality at BH1 should not be compared to the results of other groundwater monitoring locations. In addition to this, an obstruction in BH1 precluded sampling and testing of groundwater at this location. The obstruction may also preclude groundwater sampling at his location in future monitoring events.

Based on the results of historic and current monitoring for the nominated parameters, landfill operations are unlikely to represent a significant risk to human health or ecological receptors during the current reporting period.

9.2 Surface Water

Surface water monitoring data from the current 2023-2024 reporting period is generally consistent with historical monitoring data, although various parameters continue to be reported outside the EPL defined trigger levels. It is noted that the watercourses adjacent to the site are ephemeral. As a consequence, water quality will vary depending on climatic conditions, the presence of waters and the magnitude of flow within the watercourses. Sampling of surface waters has been conducted from both flowing and stagnant waters within watercourses as indicated in Table D2 in Appendix D. Variable water quality is likely to be present as a result of climatic conditions (i.e. flushing of watercourses and sampling from stagnant ponds within watercourses).

A number of outliers were observed as indicated on the graphs in Appendix G and the Annual Reporting tables in Appendix H. Some results may be spurious or influenced by elevated turbidity as discussed in Section 8.2.2 above. Continual monitoring and interpretation of future results will confirm possible trends and potential impacts where present.

The presence of analytes in downstream surface waters suggest that stormwater runoff from the landfill site is potentially influencing surface water quality when compared to upstream water quality, which is consistent with previous monitoring at the landfill.

The results of historic and current surface water monitoring for the nominated parameters generally suggest the absence of significant impacts to human health or ecological receptors as a result of landfill operations.

9.3 Gas Monitoring

The results of gas monitoring continue to indicate the general absence of elevated methane concentration within groundwater wells and Buildings (enclosed spaces) monitored within the site.

Surface methane monitoring has indicated some elevated results and localised exceedances. We understand that Council has undertaken some localised capping rehabilitation works along the southern boundary of Cell 3. Further assessment is recommended to confirm that the rehabilitation measures undertaken by Council are appropriate and have addressed the potential risks associated with elevated methane results. Further monitoring and investigation is also recommended to confirm subsurface conditions and capping within other areas identified to contain methane exceedance in order to confirm possible capping rehabilitation requirements.

Continued surface methane monitoring is recommended in accordance with the EPL. Where possible, areas/locations found to contain previous elevated results should be targeted. Future surface gas monitoring should be conducted with due consideration to ongoing site activities and operations including cell construction, modifications and drainage works.

It is noted that stockpiled fill is present over a significant portion of the monitored area. Surface methane monitoring should also be conducted at the perimeter of the stockpile and at the surface where accessible during future quarterly monitoring events. Monitoring should also be conducted following the removal of stockpiled materials from this area.

If additional surface methane monitoring and investigation identifies elevated reproducible results, further remediation/rehabilitation measures may be required to ensure that capping is performing as required. Future rehabilitation works should be conducted in accordance with the EPL and relevant regulatory requirements including validation.

10. Recommendations

The following recommendations are made based on the findings of this report:

- Replace BH1 monitoring well in order to allow a more representative assessment of baseline (upgradient) groundwater conditions;
- KSC conduct a review of current site and surface water management strategies to identify potential areas for improvement to minimise the risk of migration and impacts to receiving waters (including capacity of dams, drainage systems, irrigation and reuse procedures, discharge procedures and catchment/containment design);
- KSC consider a review and amendment of the trigger levels for monitoring based on the historic data set;
- Surface gas monitoring:
    - Continue surface methane monitoring in accordance with the EPL;

  - Target areas/locations found to contain localised elevated results;
  - Conduct gas monitoring at the perimeter and surface of the of the stockpile located over the monitored area (during future quarterly monitoring events);
  - Conduct gas monitoring following the removal of the stockpiled materials from the monitored area;
  - Conduct targeted investigation to assess the presence and condition of capping within areas observed to contain elevated methane concentrations;
  - Confirm that any capping or rehabilitation measures undertaken by Council have addressed the potential risk associated with elevated methane results.
- KSC ensure that future rehabilitation works are conducted in accordance with the EPL and relevant regulatory requirements including validation;
- Conduct monitoring with due consideration to ongoing site activities and operations including cell construction, modifications and drainage works;
- Continue monitoring surface water, groundwater, and gas in accordance with the EPL.

11. References

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene*. Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (1995). *Contaminated Sites, Sampling Design Guidelines*. NSW Environment Protection Authority.

NSW EPA. (2016). *Environmental Guidelines, Solid Waste Landfills, Second Edition, 2016*. NSW Environment Protection Authority.

NSW EPA. (2020). *Assessment and Management of Hazardous Ground Gases*. NSW Environment Protection Authority.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

NSW EPA. (2022). *Contaminated Sites, Sampling Design Guidelines*. NSW Environment Protection Authority.

12. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 638 Crescent Head Road, Kempsey with reference to DP's proposal 89781.00.P.007.Rev0 dated 20 June 2023 and Purchase Order 252133 dated 27 July 2023. The work was carried out under an AS4122 contract dated 13 October 2020. This report is provided for the exclusive use of Kempsey Shire Council for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed. It is noted that DP were not involved in any surface water discharge monitoring, nor capping rehabilitation works conducted by Council at the site.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the (geotechnical / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

Drawing 1 – Test Location Plan

Site Location

NOTE:
1. Drawing adapted from Metromap Image dated 20.08.2023.

0 50 100 150 m

Legend

- Approximate Surface Water Location
- Approximate Well Location

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Kempsey Shire Council		
OFFICE:	Port Macquarie	DRAWN BY:	PLH
SCALE:	1:3000@A3	DATE:	29.September.2023

TITLE: **Test Location Plan**
Proposed Kempsey Landfill Water and Gas Monitoring
638 Crescent Head Road, Kempsey, NSW

N

Project:	89781.24
DRAWING No:	1
REVISION:	0

DP.QGIS.A3LandscapeDrawingLayout.3.26.3 - \\DPPMQNAS01\Projects\89781.24 - KEMPSEY, 638 Crescent Head Rd 2024, GEO\7.0 Drawings\7.2 Out\QGIS\QGIS\89781.00.Master Layers.qgz

Appendix B

About this Report

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Appendix C

Quality Assurance/ Quality Control Report

Chain of Custody Sheets (Field and Despatch)

Laboratory Sample Receipt

1. Field and Laboratory Data Quality Assurance and Quality Control

The field and laboratory data quality assurance and quality control (QA/QC) procedures and results are summarised in the following Table 1. Reference should be made to the field work methodology and the laboratory results / certificates of analysis for further details. The relative percentage difference (RPD) results, along with the other field QC samples are included in the summary results tables.

Table 1: Field and laboratory quality control

Item	Evaluation / acceptance criteria	Compliance
Analytical laboratories used	NATA accreditation	C
Holding times	Various based on type of analysis	C
Intra-laboratory replicates	10% of primary samples; <30% RPD	C
Laboratory / Reagent Blanks	1 per batch; <PQL	C
Laboratory Duplicate	1 per lab batch; As laboratory certificate	C
Matrix Spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Surrogate Spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Control Samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Standard Operating Procedures (SOP)	Adopting SOP for all aspects of the sampling field work	C

Notes:
C = compliance; PC = partial compliance; NC = non-compliance

The RPD results were all within the acceptable range, with the exception of those indicated in Table 2(results in bold). The exceedances are not, however, considered to be of concern given that:

- The actual differences in the concentrations of the replicate pairs where RPD exceedances occurred were typically low;
- The majority of RPD results from a replicate pair were within the acceptable limits;
- The concentrations with elevated RPD values were found to be below the EPL Trigger Levels (Licence 6269);

- The duplicate samples were taken from surface water locations which have natural variability;
- All concentration values with a high RPD were within the mean of annual reporting values for the 2023 to 2024 reporting period; and
- All other QA/QC parameters met the data quality indicators.

In summary, the QC data is determined to be of sufficient quality to be considered acceptable for the assessment.

Table 2: Relative Percentage Difference

Field Duplicates (WATER)			SDG	ENVIROLAB 2023-09-28T00:00:00	ENVIROLAB 2023-09-28T00:00:00		ENVIROLAB 2023-09-28T00:00:00	ENVIROLAB 2023-09-28T00:00:00		ENVIROLAB 2024-01-17T00:00:00	ENVIROLAB 2024-01-17T00:00:00		ENVIROLAB 2024-04-10T00:00:00	ENVIROLAB 2024-04-10T00:00:00		ENVIROLAB 2024-07-02T00:00:00	ENVIROLAB 2024-07-02T00:00:00	
Filter: SDG in('ENVIR			Field ID	S5	D1-27/9	RPD	BH3	D2-27/9	RPD	S5	D1-16/1	RPD	BH01-2	D1-9/4/24	RPD	S4	D1-1.7.24	RPD
			Sampled Date/Time	27/09/2023	27/09/2023		27/09/2023	27/09/2023		16/01/2024	16/01/2024		9/04/2024	9/04/2024		1/07/2024	1/07/2024	
Method_T	ChemNam	Units	EQL															
Ion Balanc	Alkalinity (	mg/l	5	<5.0	<5.0	0				<5.0	<5.0	0				<5.0	<5.0	0
	Alkalinity (	mg/l	5	31.0	33.0	6				46.0	44.0	4				10.0	10.0	0
	Alkalinity (	mg/l	5	31.0	33.0	6				46.0	44.0	4				10.0	10.0	0
	Chloride	mg/l	1	530.0	530.0	0				120.0	120.0	0				26.0	26.0	0
	Ionic Balar	%		-3.0	-4.0	29				2.0	1.0	67				-11.0	-5.0	75
	Sodium (F	mg/l	0.5	290.0	280.0	4				83.0	82.0	1				14.0	15.0	7
	Sulphate	mg/l	1	110.0	110.0	0				45.0	44.0	2				1.0	<1.0	0
e																		
Miscellane	Ammonia a	mg/l	0.005	0.15	0.16	6	0.1	0.11	10	0.024	0.022	9	0.037	0.026	35	<0.005	<0.005	0
	Fluoride	mg/l	0.1	<0.1	<0.1	0				<0.1	<0.1	0				<0.1	<0.1	0
	Nitrate (as	mg/l	0.005	**0.04**	**0.072**	**57**	0.008	0.01	22	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0
	TOC	mg/l	1	24.0	25.0	4				27.0	32.0	17				15.0	13.0	14
	TSS	mg/l	5	22.0	22.0	0				14.0	13.0	7				<5.0	<5.0	0
ous Inorganics																		
Ion Balanc	Alkalinity (	mg/l	5	<5.0	<5.0	0				<5.0	<5.0	0						
e																		
HM in wate	Iron (Filter	mg/l	0.01	0.15	0.16	6				1.1	1.1	0				0.45	0.46	2
	Manganes	mg/l	0.005	0.15	0.16	6				0.11	0.098	12				0.006	0.007	15
er - dissolved																		
HM in wate	Iron	mg/l	0.01	1.4	1.3	7				2.9	2.9	0				0.51	0.56	9

Notes to Table 2:
*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

2. Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQI) as outlined in NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013):

- Completeness: a measure of the amount of usable data from a data collection activity;
- Comparability: the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness: the confidence (qualitative) of data representativeness of media present on-site;
- Precision: a measure of variability or reproducibility of data; and
- Accuracy: a measure of closeness of the data to the 'true' value.

Table 3: Data quality indicators

Data quality indicator	Method(s) of achievement
Completeness	Systematic and selected target locations sampled.
	Preparation of and chain of custody records.
	Preparation of field groundwater sampling sheets.
	Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody.
	Samples analysed for contaminants of potential concern (COPC) based on the EPL.
	Completion of chain of custody (COC) documentation.
	NATA accredited laboratory results certificates provided by the laboratory.
	Satisfactory frequency and results for field and laboratory quality control (QC) samples as discussed in Section 1.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project.
	Experienced sampler(s) used.
	Use of NATA registered laboratories, with test methods the same or similar between laboratories.
	Satisfactory results for field and laboratory QC samples.
Representativeness	Target media sampled.

Data quality indicator	Method(s) of achievement
	Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQO.
	Samples were extracted and analysed within holding times.
	Samples were analysed in accordance with the COC.
Precision	Field staff followed standard operating procedures.
	Acceptable RPD between original samples and replicates.
	Satisfactory results for all other field and laboratory QC samples.
Accuracy	Field staff followed standard operating procedures.
	Satisfactory results for all field and laboratory QC samples.

Based on the above, it is considered that the DQI have been generally complied with.

3. Conclusion

Based on the results of the field QA and field and laboratory QC, and evaluation against the DQI it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

4. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.24	**Suburb:**	Kempsey	**To:**	Envirolab Services
Project Manager:	Joel Cowan	**Order Number:**	NC232134	**Sampler:**	SBK
					15 Ashely Street, Chatswood
Email:	sarah.krebs/Shaun.VanKal@douglaspartners.com.au			**Attn:**	Sample receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				
Prior Storage:	☐ Fridge ☐ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes	(If YES, then handle, transport and store in accordance with FPM HAZID)	

Lab ID	Sample ID			Date Sampled	Sample Type (S - soil, W - water, M - Material)	Container Type (G - glass, P - plastic)	Analytes: Groundwater: Ammonia	Groundwater: Magnesium (dissolved)	Groundwater: Nitrate	Surface Water: Iron and Manganese (Total and dissolved)	Surface Water: Ionic Balance	Surface Water: Ammonia as N	Surface Water: Nitrate as N	Surface Water: Fluoride	Surface Water: Total Phenolics	Surface Water: Total Suspended Solids (TSS)	Surface Water: Total Organic Carbon (TOC)	Notes/ Preservation/ Additional Requirements
	Location / Other ID																	
1	BH01-2				W	P	✓	✓	✓									**Please upload results to: ESdat_AU+douglaspartners @ESdatLabSync.net**
	~~BH1~~				W		~~✓~~	~~✓~~	~~✓~~									
2	BH2				W		✓	✓	✓									
3	BH3				W		✓	✓	✓									
4	BH4				W		✓	✓	✓									
	~~S4~~				W					~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	
5	S5				W					✓	✓	✓	✓	✓	✓	✓	✓	
	~~S6~~				W					~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	
	~~S7~~				W					✓	✓	✓	✓	✓	✓	✓	✓	
6	L8				W					~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	
7	D1-27/9				W					✓	✓	✓	✓	✓	✓	✓	✓	
8	D2-27/9				W	↓	✓	✓	✓									
																		334150

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 334150
Date Received: 28/9/23
~~Time Received:~~ 1055
Received By: GE
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:	as above	**LAB RECEIPT**	
Number of samples in container:		**Transported to laboratory by:**	**Lab Ref. No:**
Send results to:	Douglas Partners Pty Ltd		**Received by:** GE SDD
Address:	2/32 Geebung Dr, Port Macquarie NSW 2444	**Phone:** 65815992	**Date & Time:** 28/9/23 9:00
Relinquished by:		**Date:** 27/9/23 **Signed:**	**Signed:**
Project No:	89781.24	**Suburb:** Kempsey	**To:** Envirolab Services
Project Manager:	Joel Cowan		**Dispatch date:**

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CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.24	**Suburb:**	Kempsey	**To:**	Envirolab Services
Project Manager:	Joel Cowan	**Order Number:**	NC232[illegible]413	**Sampler:**	SBK
Email:	sarah.krebs/joel.cowan@douglaspartners.com.au			**Attn:**	Sample receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				
Prior Storage:	☐ Fridge ☐ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Groundwater: Ammonia	Groundwater: Magnesium (dissolved)	Groundwater: Nitrate	Surface Water: Iron and Manganese (Total and dissolved)	Surface Water: Ionic Balance	Surface Water: Ammonia as N	Surface Water: Nitrate as N	Surface Water: Fluoride	Surface Water: Total Phenolics	Surface Water: Total Suspended Solids (TSS)	Surface Water: Total Organic Carbon (TOC)	Notes/ Preservation/ Additional Requirements
	~~BH04-2~~		~~W~~		✓	✓	✓									**Please upload results to: ESdat_AU+douglaspartners @ESdatLabSync.net**
	~~BH1~~		~~W~~		✓	✓	✓									
	~~BH2~~		~~W~~		✓	✓	✓									
	~~BH3~~		~~W~~		✓	✓	✓									
	~~BH4~~		~~W~~		✓	✓	✓									
1	S4	16/1/24	W					✓	✓	✓	✓	✓	✓	✓	✓	
2	S5	↓	W					✓	✓	✓	✓	✓	✓	✓	✓	
3	S6		W					✓	✓	✓	✓	✓	✓	✓	✓	
4	S7		W					✓	✓	✓	✓	✓	✓	✓	✓	
5	L8		W					✓	✓	✓	✓	✓	✓	✓	✓	
6	D1-16/1	↓	W													

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 341739
Date Received: 17/1/24
Time Received: 1330
Received By: CH
Temp: Cool/Ambient 5°C
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:	as above		
Number of samples in container:		**Transported to laboratory by:**	HNT
Send results to:	Douglas Partners Pty Ltd		
Address:	2/32 Geebung Dr, Port Macquarie NSW 2444	**Phone:**	65815992
Relinquished by:		**Date:**	16/1/23 **Signed:**
Project No:	89781.24	**Suburb:**	Kempsey
Project Manager:	Joel Cowan		

LAB RECEIPT

Lab Ref. No:	341739
Received by:	Christine Ho
Date & Time:	17/1/24 1330
Signed:	
To:	Envirolab Services
Dispatch date:	

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CHAIN OF CUSTODY DESPATCH SHEET

NC232652

Project No:	89781.24	**Suburb:**	Kempsey	**To:**	Envirolab Services
Project Manager:	Joel Cowan	**Order Number:** ~~[illegible]~~ NC232652	**Sampler:** SBK		15 Ashely Street, Chatswood
Email:	sarah.krebs/joel.cowan@douglaspartners.com.au			**Attn:**	Sample receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				
Prior Storage:	☐ Fridge ☐ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Groundwater: Ammonia	Groundwater: Magnesium (dissolved)	Groundwater: Nitrate	Surface Water: Iron and Manganese (Total and dissolved)	Surface Water: Ionic Balance	Surface Water: Ammonia as N	Surface Water: Nitrate as N	Surface Water: Fluoride	Surface Water: Total Phenolics	Surface Water: Total Suspended Solids (TSS)	Surface Water: Total Organic Carbon (TOC)	Notes/ Preservation/ Additional Requirements
1	BH01-2	9/4/24	W	P	✓	✓	✓									**Please upload results to: ESdat_AU+douglaspartners @ESdatLabSync.net**
	~~BH1~~		~~W~~		~~✓~~	~~✓~~	~~✓~~									
2	BH2		W		✓	✓	✓									
3	BH3		W		✓	✓	✓									
4	BH4		W		✓	✓	✓									
5	S4		W					✓	✓	✓	✓	✓	✓	✓	✓	
6	S5		W					✓	✓	✓	✓	✓	✓	✓	✓	
7	S6		W					✓	✓	✓	✓	✓	✓	✓	✓	
8	S7		W					✓	✓	✓	✓	✓	✓	✓	✓	
9	L8		W					✓	✓	✓	✓	✓	✓	✓	✓	
10	D1-9/4/24		W		✓	✓	✓									
11	D2-9/4/24	↓	~~W~~	↓												On Hold

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

~~Job No:~~ 348494
Date Received: 10/4/24
Time Received: 1030
~~Received By:~~ AW
Temp: ~~Cool~~/Ambient
Cooling: Ice/Icepack
~~Security: Intact/Broken~~/None

Metals to analyse:	as above		**LAB RECEIPT**
Number of samples in container:		**Transported to laboratory by:**	COURIER	**Lab Ref. No:**
Send results to:	Douglas Partners Pty Ltd			**Received by:** OWLCTAL
Address:	2/32 Geebung Dr, Port Macquarie NSW 2444	**Phone:**	65815992	**Date & Time:** 10/4/24 1030
Relinquished by:		**Date:**	9/4/24 **Signed:**	**Signed:** AW
Project No:	89781.24	**Suburb:**	Kempsey	**To:** Envirolab Services
Project Manager:	Joel Cowan			**Dispatch date:**

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.24	**Suburb:**	Kempsey	**To:**	Envirolab Services
Project Manager:	Joel Cowan	**Order Number:**	[redacted] NC232392	**Sampler:**	SBK
Email:	sarah.krebs/joel.cowan@douglaspartners.com.au			**Attn:**	Sample receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				
Prior Storage:	☐ Fridge ☐ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Groundwater: Ammonia	Groundwater: Magnesium (dissolved)	Groundwater: Nitrate	Surface Water: Iron and Manganese (Total and dissolved)	Surface Water: Ionic Balance	Surface Water: Ammonia as N	Surface Water: Nitrate as N	Surface Water: Fluoride	Surface Water: Total Phenolics	Surface Water: Total Suspended Solids (TSS)	Surface Water: Total Organic Carbon (TOC)	Notes/ Preservation/ Additional Requirements
	~~BH01-2~~		W		✓	✓	✓									**Please upload results to: ESdat_AU+douglaspartners @ESdatLabSync.net**
	~~BH1~~		W		✓	✓	✓									
	~~BH2~~		W		✓	✓	✓									
	~~BH3~~		W		✓	✓	✓									
	~~BH4~~		W		✓	✓	✓									
1	S4		W					✓	✓	✓	✓	✓	✓	✓	✓	
2	S5		W					✓	✓	✓	✓	✓	✓	✓	✓	
3	S6		W					✓	✓	✓	✓	✓	✓	✓	✓	
4	S7		W					✓	✓	✓	✓	✓	✓	✓	✓	
5	L8		W					✓	✓	✓	✓	✓	✓	✓	✓	
6	DI/1·7·24		W					✓	✓	✓	✓	✓	✓	✓	✓	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 355417
Date Received: 2/7/24
~~Time Received:~~ 1015
Received By: AW
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:	as above		**LAB RECEIPT**
Number of samples in container:		**Transported to laboratory by:**	Courier	**Lab Ref. No:**
Send results to:	Douglas Partners Pty Ltd			**Received by:**
Address:	2/32 Geebung Dr, Port Macquarie NSW 2444	**Phone:**	65815992	**Date & Time:**
Relinquished by:	SBK	**Date:**	1/7/24	**Signed:**	**Signed:**
Project No:	89781.24	**Suburb:**	Kempsey	**To:**	Envirolab Services
Project Manager:	Joel Cowan			**Dispatch date:**	

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	89781.24	**Client Project Name:**	Kempsey Landfill Water and Gas Monitoring
Client:	Kempsey Shire Council	**Location:**	638 Crescent Head Road, Kempsey
Project Manager:	Cowan, Joel	**DP Lab Received** By:	Date:

Do samples contain 'potential' HBM? Yes ☐ No x (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Lab 1 A Envirolab Date	Lab 2 B Date	Lab 3 C Date	
BH01-2	-		W	P	-	SBK	27/9/23	7:00	27/9/23			
~~BH1~~	-		~~W~~	~~P~~	-							well obstruct
BH2	-		W	P	-	SBK	27/9/23					
BH3	-	D2-27/9	W	P	-	↓	↓	↓				
BH4	-		W	P	-	↓	↓	↓				
~~S4~~	-		~~W~~	~~P~~	-							Location dry
S5	-	D1-27/9	W	P	-	SBK	27/9/23	↓				
~~S6~~	-		~~W~~	~~P~~	-							Location dry
~~S7~~	-		~~W~~	~~P~~	-							" "
L8	-		W	P	-	SBK	27/9/23	13:00				
												Samples sent straight
												from site to envirolab

980243063728-8 TNT

* **Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab B Provide name of Lab 2 C Provide name of Lab 3

Douglas PARTNERS

CHAIN OF CUSTODY FIELD SHEET

Project No:	89781.24	**Client Project Name:**	Kempsey Landfill Water and Gas Monitoring
Client:	Kempsey Shire Council	**Location:**	638 Crescent Head Road, Kempsey
Project Manager:	Cowan, Joel	**DP Lab Received**	By: Date:

Do samples contain 'potential' HBM? Yes ☐ No x (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Lab 1 [A] envirolab Date	Lab 2 [B] Date	Lab 3 [C] Date	
~~BH01-2~~	-		~~W~~	~~P~~	-	~~SBK~~			16/1/23			
~~BH1~~	-		~~W~~	~~P~~	-							
~~BH2~~	-		~~W~~	~~P~~	-							
~~BH3~~	-		~~W~~	~~P~~	-							Envirolab courier tracking nomber
~~BH4~~	-		~~W~~	~~P~~	-							
S4	-		W	P	-	SBK	16/1/23	12:51	16/1/23			
S5	-	DW16/1	W	P	-	↓	↓	11:37	↓			
S6	-		W	P	-			11:12				
S7	-		W	P	-			12:24				
L8	-		W	P	-	↓	↓	12:04	↓			

*** Default storage:** **glass containers in fridge,** **plastic containers shelved,** **ASS in freezer,** **water samples in fridge**

A Provide name of Lab 1 Envirolab B Provide name of Lab 2 C Provide name of Lab 3

Douglas PARTNERS

CHAIN OF CUSTODY FIELD SHEET

Project No:	89781.24	**Client Project Name:**	Kempsey Landfill Water and Gas Monitoring
Client:	Kempsey Shire Council	**Location:**	638 Crescent Head Road, Kempsey
Project Manager:	Cowan, Joel	**DP Lab Received**	By: Date:

Do samples contain 'potential' HBM? Yes ☐ No x (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Lab 1 [A] Envirolab Date	Lab 2 [B] Date	Lab 3 [C] Date	
BH01-2	-	D1-9/4/24	W	P	-	SBK	9/4/24	6:30	9/4/24			
~~BH1~~	-		W	P	-	↓	↓	↓				
BH2	-		W	P	-							
BH3	-		W	P	-							
BH4	-		W	P	-							
S4	-	D2-9/4/24	W	P	-							
S5	-		W	P	-							
S6	-		W	P	-							
S7	-		W	P	-							
L8	-		W	P	-			14:00				

*** Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab B Provide name of Lab 2 C Provide name of Lab 3

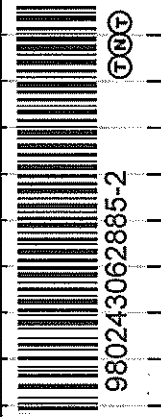
Douglas PARTNERS

CHAIN OF CUSTODY FIELD SHEET

Project No:	89781.24	**Client Project Name:**	Kempsey Landfill Water and Gas Monitoring
Client:	Kempsey Shire Council	**Location:**	638 Crescent Head Road, Kempsey
Project Manager:	Cowan, Joel	**DP Lab Received**	By: Date:

Do samples contain 'potential' HBM? Yes ☐ No x (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
~~BH01-2~~	-		W	P	-							
~~BH1~~	-		W	P	-							
~~BH2~~	-		W	P	-							
~~BH3~~	-		W	P	-							
~~BH4~~	-		W	P	-							
S4	-	01/1.7.24	W	P	-	SBK	1/7/24	10:30	Envirolab			
S5	-		W	P	-	↓	↓	↓	↓			
S6	-		W	P	-							
S7	-		W	P	-			↓				
L8	-		W	P	-	↓	↓	13:30	↓			



*** Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab B Provide name of Lab 2 C Provide name of Lab 3

Appendix D

Tabulated Field Work Results

Table D1: Groundwater Levels (2023 – 2024)

Table D2: Groundwater and Surface Water Field Parameters (2023 – 2024)

Table D3: Gas Monitoring – Groundwater Wells (2023 – 2024)

Table D4: Methane Monitoring – Surface (2023 – 2024)

Table D5: Methane Monitoring – Buildings (2023 – 2024)

Table D1: Groundwater Levels During Monitoring Period (2023-2024)

Well ID	Quarterly Round	Sampling Date	TOC Elevation (mAHD)	Depth to Water	Reduced Water
BH1	Q1	27/09/2023	50.17	14.94	35.23
BH1-2		27/09/2023	29.64	5.58	24.06
BH2		27/09/2023	25.72	1.91	23.81
BH3		27/09/2023	29.78	6.11	23.67
BH4		27/09/2023	26.35	3.09	23.26
BH1	Q2	17/01/2024	50.17	13.30	36.86
BH1-2		17/01/2024	29.64	5.37	24.27
BH2		17/01/2024	25.72	1.66	24.05
BH3		17/01/2024	29.78	6.05	23.73
BH4		17/01/2024	26.35	1.62	24.73
BH1	Q3	8/04/2024	50.17	13.42	36.75
BH1-2		8/04/2024	29.64	5.02	24.62
BH2		8/04/2024	25.72	1.29	24.42
BH3		8/04/2024	29.78	5.49	24.29
BH4		8/04/2024	26.35	1.54	24.81
BH1	Q4	1/07/2024	50.17	N/A	N/A
BH1-2		1/07/2024	29.64	4.87	24.77
BH2		1/07/2024	25.72	1.14	24.58
BH3		1/07/2024	29.78	4.99	24.79
BH4		1/07/2024	26.35	1.48	24.87

Notes

- TOC - Top of Casing
- AHD - Australian Hieght Datum

* - equipment malfunction

N/A - measurement not taken due to obstruction in well

Table D2: Groundwater and Surface Water Field Parameters During Monitoring Period (2023-2024)

Test Location ID	Quarterly Round	Sampling Date	Temp (°C)	pH	Eh (ORPmV	EC (µS/cm)	EC (mS/cm)	Turbidity (NTU)	DO (ppm)	Comments			
										Turbidity	Colour	Odour	Flow
BH1-2	Q1	27/09/2023	20.83	5.7	69	1460	1.46	118	0.3	Slight	pale brown	n/a	-
BH1	Q1	27/09/2023	Well blocked by obstruction, No Measurements Taken										
BH2	Q1	27/09/2023	19.07	6.6	-16	1510	1.51	11	7.0	High	grey	n/a	-
BH3	Q1	27/09/2023	25.67	6.1	25	1840	1.84	17	1.8	Clear	pale brown	n/a	-
BH4	Q1	27/09/2023	29.32	6.2	17	1810	1.81	155	1.3	High	pale brown	n/a	-
S4	Q1	27/09/2023	-	-	-	-	-	-	-	Slight	-	-	dry
S5	Q1	27/09/2023	15.09	6.6	95	2630	2.63	40	2.6	-	pale brown	n/a	stagnant
S6	Q1	27/09/2023	-	-	-	-	-	-	-	-	-	-	dry
S7	Q1	27/09/2023	-	-	-	-	-	-	-	-	-	-	dry
L8	Q1	27/09/2023	23.30	8.4	-66	660	0.66	70	0.7	Slight	brown	n/a	stagnant
S4	Q2	16/01/2024	23.43	6.9	146	188	-	10	1.4	Clear	pale brown	n/a	still
S5	Q2	16/01/2024	23.06	6.2	100	554	0.55	181	4.6	Slight	pale brown	n/a	flowing
S6	Q2	16/01/2024	23.29	5.5	153	513	-	17	1.7	Clear	pale brown	n/a	flowing
S7	Q2	16/01/2024	26.04	7.9	82	643	0.64	692	6.2	Minimal	pale brown	n/a	still/stagnant
L8	Q2	16/01/2024	25.20	8.4	45	3160	3.16	75	2.0	Slight	pale brown	n/a	still/stagnant
BH1-2	Q3	8/04/2024	20.74	5.8	35	1560	1.56	229	1.7	Slight	pale brown	slight H2S odour	-
BH1	Q3	8/04/2024	Well blocked by obstruction, No Measurements Taken										
BH2	Q3	8/04/2024	19.56	6.5	-34	1620	1.62	10	7.8	Minimal	brown	n/a	-
BH3	Q3	8/04/2024	22.82	5.2	173	1710	1.71	27	0.3	Minimal	pale brown	n/a	-
BH4	Q3	8/04/2024	23.75	6.3	75	1910	1.91	0	2.7	Minimal	clear	n/a	-
S4	Q3	9/04/2024	20.50	5.5	147	72	0.07	3	4.6	Clear	pale brown	n/a	still
S5	Q3	9/04/2024	19.08	6.0	126	118	0.12	55	3.1	Slight	pale brown	n/a	flowing
S6	Q3	9/04/2024	19.10	6.1	107	128	0.13	45	3.4	Minimal	pale brown	slight H2S odour	flowing
S7	Q3	9/04/2024	24.01	7.4	6	249	0.25	>1000	4.5	Very	pale brown	slight H2S odour	still/stagnant
L8	Q3	9/04/2024	23.40	8.2	27	1530	1.53	47	11.5	Slight	pale brown	slight H2S odour	still/stagnant
S4	Q4	1/07/2024	13.06	6.1	187	114	114	228	3	Slight	pale brown	n/a	still
S5	Q4	1/07/2024	12.63	6.2	116	446	0.45	69	0.9	Slight	pale brown	n/a	still
S6	Q4	1/07/2024	13.70	5.9	96	345	0.35	47	3.5	Slight	pale brown	slight H2S odour	still
S7	Q4	1/07/2024	12.75	8.1	123	583	0.58	282	1.7	Moderate	pale brown	slight H2S odour	still/stagnant
L8	Q4	1/07/2024	15.66	7.2	121	3060	3.06	69	5.7	Slight	pale brown	slight H2S odour	still/stagnant

Notes:
Turdidty descriptor - 0 to 50 - minimal, 50 to 200 - slight, 200 to 500 - moderate, 500+ high
BH - Borehole - Groundwater Well
S - Surface Water Testing Locations
L - Leachate Testing Location
EC - Electrical conductivity
DO - Dissolved oxygen
ORP - Oxidation reduction potential

Table D3: Gas Monitoring - Groundwater Wells (2023-2024)

Well ID	Quarterly Round	Sampling Date	Max Methane (ppm)	Max Carbon Dioxide (%)	Oxygen (%)	Max Hydrogen Sulfide (ppm)	Max Carbon Monoxide (ppm)	Comments	
								Weather Conditions	Atmospheric Pressure (Mb)
BH1	Q1	26/09/2023	0.00	0.70	19.90	1.00	0.00	sunny	1015
BH1-2	Q1	26/09/2023	0.00	0.40	20.40	2.00	1.00	sunny	1018
BH2	Q1	26/09/2023	0.00	0.00	20.20	2.00	1.00	sunny	1017
BH3	Q1	26/09/2023	0.00	0.10	21.00	2.00	1.00	sunny	1017
BH4	Q1	26/09/2023	0.00	0.10	21.20	2.00	2.00	sunny	1017
BH1	Q2	17/01/2024	0.00	0.90	20.40	0.00	0.00	sunny/clear	1007
BH1-2	Q2	17/01/2024	0.00	0.10	20.10	0.00	0.00	sunny/clear	1010
BH2	Q2	17/01/2024	0.00	0.10	20.00	0.00	1.00	cloudy	1009
BH3	Q2	17/01/2024	0.00	0.10	19.70	1.00	1.00	cloudy	1009
BH4	Q2	17/01/2024	0.00	0.00	20.00	0.00	1.00	cloudy	1009
BH1	Q3	8/04/2024	0.00	1.60	19.70	3.00	1.00	clear/ sunny	1005
BH1-2	Q3	8/04/2024	0.00	0.00	19.90	2.00	0.00	clear/ sunny	1010
BH2	Q3	8/04/2024	0.00	0.20	19.80	2.00	0.00	clear/ sunny	1010
BH3	Q3	8/04/2024	0.00	0.10	19.80	0.00	0.00	clear/ sunny	1008
BH4	Q3	8/04/2024	0.00	0.00	19.60	1.00	0.00	clear/ sunny	1009
BH1	Q4	1/07/2024	0.00	0.00	21.20	1.00	1.00	overcast	1016
BH1-2	Q4	1/07/2024	0.00	0.10	20.40	0.00	1.00	overcast	1020
BH2	Q4	1/07/2024	0.00	0.10	20.50	0.00	0.00	overcast	1019
BH3	Q4	1/07/2024	0.10	0.00	21.00	1.00	1.00	overcast	1019
BH4	Q4	1/07/2024	0.00	0.10	20.80	1.00	1.00	overcast	1019
Crieria (EPL 6269)			10000	NC	NC	NC	NC	NA	NA

Notes:

ppm - parts per million

Criteria of Subsurface methane 10000 ppm / 1 % (v/v) (NSW EPA, 2016 and the EPL 6269)

Table D4: Summary of Methane Monitoring - Surface (2023-2024)

Location			Methane (ppm)			
			Q1	Q2	Q3	Q4
ID	Easting	Nothing	26/09/2024	16/01/2024	8/04/2024	1/07/2024
E1	488395	6555797	N/A	N/A	N/A	N/A
E2	488218	6555940	4 - 6	5 - 10	5 - 10	20 - 50
E3	488251	6555889	6 - 10	80 - 100	5 - 10	15 - 25
E4	488436	6555793	-	N/A	N/A	N/A
E5	488465	6555797	-	N/A	N/A	N/A
E6	488478	6555818	675 - 990	N/A	500 - 750	N/A
E7	488345	6555919	2 - 6	4 - 6	10 - 30	2 - 5
E8	488457	6555765	670 to 1110	100 - 140	100 - 250	20 - 40
E9	488238	6555908	5 - 8	60 - 80	20 - 70	2 - 3
E10	488339	6555865	5 - 10	5 - 10	100 - 150	2 - 3
E11	488277	6555839	1000 - 1100	5 - 10	5 - 10	2 - 5
E12	488327	6555911	5 - 10	20 - 30	10 - 20	2 - 5
E13	488463	6555796	545 - 3290	130 - 280	10 - 20	15 - 25
E14	488257	6555892	5 -10	50 - 150	20 - 70	15 - 25

Notes to table

Methane (CH4) surface gas reading above 500 ppm (NSW EPA, 2016 and the EPL

N/A not accessible

* Datapoint found in future monitoring round

Table D5: Methane Monitoring - Buildings (2023-2024)

Quarterly Round	Location		Date	Methane (ppm)	Quarterly Round	Location		Date	Methane (ppm)
Q1	Shed 1	North cnr	27/09/2023	5.3	Q2	Shed 1	North cnr	17/01/2024	2.5
Q1	Shed 1	South cnr	27/09/2023	5.3	Q2	Shed 1	South cnr	17/01/2024	2.5
Q1	Shed 1	East cnr	27/09/2023	5.4	Q2	Shed 1	East cnr	17/01/2024	2.5
Q1	Shed 1	West cnr	27/09/2023	5.3	Q2	Shed 1	West cnr	17/01/2024	2.5
Q1	Shed 1	Drain	27/09/2023	5.6	Q2	Shed 1	Drain	17/01/2024	2.6
Q1	Shed 1	Sink	27/09/2023	5.2	Q2	Shed 1	Sink	17/01/2024	2.6
Q1	Shed 1	Outside	27/09/2023	5.2	Q2	Shed 1	Outside	17/01/2024	2.5
Q1	Shed 2	North cnr	27/09/2023	5.3	Q2	Shed 2	North cnr	17/01/2024	2.3
Q1	Shed 2	South cnr	27/09/2023	5.3	Q2	Shed 2	South cnr	17/01/2024	2.4
Q1	Shed 2	East cnr	27/09/2023	5.3	Q2	Shed 2	East cnr	17/01/2024	2.4
Q1	Shed 2	West cnr	27/09/2023	5.3	Q2	Shed 2	West cnr	17/01/2024	2.4
Q1	Shed 2	Middle	27/09/2023	5.3	Q2	Shed 2	Middle	17/01/2024	2.5
Q1	Shed 2	Entrance	27/09/2023	5.3	Q2	Shed 2	Entrance	17/01/2024	2.5
Q1	Shed 3	North cnr	27/09/2023	5.4	Q2	Shed 3	North cnr	17/01/2024	2.5
Q1	Shed 3	South cnr	27/09/2023	5.3	Q2	Shed 3	South cnr	17/01/2024	2.5
Q1	Shed 3	East cnr	27/09/2023	5.3	Q2	Shed 3	East cnr	17/01/2024	2.5
Q1	Shed 3	West cnr	27/09/2023	5.3	Q2	Shed 3	West cnr	17/01/2024	2.5
Q1	Office	North end	27/09/2023	5.2	Q2	Office	North end	17/01/2024	2.5
Q1	Office	South end	27/09/2023	5.2	Q2	Office	South end	17/01/2024	2.5
Q1	Office	West end	27/09/2023	5.2	Q2	Office	West end	17/01/2024	3
Q1	Office	East end	27/09/2023	5.2	Q2	Office	East end	17/01/2024	3.4
Q1	Office	Kitchen Sink	27/09/2023	5.2	Q2	Office	Kitchen Sink	17/01/2024	7.8
Q1	Office	Drain	27/09/2023	6.7	Q2	Office	Drain	17/01/2024	9
Q1	Office	Bathroom Sink	27/09/2023	5.2	Q2	Office	Bathroom Sink	17/01/2024	7.6
Q1	Office	Entrance	27/09/2023	5.2	Q2	Office	Entrance	17/01/2024	5.2
Q1	B1	North cnr	27/09/2023	5.3	Q2	B1	North cnr	17/01/2024	2.5
Q1	B1	South cnr	27/09/2023	5.3	Q2	B1	South cnr	17/01/2024	2.5
Q1	B1	East cnr	27/09/2023	5.3	Q2	B1	East cnr	17/01/2024	2.6
Q1	B1	West cnr	27/09/2023	5.3	Q2	B1	West cnr	17/01/2024	2.6
Q1	B2	North cnr	27/09/2023	5.3	Q2	B2	North cnr	17/01/2024	2.5
Q1	B2	South cnr	27/09/2023	5.3	Q2	B2	South cnr	17/01/2024	2.5
Q1	B2	East cnr	27/09/2023	5.3	Q2	B2	East cnr	17/01/2024	2.5
Q1	B2	West cnr	27/09/2023	5.3	Q2	B2	West cnr	17/01/2024	2.5
Q1	B3	North cnr	27/09/2023	5.3	Q2	B3	North cnr	17/01/2024	2.5
Q1	B3	South cnr	27/09/2023	5.3	Q2	B3	South cnr	17/01/2024	2.5
Q1	B3	East cnr	27/09/2023	5.3	Q2	B3	East cnr	17/01/2024	2.5
Q1	B3	West cnr	27/09/2023	5.3	Q2	B3	West cnr	17/01/2024	2.5
Q1	T1	sink	27/09/2023	5.3	Q2	T1	sink	17/01/2024	2.5
Q1	T1	room	27/09/2023	5.3	Q2	T1	room	17/01/2024	2.5
Q1	T2	sink	27/09/2023	5.3	Q2	T2	sink	17/01/2024	2.5
Q1	T2	room	27/09/2023	5.3	Q2	T2	room	17/01/2024	2.5

Notes:
- ppm - parts per million
- Criteria of Subsurface methane 10000 ppm / 1 % (v/v) (NSW EPA, 2016 and the EPL 6269)

Table D5: Methane Monitoring - Buildings (2023-2024)

Quarterly Round	Location		Date	Methane (ppm)	Quarterly Round	Location		Date	Methane (ppm)
Q3	Shed 1	North cnr	8/04/2024	2.4	Q4	Shed 1	North cnr	1/07/2024	2.5
Q3	Shed 1	South cnr	8/04/2024	2.4	Q4	Shed 1	South cnr	1/07/2024	2.5
Q3	Shed 1	East cnr	8/04/2024	2.4	Q4	Shed 1	East cnr	1/07/2024	2.5
Q3	Shed 1	West cnr	8/04/2024	2.6	Q4	Shed 1	West cnr	1/07/2024	2.5
Q3	Shed 1	Drain	8/04/2024	2.8	Q4	Shed 1	Drain	1/07/2024	2.5
Q3	Shed 1	Sink	8/04/2024	2.4	Q4	Shed 1	Sink	1/07/2024	2.5
Q3	Shed 1	Outside	8/04/2024	2.4	Q4	Shed 1	Outside	1/07/2024	2.5
Q3	Shed 2	North cnr	8/04/2024	2.4	Q4	Shed 2	North cnr	1/07/2024	2.5
Q3	Shed 2	South cnr	8/04/2024	2.5	Q4	Shed 2	South cnr	1/07/2024	2.5
Q3	Shed 2	East cnr	8/04/2024	2.5	Q4	Shed 2	East cnr	1/07/2024	2.6
Q3	Shed 2	West cnr	8/04/2024	2.5	Q4	Shed 2	West cnr	1/07/2024	2.6
Q3	Shed 2	Middle	8/04/2024	2.5	Q4	Shed 2	Middle	1/07/2024	2.6
Q3	Shed 2	Entrance	8/04/2024	2.5	Q4	Shed 2	Entrance	1/07/2024	2.6
Q3	Shed 3	North cnr	8/04/2024	2.4	Q4	Shed 3	North cnr	1/07/2024	2.6
Q3	Shed 3	South cnr	8/04/2024	2.4	Q4	Shed 3	South cnr	1/07/2024	2.6
Q3	Shed 3	East cnr	8/04/2024	2.4	Q4	Shed 3	East cnr	1/07/2024	3
Q3	Shed 3	West cnr	8/04/2024	2.4	Q4	Shed 3	West cnr	1/07/2024	3.7
Q3	Office	North end	8/04/2024	2.4	Q4	Office	North end	1/07/2024	2.5
Q3	Office	South end	8/04/2024	2.4	Q4	Office	South end	1/07/2024	2.5
Q3	Office	West end	8/04/2024	2.5	Q4	Office	West end	1/07/2024	2.5
Q3	Office	East end	8/04/2024	2.5	Q4	Office	East end	1/07/2024	2.5
Q3	Office	Kitchen Sink	8/04/2024	9.3	Q4	Office	Kitchen Sink	1/07/2024	2.6
Q3	Office	Drain	8/04/2024	50.7	Q4	Office	Drain	1/07/2024	2.5
Q3	Office	Bathroom Sink	8/04/2024	2.9	Q4	Office	Bathroom Sink	1/07/2024	2.9
Q3	Office	Entrance	8/04/2024	2.4	Q4	Office	Entrance	1/07/2024	2.5
Q3	B1	North cnr	8/04/2024	2.4	Q4	B1	North cnr	1/07/2024	2.5
Q3	B1	South cnr	8/04/2024	2.4	Q4	B1	South cnr	1/07/2024	2.5
Q3	B1	East cnr	8/04/2024	2.4	Q4	B1	East cnr	1/07/2024	2.5
Q3	B1	West cnr	8/04/2024	2.4	Q4	B1	West cnr	1/07/2024	2.5
Q3	B2	North cnr	8/04/2024	2.5	Q4	B2	North cnr	1/07/2024	2.5
Q3	B2	South cnr	8/04/2024	2.5	Q4	B2	South cnr	1/07/2024	2.5
Q3	B2	East cnr	8/04/2024	2.5	Q4	B2	East cnr	1/07/2024	2.5
Q3	B2	West cnr	8/04/2024	2.5	Q4	B2	West cnr	1/07/2024	2.5
Q3	B3	North cnr	8/04/2024	2.4	Q4	B3	North cnr	1/07/2024	2.5
Q3	B3	South cnr	8/04/2024	2.4	Q4	B3	South cnr	1/07/2024	2.5
Q3	B3	East cnr	8/04/2024	2.4	Q4	B3	East cnr	1/07/2024	2.5
Q3	B3	West cnr	8/04/2024	2.4	Q4	B3	West cnr	1/07/2024	2.5
Q3	T1	sink	8/04/2024	2.4	Q4	T1	sink	1/07/2024	2.5
Q3	T1	room	8/04/2024	2.4	Q4	T1	room	1/07/2024	2.5
Q3	T2	sink	8/04/2024	2.4	Q4	T2	sink	1/07/2024	2.5
Q3	T2	room	8/04/2024	2.4	Q4	T2	room	1/07/2024	2.5

Notes:
- ppm - parts per million
- Criteria of Subsurface methane 10000 ppm / 1 % (v/v) (NSW EPA, 2016 and the EPL 6269)

Appendix E

Laboratory Report Sheets

Envirolab Services Pty Ltd
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customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 334150

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.24, Kempsey**
Number of Samples	8 Water
Date samples received	28/09/2023
Date completed instructions received	28/09/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	06/10/2023
Date of Issue	06/10/2023

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist
Priya Samarawickrama, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Total Phenolics in Water				
Our Reference		334150-5	334150-6	334150-7
Your Reference	UNITS	S5	L8	D1-27/9
Date Sampled		27/09/2023	27/09/2023	27/09/2023
Type of sample		Water	Water	Water
Date extracted	-	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	29/09/2023	29/09/2023	29/09/2023
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

Miscellaneous Inorganics						
Our Reference		334150-1	334150-2	334150-3	334150-4	334150-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S5
Date Sampled		27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Ammonia as N in water	mg/L	0.044	0.086	0.10	0.13	0.15
Nitrate as N in water	mg/L	<0.005	<0.005	0.008	<0.005	0.04
Fluoride, F	mg/L	[NA]	[NA]	[NA]	[NA]	<0.1
Total Organic Carbon	mg/L	[NA]	[NA]	[NA]	[NA]	24
Total Suspended Solids	mg/L	[NA]	[NA]	[NA]	[NA]	22

Miscellaneous Inorganics				
Our Reference		334150-6	334150-7	334150-8
Your Reference	UNITS	L8	D1-27/9	D2-27/9
Date Sampled		27/09/2023	27/09/2023	27/09/2023
Type of sample		Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023
Ammonia as N in water	mg/L	97	0.16	0.11
Nitrate as N in water	mg/L	<0.050	0.072	0.01
Fluoride, F	mg/L	0.2	<0.1	[NA]
Total Organic Carbon	mg/L	190	25	[NA]
Total Suspended Solids	mg/L	120	22	[NA]

Ion Balance						
Our Reference		334150-1	334150-2	334150-3	334150-4	334150-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S5
Date Sampled		27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Calcium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	37
Potassium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	20
Sodium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	290
Magnesium - Dissolved	mg/L	17	15	35	27	23
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	31
Carbonate Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Total Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	31
Sulphate, SO4	mg/L	[NA]	[NA]	[NA]	[NA]	110
Chloride, Cl	mg/L	[NA]	[NA]	[NA]	[NA]	530
Ionic Balance	%	[NA]	[NA]	[NA]	[NA]	-3.0

Ion Balance				
Our Reference		334150-6	334150-7	334150-8
Your Reference	UNITS	L8	D1-27/9	D2-27/9
Date Sampled		27/09/2023	27/09/2023	27/09/2023
Type of sample		Water	Water	Water
Date prepared	-	28/09/2023	28/09/2023	28/09/2023
Date analysed	-	28/09/2023	28/09/2023	28/09/2023
Calcium - Dissolved	mg/L	58	37	[NA]
Potassium - Dissolved	mg/L	150	19	[NA]
Sodium - Dissolved	mg/L	650	280	[NA]
Magnesium - Dissolved	mg/L	33	23	35
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	[NA]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	950	33	[NA]
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	[NA]
Total Alkalinity as $CaCO_3$	mg/L	950	33	[NA]
Sulphate, SO4	mg/L	14	110	[NA]
Chloride, Cl	mg/L	1,300	530	[NA]
Ionic Balance	%	-18	-4.0	[NA]

HM in water - dissolved				
Our Reference		334150-5	334150-6	334150-7
Your Reference	UNITS	S5	L8	D1-27/9
Date Sampled		27/09/2023	27/09/2023	27/09/2023
Type of sample		Water	Water	Water
Date prepared	-	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	29/09/2023	29/09/2023	29/09/2023
Iron-Dissolved	µg/L	150	7,900	160
Manganese-Dissolved	µg/L	150	590	160

HM in water - total				
Our Reference		334150-5	334150-6	334150-7
Your Reference	UNITS	S5	L8	D1-27/9
Date Sampled		27/09/2023	27/09/2023	27/09/2023
Type of sample		Water	Water	Water
Date prepared	-	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	29/09/2023	29/09/2023	29/09/2023
Iron-Total	µg/L	1,400	9,400	1,300
Manganese-Total	µg/L	170	630	170

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			29/09/2023	5	29/09/2023	29/09/2023		29/09/2023	[NT]
Date analysed	-			29/09/2023	5	29/09/2023	29/09/2023		29/09/2023	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	5	<0.05	<0.05	0	107	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			29/09/2023	1	28/09/2023	28/09/2023		29/09/2023	[NT]
Date analysed	-			29/09/2023	1	28/09/2023	28/09/2023		29/09/2023	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.044	0.053	19	112	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	102	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	[NT]	[NT]	[NT]	[NT]	93	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			28/09/2023	[NT]	[NT]	[NT]	[NT]	28/09/2023	[NT]
Date analysed	-			28/09/2023	[NT]	[NT]	[NT]	[NT]	28/09/2023	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	85	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	80	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	92	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	81	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			29/09/2023	[NT]	[NT]	[NT]	[NT]	29/09/2023	[NT]
Date analysed	-			29/09/2023	[NT]	[NT]	[NT]	[NT]	29/09/2023	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	97	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W6	[NT]
Date prepared	-			29/09/2023	[NT]	[NT]	[NT]	[NT]	29/09/2023	[NT]
Date analysed	-			29/09/2023	[NT]	[NT]	[NT]	[NT]	29/09/2023	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	101	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Nitrate, #6 - PQL raised due to matrix interference

The mass inbalance may be caused by other ions that have not been measured.

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CERTIFICATE OF ANALYSIS 341739

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.24, Kempsey**
Number of Samples	6 Water
Date samples received	17/01/2024
Date completed instructions received	17/01/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	24/01/2024
Date of Issue	25/01/2024

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Greta Petzold, Operation Manager
Loren Bardwell, Development Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Total Phenolics in Water						
Our Reference		341739-1	341739-2	341739-3	341739-4	341739-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Sampling Period Dates		16/01/2024	16/01/2024	16/01/2024	16/01/2024	16/01/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	18/01/2024	18/01/2024	18/01/2024	18/01/2024	18/01/2024
Date analysed	-	18/01/2024	18/01/2024	18/01/2024	18/01/2024	18/01/2024
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Total Phenolics in Water		
Our Reference		341739-6
Your Reference	UNITS	D1-16/1
Sampling Period Dates		16/01/2024
Type of sample		Water
Date extracted	-	18/01/2024
Date analysed	-	18/01/2024
Total Phenolics (as Phenol)	mg/L	<0.05

Miscellaneous Inorganics						
Our Reference		341739-1	341739-2	341739-3	341739-4	341739-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Sampling Period Dates		16/01/2024	16/01/2024	16/01/2024	16/01/2024	16/01/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/01/2024	17/01/2024	17/01/2024	17/01/2024	17/01/2024
Date analysed	-	17/01/2024	17/01/2024	17/01/2024	17/01/2024	17/01/2024
Ammonia as N in water	mg/L	0.28	0.024	0.046	<0.005	11
Nitrate as N in water	mg/L	<0.005	<0.005	0.007	0.11	<0.005
Fluoride, F	mg/L	<0.1	<0.1	<0.1	<0.1	0.2
Total Organic Carbon	mg/L	76	27	29	28	150
Total Suspended Solids	mg/L	13	14	8	180	20

Miscellaneous Inorganics		
Our Reference		341739-6
Your Reference	UNITS	D1-16/1
Sampling Period Dates		16/01/2024
Type of sample		Water
Date prepared	-	17/01/2024
Date analysed	-	17/01/2024
Ammonia as N in water	mg/L	0.022
Nitrate as N in water	mg/L	<0.005
Fluoride, F	mg/L	<0.1
Total Organic Carbon	mg/L	32
Total Suspended Solids	mg/L	13

Ion Balance						
Our Reference		341739-1	341739-2	341739-3	341739-4	341739-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Sampling Period Dates		16/01/2024	16/01/2024	16/01/2024	16/01/2024	16/01/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/01/2024	17/01/2024	17/01/2024	17/01/2024	17/01/2024
Date analysed	-	17/01/2024	17/01/2024	17/01/2024	17/01/2024	17/01/2024
Calcium - Dissolved	mg/L	2	16	12	24	37
Potassium - Dissolved	mg/L	3	10	7.9	10	94
Sodium - Dissolved	mg/L	23	83	69	78	550
Magnesium - Dissolved	mg/L	3	9.0	8.3	8.1	24
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	13	46	25	58	450
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	13	46	25	58	450
Sulphate, SO4	mg/L	2	45	43	58	32
Chloride, Cl	mg/L	33	120	100	99	730
Ionic Balance	%	5.0	2.0	3.0	3.0	0

Ion Balance		
Our Reference		341739-6
Your Reference	UNITS	D1-16/1
Sampling Period Dates		16/01/2024
Type of sample		Water
Date prepared	-	17/01/2024
Date analysed	-	17/01/2024
Calcium - Dissolved	mg/L	14
Potassium - Dissolved	mg/L	10
Sodium - Dissolved	mg/L	82
Magnesium - Dissolved	mg/L	8.3
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	44
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	44
Sulphate, SO4	mg/L	44
Chloride, Cl	mg/L	120
Ionic Balance	%	1.0

HM in water - dissolved						
Our Reference		341739-1	341739-2	341739-3	341739-4	341739-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Sampling Period Dates		16/01/2024	16/01/2024	16/01/2024	16/01/2024	16/01/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	22/01/2024	22/01/2024	22/01/2024	22/01/2024	22/01/2024
Date analysed	-	22/01/2024	22/01/2024	22/01/2024	22/01/2024	22/01/2024
Iron-Dissolved	µg/L	1,100	1,100	800	40	2,600
Manganese-Dissolved	µg/L	35	110	170	<5	180

HM in water - dissolved		
Our Reference		341739-6
Your Reference	UNITS	D1-16/1
Sampling Period Dates		16/01/2024
Type of sample		Water
Date prepared	-	22/01/2024
Date analysed	-	22/01/2024
Iron-Dissolved	µg/L	1,100
Manganese-Dissolved	µg/L	98

HM in water - total						
Our Reference		341739-1	341739-2	341739-3	341739-4	341739-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Sampling Period Dates		16/01/2024	16/01/2024	16/01/2024	16/01/2024	16/01/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	19/01/2024	19/01/2024	19/01/2024	19/01/2024	19/01/2024
Date analysed	-	22/01/2024	22/01/2024	22/01/2024	22/01/2024	22/01/2024
Iron-Total	µg/L	1,600	2,900	3,400	2,200	4,700
Manganese-Total	µg/L	58	120	260	54	260

HM in water - total		
Our Reference		341739-6
Your Reference	UNITS	D1-16/1
Sampling Period Dates		16/01/2024
Type of sample		Water
Date prepared	-	19/01/2024
Date analysed	-	22/01/2024
Iron-Total	µg/L	2,900
Manganese-Total	µg/L	120

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/01/2024	1	18/01/2024	18/01/2024		18/01/2024	[NT]
Date analysed	-			18/01/2024	1	18/01/2024	18/01/2024		18/01/2024	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	104	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	341739-1
Date prepared	-			17/01/2024	2	17/01/2024	17/01/2024		17/01/2024	17/01/2024
Date analysed	-			17/01/2024	2	17/01/2024	17/01/2024		17/01/2024	17/01/2024
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	2	0.024	[NT]		94	95
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	2	<0.005	[NT]		96	83
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	2	<0.1	[NT]		109	103
Total Organic Carbon	mg/L	1	Inorg-079	<1	2	27	27	0	102	106
Total Suspended Solids	mg/L	5	Inorg-019	<5	2	14	[NT]		103	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			17/01/2024	3	17/01/2024	17/01/2024		17/01/2024	[NT]
Date analysed	-			17/01/2024	3	17/01/2024	17/01/2024		17/01/2024	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	3	12	[NT]		98	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	3	7.9	[NT]		98	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	3	69	[NT]		105	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	3	8.3	[NT]		97	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	3	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	3	25	23	8	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	3	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	3	25	23	8	114	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	3	43	[NT]		109	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	3	100	[NT]		94	[NT]
Ionic Balance	%		Inorg-040	[NT]	3	3.0	[NT]		[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	341739-2
Date prepared	-			22/01/2024	1	22/01/2024	22/01/2024		22/01/2024	22/01/2024
Date analysed	-			22/01/2024	1	22/01/2024	22/01/2024		22/01/2024	22/01/2024
Iron-Dissolved	µg/L	10	Metals-022	<10	1	1100	1100	0	94	#
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	35	36	3	96	97

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	341739-2
Date prepared	-			22/01/2024	1	19/01/2024	19/01/2024		22/01/2024	22/01/2024
Date analysed	-			22/01/2024	1	22/01/2024	22/01/2024		22/01/2024	22/01/2024
Iron-Total	µg/L	10	Metals-022	<10	1	1600	1500	6	96	#
Manganese-Total	µg/L	5	Metals-022	<5	1	58	57	2	100	96

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

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Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
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The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Total Organic Carbon analysed by MPL Laboratories. Report No. PFA1137

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CERTIFICATE OF ANALYSIS 348424

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan, Sarah Krebs
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.24 Kempsey**
Number of Samples	11 Water
Date samples received	10/04/2024
Date completed instructions received	10/04/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	17/04/2024
Date of Issue	17/04/2024

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist
Nick Sarlamis, Assistant Operation Manager

Authorised By
Nancy Zhang, Laboratory Manager

Total Phenolics in Water						
Our Reference		348424-5	348424-6	348424-7	348424-8	348424-9
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		09/04/2024	09/04/2024	09/04/2024	09/04/2024	09/04/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	16/04/2024	16/04/2024	16/04/2024	16/04/2024	16/04/2024
Date analysed	-	16/04/2024	16/04/2024	16/04/2024	16/04/2024	16/04/2024
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

HM in water - dissolved						
Our Reference		348424-5	348424-6	348424-7	348424-8	348424-9
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		09/04/2024	09/04/2024	09/04/2024	09/04/2024	09/04/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024
Date analysed	-	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024
Manganese-Dissolved	µg/L	7	13	6	21	140
Iron-Dissolved	µg/L	1,100	560	1,100	370	2,800

HM in water - total						
Our Reference		348424-5	348424-6	348424-7	348424-8	348424-9
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		09/04/2024	09/04/2024	09/04/2024	09/04/2024	09/04/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	12/04/2024	12/04/2024	12/04/2024	12/04/2024	12/04/2024
Date analysed	-	12/04/2024	12/04/2024	12/04/2024	12/04/2024	12/04/2024
Manganese-Total	µg/L	8	16	11	42	190
Iron-Total	µg/L	1,400	3,500	3,300	2,900	4,600

Ion Balance						
Our Reference		348424-1	348424-2	348424-3	348424-4	348424-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S4
Date Sampled		09/04/2024	09/04/2024	09/04/2024	09/04/2024	09/04/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Date analysed	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Calcium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	0.7
Potassium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	0.9
Sodium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	11
Magnesium - Dissolved	mg/L	18	14	33	25	1
Hardness (calc) equivalent $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	6.3
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	7
Carbonate Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Total Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	7
Sulphate, SO4	mg/L	[NA]	[NA]	[NA]	[NA]	2
Chloride, Cl	mg/L	[NA]	[NA]	[NA]	[NA]	16
Ionic Balance	%	[NA]	[NA]	[NA]	[NA]	-3.0

Ion Balance						
Our Reference		348424-6	348424-7	348424-8	348424-9	348424-10
Your Reference	UNITS	S5	S6	S7	L8	D1-9/4/24
Date Sampled		09/04/2024	09/04/2024	09/04/2024	09/04/2024	09/04/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Date analysed	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Calcium - Dissolved	mg/L	1	0.9	4	18	[NA]
Potassium - Dissolved	mg/L	1	2	4	37	[NA]
Sodium - Dissolved	mg/L	14	14	20	250	[NA]
Magnesium - Dissolved	mg/L	1	0.8	2	12	17
Hardness (calc) equivalent $CaCO_3$	mg/L	9.2	5.4	17	93	[NA]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	[NA]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	11	11	43	120	[NA]
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	62	[NA]
Total Alkalinity as $CaCO_3$	mg/L	11	11	43	180	[NA]
Sulphate, SO4	mg/L	4	4	20	18	[NA]
Chloride, Cl	mg/L	24	23	39	360	[NA]
Ionic Balance	%	-7.0	-12	-29	-2.0	[NA]

Miscellaneous Inorganics						
Our Reference		348424-1	348424-2	348424-3	348424-4	348424-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S4
Date Sampled		09/04/2024	09/04/2024	09/04/2024	09/04/2024	09/04/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Date analysed	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Total Suspended Solids	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Ammonia as N in water	mg/L	0.037	0.092	0.009	0.036	0.015
Nitrate as N in water	mg/L	<0.005	<0.005	1.5	0.22	<0.005
Fluoride, F	mg/L	[NA]	[NA]	[NA]	[NA]	<0.1
Total Organic Carbon	mg/L	[NA]	[NA]	[NA]	[NA]	20

Miscellaneous Inorganics						
Our Reference		348424-6	348424-7	348424-8	348424-9	348424-10
Your Reference	UNITS	S5	S6	S7	L8	D1-9/4/24
Date Sampled		09/04/2024	09/04/2024	09/04/2024	09/04/2024	09/04/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Date analysed	-	10/04/2024	10/04/2024	10/04/2024	10/04/2024	10/04/2024
Total Suspended Solids	mg/L	16	15	140	26	[NA]
Ammonia as N in water	mg/L	0.34	0.23	5.5	0.042	0.026
Nitrate as N in water	mg/L	0.058	0.13	0.49	0.051	<0.005
Fluoride, F	mg/L	<0.1	<0.1	<0.1	0.1	[NA]
Total Organic Carbon	mg/L	22	21	10	56	[NA]

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.

QUALITY CONTROL: Total Phenolics in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			16/04/2024	[NT]	[NT]	[NT]	[NT]	16/04/2024	[NT]
Date analysed	-			16/04/2024	[NT]	[NT]	[NT]	[NT]	16/04/2024	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	105	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			15/04/2024	[NT]	[NT]	[NT]	[NT]	15/04/2024	[NT]
Date analysed	-			15/04/2024	[NT]	[NT]	[NT]	[NT]	15/04/2024	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			12/04/2024	5	12/04/2024	12/04/2024		12/04/2024	[NT]
Date analysed	-			12/04/2024	5	12/04/2024	12/04/2024		12/04/2024	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	5	8	8	0	100	[NT]
Iron-Total	µg/L	10	Metals-022	<10	5	1400	1500	7	105	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			10/04/2024	1	10/04/2024	10/04/2024		10/04/2024	[NT]
Date analysed	-			10/04/2024	1	10/04/2024	10/04/2024		10/04/2024	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	6	1	[NT]		91	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	6	1	[NT]		81	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	6	14	[NT]		101	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	18	17	6	92	[NT]
Hardness (calc) equivalent $CaCO_3$	mg/L	3	Metals-020	[NT]	6	9.2	[NT]		[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	6	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	6	11	11	0	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	6	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	6	11	11	0	104	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	6	4	[NT]		114	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	6	24	[NT]		110	[NT]
Ionic Balance	%		Inorg-040	[NT]	6	-7.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	6	10/04/2024	10/04/2024		[NT]	[NT]
Date analysed	-			[NT]	6	10/04/2024	10/04/2024		[NT]	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	6	1	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	348424-4
Date prepared	-			10/04/2024	1	10/04/2024	10/04/2024		10/04/2024	10/04/2024
Date analysed	-			10/04/2024	1	10/04/2024	10/04/2024		10/04/2024	10/04/2024
Total Suspended Solids	mg/L	5	Inorg-019	<5	5	<5	[NT]		95	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.037	0.035	6	105	100
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	101	103
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	5	<0.1	[NT]		108	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	5	20	22	10	88	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	348424-6
Date prepared	-			[NT]	5	10/04/2024	10/04/2024		[NT]	10/04/2024
Date analysed	-			[NT]	5	10/04/2024	10/04/2024		[NT]	10/04/2024
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	5	0.015	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	5	<0.005	[NT]		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	8	140	120	15	[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	8	<0.1	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	8	10	[NT]		[NT]	83

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	8	10/04/2024	10/04/2024		[NT]	[NT]
Date analysed	-			[NT]	8	10/04/2024	10/04/2024		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	8	5.5	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	8	0.49	[NT]		[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

The mass inbalance may be caused by other ions that have not been measured.

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CERTIFICATE OF ANALYSIS 355417

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.24, Kempsey**
Number of Samples	6 Water
Date samples received	02/07/2024
Date completed instructions received	02/07/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	09/07/2024
Date of Issue	11/07/2024

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Giovanni Agosti, Group Technical Manager
Jenny He, Senior Chemist
Nick Sarlamis, Assistant Operation Manager

Authorised By
Nancy Zhang, Laboratory Manager

Total Phenolics in Water						
Our Reference		355417-1	355417-2	355417-3	355417-4	355417-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	04/07/2024	04/07/2024	04/07/2024	04/07/2024	04/07/2024
Date analysed	-	04/07/2024	04/07/2024	04/07/2024	04/07/2024	04/07/2024
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Total Phenolics in Water		
Our Reference		355417-6
Your Reference	UNITS	D1-1.7.24
Type of sample		Water
Date extracted	-	04/07/2024
Date analysed	-	04/07/2024
Total Phenolics (as Phenol)	mg/L	<0.05

Miscellaneous Inorganics						
Our Reference	UNITS	355417-1	355417-2	355417-3	355417-4	355417-5
Your Reference		S4	S5	S6	S7	L8
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	02/07/2024	02/07/2024	02/07/2024	02/07/2024	02/07/2024
Date analysed	-	02/07/2024	02/07/2024	02/07/2024	02/07/2024	02/07/2024
Ammonia as N in water	mg/L	<0.005	0.044	0.011	0.079	51
Nitrate as N in water	mg/L	<0.005	0.054	0.02	0.74	2.3
Fluoride, F	mg/L	<0.1	<0.1	<0.1	<0.1	0.1
Total Organic Carbon	mg/L	15	13	17	14	72
Total Suspended Solids	mg/L	<5	33	14	62	22

Miscellaneous Inorganics		
Our Reference	UNITS	355417-6
Your Reference		D1-1.7.24
Type of sample		Water
Date prepared	-	02/07/2024
Date analysed	-	02/07/2024
Ammonia as N in water	mg/L	<0.005
Nitrate as N in water	mg/L	<0.005
Fluoride, F	mg/L	<0.1
Total Organic Carbon	mg/L	13
Total Suspended Solids	mg/L	<5

Ion Balance						
Our Reference		355417-1	355417-2	355417-3	355417-4	355417-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	02/07/2024	02/07/2024	02/07/2024	02/07/2024	02/07/2024
Date analysed	-	02/07/2024	02/07/2024	02/07/2024	02/07/2024	02/07/2024
Calcium - Dissolved	mg/L	0.5	9.1	5.3	29	27
Potassium - Dissolved	mg/L	1	4	3	8.2	76
Sodium - Dissolved	mg/L	14	30	24	47	380
Magnesium - Dissolved	mg/L	1	5.3	4	8.5	20
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	10	30	26	66	480
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	10	30	26	66	480
Sulphate, SO4	mg/L	1	17	5	45	15
Chloride, Cl	mg/L	26	70	54	97	590
Ionic Balance	%	-11	-12	-12	-6.0	-10

Ion Balance		
Our Reference		355417-6
Your Reference	UNITS	D1-1.7.24
Type of sample		Water
Date prepared	-	02/07/2024
Date analysed	-	02/07/2024
Calcium - Dissolved	mg/L	0.7
Potassium - Dissolved	mg/L	1
Sodium - Dissolved	mg/L	15
Magnesium - Dissolved	mg/L	2
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	10
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	10
Sulphate, SO4	mg/L	<1
Chloride, Cl	mg/L	26
Ionic Balance	%	-5.0

HM in water - dissolved						
Our Reference		355417-1	355417-2	355417-3	355417-4	355417-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/07/2024	03/07/2024	03/07/2024	03/07/2024	03/07/2024
Date analysed	-	03/07/2024	03/07/2024	03/07/2024	03/07/2024	03/07/2024
Iron-Dissolved	µg/L	450	450	810	20	50
Manganese-Dissolved	µg/L	6	64	28	71	270

HM in water - dissolved		
Our Reference		355417-6
Your Reference	UNITS	D1-1.7.24
Type of sample		Water
Date prepared	-	03/07/2024
Date analysed	-	03/07/2024
Iron-Dissolved	µg/L	460
Manganese-Dissolved	µg/L	7

HM in water - total						
Our Reference		355417-1	355417-2	355417-3	355417-4	355417-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	08/07/2024	08/07/2024	08/07/2024	08/07/2024	08/07/2024
Date analysed	-	08/07/2024	08/07/2024	08/07/2024	08/07/2024	08/07/2024
Iron-Total	µg/L	510	2,800	1,900	3,100	400
Manganese-Total	µg/L	9	79	33	120	400

HM in water - total		
Our Reference		355417-6
Your Reference	UNITS	D1-1.7.24
Type of sample		Water
Date prepared	-	08/07/2024
Date analysed	-	08/07/2024
Iron-Total	µg/L	560
Manganese-Total	µg/L	10

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	355417-2
Date extracted	-			04/07/2024	1	04/07/2024	04/07/2024		04/07/2024	04/07/2024
Date analysed	-			04/07/2024	1	04/07/2024	04/07/2024		04/07/2024	04/07/2024
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	101	97

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	355417-2
Date prepared	-			02/07/2024	1	02/07/2024	02/07/2024		02/07/2024	02/07/2024
Date analysed	-			02/07/2024	1	02/07/2024	02/07/2024		02/07/2024	02/07/2024
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	<0.005	<0.005	0	96	93
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	0.006	18	97	91
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	<0.1	<0.1	0	96	98
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	15	14	7	98	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	<5	[NT]		91	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	02/07/2024	02/07/2024		[NT]	[NT]
Date analysed	-			[NT]	3	02/07/2024	02/07/2024		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	3	0.011	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	3	0.02	[NT]		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	3	<0.1	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	3	17	[NT]		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	3	14	13	7	[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	355417-2
Date prepared	-			02/07/2024	1	02/07/2024	02/07/2024		02/07/2024	02/07/2024
Date analysed	-			02/07/2024	1	02/07/2024	02/07/2024		02/07/2024	02/07/2024
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	0.5	0.5	0	107	107
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1	1	0	98	96
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	14	14	0	91	95
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1	1	0	108	108
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	9	11	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	9	11	112	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	1	2	67	118	111
Chloride, Cl	mg/L	1	Inorg-081	<1	1	26	26	0	109	#
Ionic Balance	%		Inorg-040	[NT]	1	-11	-12	-9	[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	[NT]
Date prepared	-			03/07/2024	[NT]	[NT]	[NT]	[NT]	03/07/2024	[NT]
Date analysed	-			03/07/2024	[NT]	[NT]	[NT]	[NT]	03/07/2024	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	96	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			08/07/2024	1	08/07/2024	08/07/2024		08/07/2024	[NT]
Date analysed	-			08/07/2024	1	08/07/2024	08/07/2024		08/07/2024	[NT]
Iron-Total	µg/L	10	Metals-022	<10	1	510	550	8	99	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	1	9	9	0	98	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

ION_BALANCE:
Percent recovery is not applicable due to the high concentration of the analyte/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Appendix F

Tabulated Laboratory Results:

Table F1 – Field and Laboratory Results for Groundwater – September 2023 – Q1

Table F2 – Field and Laboratory Results for Surface Water - September 2023 – Q1

Table F3 – Field and Laboratory Results for Surface Water – January 2024 – Q2

Table F4 - Field and Laboratory Results for Groundwater – April 2023 – Q3

Table F5 – Field and Laboratory Results for Surface Water - April 2023 – Q3

Table F6 – Field and Laboratory Results for Surface Water – July 2023 – Q4

Table F1 - Field and Laboratory Results for Groundwater - September 2023 - Q1

Analyte		Units	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	BH1 MP1 27/09/2023	BH2 MP2 27/09/2023	BH3 MP3 27/09/2023	BH4 MP12 27/09/2023	BH1-2 MP14 27/09/2023
Field	Dissolved Oxygen (Filtered)	mg/L			*	6.97	1.82	1.31	0.33
	EC (Field)	µS/cm		1065	*	1510	1840	1810	1460
	pH (Field)	pH_Units		6.5 - 8.0	*	6.60	6.10	6.20	5.70
	PID (Top of Well)	ppm			*	<1	<1	<1	<1
	Temp	°C			*	19.07	25.67	29.32	20.83
Ion Balance	Magnesium (Filtered)	mg/L		10.05	*	15	35	27	17
Miscellaneous Inorganics	Ammonia as N	mg/L	0.9	0.9	*	0.086	0.10	0.13	0.044
	Nitrate (as N)	mg/L	0.7	0.7	*	<0.005	0.008	<0.005	<0.005

Notes
Only EPL Trigger Levels exceedances highlighted
* Location not sampled due to obstruction

Table F2 - Field and Laboratory Results for Surface water - September 2023 - Q1

Analytes		Units	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	S4 MP4 27/09/2023	S5 MP5 27/09/2023	S6 MP6 27/09/2023	S7 MP7 27/09/2023	L8 MP8 27/09/2023
Field	Dissolved Oxygen (Filtered)	mg/L		12.057	-	2.63	-	-	0.66
	EC (field)	µS/cm		1065	-	2630	-	-	660
	pH (Field)	pH_Units		6.5 - 8.0	-	6.6	-	-	8.4
	Temp	°C			-	15.09	-	-	23.3
HM in water - dissolved	Iron (Filtered)	mg/L		1.84	-	0.15	-	-	7.9
	Manganese (Filtered)	mg/L	1.9	1.9	-	0.15	-	-	0.59
HM in water - total	Iron	mg/L		1.84	-	1.4	-	-	9.4
	Manganese	mg/L	1.9	1.9	-	0.17	-	-	0.63
Ion Balance	Alkalinity (Carbonate)	mg/L			-	<5	-	-	<5
	Alkalinity (Hydroxide) as	mg/L			-	<5	-	-	<5
	Alkalinity (total) as CaCO3	mg/L		12.283	-	31	-	-	950
	Alkalinity (Bicarbonate as	mg/L			-	31	-	-	950
	Calcium (Filtered)	mg/L		2.05	-	37	-	-	58
	Chloride	mg/L		54.49	-	530	-	-	1300
	Ionic Balance	%			-	-3.0	-	-	-18
	Magnesium (Filtered)	mg/L		10.05	-	23	-	-	33
	Potassium (Filtered)	mg/L		2.282	-	20	-	-	150
	Sodium (Filtered)	mg/L		34	-	290	-	-	650
	Sulphate	mg/L		3.1	-	110	-	-	14
Miscellaneous Inorganics	Ammonia as N	mg/L	0.9	0.9	-	0.15	-	-	97
	Fluoride	mg/L			-	<0.1	-	-	0.2
	Nitrate (as N)	mg/L	0.7	0.7	-	0.04	-	-	<0.050
	TOC	mg/L		33.1	-	24	-	-	190
	TSS	mg/L		33.415	-	22	-	-	120
Total Phenolics	Phenolics Total	mg/L	0.32	0.32	-	<0.05	-	-	<0.05

Notes
Only EPL Trigger Level Exceedances highlighted
- Locations were dry

Table F3 - Field and Laboratory Results for Surface water - January 2024 - Q2

Analytes		Units	ANZECC 2000 FW 95%	EPL Surface Water Trigger Levels Licence 6269	S4 MP4 16/01/2024	S5 MP5 16/01/2024	S6 MP6 16/01/2024	S7 MP7 16/01/2024	L8 MP8 16/01/2024
Field	Dissolved Oxygen (Filtered)	mg/L		12.057	1.42	4.57	1.65	6.24	1.96
	EC (field)	µS/cm		1065	188	554	513	643	3160
	pH (Field)	pH_Units		6.5 - 8.0	6.9	6.2	5.5	7.9	8.4
	Temp	°C			23.43	23.1	23.3	26.0	25.17
HM in water - dissolved	Iron (Filtered)	mg/L		1.84	1.1	1.1	0.8	0.04	2600
	Manganese (Filtered)	mg/L	1.9	1.9	0.035	0.11	0.17	<0.005	180
HM in water - total	Iron	mg/L		1.84	1.6	2.9	3.4	2.2	4700
	Manganese	mg/L	1.9	1.9	0.058	0.12	0.26	0.054	260
Ion Balance	Alkalinity (Carbonate)	mg/L			<5	<5	<5	<5	<5
	Alkalinity (Hydroxide) as	mg/L			<5	<5	<5	<5	<5
	Alkalinity (total) as CaCO3	mg/L		12.283	13	46	25	58	450
	Alkalinity (Bicarbonate as	mg/L			13	46	25	58	450
	Calcium (Filtered)	mg/L		2.05	2	16	12	24	37
	Chloride	mg/L		54.49	33	120	100	99	730
	Ionic Balance	%			5	2	3	3	0
	Magnesium (Filtered)	mg/L		10.05	3	9	8.3	8.1	24
	Potassium (Filtered)	mg/L		2.282	3	10	7.9	10	94
	Sodium (Filtered)	mg/L		34	23	83	69	78	550
	Sulphate	mg/L		3.1	2	45	43	58	32
Miscellaneous Inorganics	Ammonia as N	mg/L	0.9	0.9	0.28	0.024	0.046	<0.005	11
	Fluoride	mg/L			<0.1	<0.1	<0.1	<0.1	0.2
	Nitrate (as N)	mg/L	0.7	0.7	<0.005	<0.005	0.007	0.11	<0.005
	TOC	mg/L		33.1	76	27	29	28	0
	TSS	mg/L		33.415	13	14	8	180	20
Total Phenolics	Phenolics Total	mg/L	0.32	0.32	<0.05	<0.05	<0.05	<0.05	<0.05

Notes
Only EPL Trigger Level Exceedances highlighted

Table F4 - Field and Laboratory Results for Groundwater - April 2024 - Q3

Analyte		Units	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	BH1 MP1 8/04/2024	BH2 MP2 8/04/2024	BH3 MP3 8/04/2024	BH4 MP12 8/04/2024	BH1-2 MP14 8/04/2024
Field	Dissolved Oxygen (Filtered)	mg/L			*	7.79	0.34	2.73	1.69
	EC (Field)	µS/cm		1065	*	1620	1710	1910	1560
	pH (Field)	pH_Units		6.5 - 8.0	*	6.50	5.20	6.30	5.80
	PID (Top of Well)	ppm			*	<1	<1	<1	<1
	Temp	°C			*	19.56	22.82	23.75	20.74
Ion Balance	Magnesium (Filtered)	mg/L		10.05	*	14.00	33.00	25.00	18.00
Miscellaneous Inorganics	Ammonia as N	mg/L	0.9	0.9	*	0.09	0.01	0.04	0.04
	Nitrate (as N)	mg/L	0.7	0.7	*	<0.005	1.50	0.22	<0.005

Notes
Only EPL Trigger Levels exceedances highlighted
* Location not sampled due to obstruction

Table F5 - Field and Laboratory Results for Surface water - April 2024 - Q3

Analytes		Units	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	S4 MP4 8/04/2024	S5 MP5 8/04/2024	S6 MP6 8/04/2024	S7 MP7 8/04/2024	L8 MP8 8/04/2024
Field	Dissolved Oxygen (Filtered)	mg/L		12.057	4.59	3.12	3.43	4.49	11.48
	EC (field)	µS/cm		1065	72	118	128	249	1530
	pH (Field)	pH_Units		6.5 - 8.0	5.5	6	6.1	7.4	8.2
	Temp	°C			20.5	19.08	19.1	24.01	23.4
HM in water - dissolved	Iron (Filtered)	mg/L		1.84	1.1	0.56	1.1	0.37	2.8
	Manganese (Filtered)	mg/L	1.9	1.9	0.007	0.013	0.006	0.021	0.14
HM in water - total	Iron	mg/L		1.84	1.4	3.5	3.3	2.9	4.6
	Manganese	mg/L	1.9	1.9	0.008	0.016	0.011	0.042	0.19
Ion Balance	Alkalinity (Carbonate)	mg/L			<5	<5	<5	<5	62
	Alkalinity (Hydroxide) as	mg/L			<5	<5	<5	<5	<5
	Alkalinity (total) as CaCO3	mg/L		12.283	7	11	11	43	180
	Alkalinity (Bicarbonate as	mg/L			7	11	11	43	120
	Calcium (Filtered)	mg/L		2.05	0.7	1	0.9	4	18
	Chloride	mg/L		54.49	16	24	23	39	360
	Ionic Balance	%			-3	-7	-12	-29	-2
	Magnesium (Filtered)	mg/L		10.05	1	1	0.8	2	12
	Potassium (Filtered)	mg/L		2.282	0.9	1	2	4	37
	Sodium (Filtered)	mg/L		34	11	14	14	20	250
	Sulphate	mg/L		3.1	2	4	4	20	18
Miscellaneous Inorganics	Ammonia as N	mg/L	0.9	0.9	0.015	0.34	0.23	5.5	0.042
	Fluoride	mg/L			<0.1	<0.1	<0.1	<0.1	0.1
	Nitrate (as N)	mg/L	0.7	0.7	<0.005	0.058	0.13	0.49	0.051
	TOC	mg/L		33.1	20	22	21	10	56
	TSS	mg/L		33.415	<5	16	15	140	26
Total Phenolics	Phenolics Total	mg/L	0.32	0.32	<0.05	<0.05	<0.05	<0.05	<0.05

Notes
Only EPL Trigger Level Exceedances highlighted

Table F6 - Field and Laboratory Results for Surface water - July 2024 - Q4

Analytes		Units	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	S4 MP4 1/07/2024	S5 MP5 1/07/2024	S6 MP6 1/07/2024	S7 MP7 1/07/2024	L8 MP8 1/07/2024
Field	Dissolved Oxygen (Filtered)	mg/L		12.057	3.08	0.92	3.46	1.72	5.7
	EC (field)	µS/cm		1065	114	446	345	583	3060
	pH (Field)	pH_Units		6.5 - 8.0	6.1	6.2	5.9	8.1	7.2
	Temp	°C			13.06	12.63	13.7	12.75	15.66
HM in water - dissolved	Iron (Filtered)	mg/L		1.84	0.45	0.45	0.81	0.02	0.05
	Manganese (Filtered)	mg/L	1.9	1.9	0.006	0.064	0.028	0.071	0.27
HM in water - total	Iron	mg/L		1.84	0.51	2.8	1.9	3.1	0.4
	Manganese	mg/L	1.9	1.9	0.009	0.079	0.033	0.12	0.4
Ion Balance	Alkalinity (Carbonate)	mg/L			<5	<5	<5	<5	<5
	Alkalinity (Hydroxide) as	mg/L			<5	<5	<5	<5	<5
	Alkalinity (total) as CaCO3	mg/L		12.283	10	30	26	66	480
	Alkalinity (Bicarbonate as	mg/L			10	30	26	66	480
	Calcium (Filtered)	mg/L		2.05	0.5	9.1	5.3	29	27
	Chloride	mg/L		54.49	26	70	54	97	590
	Ionic Balance	%			-11	-12	-12	-6	-10
	Magnesium (Filtered)	mg/L		10.05	1	5.3	4	8.5	20
	Potassium (Filtered)	mg/L		2.282	1	4	3	8.2	76
	Sodium (Filtered)	mg/L		34	14	30	24	47	380
	Sulphate	mg/L		3.1	1	17	5	45	15
Miscellaneous Inorganics	Ammonia as N	mg/L	0.9	0.9	<0.005	0.044	0.011	0.079	51
	Fluoride	mg/L			<0.1	<0.1	<0.1	<0.1	0.1
	Nitrate (as N)	mg/L	0.7	0.7	<0.005	0.054	0.02	0.74	2.3
	TOC	mg/L		33.1	15	13	17	14	72
	TSS	mg/L		33.415	<5	33	14	62	22
Total Phenolics	Phenolics Total	mg/L	0.32	0.32	<0.04	<0.05	<0.05	<0.05	<0.05

Notes

Only EPL Trigger Level Exceedances highlighted

Appendix G

Graphed Historical Data

Figure G1: Rainfall Data and Groundwater Levels 2020 – 2024

Figure G2: Groundwater Chemistry (Ammonia and EC) vs Time

Figure G3: Groundwater Chemistry (Magnesium and Nitrate) vs Time

Figure G4: Groundwater Chemistry (pH) vs Time

Figure G5: Surface Water Chemistry (Chloride and EC) vs Time

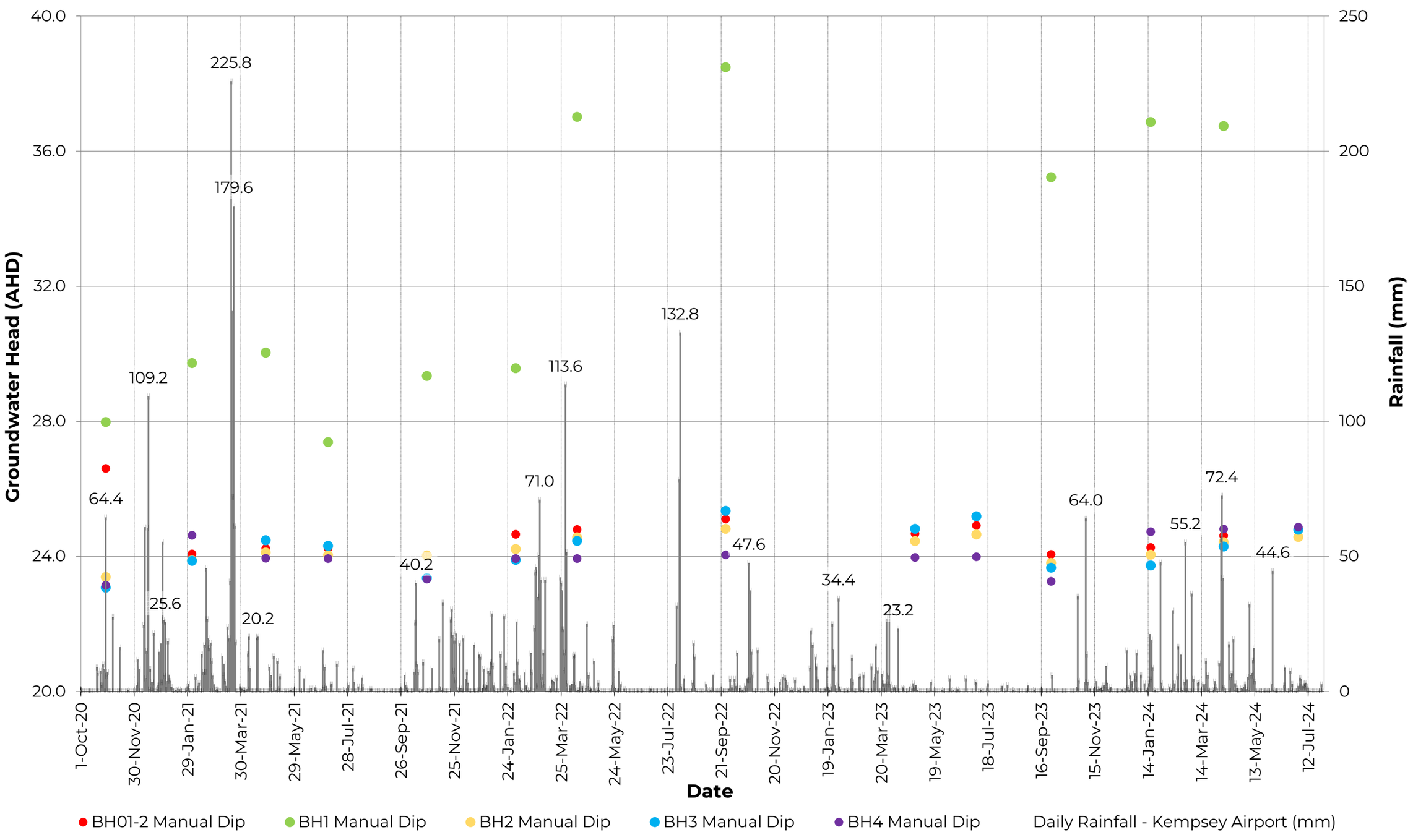
Figure G6: Surface Water Chemistry (Iron and Magnesium) vs Time

Figure G7: Surface Water Chemistry (Manganese and Nitrate) vs Time

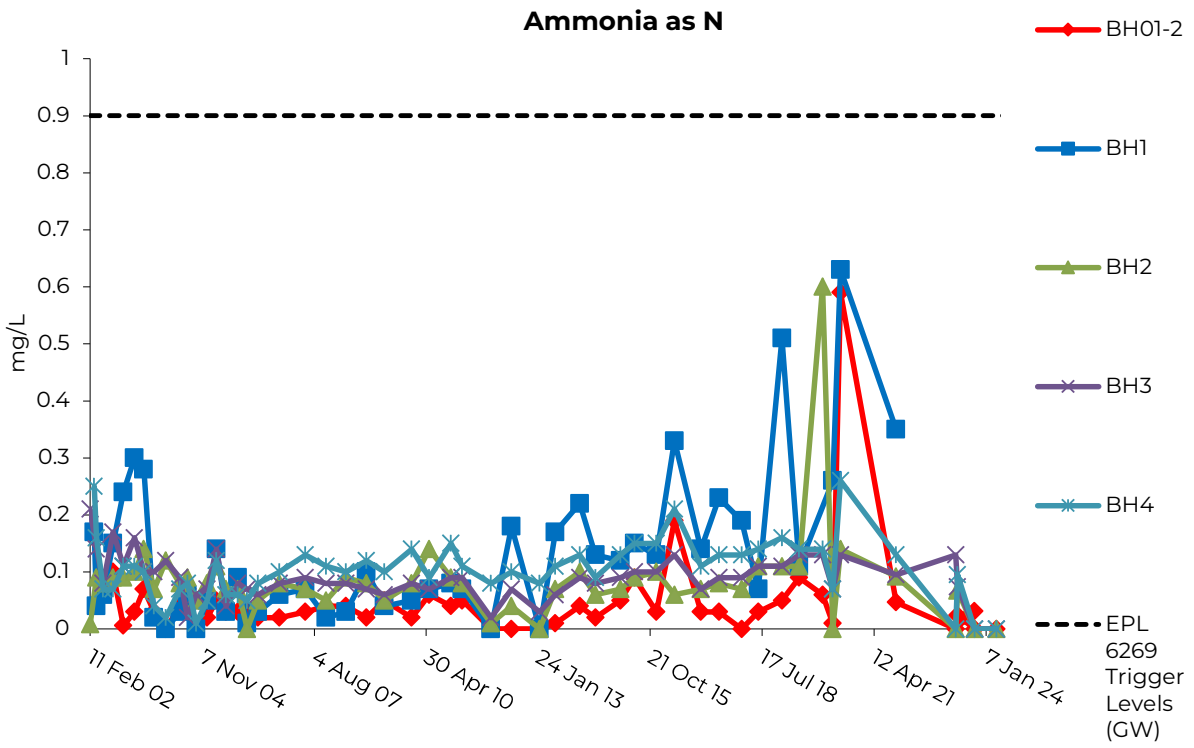
Figure G8: Surface Water Chemistry (pH and Potassium) vs Time

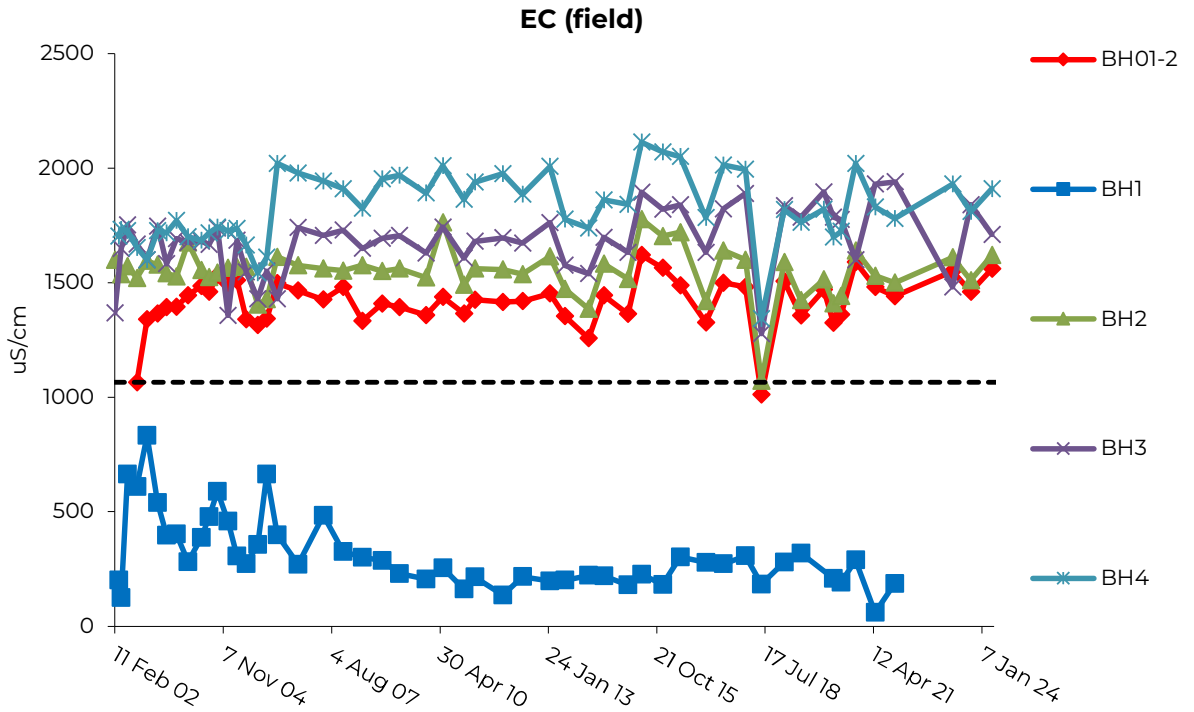
Figure G9: Surface Water Chemistry (Sodium and Sulfate) vs Time

Figure G10: Surface Water Chemistry (TSS and TOC) vs Time

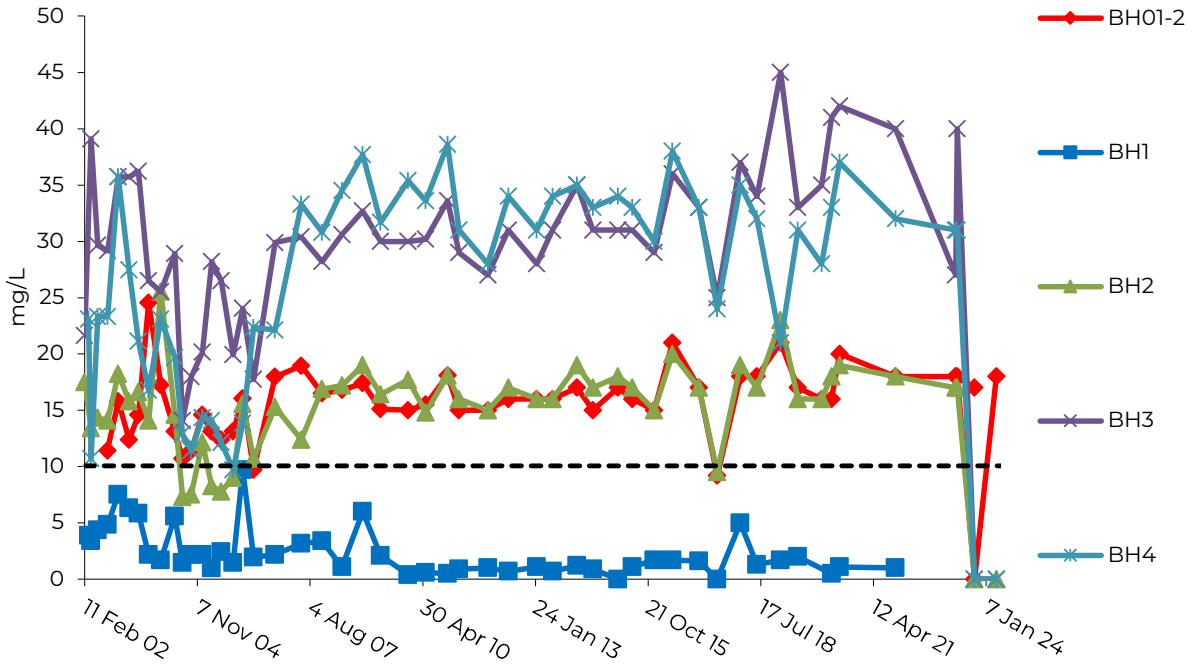


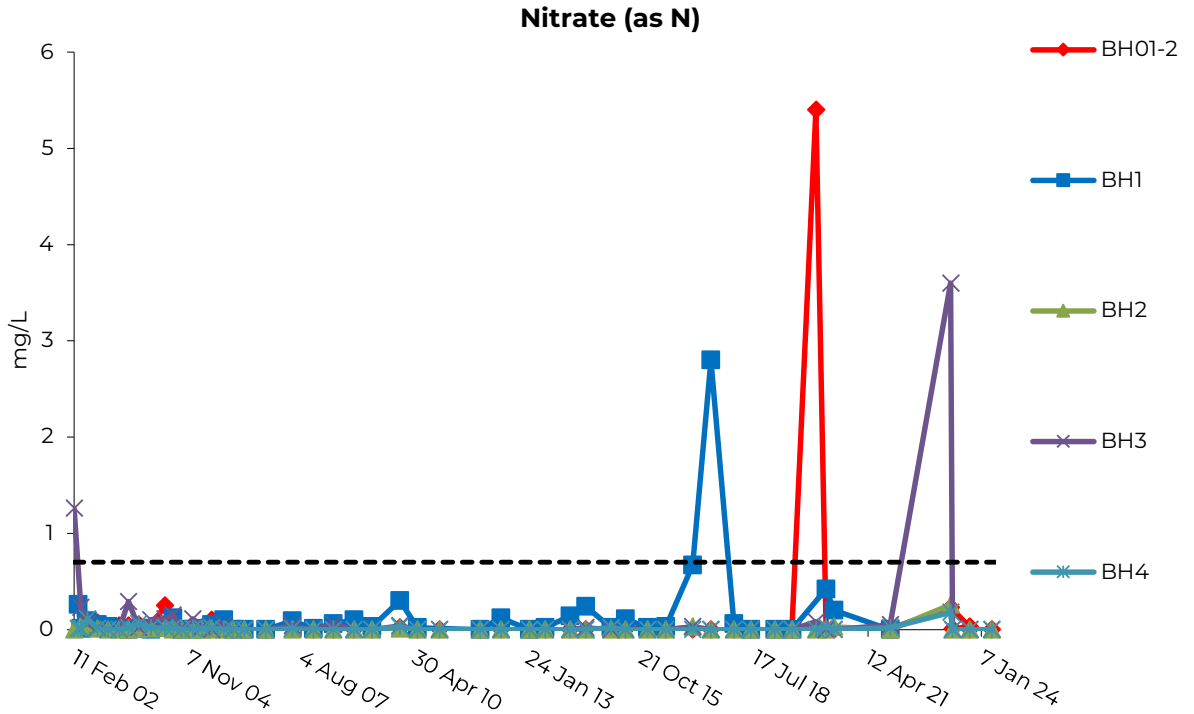
Douglas PARTNERS	CLIENT: Kempsey Shire Council	**Groundwater Level vs Rainfall (October 2020 to July 2024)** **Kempsey Landfill** **538 Crescent Head Road, Kemspey**	PROJECT NO: 89781.24
	OFFICE: Port Macquarie / DRAWN BY: SBK		FIGURE NO: G1
	SCALE: N/A / DATE: 14 August 2024		REVISION: 0



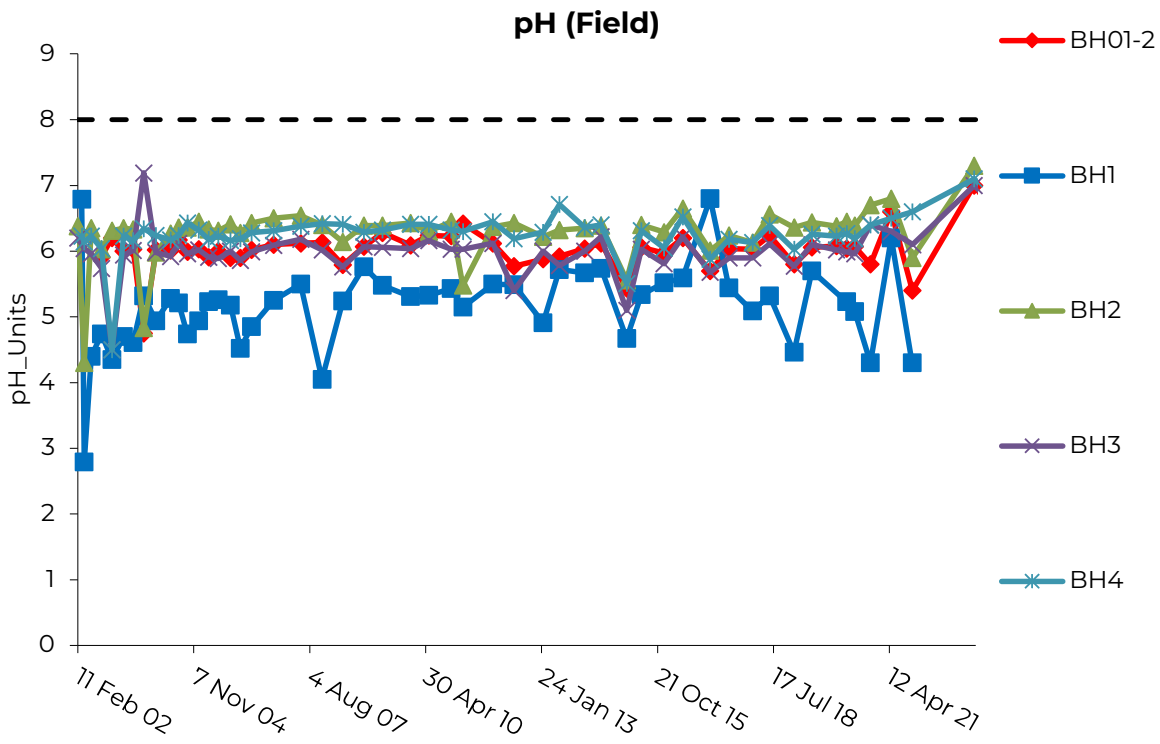


Groundwater Ammonia Vs Time (Feb 2002 - April 2024)	**Figure G2**
Groundwater EC Vs Time (Feb 2002 - April 2024)	
Project No: 89781.24 **Kempsey Landfill**	Douglas PARTNERS

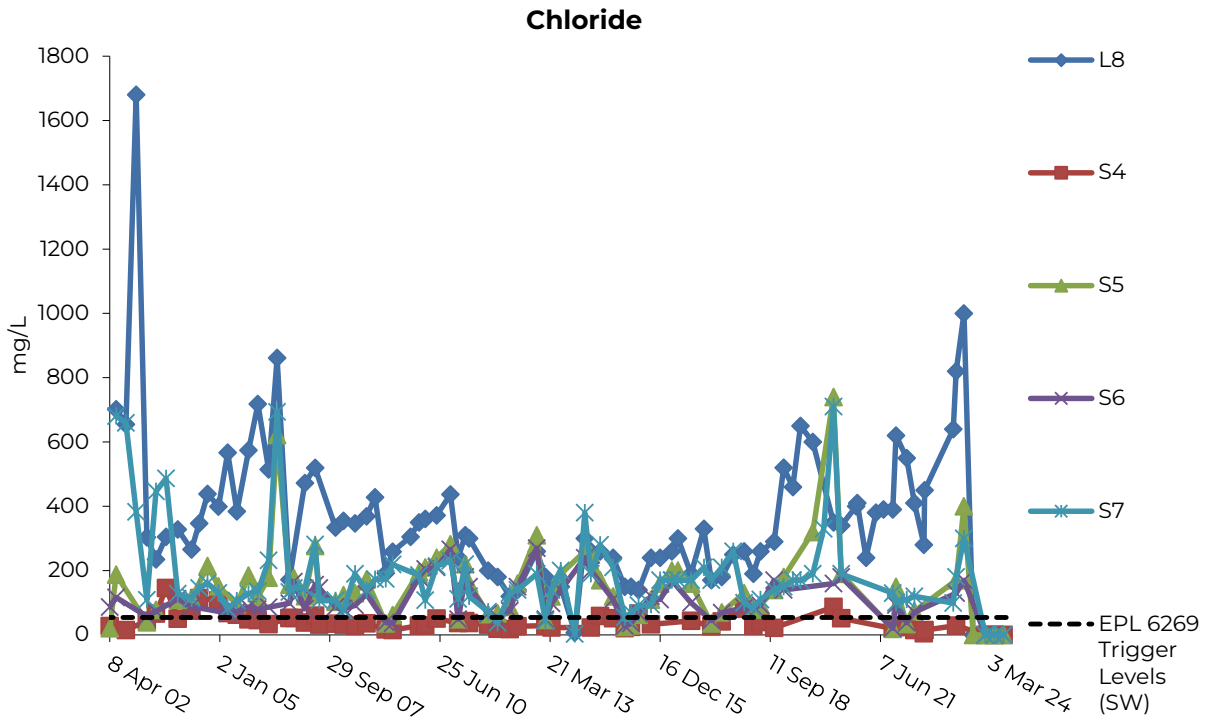


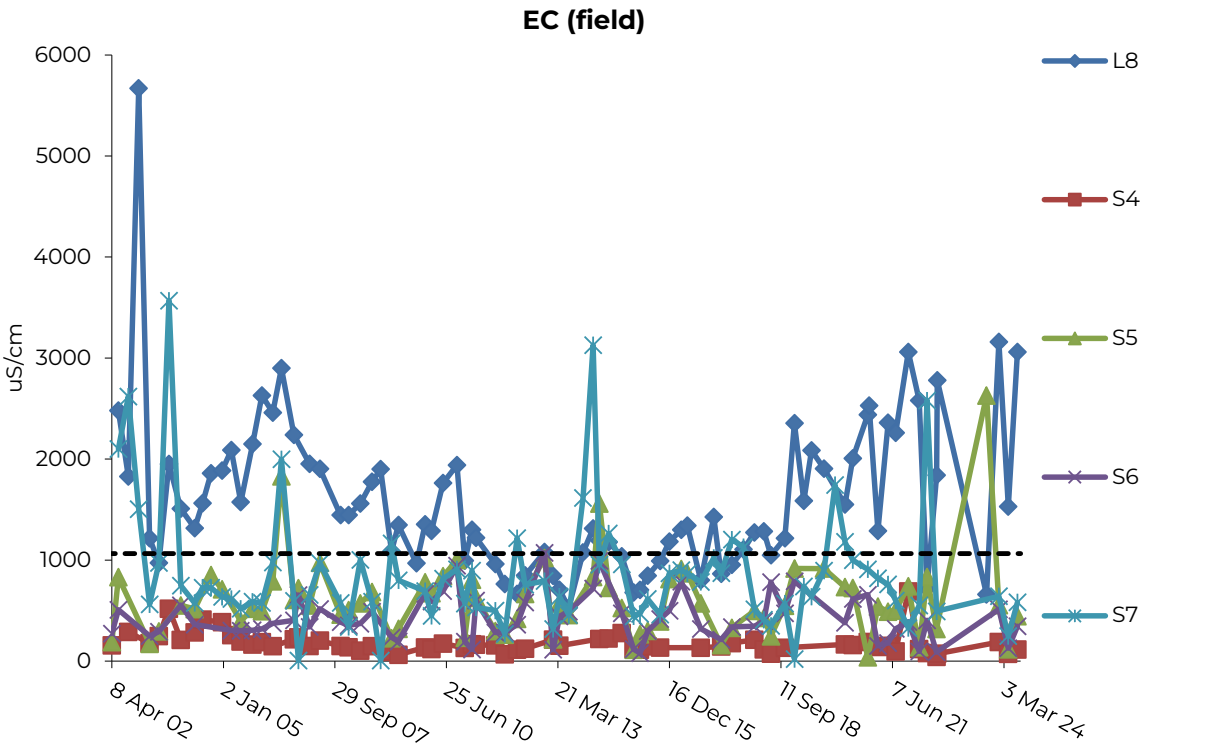


Groundwater Magnesium Vs Time (Feb 2002 - April 2024)	**Figure G3**
Groundwater Nitrate (as N) Vs Time (Feb 2002 - April 2024)	
Project No: 89781.24 **Kempsey Landfill**	Douglas PARTNERS

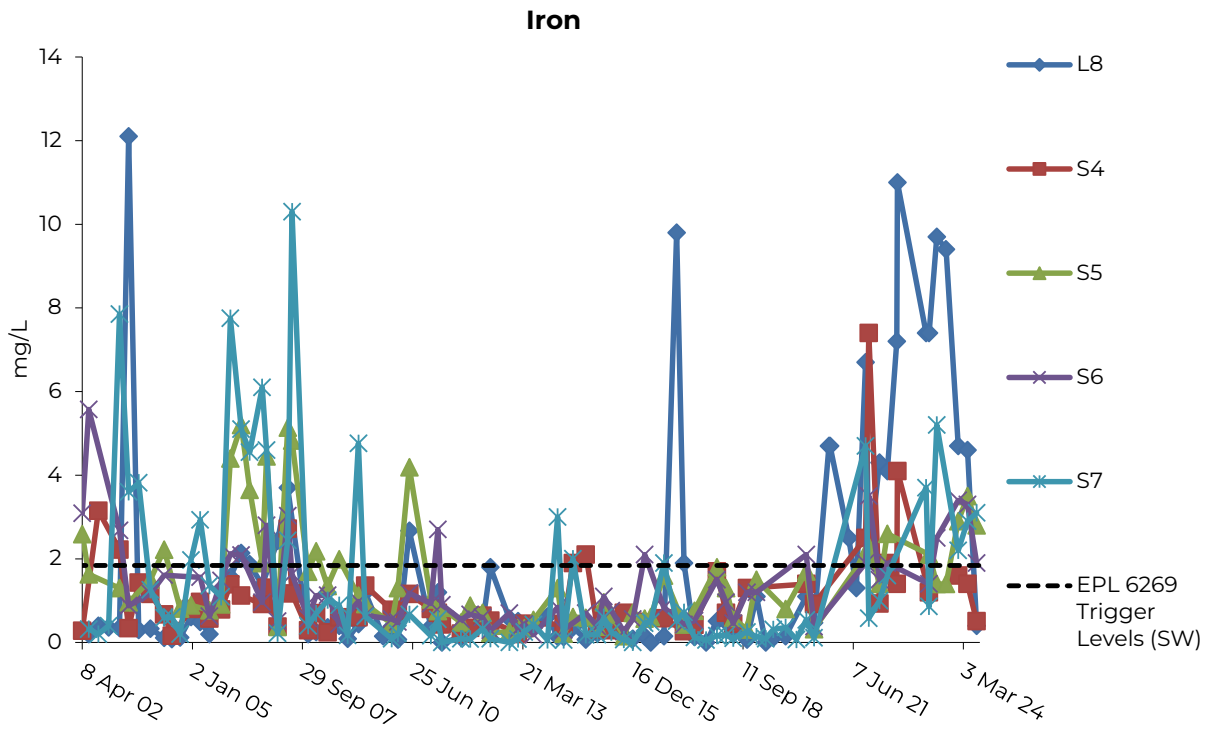


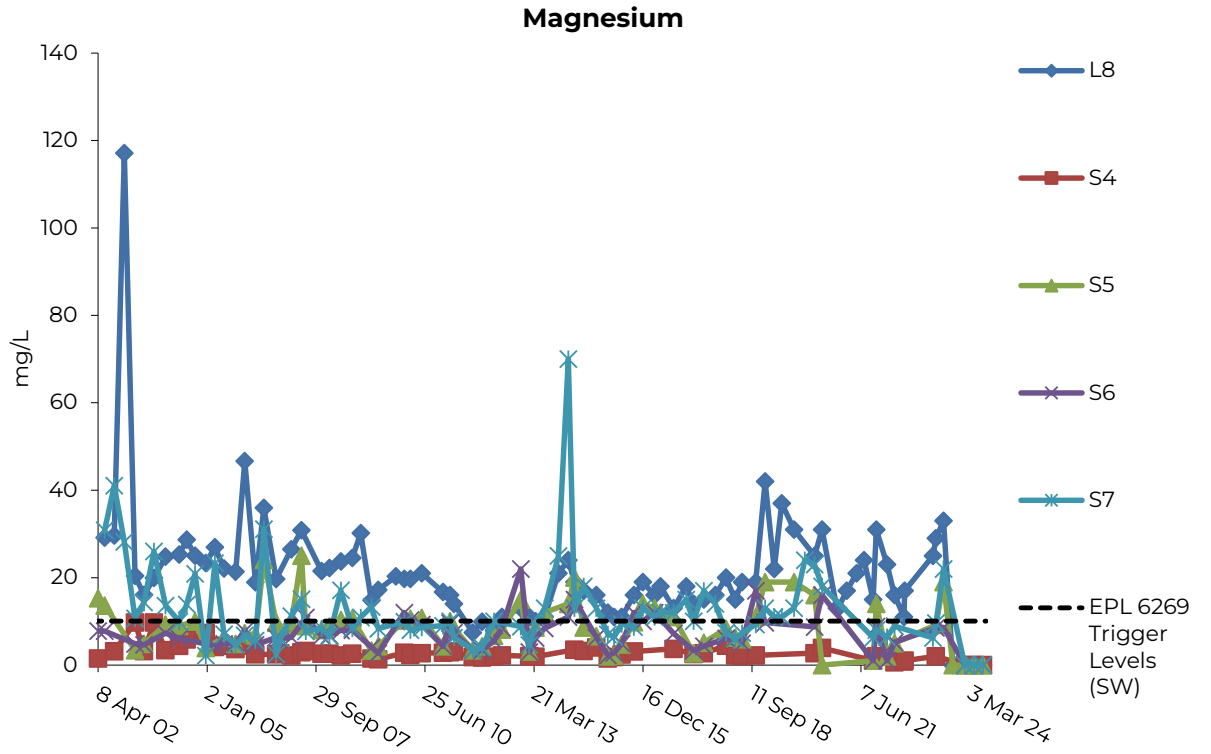
Groundwater pH Vs Time (Feb 2002 - April 2024)	**Figure G4**
Project No: 89781.24 **Kempsey Landfill**	Douglas PARTNERS



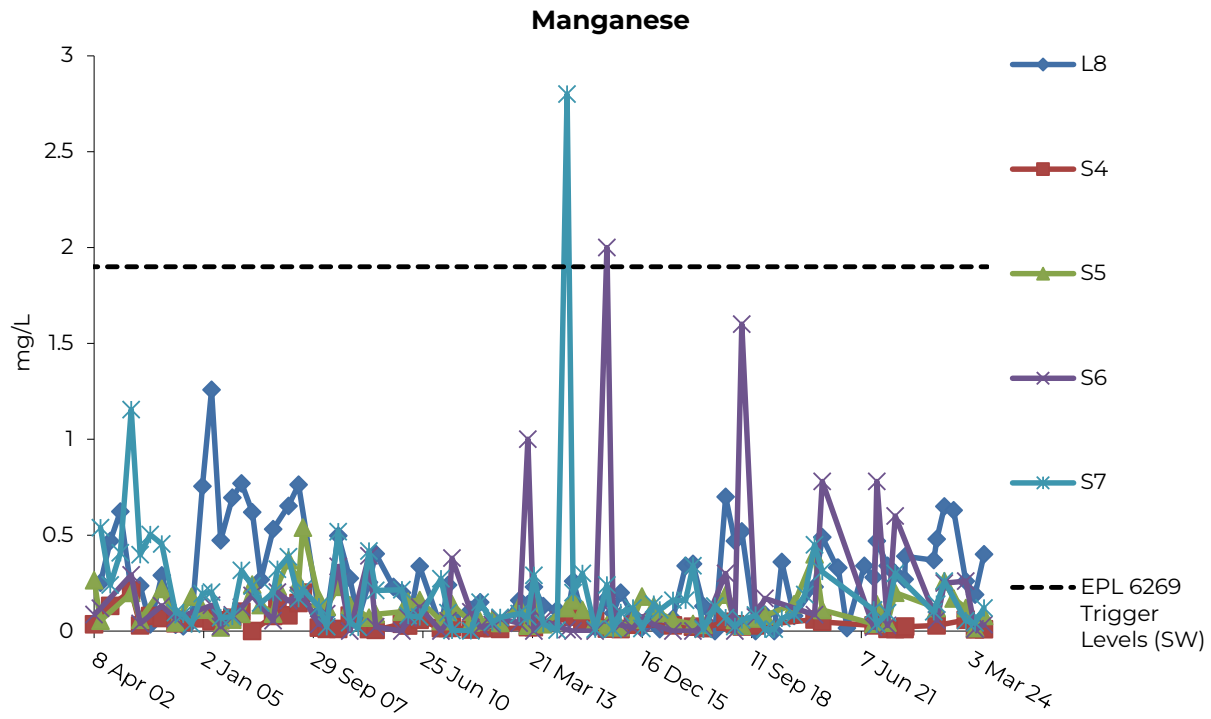


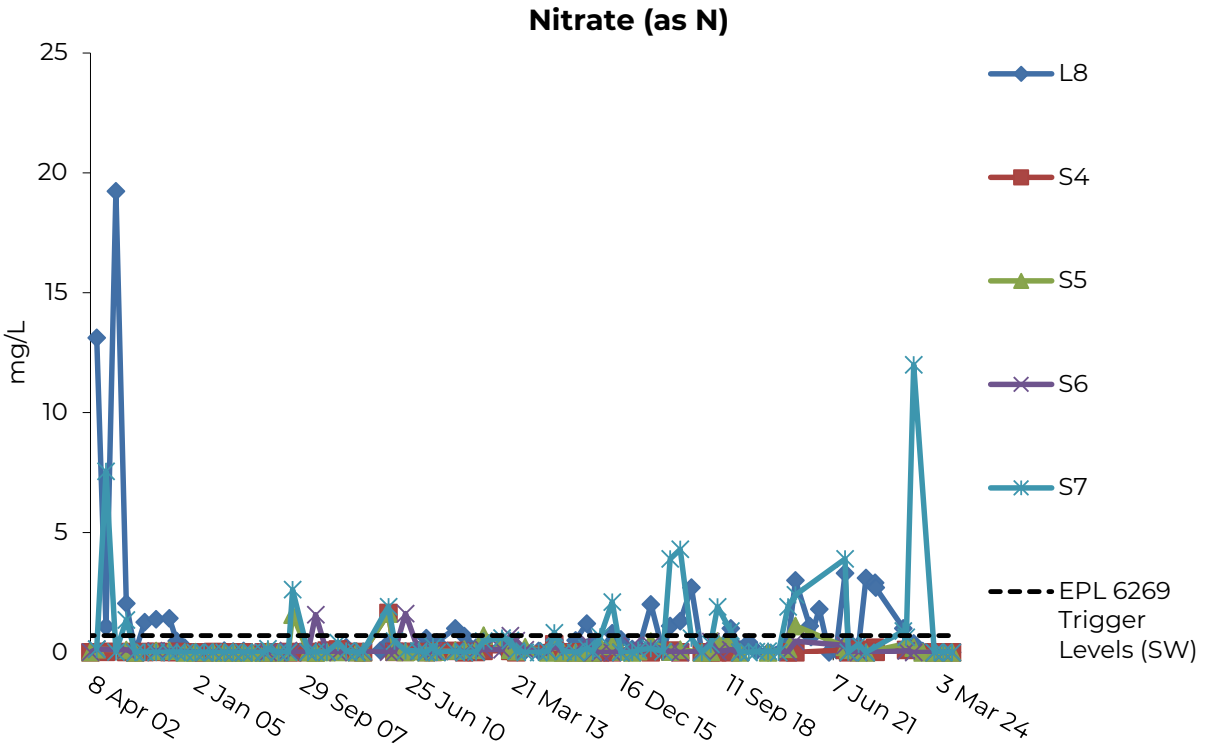
Surface Water Chloride Vs Time (Feb 2002 - July 2024)	**Figure G5**
Surface Water EC Vs Time (Feb 2002 - July 2024)	
Project No: 89781.24 Kempsey Landfill	Douglas PARTNERS



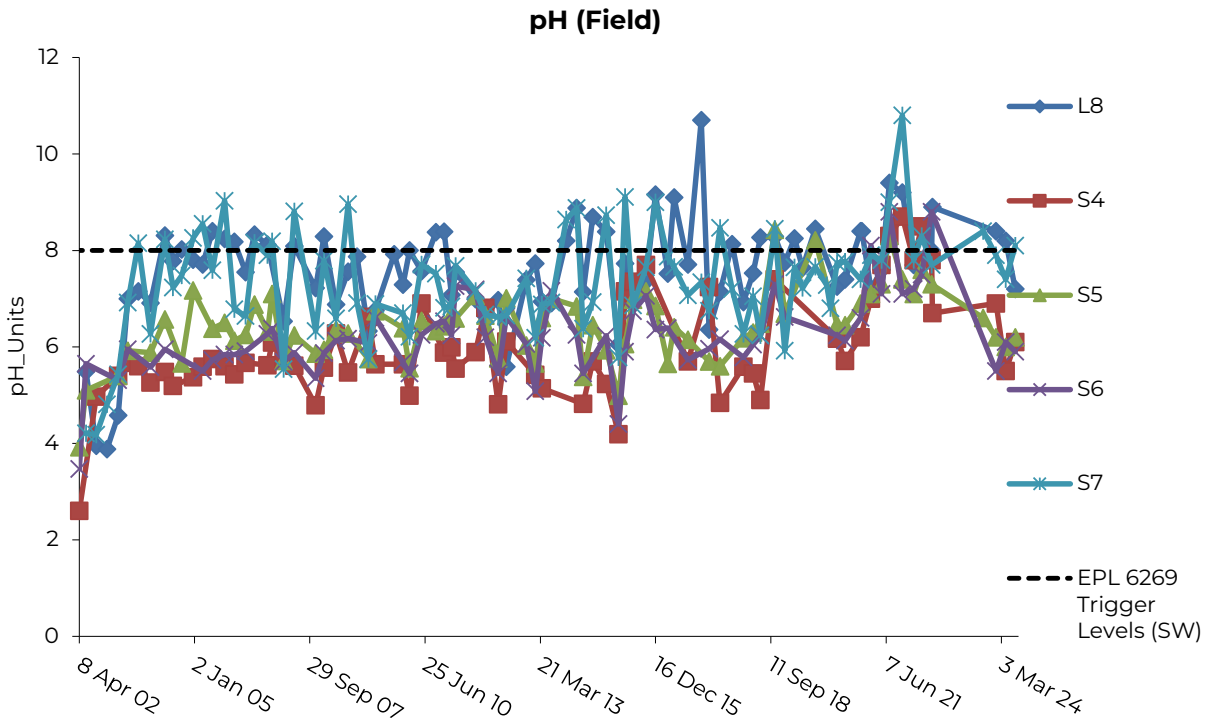


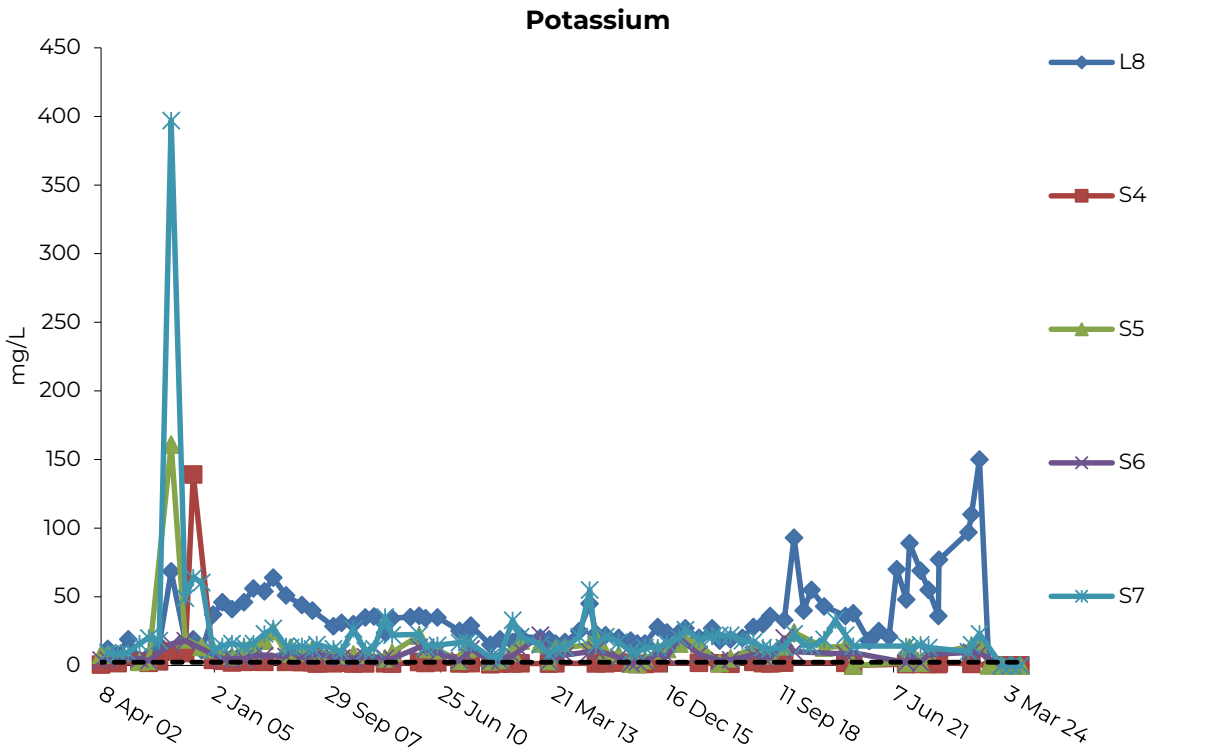
Surface Water Iron Vs Time (Feb 2002 - July 2024)	**Figure G6**
Surface Water Magnesium Vs Time (Feb 2002 - July 2024)	
Project No: 89781.24 Kempsey Landfill	Douglas PARTNERS



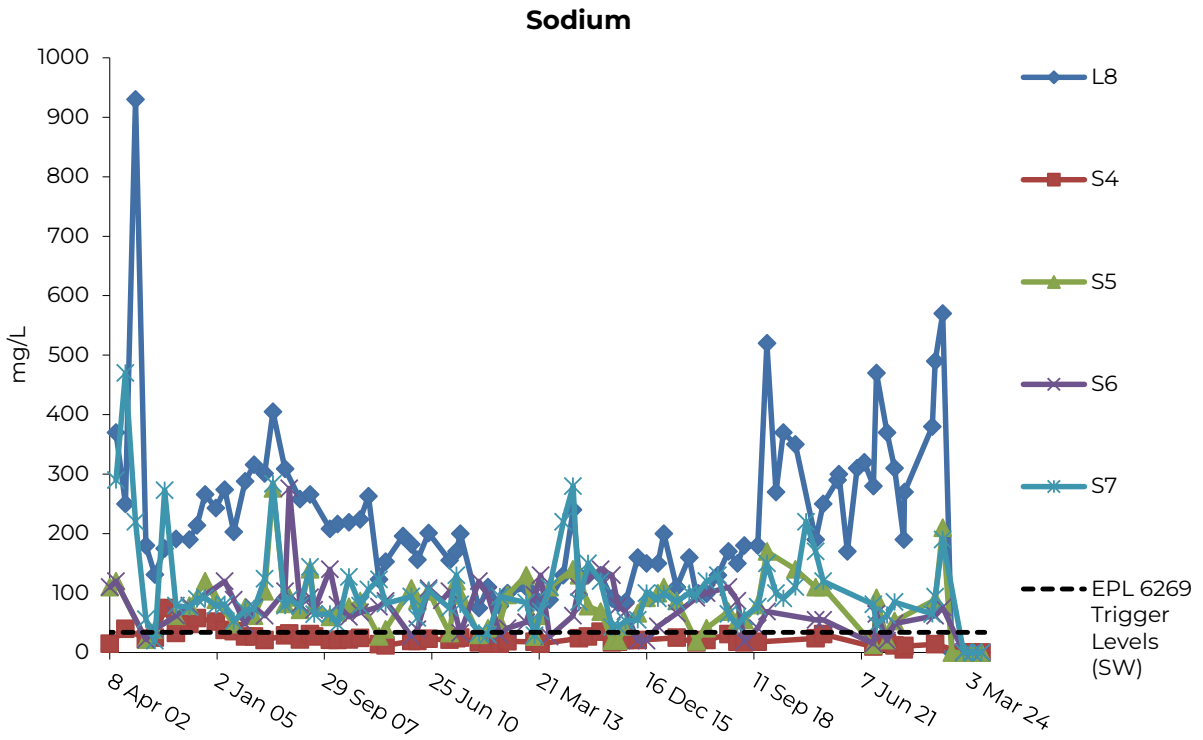


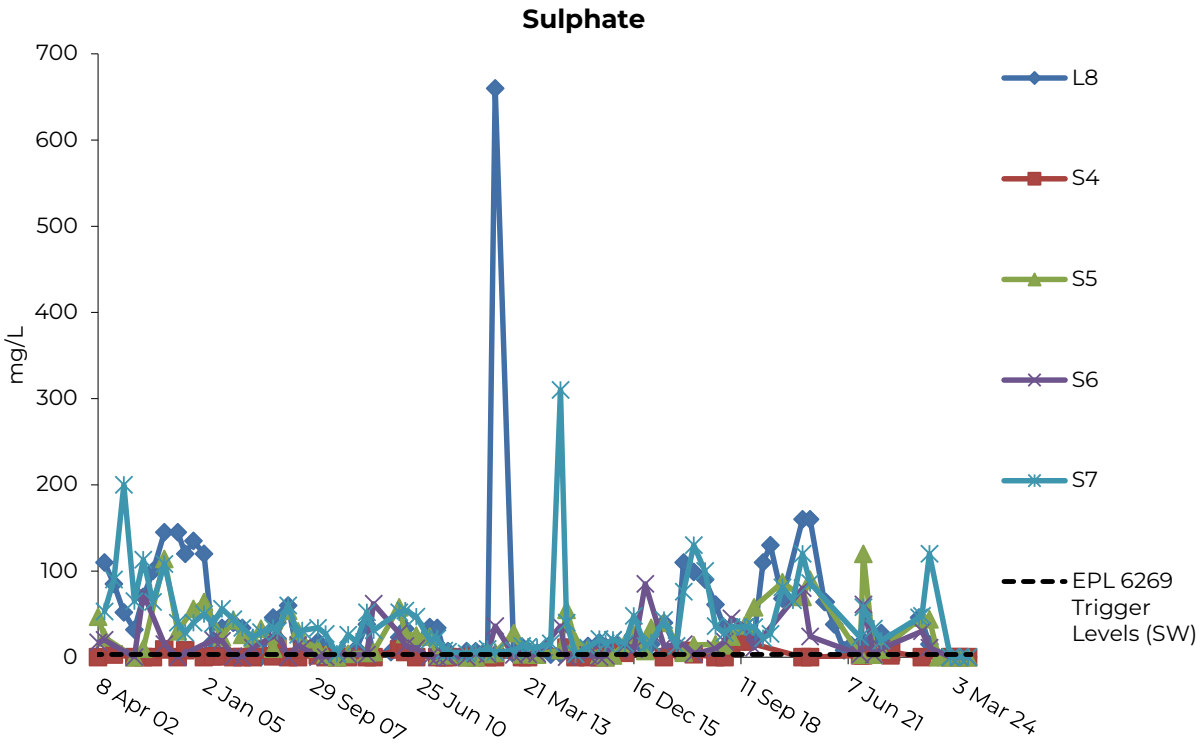
Surface Water Manganese Vs Time (Feb 2002 - July 2024)	**Figure G7**
Surface Water Nitrate (as N) Vs Time (Feb 2002 - July 2024)	
Project No: 89781.24 Kempsey Landfill	Douglas PARTNERS



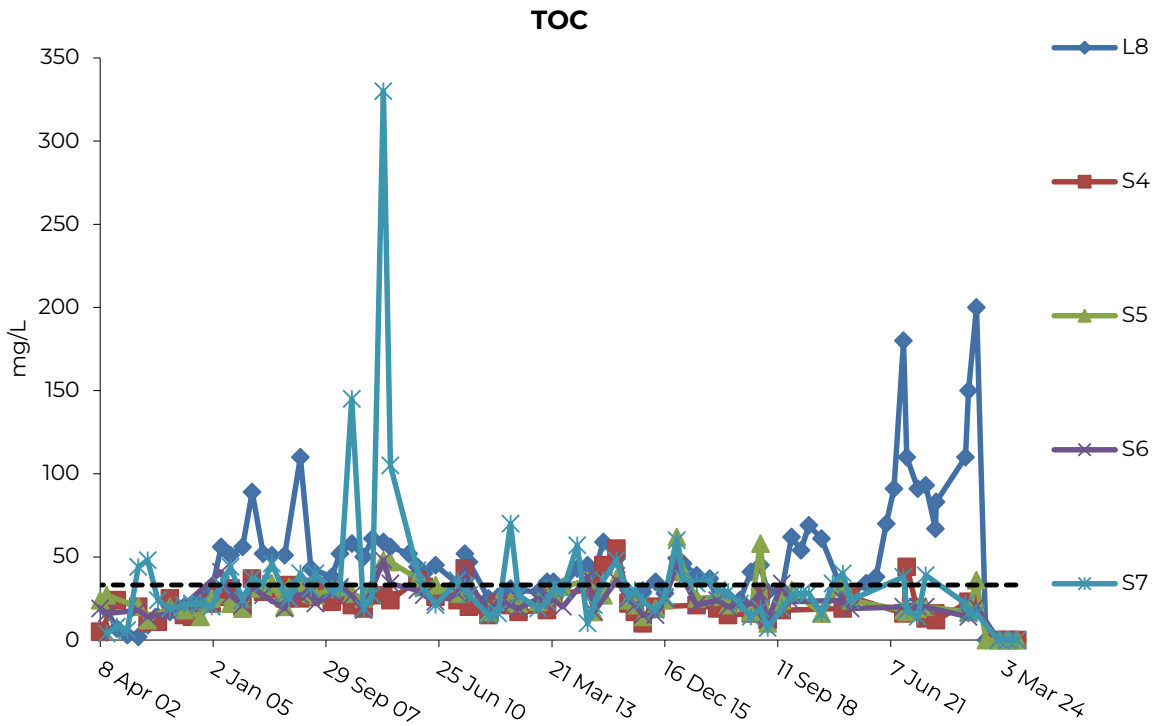


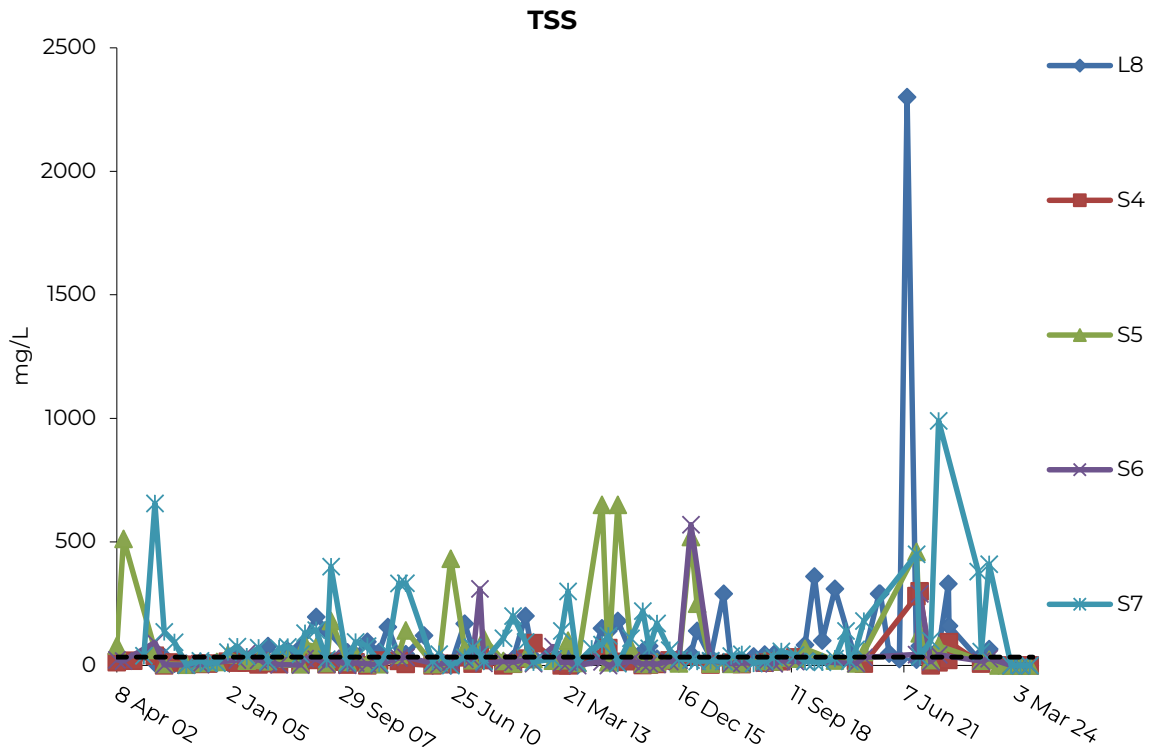
Surface Water pH Vs Time (Feb 2002 - July 2024)	**Figure G8**
Surface Water Potassium Vs Time (Feb 2002 - July 2024)	
Project No: 89781.24 Kempsey Landfill	Douglas PARTNERS





Surface Water Sodium Vs Time (Feb 2002 - July 2024)	**Figure G9**
Surface Water Sulfate Vs Time (Feb 2002 - July 2024)	
Project No: 89781.24 Kempsey Landfill	Douglas PARTNERS





Surface Water TOC Vs Time (Feb 2002 - July 2024)	**Figure G10**
Surface Water TSS Vs Time (Feb 2002 - July 2024)	
Project No: 89781.24 Kempsey Landfill	Douglas PARTNERS

Appendix H

Tabulated Annual Return Data

Table H1: Annual Return Reporting Values for Monitoring Point 1 (BH1) (2023 to 2024)

Table H2: Annual Return Reporting Values for Monitoring Point 2 (BH2) (2023 to 2024)

Table H3: Annual Return Reporting Values for Monitoring Point 3 (BH3) (2023 to 2024)

Table H4: Annual Return Reporting Values for Monitoring Point 4 (S4) (2023 to 2024)

Table H5: Annual Return Reporting Values for Monitoring Point 5 (S5) (2023 to 2024)

Table H6: Annual Return Reporting Values for Monitoring Point 6 (S6) (2023 to 2024)

Table H7: Annual Return Reporting Values for Monitoring Point 7 (S7) (2023 to 2024)

Table H8: Annual Return Reporting Values for Monitoring Point 8 (L8) (2023 to 2024)

Table H9: Annual Return Reporting Values for Monitoring Point 9 (Methane Buildings) (2023 to 2024)

Table H10: Annual Return Reporting Values for Monitoring Point 10 (Methane Surface) (2023 to 2024)

Table H11: Annual Return Reporting Values for Monitoring Point 11 (Methane in Groundwater Bores) (2023 to 2024)

Table H12: Annual Return Reporting Values for Monitoring Point 12 (BH4) (2023 to 2024)

Table H13: Annual Return Reporting Values for Monitoring Point 14 (BH01-2) (2023 to 2024)

Table H1: Annual Return Reporting Values for Monitoring Point 1 (BH1) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	0	-	-	-	No data obtained
Conductivity	µS/cm	0	-	-	-	No data obtained
Magnesium	mg/l	0	-	-	-	No data obtained
Nitrate	mg/l	0	-	-	-	No data obtained
pH	pH	0	-	-	-	No data obtained
Standing Water Level	AHD	4	35.225	39.750	50.165	Water level data may be inaccurate due to obstruction in well
Temperature	°C	0	-	-	-	No data obtained

Table H2: Annual Return Reporting Values for Monitoring Point 2 (BH2) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	1	0.092	0.092	0.092	Within historical data and below trigger levels
Conductivity	µS/cm	2	1510	1565	1620	Within historical data and below trigger levels
Magnesium	mg/l	1	14.0	14.0	14.0	Within historical data and below trigger levels
Nitrate	mg/l	2	0.005	0.005	0.005	Within historical data and below trigger levels
pH	pH	2	6.5	6.6	6.6	Consistent with historical data
Standing Water Level	AHD	4	23.81	24.215	24.576	Consistent with historical data
Temperature	°C	2	19.07	19.32	19.56	Consistent with historical data

Table H3: Annual Return Reporting Values for Monitoring Point 3 (BH3) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	1	0.009	0.009	0.009	Within historical data and below trigger level
Conductivity	µS/cm	2	1710	1775	1840	Within historical data and below trigger level
Magnesium	mg/l	1	33.0	33.0	33.0	Within historical data and above trigger level
Nitrate	mg/l	1	1.5	1.500	1.500	Consistent with historical data, exceeds trigger level
pH	pH	2	5.2	5.7	6.1	Consistent with historical data, exceeds trigger level
Standing Water Level	AHD	4	23.668	24.122	24.794	Consistent with historical data
Temperature	°C	2	22.82	24.25	25.67	Consistent with historical data

Table H4: Annual Return Reporting Values for Monitoring Point 4 (S4) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	3	7.0	10	13.0	Within historical data and below trigger level
Ammonia	mg/l	3	0.005	0.100	0.28	Within historical data and below trigger level
Calcium	mg/l	3	0.5	1.1	2.0	Within historical data and below trigger level
Chloride	mg/l	3	16	25	33	Within historical data and below trigger level
Conductivity	µS/cm	3	72	125	188	Within historical data and below trigger level
Dissolved Oxygen	mg/l	3	1.42	3.03	4.59	Within historical data and below trigger level
Fluoride	mg/l	3	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	3	0.00	0.52	1.10	Within historical data and below trigger level
Magnesium	mg/l	3	1.0	1.7	3.0	Within historical data and below trigger level
Manganese (Filtered)	mg/l	3	0.000	0.014	0.035	Within historical data and below trigger level
Nitrate	mg/l	3	0.005	0.005	0.005	Within historical data and below trigger level
pH	pH	3	5.5	6.2	6.9	Consistent with historical data, some exceedances
Potassium	mg/l	3	0.9	1.6	3.0	Consistent with historical data
Sodium	mg/l	3	11	16.0	23.0	Consistent with historical data
Sulfate	mg/l	3	1	1.667	2	Within historical data and below trigger level
Temperature	°C	3	13.06	19.00	23.43	Consistent with historical data
Total Organic Carbon	mg/l	3	0	12	20	Within historical data and below trigger level
Total Phenolics	mg/l	3	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	3	5	8	13	Within historical data and below trigger level

Table H5: Annual Return Reporting Values for Monitoring Point 5 (S5) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	3	11.0	29.0	46.0	Average exceeding trigger level
Ammonia	mg/l	3	0.024	0.136	0.340	Within historical data and below trigger level
Calcium	mg/l	3	1.0	8.7	16.0	Consistent with historical data, some exceedances
Chloride	mg/l	3	24	71	120	Consistent with historical data, some exceedances
Conductivity	µS/cm	4	118	937	2630	Consistent with historical data, some exceedances
Dissolved Oxygen	mg/l	4	0.92	2.81	4.57	Within historical data and below trigger level
Fluoride	mg/l	4	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	4	0.00	0.43	1.10	Within historical data and below trigger level
Magnesium	mg/l	3	1.0	5.1	9.0	Within historical data and below trigger level
Manganese (Filtered)	mg/l	4	0.000	0.081	0.150	Within historical data and below trigger level
Nitrate	mg/l	3	0.005	0.039	0.058	Within historical data and below trigger level
pH	pH	4	6	6.3	6.6	Consistent with historical data, some exceedances
Potassium	mg/l	3	1.0	5.0	10.0	Consistent with historical data, some exceedances
Sodium	mg/l	3	14.0	42.3	83.0	Consistent with historical data, some exceedances
Sulfate	mg/l	3	4	22	45	Consistent with historical data, some exceedances
Temperature	°C	4	12.63	17.47	23.06	Consistent with historical data
Total Organic Carbon	mg/l	3	0	12	22	Within historical data and below trigger level
Total Phenolics	mg/l	4	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	3	14	21	33	Within historical data and below trigger level

Table H6: Annual Return Reporting Values for Monitoring Point 6 (S6) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	3	11.0	20.7	26.0	Consistent with historical data, some exceedances
Ammonia	mg/l	3	0.011	0.096	0.230	Consistent with historical data, some exceedances
Calcium	mg/l	3	0.9	6.1	12.0	Consistent with historical data, some exceedances
Cholride	mg/l	3	23	59	100	Consistent with historical data, some exceedances
Conductivity	µS/cm	3	128	329	513	Within historical data and below trigger level
Dissolved Oxygen	mg/l	3	1.65	2.85	3.46	Within historical data and below trigger level
Fluoride	mg/l	3	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	3	0.00	0.54	0.81	Within historical data
Magnesium	mg/l	3	0.8	4.4	8.3	Within historical data and below trigger level
Manganese (Filtered)	mg/l	3	0.000	0.066	0.170	Within historical data and below trigger level
Nitrate	mg/l	3	0.007	0.052	0.130	Within historical data and below trigger level
pH	pH	3	5.5	5.8	6.1	Consistent with historical data, exceeds trigger level
Potassium	mg/l	3	2.0	4.3	7.9	Consistent with historical data, some exceedances
Sodium	mg/l	3	14	35.7	69.0	Consistent with historical data, some exceedances
Sulfate	mg/l	3	4	17	43	Consistent with historical data, exceeds trigger level
Temperature	°C	3	13.70	18.70	23.29	Consistent with historical data
Total Organic Carbon	mg/l	3	0	13	21	Within historical data and below trigger level
Total Phenolics	mg/l	3	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	3	8	12	15	Within historical data and below trigger level

Table H7: Annual Return Reporting Values for Monitoring Point 7 (S7) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	3	43.0	55.7	66.0	Consistent with historical data, exceeds trigger level
Ammonia	mg/l	3	0.005	1.861	5.500	Consistent with historical data, some exceedances
Calcium	mg/l	3	4.0	19.0	29.0	Consistent with historical data, exceeds trigger level
Chloride	mg/l	3	39	78	99	Consistent with historical data, some exceedances
Conductivity	µS/cm	3	249	492	643	Within historical data and below trigger level
Dissolved Oxygen	mg/l	3	1.72	4.15	6.24	Within historical data and below trigger level
Fluoride	mg/l	3	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	3	0.00	0.02	0.04	Within historical data and below trigger level
Magnesium	mg/l	3	2.0	6.2	8.5	Within historical data and below trigger level
Manganese (Filtered)	mg/l	2	0.000	0.036	0.071	Within historical data and below trigger level
Nitrate	mg/l	3	0.110	0.447	0.740	Consistent with historical data, some exceedances
pH	pH	3	7.4	7.8	8.1	Consistent with historical data, some exceedances
Potassium	mg/l	3	4.0	7.4	10.0	Consistent with historical data, some exceedances
Sodium	mg/l	3	20.0	48.3	78.0	Consistent with historical data, some exceedances
Sulfate	mg/l	3	20	41	58	Consistent with historical data, exceeds trigger level
Temperature	°C	3	12.75	20.93	26.04	Consistent with historical data
Total Organic Carbon	mg/l	3	0	8	14	Within historical data and below trigger level
Total Phenolics	mg/l	3	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	3	62	127	180	Consistent with historical data, exceeds trigger level

Table H8: Annual Return Reporting Values for Monitoring Point 8 (L8) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	3	180.0	370.0	480.0	Within historical data and exceeds trigger level
Ammonia	mg/l	3	0.042	20.681	51.000	Within historical data and some exceedances
Calcium	mg/l	3	18.0	27.3	37.0	Within historical data and exceeds trigger level
Chloride	mg/l	3	360	560	730	Within historical data and exceeds trigger level
Conductivity	µS/cm	4	660	2103	3160	Within historical data and some exceedances
Dissolved Oxygen	mg/l	4	0.66	4.95	11.48	Within historical data and below trigger level
Fluoride	mg/l	3	0.1	0.1	0.2	Within historical data and below trigger level
Iron (Filtered)	mg/l	4	0.00	651.99	2600.00	Within historical data and some exceedances
Magnesium	mg/l	3	12.0	18.7	24.0	Within historical data and exceeds trigger level
Manganese (Filtered)	mg/l	4	0.000	45.215	180.000	Within historical data and some exceedances
Nitrate	mg/l	4	0.005	0.590	2.300	Within historical data and some exceedances
pH	pH	4	7.2	8.1	8.4	Consistent with historical data, some exceedances
Potassium	mg/l	3	37.0	69.0	94.0	Within historical data and exceeds trigger level
Sodium	mg/l	3	250.0	393.3	550.0	Within historical data and exceeds trigger level
Sulfate	mg/l	3	15	22	32	Within historical data and exceeds trigger level
Temperature	°C	4	15.66	21.88	25.17	Consistent with historical data
Total Organic Carbon	mg/l	3	0	43	72	Within historical data and some exceedances
Total Phenolics	mg/l	4	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	3	20	23	26	Within historical data and below trigger level

Table H9: Annual Return Reporting Values for Monitoring Point 9 (Methane Buildings) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Methane	%	100	0.000001	0.000003	0.000017	No exceedances recorded

Table H10: Annual Return Reporting Values for Monitoring Point 10 (Methane Surface) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Methane	%	462	0.000001	0.000061	0.010099	Total of 5 localised exceedances (4 in Q1 and 1 in Q3)

Table H11: Annual Return Reporting Values for Monitoring Point 11 (Methane in Groundwater Bores) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Methane	%	20	0.000000	0.000000	0.000000	No exceedances recorded

Table H12: Annual Return Reporting Values for Monitoring Point 12 (BH4) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	1	0.036	0.036	0.036	Within historical data and below trigger level
Conductivity	µS/cm	2	1810	1860	1910	Within historical data and exceeds trigger level
Magnesium	mg/l	1	25.0	25.0	25.0	Within historical data and exceeds trigger level
Nitrate	mg/l	2	0.01	0.11	0.22	Within historical data, some exceedances
pH	pH	2	6.2	6.3	6.3	Within historical data and exceeds trigger level
Standing Water Level	AHD	4	23.263	24.419	24.870	Consistent with historical data
Temperature	°C	2	23.75	26.54	29.32	Consistent with historical data

Table H13: Annual Return Reporting Values for Monitoring Point 14 (BH01-2) (2023 to 2024)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	1	0.037	0.037	0.037	Within historical data and below trigger level
Conductivity	µS/cm	2	1460	1510	1560	Within historical data and exceeds trigger level
Magnesium	mg/l	1	18.0	18.0	18.0	Within historical data and exceeds trigger level
Nitrate	mg/l	2	0.01	0.01	0.01	Within historical data and below trigger level
pH	pH	2	5.7	5.8	5.8	Within historical data and exceeds trigger level
Standing Water Level	AHD	4	24.061	24.429	24.772	Consistent with historical data
Temperature	°C	2	20.74	20.79	20.83	Consistent with historical data