



## CERTIFICATE OF ANALYSIS

Work Order : ES2436650

Client :

Contact :

Address :

Telephone :

Project :

Order number :

C-O-C number :

Sampler :

Site :

Quote number : ES24MACUNI0001

No. of samples received : 17

No. of samples analysed : 17

Page : 1 of 10

Laboratory :

Contact :

Address :

Telephone :

Date Samples Received : 11-Nov-2024 14:44

Date Analysis Commenced : 12-Nov-2024

Issue Date : 18-Nov-2024 11:32



Accreditation No. 925  
Accredited for compliance with  
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories

Position

Accreditation Category

Senior Chemist - Inorganics

Sydney Inorganics, Smithfield, NSW

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Work Order : ES2436650  
Client :   
Project :



### General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK061G: LOR raised for TKN on sample 14 due to sample matrix.
- EK061G: LOR raised for TKN on a few samples due to sample matrix.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EG020A: LORs have been raised for some samples due to matrix interference (High sample salinity)
- EK059G: LOR raised for NOx due to sample matrix.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	40371	87616	88090	88209	87746
Sampling date / time					04-Nov-2024 10:00	05-Nov-2024 11:45	05-Nov-2024 15:00	05-Nov-2024 15:35	05-Nov-2024 18:05
Compound	CAS Number	LOR	Unit	ES2436650-001	ES2436650-002	ES2436650-003	ES2436650-004	ES2436650-005	
				Result	Result	Result	Result	Result	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	304	318	441	581	282	
Total Alkalinity as CaCO3	----	1	mg/L	304	318	441	581	282	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	19	5660	204	285	14	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	168	28700	643	966	161	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	26	1240	101	47	57	
Magnesium	7439-95-4	1	mg/L	14	2110	81	51	21	
Sodium	7440-23-5	1	mg/L	180	16100	452	804	136	
Potassium	7440-09-7	1	mg/L	5	61	14	17	6	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.10	<0.01	<0.01	<0.01	
Arsenic	7440-38-2	0.001	mg/L	0.002	<0.010	0.008	0.010	<0.001	
Barium	7440-39-3	0.001	mg/L	0.100	0.084	0.233	0.333	0.264	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0010	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.010	<0.001	<0.001	<0.001	
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.010	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.010	0.001	<0.001	0.004	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.010	<0.001	<0.001	0.004	
Manganese	7439-96-5	0.001	mg/L	1.08	0.518	0.175	0.071	2.38	
Zinc	7440-66-6	0.005	mg/L	0.010	0.160	0.068	0.080	0.076	
Iron	7439-89-6	0.05	mg/L	3.52	<0.10	<0.05	<0.05	<0.05	
EG051G: Ferrous Iron by Discrete Analyser									
Ferrous Iron	----	0.05	mg/L	3.85	<0.05	<0.05	0.09	<0.05	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	40371	87616	88090	88209	87746
Sampling date / time					04-Nov-2024 10:00	05-Nov-2024 11:45	05-Nov-2024 15:00	05-Nov-2024 15:35	05-Nov-2024 18:05
Compound	CAS Number	LOR	Unit	ES2436650-001	ES2436650-002	ES2436650-003	ES2436650-004	ES2436650-005	
				Result	Result	Result	Result	Result	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.30	0.45	0.14	0.09	3.09	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.02	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	0.28	<0.01	<0.10	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.28	<0.01	<0.10	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.9	1.0	0.6	0.5	3.4	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
<sup>A</sup> Total Nitrogen as N	----	0.1	mg/L	0.9	1.0	0.9	0.5	3.4	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	1.19	0.32	0.40	0.91	1.22	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.11	<0.01	0.08	0.72	0.82	
EN055: Ionic Balance									
☉ Total Anions	----	0.01	meq/L	11.2	934	31.2	44.8	10.5	
☉ Total Cations	----	0.01	meq/L	10.4	937	31.7	41.9	10.6	
☉ Ionic Balance	----	0.01	%	3.71	0.19	0.84	3.28	0.82	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	6	53	22	8	16	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	40366	88323	40892-1	36806	87802
Sampling date / time					06-Nov-2024 11:00	06-Nov-2024 14:00	07-Nov-2024 11:00	07-Nov-2024 13:15	07-Nov-2024 19:00
Compound	CAS Number	LOR	Unit	ES2436650-006	ES2436650-007	ES2436650-008	ES2436650-009	ES2436650-010	
				Result	Result	Result	Result	Result	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	230	293	275	332	236	
Total Alkalinity as CaCO3	----	1	mg/L	230	293	275	332	236	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	9	7	9	121	345	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	69	177	192	529	1510	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	49	39	67	37	405	
Magnesium	7439-95-4	1	mg/L	16	33	37	26	112	
Sodium	7440-23-5	1	mg/L	70	146	96	448	583	
Potassium	7440-09-7	1	mg/L	5	6	8	6	12	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Arsenic	7440-38-2	0.001	mg/L	0.051	<0.001	<0.001	<0.001	0.008	
Barium	7440-39-3	0.001	mg/L	0.235	0.467	0.346	0.298	0.285	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Manganese	7439-96-5	0.001	mg/L	0.109	0.220	0.652	0.242	7.56	
Zinc	7440-66-6	0.005	mg/L	0.016	0.136	0.064	0.012	0.042	
Iron	7439-89-6	0.05	mg/L	1.12	1.04	3.14	0.23	26.6	
EG051G: Ferrous Iron by Discrete Analyser									
Ferrous Iron	----	0.05	mg/L	1.47	1.33	3.59	0.27	30.7	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	40366	88323	40892-1	36806	87802
Sampling date / time					06-Nov-2024 11:00	06-Nov-2024 14:00	07-Nov-2024 11:00	07-Nov-2024 13:15	07-Nov-2024 19:00
Compound	CAS Number	LOR	Unit	ES2436650-006	ES2436650-007	ES2436650-008	ES2436650-009	ES2436650-010	
				Result	Result	Result	Result	Result	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.05	0.38	0.63	0.81	0.39	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	<1.0	1.0	<1.0	0.6	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
<sup>A</sup> Total Nitrogen as N	----	0.1	mg/L	0.3	<1.0	1.0	<1.0	0.6	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.47	1.40	0.56	0.97	0.23	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.16	0.18	0.02	0.06	<0.01	
EN055: Ionic Balance									
☐ Total Anions	----	0.01	meq/L	6.73	11.0	11.1	24.1	54.5	
☐ Total Cations	----	0.01	meq/L	6.93	11.2	10.8	23.6	55.1	
☐ Ionic Balance	----	0.01	%	1.50	0.78	1.50	0.94	0.55	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	7	11	12	13	5	





Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	40805	36836	40797	87796	87794
Sampling date / time					07-Nov-2024 14:15	08-Nov-2024 09:30	08-Nov-2024 09:38	08-Nov-2024 11:30	08-Nov-2024 13:20
Compound	CAS Number	LOR	Unit	ES2436650-011	ES2436650-012	ES2436650-013	ES2436650-014	ES2436650-015	
				Result	Result	Result	Result	Result	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	232	267	278	294	347	
Total Alkalinity as CaCO3	----	1	mg/L	232	267	278	294	347	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	18	31	31	9	67	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	65	170	171	232	72	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	46	41	38	101	57	
Magnesium	7439-95-4	1	mg/L	16	20	15	38	31	
Sodium	7440-23-5	1	mg/L	63	166	188	104	98	
Potassium	7440-09-7	1	mg/L	8	5	14	9	8	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Arsenic	7440-38-2	0.001	mg/L	0.005	0.003	0.001	0.013	0.007	
Barium	7440-39-3	0.001	mg/L	0.092	0.155	0.114	0.840	0.571	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	0.012	0.002	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.008	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.012	
Manganese	7439-96-5	0.001	mg/L	1.29	0.004	0.295	2.26	1.05	
Zinc	7440-66-6	0.005	mg/L	<0.005	0.033	0.014	0.097	0.074	
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.06	20.1	0.38	
EG051G: Ferrous Iron by Discrete Analyser									
Ferrous Iron	----	0.05	mg/L	4.80	<0.05	0.60	23.8	0.48	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	40805	36836	40797	87796	87794
Sampling date / time					07-Nov-2024 14:15	08-Nov-2024 09:30	08-Nov-2024 09:38	08-Nov-2024 11:30	08-Nov-2024 13:20
Compound	CAS Number	LOR	Unit	ES2436650-011	ES2436650-012	ES2436650-013	ES2436650-014	ES2436650-015	
				Result	Result	Result	Result	Result	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.90	0.06	1.63	0.25	0.30	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.60	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.60	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.8	0.1	3.4	<1.0	1.4	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
<sup>A</sup> Total Nitrogen as N	----	0.1	mg/L	1.8	0.1	3.4	<1.0	2.0	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.82	0.34	1.45	0.75	0.25	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.02	0.29	1.13	<0.01	<0.01	
EN055: Ionic Balance									
☐ Total Anions	----	0.01	meq/L	6.84	10.8	11.0	12.6	10.4	
☐ Total Cations	----	0.01	meq/L	6.56	11.0	11.7	12.9	9.86	
☐ Ionic Balance	----	0.01	%	2.14	1.21	2.83	1.24	2.45	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	13	1	8	10	37	





Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID		87788	36813	----	----	----
Sampling date / time				08-Nov-2024 14:15		08-Nov-2024 00:00		----	----
Compound	CAS Number	LOR	Unit	ES2436650-016		ES2436650-017		-----	-----
				Result		Result		----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1		<1		----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1		<1		----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	587		445		----	----
Total Alkalinity as CaCO3	----	1	mg/L	587		445		----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1480		75		----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	1460		218		----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	59		10		----	----
Magnesium	7439-95-4	1	mg/L	54		7		----	----
Sodium	7440-23-5	1	mg/L	1990		376		----	----
Potassium	7440-09-7	1	mg/L	8		3		----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01		<0.01		----	----
Arsenic	7440-38-2	0.001	mg/L	0.001		0.004		----	----
Barium	7440-39-3	0.001	mg/L	0.149		0.137		----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001		<0.0001		----	----
Chromium	7440-47-3	0.001	mg/L	<0.001		<0.001		----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001		<0.001		----	----
Copper	7440-50-8	0.001	mg/L	<0.001		<0.001		----	----
Lead	7439-92-1	0.001	mg/L	<0.001		<0.001		----	----
Manganese	7439-96-5	0.001	mg/L	0.218		0.010		----	----
Zinc	7440-66-6	0.005	mg/L	0.056		0.032		----	----
Iron	7439-89-6	0.05	mg/L	<0.05		<0.05		----	----
EG051G: Ferrous Iron by Discrete Analyser									
Ferrous Iron	----	0.05	mg/L	<0.05		<0.05		----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	87788	36813	----	----	----
Sampling date / time					08-Nov-2024 14:15	08-Nov-2024 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES2436650-016	ES2436650-017	-----	-----	-----
				Result	Result		----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.16	0.02	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.11	0.03	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.11	0.03	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<1.0	<1.0	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
<sup>A</sup> Total Nitrogen as N	----	0.1	mg/L		<1.0	<1.0	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		1.16	5.44	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	0.13	----	----	----
EN055: Ionic Balance									
☉ Total Anions	----	0.01	meq/L		83.7	16.6	----	----	----
☉ Total Cations	----	0.01	meq/L		94.2	17.5	----	----	----
☉ Ionic Balance	----	0.01	%		5.86	2.65	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		24	2	----	----	----