

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2002206**  
**Client** : **WOLLONGONG CITY COUNCIL**  
**Contact** : DELLA KUTZNER  
**Address** : 41 BURELLI STREET  
 WOLLONGONG NSW, AUSTRALIA 2500  
  
**Telephone** : +61 02 4227 7111  
**Project** : Whytes Gully Stage 3 Bores Quarterly  
**Order number** : 1011047  
**C-O-C number** : ----  
**Sampler** : Robert DaLio  
**Site** : ----  
**Quote number** : WO/005/18 TENDER  
**No. of samples received** : 13  
**No. of samples analysed** : 13

**Page** : 1 of 7  
**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** : 08-May-2020 16:18  
**Date Analysis Commenced** : 08-May-2020  
**Issue Date** : 19-May-2020 16:16



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 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.**
- EG020: Poor matrix spike recovery was obtained for Lead on sample ES2016445-006 due to matrix interference. Confirmed by reanalysis.
- TDS by method EA-015 may bias high for sample 8 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- 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	GMW102 (Point 9)	GMW103 (Point 10)	GMW104 (Point 11)	GMW105 (Point 12)	GMW106 (Point 13)
Client sampling date / time				08-May-2020 11:45	08-May-2020 11:50	08-May-2020 11:30	08-May-2020 12:05	08-May-2020 12:25	
Compound	CAS Number	LOR	Unit	EW2002206-001	EW2002206-002	EW2002206-003	EW2002206-004	EW2002206-005	
				Result	Result	Result	Result	Result	
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	----	6.9	7.1	5.5	----	
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	1900	934	356	----	
<b>EA015: Total Dissolved Solids</b>									
Total Dissolved Solids @180°C	----	10	mg/L	----	1160	540	290	----	
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	<1	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	<1	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	579	398	51	----	
Total Alkalinity as CaCO3	----	1	mg/L	----	579	398	51	----	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	145	38	15	----	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	----	274	66	67	----	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	----	175	50	9	----	
Magnesium	7439-95-4	1	mg/L	----	63	31	5	----	
Sodium	7440-23-5	1	mg/L	----	179	132	45	----	
Potassium	7440-09-7	1	mg/L	----	<1	<1	<1	----	
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	----	----	6.32	----	----	
Barium	7440-39-3	0.001	mg/L	----	----	0.034	----	----	
Cadmium	7440-43-9	0.0001	mg/L	----	----	0.0001	----	----	
Cobalt	7440-48-4	0.001	mg/L	----	----	0.004	----	----	
Chromium	7440-47-3	0.001	mg/L	----	----	0.004	----	----	
Copper	7440-50-8	0.001	mg/L	----	----	0.010	----	----	
Manganese	7439-96-5	0.001	mg/L	----	----	0.280	----	----	
Lead	7439-92-1	0.001	mg/L	----	----	0.004	----	----	
Zinc	7440-66-6	0.005	mg/L	----	----	0.019	----	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	----	0.02	0.02	0.01	----	
<b>EN67 PK: Field Tests</b>									



**Analytical Results**

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GMW102 (Point 9)	GMW103 (Point 10)	GMW104 (Point 11)	GMW105 (Point 12)	GMW106 (Point 13)
Client sampling date / time					08-May-2020 11:45	08-May-2020 11:50	08-May-2020 11:30	08-May-2020 12:05	08-May-2020 12:25
Compound	CAS Number	LOR	Unit		EW2002206-001	EW2002206-002	EW2002206-003	EW2002206-004	EW2002206-005
					Result	Result	Result	Result	Result
<b>EN67 PK: Field Tests - Continued</b>									
Field Observations	----	0.01	--		DRY	----	----	----	DRY
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L		----	2	1	2	----
<b>FWI-EN/001: Groundwater Sampling - Depth</b>									
Depth	----	0.01	m		----	7.80	7.25	11.1	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID				
				GMW108S (Point 14)	GMW108D (Point 15)	GMW109S (Point 16)	GMW109D (Point 19)	GMW110 (Point 17)
Client sampling date / time				08-May-2020 10:15	08-May-2020 10:30	08-May-2020 09:20	08-May-2020 09:15	08-May-2020 09:00
Compound	CAS Number	LOR	Unit	EW2002206-006	EW2002206-007	EW2002206-008	EW2002206-009	EW2002206-010
				Result	Result	Result	Result	Result
<b>EA005FD: Field pH</b>								
pH	----	0.1	pH Unit	6.6	6.6	5.8	6.5	6.3
<b>EA010FD: Field Conductivity</b>								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	912	3220	1760	1810	4220
<b>EA015: Total Dissolved Solids</b>								
Total Dissolved Solids @180°C	----	10	mg/L	566	1860	2130	1240	2650
<b>ED037P: Alkalinity by PC Titrator</b>								
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	282	527	223	253	636
Total Alkalinity as CaCO3	----	1	mg/L	282	527	223	253	636
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	34	202	186	24	312
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	113	723	425	486	941
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	50	145	114	110	230
Magnesium	7439-95-4	1	mg/L	26	98	66	57	177
Sodium	7440-23-5	1	mg/L	120	467	200	210	518
Potassium	7440-09-7	1	mg/L	4	1	2	1	2
<b>EG020T: Total Metals by ICP-MS</b>								
Aluminium	7429-90-5	0.01	mg/L	----	----	137	----	----
Barium	7440-39-3	0.001	mg/L	----	----	2.19	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	0.0019	----	----
Cobalt	7440-48-4	0.001	mg/L	----	----	0.187	----	----
Chromium	7440-47-3	0.001	mg/L	----	----	0.191	----	----
Copper	7440-50-8	0.001	mg/L	----	----	0.479	----	----
Manganese	7439-96-5	0.001	mg/L	----	----	11.2	----	----
Lead	7439-92-1	0.001	mg/L	----	----	0.187	----	----
Zinc	7440-66-6	0.005	mg/L	----	----	0.784	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	0.16	0.02	0.41	0.09	0.05
<b>EP005: Total Organic Carbon (TOC)</b>								



### Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GMW108S (Point 14)	GMW108D (Point 15)	GMW109S (Point 16)	GMW109D (Point 19)	GMW110 (Point 17)
Client sampling date / time					08-May-2020 10:15	08-May-2020 10:30	08-May-2020 09:20	08-May-2020 09:15	08-May-2020 09:00
Compound	CAS Number	LOR	Unit	EW2002206-006	EW2002206-007	EW2002206-008	EW2002206-009	EW2002206-010	EW2002206-010
				Result	Result	Result	Result	Result	Result
<b>EP005: Total Organic Carbon (TOC) - Continued</b>									
Total Organic Carbon	----	1	mg/L	8	2	9	<1	3	
<b>FWI-EN/001: Groundwater Sampling - Depth</b>									
Depth	----	0.01	m	2.87	2.42	3.29	3.10	4.08	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GMW111 (Point 18)	GABH02 (Point 5)	BH6 (Point 20)	----	----
Client sampling date / time				08-May-2020 08:45	08-May-2020 10:55	08-May-2020 09:50	----	----	
Compound	CAS Number	LOR	Unit	EW2002206-011	EW2002206-012	EW2002206-013	-----	-----	
				Result	Result	Result	----	----	
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	6.7	6.3	6.6	----	----	
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2830	5400	1580	----	----	
<b>EA015: Total Dissolved Solids</b>									
Total Dissolved Solids @180°C	----	10	mg/L	----	----	915	----	----	
Total Dissolved Solids @180°C	----	10	mg/L	1710	3320	----	----	----	
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	646	1210	627	----	----	
Total Alkalinity as CaCO3	----	1	mg/L	646	1210	627	----	----	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	207	159	77	----	----	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	518	1160	157	----	----	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	116	320	86	----	----	
Magnesium	7439-95-4	1	mg/L	87	208	50	----	----	
Sodium	7440-23-5	1	mg/L	429	678	237	----	----	
Potassium	7440-09-7	1	mg/L	2	3	4	----	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	1.11	0.08	0.46	----	----	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	17	7	18	----	----	
<b>FWI-EN/001: Groundwater Sampling - Depth</b>									
Depth	----	0.01	m	6.42	5.22	1.65	----	----	