

Memorandum

To:	Kempsey Shire Council	Date:	April 2024
Attention:	Jason Magill	Project No.:	89781.24
Email:	jason.magill@kempsey.nsw.gov.au	Reference:	R.004.Rev0 Q3 April 2024 - Memo
CC:	Sarah Krebs		
Subject:	Quarterly Monitoring Memo - Q3 April 2024 Kempsey Landfill- Groundwater, Surface Water and Gas Monitoring 2023 - 2024 638 Crescent Head Road, Kempsey		

1. Introduction

This memo presents the April 2024 (Q3) results of groundwater, surface water and gas monitoring 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 site is licensed by the Environmental Protection Authority under Environmental Protection Licence (EPL) 6269. The EPL notice specifies requirements for surface water, groundwater, and gas monitoring including test locations, analytes, and threshold concentration. Monitoring was conducted with reference to EPL 6269 requirements.

2. Scope of Works

The current round of monitoring was undertaken on 8 and 9 April 2024 (Q3) and comprised;

- Assessment of methane gas concentrations within existing buildings and capped landfill areas on 8 April 2024;
- Gas monitoring using landfill gas analyser at Wells BH1-02, BH1, BH2, BH3 and BH4 on 8 April 2024.;
- Collection of surface water samples at Locations S4, S5, S6, S7 and L8 on 9 April 2024, and
- Collection of groundwater samples at Wells BH01-2, BH1, BH3 and BH4 on 9 April 2024.

3. Field Work Results

3.1 Discussions with Site Personnel

It is understood that there has been one discharge event since the previous January 2024 (Q2) monitoring round. It is understood that these events were directly reported to the EPA by KSC.

3.2 Field Work Observations

The following observations were noted during fieldwork on 8 and 9 April 2024;

- It is noted that the site received a significant amount of rainfall in the days prior to monitoring (ie 171 mm of rainfall was recorded over the three days prior to monitoring);
- Localised migration of potential leachate from the capped landfill area south east of the leachate dam (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 (see Figure 3).



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



Figure 2: Potential Leachate flowing into stormwater drain catchment (which discharges to Sediment Dam S7) (8 April 2024)



Figure 3: Back of Sediment Dam (S7) overflowing and discharging to surface water bodies downgradient (8 April 2024)

3.3 Groundwater

Refer to attached laboratory testing results (348424-[R00]) and summary tables as follows:

- Table F5: Field and Laboratory Results for Groundwater – April 2024 – Q3;
- Table A2: Groundwater and Surface water field parameters – Q3 April 2024.

With reference to Kempsey Landfill EPL there were some exceedances reported within the lab samples as indicated by the highlighted cells in the attached summary tables.

The reported exceedances from surface water quality were generally within the historical ranges for these analytes at these locations. As such the exceedance results are generally not considered to be significant. Further information and limitations will be provided in the annual report.

It is noted that groundwater sampling in BH1 was precluded due to an obstruction in the well.

3.4 Surface Water

Refer to attached laboratory testing results (348424-[R00]) and summary tables as follows:

- Table F6: Field and Laboratory Results for Surface water– April 2024 – Q3;
- Table A2: Groundwater and Surface water field parameters – Q3 April 2024.

With reference to Kempsey Landfill EPL there were some exceedances reported within the lab samples as indicated by the highlighted cells in the attached summary tables.

The reported exceedances from surface water quality were generally within the historical ranges for these analytes at these locations. As such the exceedance results are generally not considered to be significant. Further information and limitations will be provided in the annual report.

3.5 Gas

The methane walkover was conducted on 8 April 2024 with reference to EPA Environmental Guidelines for Solid Waste Landfills (2016).

No methane exceedances were recorded within the monitored on-site structures or within the groundwater monitoring bores (see results in Table A1 attached).

Past surface methane exceedance locations (E1 to E14) were accessed where possible. Results of current methane monitoring at these locations are outlined in Table 1 below:

Table 1: Summary of Surface Methane Monitoring – 8 April 2024 (Q3)

Location ID	Methane (ppm)	Description of Location
E1	-	Not accessible (under clay stockpile)
E2	5 - 10	Tall grassed area
E3	5 - 10	Tall grassed area
E4	-	Not accessible (under clay stockpile)
E5	-	Not accessible (under clay stockpile)
E6	500 - 750	Edge of capping area
E7	10 - 30-	Tall grassed area
E8	100 - 250	Edge of capping area
E9	20 - 70-	Tall grassed area
E10	100 - 150	Tall grassed area
E11	5 - 10	Dead grass, edge of batter
E12	10 - 20-	Edge of capping area
E13	10 - 20	Edge of stockpile batter
E14	20 - 70	Tall grassed area

Coordinates of surface methane monitoring locations can be provided as required.

No new methane exceedances (i.e. at existing or new locations) were found in the current round of monitoring. It is noted, however, that the surface soils were saturated during monitoring as a result of recent rainfall (ie 171 mm of rainfall was recorded over the three days prior to monitoring), which may have impacted the results of surface methane monitoring.

Additionally, it is noted that majority of the methane walkover area is covered by tall grass, which may also impact field data capture. It is recommended that tall grasses are slashed prior to the next monitoring event in July 2024.

Refer to Figure 1 below for approximate locations of E1 to E14.

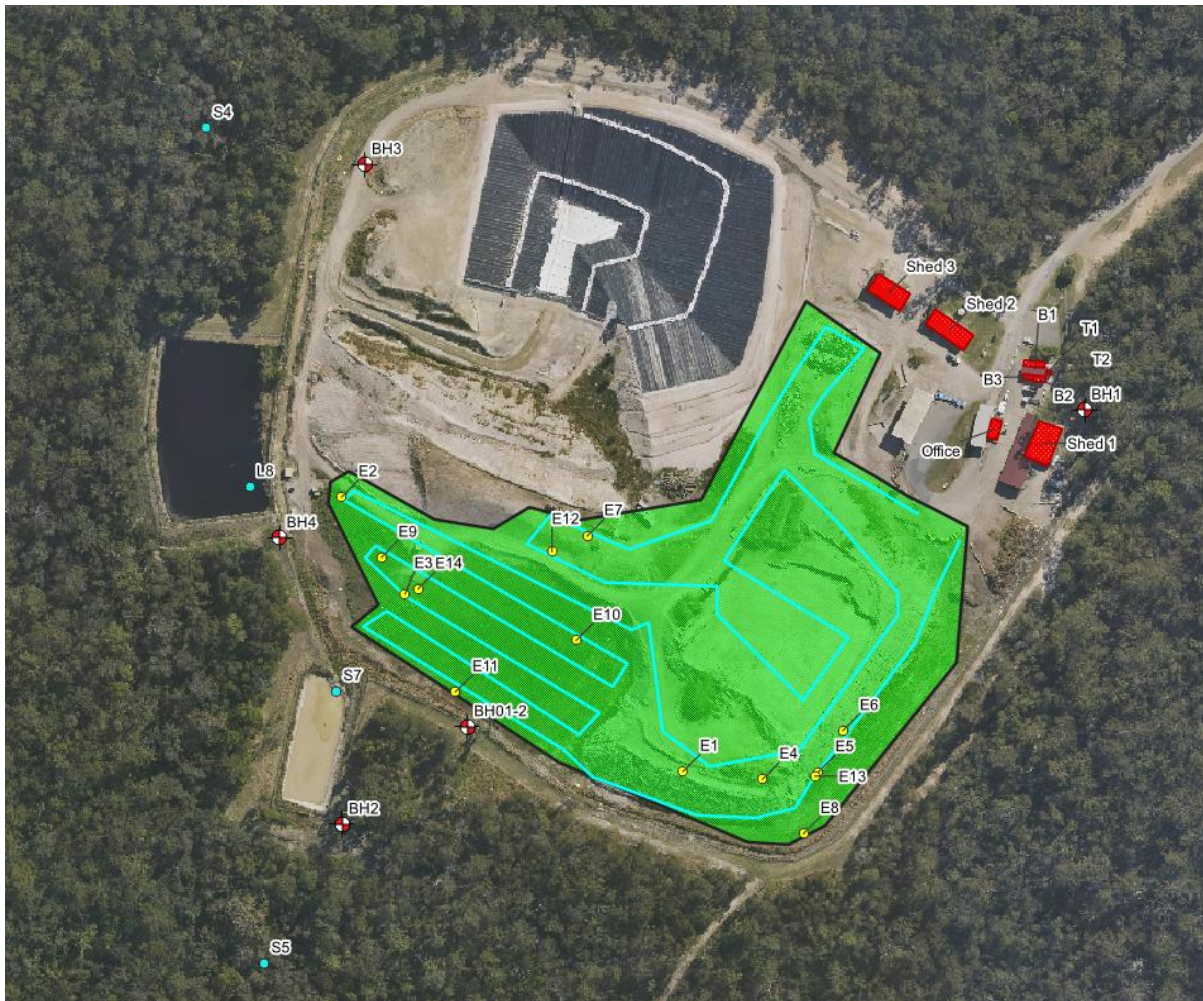


Figure 1: Approximate locations of historical methane exceedances (8 April 2024)

Historical surface methane monitoring has indicated some elevated results and localised exceedances. Further assessment was recommended to confirm subsurface conditions and capping within areas identified to contain methane exceedance in order to confirm possible capping rehabilitation requirements. Further details will be provided in the annual report.

4. Comments

It is recommended that appropriate measures are undertaken to address possible leachate migration as observed in Figures 1 and 2 above.

Any discharges from the site should be conducted in accordance with the landfill EPL requirements.

It is recommended that tall grasses are slashed prior to the next monitoring event in July 2024 to facilitate surface gas monitoring.

Further details will be provided in the annual report.

5. Limitations

The above interim results have been provided for the exclusive use of Kempsey Shire Council. Further details will be provided in the annual report.

6. 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.

Please contact the undersigned if you have any questions on this matter.

Douglas Partners Pty Ltd



Sarah Krebs
Environmental Scientist

Reviewed by



Chris Bozinovski
Principal

Attachments:

Table A1 – Gas monitoring results – Q3 April 2024
Table A2 – Groundwater and Surface water field parameters – Q3 April 2024.
Table F4 - Field and Laboratory Results for Groundwater – April 2024 – Q3
Table F5 - Field and Laboratory Results for Surface Water – April 2024 – Q3
Laboratory Test Results - (348424-[R00])
Drawing – 89781.00.D.001.Rev0

Table A1: Gas monitoring Results - Q3 April 2024

Well ID	Gauging Date	Max Methane (ppm)	Max Carbon Dioxide (%)	Oxygen(%)	Max Hydrogen Sulfide (ppm)	Max Carbon Monoxide (ppm)	Atmospheric Pressure (mb)	Flow (l/hr)
BH1	8/04/2024	0	1.6	20.2	3	1	1005	0.2
BH1-2	8/04/2024	0	0.0	19.9	2	1	1010	0.2
BH2	8/04/2024	0	0.2	19.8	1	2	1010	0.3
BH3	8/04/2024	0	0.1	19.8	0	0	1008	22.8
BH4	8/04/2024	0	0.0	19.6	1	0	1009	0.1

Notes to Table A1:

ppm parts per million

mb millibars

l/hr litres per hour

Table A2: Groundwater and Surface water field parameters - Q3 April 2024

	Well ID	Gauging Date	TOC Elevation (mAHD)	Total Depth (mbTOC)	Depth to Water (mbTOC)	Corrected Water Elevation (mAHD)	PID	pH	EC (uS/cm)	mV	DO (ppm)	Temp (°C)	Turbidity (NTU)	Comments
Groundwater	BH1	9/04/2024	50.165	25.130	13.420	36.745	<1	-	-	-	-	-	-	Well obstructed
	BH1-2	9/04/2024	29.637	25.300	5.020	24.617	<1	5.8	1560	35	1.69	20.74	229	pale brown, moderately turbid, slight H ₂ S odour
	BH2	9/04/2024	25.716	25.630	1.267	24.449	<1	6.5	1620	-34	7.79	19.56	9.6	brown, slightly turbid, slight H ₂ S odour
	BH3	9/04/2024	29.779	25.880	4.474	25.305	<1	5.2	1710	173	0.34	22.82	27	pale brown, clear
	BH4	9/04/2024	26.348	21.770	1.510	24.838	<1	6.3	1910	75	2.73	23.75	0.1	clear
Surface Water	S4	9/04/2024	-	-	-	-	<1	5.5	72	147	4.59	20.5	3.3	slightly turbid, pale brown, slight H ₂ S odour
	S5	9/04/2024	-	-	-	-	<1	6	118	126	3.12	19.08	55	slightly turbid, pale brown
	S6	9/04/2024	-	-	-	-	<1	6.1	128	107	3.43	19.1	44.8	slightly turbid, pale brown
	S7	9/04/2024	-	-	-	-	<1	7.4	249	6	4.49	24.01	>1000	very turbid, pale brown, slight H ₂ S odour
	L8	9/04/2024	-	-	-	-	<1	8.2	1530	27	11.48	23.4	47.4	slightly turbid, orange brown, slight H ₂ S odour

Notes to Table A2:

AHD Australian Height Datum

mbTOC metres below top of PVC casing

PID photo-ionisation detector

EC electrical conductivity

ppm parts per million

ORP oxidation reduction potential

DO Dissolved Oxygen

NTU nephelometric turbidity unit

H₂S Hydrogen Sulfide

uS/cm microsiemens

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

Analyte		Units	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	BH1	BH2	BH3	BH4	BH1-2
					MP1	MP2	MP3	MP12	MP14
					-	8/04/2024	8/04/2024	8/04/2024	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	<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

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	S5	S6	S7	L8
					MP4	MP5	MP6	MP7	MP8
					8/04/2024	8/04/2024	8/04/2024	8/04/2024	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

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
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
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

Client Reference: 89781.24 Kempsey

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

Client Reference: 89781.24 Kempsey

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, SO ₄	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, SO ₄	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 gravimetrically 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.

Client Reference: 89781.24 Kempsey

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]

Client Reference: 89781.24 Kempsey

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]

Client Reference: 89781.24 Kempsey

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]

Client Reference: 89781.24 Kempsey

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, SO ₄	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]

Client Reference: 89781.24 Kempsey

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.

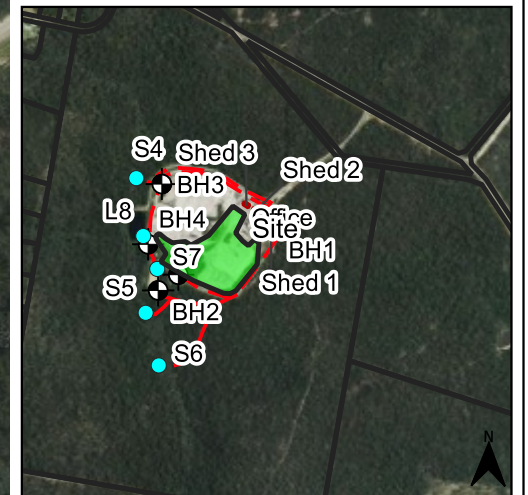
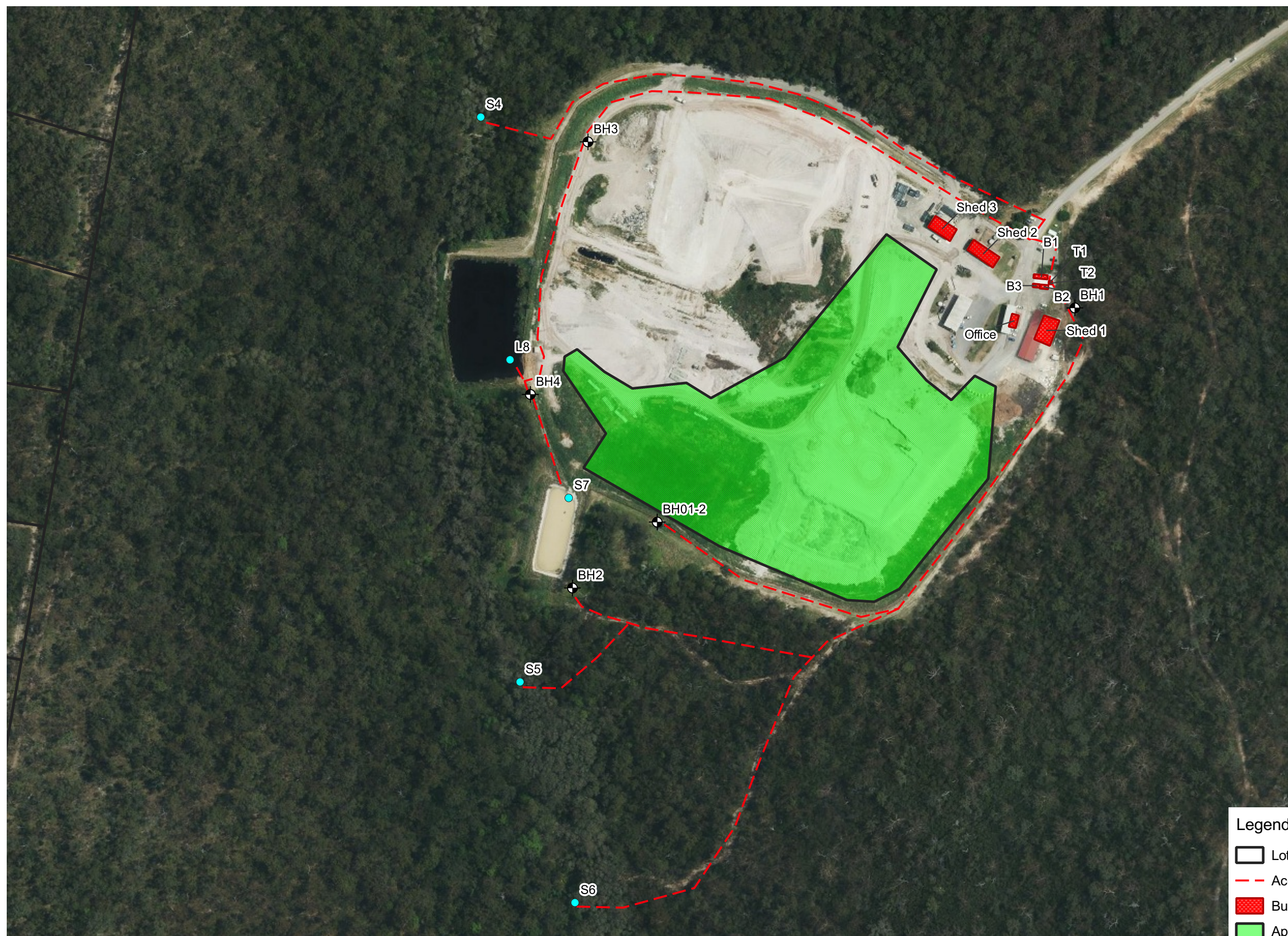
Measurement Uncertainty estimates are available for most tests upon request.

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.



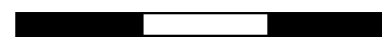
Site Location

Legend

- Lot Boundary
- Access Tracks
- Building Locations Monitored for Gas
- Approximate Area of Surface Gas Monitoring
- Approximate Surface Water Location
- Approximate Well Location

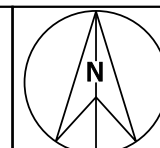
NOTE:
1. Drawing adapted from Metromap Image dated 22.11.2022.

0 50 100 150 m



CLIENT:	Kempsey Shire Council
OFFICE:	Port Macquarie
DRAWN BY:	PLH
SCALE:	1:3000@A3
DATE:	21.August.2023

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



Project:	89781.00
DRAWING No:	1
REVISION:	0