Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 314239

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	**89781.00, Kempsey**
Number of Samples	3 Water
Date samples received	11/01/2023
Date completed instructions received	11/01/2023

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	18/01/2023
Date of Issue	18/01/2023

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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
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Total Phenolics in Water				
Our Reference		314239-1	314239-2	314239-3
Your Reference	UNITS	S5	S7	L8
Type of sample		Water	Water	Water
Date extracted	-	12/01/2023	12/01/2023	12/01/2023
Date analysed	-	12/01/2023	12/01/2023	12/01/2023
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

Miscellaneous Inorganics				
Our Reference	UNITS	314239-1	314239-2	314239-3
Your Reference		S5	S7	L8
Type of sample		Water	Water	Water
Date prepared	-	11/01/2023	11/01/2023	11/01/2023
Date analysed	-	11/01/2023	11/01/2023	11/01/2023
Ammonia as N in water	mg/L	3.8	0.027	160
Nitrate as N in water	mg/L	0.26	0.54	0.10
Fluoride, F	mg/L	<0.1	0.2	0.2
Total Organic Carbon	mg/L	28	59	190
Total Suspended Solids	mg/L	1,900	120	75

Ion Balance				
Our Reference	UNITS	314239-1	314239-2	314239-3
Your Reference		S5	S7	L8
Type of sample		Water	Water	Water
Date prepared	-	11/01/2023	11/01/2023	11/01/2023
Date analysed	-	11/01/2023	11/01/2023	11/01/2023
Calcium - Dissolved	mg/L	7.8	41	51
Potassium - Dissolved	mg/L	7.9	29	100
Sodium - Dissolved	mg/L	40	360	550
Magnesium - Dissolved	mg/L	5.2	22	29
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	49	60	1,100
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	69	<5
Total Alkalinity as $CaCO_3$	mg/L	49	130	1,100
Sulphate, SO4	mg/L	35	66	23
Chloride, Cl	mg/L	73	640	960
Ionic Balance	%	-16	-4.0	-22

HM in water - dissolved				
Our Reference	UNITS	314239-1	314239-2	314239-3
Your Reference		S5	S7	L8
Type of sample		Water	Water	Water
Date prepared	-	12/01/2023	12/01/2023	12/01/2023
Date analysed	-	12/01/2023	12/01/2023	12/01/2023
Iron-Dissolved	µg/L	570	<10	10,000
Manganese-Dissolved	µg/L	70	<5	460

HM in water - total				
Our Reference	UNITS	314239-1	314239-2	314239-3
Your Reference		S5	S7	L8
Type of sample		Water	Water	Water
Date prepared	-	12/01/2023	12/01/2023	12/01/2023
Date analysed	-	12/01/2023	12/01/2023	12/01/2023
Iron-Total	µg/L	9,800	790	11,000
Manganese-Total	µg/L	350	48	460

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.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	314239-2
Date extracted	-			12/01/2023	1	12/01/2023	12/01/2023		12/01/2023	12/01/2023
Date analysed	-			12/01/2023	1	12/01/2023	12/01/2023		12/01/2023	12/01/2023
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	103	97

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	314239-2
Date prepared	-			11/01/2023	1	11/01/2023	11/01/2023		11/01/2023	11/01/2023
Date analysed	-			11/01/2023	1	11/01/2023	11/01/2023		11/01/2023	11/01/2023
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	3.8	3.8	0	108	96
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.26	0.26	0	93	99
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	<0.1	<0.1	0	93	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	28	28	0	101	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	1900	1800	5	95	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			11/01/2023	1	11/01/2023	11/01/2023		11/01/2023	[NT]
Date analysed	-			11/01/2023	1	11/01/2023	11/01/2023		11/01/2023	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	7.8	7.6	3	91	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	7.9	7.9	0	84	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	40	40	0	89	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	5.2	5.1	2	91	[NT]
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	49	47	4	[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	49	47	4	97	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	35	34	3	110	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	73	73	0	106	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	-16	-15	-6	[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			12/01/2023	2	12/01/2023	12/01/2023		12/01/2023	[NT]
Date analysed	-			12/01/2023	2	12/01/2023	12/01/2023		12/01/2023	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	2	<10	<10	0	94	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	2	<5	<5	0	97	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	314239-2
Date prepared	-			12/01/2023	1	12/01/2023	12/01/2023		12/01/2023	12/01/2023
Date analysed	-			12/01/2023	1	12/01/2023	12/01/2023		12/01/2023	12/01/2023
Iron-Total	µg/L	10	Metals-022	<10	1	9800	9300	5	107	#
Manganese-Total	µg/L	5	Metals-022	<5	1	350	360	3	104	106

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 in sample #3 may be caused by other ions that have not been measured.

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.