

CERTIFICATE OF ANALYSIS

Work Order : **EW2000787**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Minnamurra Landfill**
Order number : **141275**
C-O-C number : **----**
Sampler : **----**
Site : **Minnamurra Landfill**
Quote number : **WO/029/19**
No. of samples received : **20**
No. of samples analysed : **20**

Page : 1 of 10
Laboratory : Environmental Division NSW South Coast
Contact : Glenn Davies
Address : 1/19 Ralph Black Dr, North Wollongong 2500
 4/13 Geary Pl, North Nowra 2541
 Australia NSW Australia

Telephone : 02 42253125
Date Samples Received : 14-Feb-2020 13:53
Date Analysis Commenced : 14-Feb-2020
Issue Date : 24-Feb-2020 16:07



Accreditation No. 825
 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. 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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 Contact 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.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EP002: It has been noted that DOC is greater than TOC for samples 3, 4 and 5, however this difference is within the limits of experimental variation.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per EN/67.11 Groundwater Sampling.
- Sampling completed as per EN/67.6 Rivers and Streams
- Field tests completed on day of sampling/receipt.
- EP 035SF: LOR raised for Phenol sample 12 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.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 1A	MD 1B	MD 2A	MD 2B	MD 2C
Client sampling date / time				14-Feb-2020 00:00	14-Feb-2020 11:15	14-Feb-2020 10:12	14-Feb-2020 10:22	14-Feb-2020 10:30	
Compound	CAS Number	LOR	Unit	EW2000787-001	EW2000787-002	EW2000787-003	EW2000787-004	EW2000787-005	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	----	7.6	6.9	6.9	7.0	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	601	18200	33800	48000	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	----	0.3	10.4	21.3	31.4	
EA116: Temperature									
Temperature	----	0.1	°C	----	24.9	26.3	24.7	24.8	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	222	990	736	543	
Total Alkalinity as CaCO3	----	1	mg/L	----	222	990	736	543	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	16	605	1710	2450	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	----	43	5980	11600	16200	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	----	49	250	496	547	
Magnesium	7439-95-4	1	mg/L	----	9	405	782	1080	
Sodium	7440-23-5	1	mg/L	----	34	3040	6140	8720	
Potassium	7440-09-7	1	mg/L	----	14	176	262	344	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	----	0.057	0.067	0.137	0.143	
Iron	7439-89-6	0.05	mg/L	----	0.68	2.75	1.65	1.56	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	----	0.2	0.9	0.6	0.7	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	----	17.0	31.5	14.0	3.42	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	----	<0.01	0.05	<0.01	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	----	0.06	0.19	<0.01	<0.01	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 1A	MD 1B	MD 2A	MD 2B	MD 2C
Client sampling date / time				14-Feb-2020 00:00	14-Feb-2020 11:15	14-Feb-2020 10:12	14-Feb-2020 10:22	14-Feb-2020 10:30	
Compound	CAS Number	LOR	Unit	EW2000787-001	EW2000787-002	EW2000787-003	EW2000787-004	EW2000787-005	
				Result	Result	Result	Result	Result	
EP059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.06	0.24	<0.01	<0.01	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	----	5.98	201	378	519	
∅ Total Cations	----	0.01	meq/L	----	6.24	----	----	----	
∅ Total Cations	----	0.01	meq/L	----	----	182	363	504	
∅ Ionic Balance	----	0.01	%	----	2.05	----	----	----	
∅ Ionic Balance	----	0.01	%	----	----	4.83	1.98	1.42	
EN67 PK: Field Tests									
Field Observations	----	0.01	--	DESTROYED	----	----	----	----	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	----	7	66	44	26	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	----	7	65	43	25	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	----	2.52	3.69	2.53	2.47	
Dissolved Oxygen - % Saturation	----	0.1	% saturation	----	30.7	45.9	30.8	30.0	
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L	----	<0.05	<0.05	<0.05	<0.05	
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m	----	1.08	0.21	0.50	0.52	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 4A	MD 4B	MD 4C	MD 6A	MD 6B
Client sampling date / time				14-Feb-2020 00:00	14-Feb-2020 09:48	14-Feb-2020 09:55	14-Feb-2020 10:50	14-Feb-2020 10:55	
Compound	CAS Number	LOR	Unit	EW2000787-006	EW2000787-007	EW2000787-008	EW2000787-009	EW2000787-010	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	----	7.0	7.0	7.2	7.1	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	18100	45900	1530	1520	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	----	10.8	30.2	0.8	0.8	
EA116: Temperature									
Temperature	----	0.1	°C	----	24.6	24.4	25.1	25.3	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	875	618	656	625	
Total Alkalinity as CaCO3	----	1	mg/L	----	875	618	656	625	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	625	2360	39	6	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	----	6220	15400	102	87	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	----	386	523	120	108	
Magnesium	7439-95-4	1	mg/L	----	385	1030	46	50	
Sodium	7440-23-5	1	mg/L	----	2850	8350	109	94	
Potassium	7440-09-7	1	mg/L	----	165	311	43	46	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	----	0.106	0.164	0.049	0.104	
Iron	7439-89-6	0.05	mg/L	----	1.80	1.66	1.73	0.22	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	----	0.6	1.0	0.8	0.6	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	----	38.5	2.18	36.0	39.0	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	----	<0.01	<0.01	0.08	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	----	0.03	<0.01	0.62	0.05	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 4A	MD 4B	MD 4C	MD 6A	MD 6B
Client sampling date / time				14-Feb-2020 00:00	14-Feb-2020 09:48	14-Feb-2020 09:55	14-Feb-2020 10:50	14-Feb-2020 10:55	
Compound	CAS Number	LOR	Unit	EW2000787-006	EW2000787-007	EW2000787-008	EW2000787-009	EW2000787-010	
				Result	Result	Result	Result	Result	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.03	<0.01	0.70	0.05	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	----	206	496	16.8	15.1	
∅ Total Cations	----	0.01	meq/L	----	179	482	15.6	14.8	
∅ Ionic Balance	----	0.01	%	----	6.96	1.42	3.64	1.00	
EN67 PK: Field Tests									
Field Observations	----	0.01	--	DESTROYED	----	----	----	----	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	----	47	28	35	36	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	----	47	29	36	36	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	----	2.84	3.31	2.93	2.50	
Dissolved Oxygen - % Saturation	----	0.1	% saturation	----	34.1	39.9	35.8	30.8	
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L	----	<0.05	<0.05	<0.05	<0.05	
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m	----	0.90	0.94	0.93	1.05	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 6C	MD 9A	MD 9B	MD 9C	MD 10A
Client sampling date / time				14-Feb-2020 11:00	14-Feb-2020 09:18	14-Feb-2020 09:24	14-Feb-2020 09:33	14-Feb-2020 08:55	
Compound	CAS Number	LOR	Unit	EW2000787-011	EW2000787-012	EW2000787-013	EW2000787-014	EW2000787-015	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.1	7.0	7.1	7.0	6.6	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	38800	4400	3250	13700	49200	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	25.0	2.3	1.7	7.9	29.6	
EA116: Temperature									
Temperature	----	0.1	°C	24.5	25.2	24.4	24.7	28.8	
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	386	670	1210	864	250	
Total Alkalinity as CaCO3	----	1	mg/L	386	670	1210	864	250	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2070	106	<1	345	2840	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	13200	1080	378	4470	16600	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	426	118	114	258	1060	
Magnesium	7439-95-4	1	mg/L	936	120	59	253	1090	
Sodium	7440-23-5	1	mg/L	7270	590	300	2200	8500	
Potassium	7440-09-7	1	mg/L	256	67	126	149	196	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.066	0.029	0.160	0.222	0.610	
Iron	7439-89-6	0.05	mg/L	20.2	0.08	2.82	5.94	0.64	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.6	0.2	0.7	0.6	0.6	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	42.8	23.5	116	92.0	0.19	
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	0.04	0.09	0.04	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 6C	MD 9A	MD 9B	MD 9C	MD 10A
Client sampling date / time				14-Feb-2020 11:00	14-Feb-2020 09:18	14-Feb-2020 09:24	14-Feb-2020 09:33	14-Feb-2020 08:55	
Compound	CAS Number	LOR	Unit	EW2000787-011	EW2000787-012	EW2000787-013	EW2000787-014	EW2000787-015	
				Result	Result	Result	Result	Result	
EPK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.04	0.09	0.04	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	423	46.0	34.8	150	532	
∅ Total Cations	----	0.01	meq/L	----	----	----	141	----	
∅ Total Cations	----	0.01	meq/L	421	43.1	26.8	----	517	
∅ Ionic Balance	----	0.01	%	----	----	----	3.11	----	
∅ Ionic Balance	----	0.01	%	0.25	3.27	13.0	----	1.43	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	13	50	66	64	62	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	14	50	71	64	62	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	1.82	1.31	2.37	1.64	4.52	
Dissolved Oxygen - % Saturation	----	0.1	% saturation	22.3	16.0	28.6	20.0	58.8	
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m	1.18	0.26	0.66	0.63	0.78	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 10B	Rocklow Down	Rocklow Middle	Rocklow Up	BLANK
Client sampling date / time				14-Feb-2020 09:00	14-Feb-2020 07:40	14-Feb-2020 08:45	14-Feb-2020 08:15	14-Feb-2020 07:35	
Compound	CAS Number	LOR	Unit	EW2000787-016	EW2000787-017	EW2000787-018	EW2000787-019	EW2000787-020	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.1	7.2	7.1	6.6	----	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1880	3010	2670	1610	----	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	0.9	1.4	1.3	0.8	----	
EA116: Temperature									
Temperature	----	0.1	°C	26.6	28.6	29.2	28.4	----	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	710	80	79	41	----	
Total Alkalinity as CaCO3	----	1	mg/L	710	80	79	41	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	186	169	86	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	185	900	781	493	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	104	----	----	----	----	
Magnesium	7439-95-4	1	mg/L	43	----	----	----	----	
Sodium	7440-23-5	1	mg/L	124	----	----	----	----	
Potassium	7440-09-7	1	mg/L	75	----	----	----	----	
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L	----	54	52	22	----	
Magnesium	7439-95-4	1	mg/L	----	57	51	34	----	
Sodium	7440-23-5	1	mg/L	----	444	386	238	----	
Potassium	7440-09-7	1	mg/L	----	20	18	17	----	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.365	----	----	----	<0.001	
Iron	7439-89-6	0.05	mg/L	0.89	----	----	----	<0.05	
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	----	0.066	0.068	0.086	----	
Iron	7439-89-6	0.05	mg/L	----	0.88	0.99	0.98	----	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MD 10B	Rocklow Down	Rocklow Middle	Rocklow Up	BLANK
Client sampling date / time					14-Feb-2020 09:00	14-Feb-2020 07:40	14-Feb-2020 08:45	14-Feb-2020 08:15	14-Feb-2020 07:35
Compound	CAS Number	LOR	Unit		EW2000787-016	EW2000787-017	EW2000787-018	EW2000787-019	EW2000787-020
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.9	0.3	0.3	0.2	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.14	0.23	0.16	0.15	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	0.02	0.02	0.02	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.60	0.57	0.57	0.43	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.60	0.59	0.59	0.45	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		19.4	----	----	----	----
∅ Total Cations	----	0.01	meq/L		16.0	----	----	----	----
∅ Ionic Balance	----	0.01	%		9.49	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		51	16	16	24	<1
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		53	16	17	25	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.42	6.65	6.28	4.84	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation		30.3	85.3	81.6	28.2	----
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		0.67	----	----	----	----