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CERTIFICATE OF ANALYSIS 293430

Client Details

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

Sample Details

Your Reference	89781.00, Kempsey Landfill Water & Gas Monitoring
Number of Samples	12 Water
Date samples received	14/04/2022
Date completed instructions received	21/04/2022

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 26/04/2022

Date of Issue 26/04/2022

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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
Giovanni Agosti, Group Technical Manager
Hannah Nguyen, Metals Supervisor
Jenny He, Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

Total Phenolics in Water						
Our Reference		293430-5	293430-6	293430-7	293430-8	293430-9
Your Reference	UNITS	S4	S5	S6 (A)	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date extracted	-	20/04/2022	20/04/2022	20/04/2022	20/04/2022	20/04/2022
Date analysed	-	20/04/2022	20/04/2022	20/04/2022	20/04/2022	20/04/2022
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

Miscellaneous Inorganics						
Our Reference		293430-1	293430-2	293430-3	293430-4	293430-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S4
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Ammonia as N in water	mg/L	<0.005	<0.005	0.13	<0.005	0.012
Nitrate as N in water	mg/L	0.23	0.22	3.6	0.18	0.02
Fluoride, F	mg/L	[NA]	[NA]	[NA]	[NA]	<0.1
Total Organic Carbon	mg/L	[NA]	[NA]	[NA]	[NA]	13
Total Suspended Solids	mg/L	[NA]	[NA]	[NA]	[NA]	12

Miscellaneous Inorganics						
Our Reference		293430-6	293430-7	293430-8	293430-9	293430-10
Your Reference	UNITS	S5	S6 (A)	S7	D1	D2
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Ammonia as N in water	mg/L	4.7	4.0	8.6	4.1	<0.005
Nitrate as N in water	mg/L	<0.005	<0.005	<0.005	<0.005	0.26
Fluoride, F	mg/L	<0.1	<0.1	<0.1	<0.1	[NA]
Total Organic Carbon	mg/L	20	20	39	18	[NA]
Total Suspended Solids	mg/L	79	33	990	43	[NA]

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

Ion Balance						
Our Reference		293430-1	293430-2	293430-3	293430-4	293430-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S4
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Calcium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	<0.5
Potassium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	1
Sodium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	12
Magnesium - Dissolved	mg/L	18	17	27	31	0.6
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Carbonate Alkalinity as CaCO ₃	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Total Alkalinity as CaCO ₃	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Sulphate, SO ₄	mg/L	[NA]	[NA]	[NA]	[NA]	3
Chloride, Cl	mg/L	[NA]	[NA]	[NA]	[NA]	15
Ionic Balance	%	[NA]	[NA]	[NA]	[NA]	12

Ion Balance						
Our Reference		293430-6	293430-7	293430-8	293430-9	293430-10
Your Reference	UNITS	S5	S6 (A)	S7	D1	D2
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Calcium - Dissolved	mg/L	14	13	31	13	[NA]
Potassium - Dissolved	mg/L	7.9	7.8	13	7.7	[NA]
Sodium - Dissolved	mg/L	53	49	85	49	[NA]
Magnesium - Dissolved	mg/L	5	5.2	8.9	5.2	17
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	[NA]
Bicarbonate Alkalinity as CaCO ₃	mg/L	73	63	120	61	[NA]
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	[NA]
Total Alkalinity as CaCO ₃	mg/L	73	63	120	61	[NA]
Sulphate, SO ₄	mg/L	9	10	19	10	[NA]
Chloride, Cl	mg/L	74	71	120	70	[NA]
Ionic Balance	%	-2.0	0	0	0	[NA]

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

HM in water - dissolved						
Our Reference		293430-5	293430-6	293430-7	293430-8	293430-9
Your Reference	UNITS	S4	S5	S6 (A)	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Date analysed	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Iron-Dissolved	µg/L	1,900	1,300	500	1,600	900
Manganese-Dissolved	µg/L	5	160	<5	240	540

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

HM in water - total						
Our Reference		293430-5	293430-6	293430-7	293430-8	293430-9
Your Reference	UNITS	S4	S5	S6 (A)	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Date analysed	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Iron-Total	µg/L	800	2,600	1,900	1,600	1,700
Manganese-Total	µg/L	10	200	600	300	500

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

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.

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

QUALITY CONTROL: Total Phenolics in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			20/04/2022	5	20/04/2022	20/04/2022		20/04/2022	[NT]
Date analysed	-			20/04/2022	5	20/04/2022	20/04/2022		20/04/2022	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	5	<0.05	<0.05	0	98	[NT]

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-2
Date prepared	-			19/04/2022	5	14/04/2022	14/04/2022		19/04/2022	19/04/2022
Date analysed	-			19/04/2022	5	14/04/2022	14/04/2022		19/04/2022	19/04/2022
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	5	0.012	[NT]		106	93
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	5	0.02	[NT]		101	100
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	5	<0.1	[NT]		94	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	5	13	13	0	97	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	5	12	[NT]		101	[NT]

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	293430-6
Date prepared	-			[NT]	8	14/04/2022	14/04/2022		[NT]	19/04/2022
Date analysed	-			[NT]	8	14/04/2022	14/04/2022		[NT]	19/04/2022
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	8	8.6	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	8	<0.005	[NT]		[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	39	[NT]		[NT]	99
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	8	990	1000	1	[NT]	[NT]

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-6
Date prepared	-			14/04/2022	5	14/04/2022	14/04/2022		14/04/2022	14/04/2022
Date analysed	-			14/04/2022	5	14/04/2022	14/04/2022		14/04/2022	14/04/2022
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	<0.5	<0.5	0	100	102
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	1	1	0	92	84
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	12	12	0	120	102
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	0.6	0.6	0	97	99
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	5	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	5	<5	[NT]		[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	5	<5	[NT]		[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	5	<5	[NT]		101	[NT]
Sulphate, SO ₄	mg/L	1	Inorg-081	<1	5	3	[NT]		94	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	5	15	[NT]		106	[NT]
Ionic Balance	%		Inorg-040	[NT]	5	12	[NT]		[NT]	[NT]

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

QUALITY CONTROL: HM in water - dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-6
Date prepared	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Date analysed	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Iron-Dissolved	µg/L	10	Metals-022	<10	5	1900	2000	5	96	#
Manganese-Dissolved	µg/L	5	Metals-022	<5	5	5	5	0	96	98

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

QUALITY CONTROL: HM in water - total				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-6
Date prepared	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Date analysed	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Iron-Total	µg/L	10	Metals-022	<10	5	800	1000	22	96	#
Manganese-Total	µg/L	5	Metals-022	<5	5	10	10	0	94	#

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.

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 - 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.

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.

TRACE METALS: In theory the total metal content should be higher than the dissolved metal content. However, in some samples this is not the case. The sample has been re-analysed for both Total and Dissolved metals and results have been confirmed.