

CERTIFICATE OF ANALYSIS

Work Order : **EW2005232**
Client : **KIAMA COUNCIL**
Contact : **MS JULIE MILEVSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0557**
Project : **Minnamurra Landfill**
Order number : **141275**
C-O-C number : **----**
Sampler : **Robert DaLio**
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 : 19-Nov-2020 15:03
Date Analysis Commenced : 19-Nov-2020
Issue Date : 26-Nov-2020 13:28



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, 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.

<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 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 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.**
- EK057G/EK058G/EK059G: LOR raised for Nitrite/Nitrate/NOx on sample 12 due to sample matrix.
- ED041G: LOR raised for Sulfate on sample 16 due to sample matrix.
- EP002: It has been noted that DOC is greater than TOC for various samples, 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.
- 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)				Sample ID	MD 1A	MD 1B	MD 2A	MD 2B	MD 2C
Sampling date / time				19-Nov-2020 00:00	19-Nov-2020 12:50	19-Nov-2020 11:15	19-Nov-2020 11:20	19-Nov-2020 11:26	
Compound	CAS Number	LOR	Unit	EW2005232-001	EW2005232-002	EW2005232-003	EW2005232-004	EW2005232-005	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	----	7.7	6.9	7.0	7.0	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	606	26200	31800	49200	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	----	0.3	18.4	23.4	37.9	
EA116: Temperature									
Temperature	----	0.1	°C	----	22.5	19.0	17.7	17.9	
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	----	241	918	850	606	
Total Alkalinity as CaCO3	----	1	mg/L	----	241	918	850	606	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	18	754	959	2020	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	----	45	7830	9150	13200	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	----	49	292	418	440	
Magnesium	7439-95-4	1	mg/L	----	8	546	677	990	
Sodium	7440-23-5	1	mg/L	----	36	4410	5470	7940	
Potassium	7440-09-7	1	mg/L	----	12	208	243	293	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	----	0.049	0.087	0.108	0.160	
Iron	7439-89-6	0.05	mg/L	----	0.54	1.91	1.13	1.40	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	----	0.2	0.8	0.7	0.8	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	----	12.0	14.2	9.85	5.12	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	----	0.02	0.04	0.02	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	----	0.06	0.03	0.05	<0.01	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MD 1A	MD 1B	MD 2A	MD 2B	MD 2C
Sampling date / time				19-Nov-2020 00:00	19-Nov-2020 12:50	19-Nov-2020 11:15	19-Nov-2020 11:20	19-Nov-2020 11:26	
Compound	CAS Number	LOR	Unit	EW2005232-001	EW2005232-002	EW2005232-003	EW2005232-004	EW2005232-005	
				Result	Result	Result	Result	Result	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.08	0.07	0.07	0.07	<0.01
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	----	6.46	255	295	426	
∅ Total Cations	----	0.01	meq/L	----	5.86	----	----	----	
∅ Total Cations	----	0.01	meq/L	----	----	257	321	456	
∅ Ionic Balance	----	0.01	%	----	4.88	----	----	----	
∅ Ionic Balance	----	0.01	%	----	----	0.34	4.17	3.37	
EN67 PK: Field Tests									
Field Observations	----	0.01	--	DESTROYED	----	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	----	6	56	25	14	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	----	4	64	24	15	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	----	0.83	2.17	1.93	1.81	
Dissolved Oxygen - % Saturation	----	0.1	% saturation	----	9.5	23.1	20.1	19.0	
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	----	1.35	0.33	0.62	0.66	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MD 4A	MD 4B	MD 4C	MD 6A	MD 6B
Sampling date / time				19-Nov-2020 00:00	19-Nov-2020 10:49	19-Nov-2020 10:54	19-Nov-2020 12:13	19-Nov-2020 12:18	
Compound	CAS Number	LOR	Unit	EW2005232-006	EW2005232-007	EW2005232-008	EW2005232-009	EW2005232-010	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	----	6.9	6.9	7.1	7.1	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	17800	48700	4560	1420	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	----	11.9	37.2	2.7	0.8	
EA116: Temperature									
Temperature	----	0.1	°C	----	19.3	18.2	20.7	22.3	
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	----	981	775	851	682	
Total Alkalinity as CaCO3	----	1	mg/L	----	981	775	851	682	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	524	1980	364	38	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	----	5320	12600	782	81	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	----	409	496	264	120	
Magnesium	7439-95-4	1	mg/L	----	349	1020	86	39	
Sodium	7440-23-5	1	mg/L	----	2800	8150	502	82	
Potassium	7440-09-7	1	mg/L	----	157	304	78	38	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	----	0.107	0.185	0.076	0.099	
Iron	7439-89-6	0.05	mg/L	----	1.77	1.50	0.87	0.17	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	----	0.5	1.0	0.7	0.5	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	----	51.8	2.91	36.4	25.3	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	----	0.02	<0.01	0.22	0.02	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	----	0.04	<0.01	1.31	0.01	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MD 4A	MD 4B	MD 4C	MD 6A	MD 6B
Sampling date / time				19-Nov-2020 00:00	19-Nov-2020 10:49	19-Nov-2020 10:54	19-Nov-2020 12:13	19-Nov-2020 12:18	
Compound	CAS Number	LOR	Unit	EW2005232-006	EW2005232-007	EW2005232-008	EW2005232-009	EW2005232-010	
				Result	Result	Result	Result	Result	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.06	<0.01	1.53	0.03	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	----	180	412	46.6	16.7	
∅ Total Cations	----	0.01	meq/L	----	175	471	44.1	13.7	
∅ Ionic Balance	----	0.01	%	----	1.59	6.66	2.82	9.74	
EN67 PK: Field Tests									
Field Observations	----	0.01	--	DESTROYED	----	----	----	----	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	----	32	22	61	19	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	----	47	20	54	21	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	----	1.46	1.11	1.33	1.56	
Dissolved Oxygen - % Saturation	----	0.1	% saturation	----	15.6	11.7	14.8	17.3	
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	----	1.10	1.10	1.05	1.08	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MD 6C	MD 9A	MD 9B	MD 9C	MD 10A
Sampling date / time				19-Nov-2020 12:26	19-Nov-2020 09:50	19-Nov-2020 10:10	19-Nov-2020 10:15	19-Nov-2020 09:18	
Compound	CAS Number	LOR	Unit	EW2005232-011	EW2005232-012	EW2005232-013	EW2005232-014	EW2005232-015	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.2	6.6	7.0	7.0	7.2	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	34500	7310	3570	9810	32200	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	24.2	4.5	2.2	6.3	22.0	
EA116: Temperature									
Temperature	----	0.1	°C	20.1	20.0	18.4	19.1	20.9	
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	452	223	1100	1000	583	
Total Alkalinity as CaCO3	----	1	mg/L	452	223	1100	1000	583	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1600	262	27	185	1690	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	9690	1760	556	2600	11600	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	357	57	160	198	657	
Magnesium	7439-95-4	1	mg/L	719	132	79	151	675	
Sodium	7440-23-5	1	mg/L	5550	1310	298	1370	5150	
Potassium	7440-09-7	1	mg/L	189	63	112	132	132	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.073	0.025	0.204	0.133	0.581	
Iron	7439-89-6	0.05	mg/L	17.1	0.12	3.12	2.94	2.92	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.5	0.1	0.7	0.6	0.8	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	40.7	6.64	64.7	68.0	0.74	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.02	<0.10	<0.01	0.02	0.22	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.03	<0.10	0.01	0.03	0.10	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MD 6C	MD 9A	MD 9B	MD 9C	MD 10A
Sampling date / time				19-Nov-2020 12:26	19-Nov-2020 09:50	19-Nov-2020 10:10	19-Nov-2020 10:15	19-Nov-2020 09:18	
Compound	CAS Number	LOR	Unit	EW2005232-011	EW2005232-012	EW2005232-013	EW2005232-014	EW2005232-015	
				Result	Result	Result	Result	Result	
EPK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.05	<0.10	0.01	0.05	0.32	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	316	59.6	38.2	97.2	374	
∅ Total Cations	----	0.01	meq/L	----	----	34.9	----	----	
∅ Total Cations	----	0.01	meq/L	323	72.3	----	85.3	316	
∅ Ionic Balance	----	0.01	%	----	----	4.53	----	----	
∅ Ionic Balance	----	0.01	%	1.18	9.66	----	6.52	8.46	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	27	135	43	45	56	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	25	140	42	49	68	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	0.62	1.46	1.29	1.31	6.63	
Dissolved Oxygen - % Saturation	----	0.1	% saturation	6.8	15.8	13.7	14.1	73.8	
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	1.11	0.45	0.77	0.67	0.59	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MD 10B	Rocklow Down	Rocklow Middle	Rocklow Up	BLANK
Sampling date / time				19-Nov-2020 09:30	19-Nov-2020 08:20	19-Nov-2020 09:10	19-Nov-2020 08:50	19-Nov-2020 08:10	
Compound	CAS Number	LOR	Unit	EW2005232-016	EW2005232-017	EW2005232-018	EW2005232-019	EW2005232-020	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.2	7.2	7.1	7.2	----	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1800	35400	9810	32200	----	
EA020FD: Field Salinity									
Salinity	----	0.2	g/L	1.0	24.8	13.8	20.1	----	
EA116: Temperature									
Temperature	----	0.1	°C	20.3	20.6	21.1	22.7	----	
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	606	182	189	134	----	
Total Alkalinity as CaCO3	----	1	mg/L	606	182	189	134	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	1580	669	903	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	231	9910	6220	9030	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	74	----	----	----	----	
Magnesium	7439-95-4	1	mg/L	30	----	----	----	----	
Sodium	7440-23-5	1	mg/L	102	----	----	----	----	
Potassium	7440-09-7	1	mg/L	65	----	----	----	----	
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L	----	296	192	247	----	
Magnesium	7439-95-4	1	mg/L	----	827	447	642	----	
Sodium	7440-23-5	1	mg/L	----	6800	3580	5270	----	
Potassium	7440-09-7	1	mg/L	----	234	136	197	----	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.272	----	----	----	<0.001	
Iron	7439-89-6	0.05	mg/L	0.61	----	----	----	<0.05	
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	----	0.093	0.121	0.185	----	
Iron	7439-89-6	0.05	mg/L	----	0.34	0.40	1.00	----	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MD 10B	Rocklow Down	Rocklow Middle	Rocklow Up	BLANK
Sampling date / time				19-Nov-2020 09:30	19-Nov-2020 08:20	19-Nov-2020 09:10	19-Nov-2020 08:50	19-Nov-2020 08:10	
Compound	CAS Number	LOR	Unit	EW2005232-016	EW2005232-017	EW2005232-018	EW2005232-019	EW2005232-020	
				Result	Result	Result	Result	Result	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.9	0.9	0.7	0.7	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	57.4	1.07	1.78	<0.01	----	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.02	0.02	<0.01	----	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	0.03	0.02	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.02	0.05	0.02	----	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	18.6	----	----	----	----	
∅ Total Cations	----	0.01	meq/L	16.4	----	----	----	----	
∅ Ionic Balance	----	0.01	%	6.50	----	----	----	----	
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L	36	6	8	6	<1	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	32	7	8	6	----	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	2.41	4.81	5.78	6.30	----	
Dissolved Oxygen - % Saturation	----	0.1	% saturation	26.8	52.7	63.3	70.0	----	
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	0.79	----	----	----	----	