



CERTIFICATE OF ANALYSIS

Work Order : **EW1500529**

Client : **WOLLONGONG CITY COUNCIL**

Contact : MR WAYDE PETERSON

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Project : Whytes Gully Stage 3 Bores Annual

Order number : 3032573

C-O-C number : ----

Sampler : Craig Wilson

Site : ----

Quote number : SY/454/14 Tender

Page : 1 of 6

Laboratory : Environmental Division NSW South Coast

Contact : Glenn Davies

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QC Level : NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 13-FEB-2015

Issue Date : 24-FEB-2015

No. of samples received : 17

No. of samples analysed : 17

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong
Shobhna Chandra	Metals Coordinator	Sydney Inorganics
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics



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

- **EP005:Nonpurgeable Organic Carbon has been analysed for sample GABH02 due to high Inorganic Carbon content.**
- **Field tests completed on day of sampling/receipt.**
- **Ionic Balance out of acceptable limits for sample 17 due to analytes not quantified in this report.**
- **Sampling and sample data supplied by ALS Wollongong.**
- **Sampling completed as per FWI-EN001 Groundwater Sampling.**
- **Site GMW106 - Dry at time of sampling.**
- **Site GABH01 - Found destroyed at time of sampling.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**



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
				13-FEB-2015 11:20	13-FEB-2015 11:35	13-FEB-2015 10:55	13-FEB-2015 11:55	13-FEB-2015 11:50
				EW1500529-001	EW1500529-002	EW1500529-003	EW1500529-004	EW1500529-005
Compound	CAS Number	LOR	Unit	Client sampling date / time				
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.0	6.8	6.7	5.4	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	245	2280	579	243	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	296	1110	299	198	----
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	84	430	186	39	----
Total Alkalinity as CaCO3	----	1	mg/L	84	430	186	39	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	13	127	31	12	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	16	416	40	29	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	10	176	22	4	----
Magnesium	7439-95-4	1	mg/L	4	67	16	2	----
Sodium	7440-23-5	1	mg/L	34	214	66	42	----
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.04	0.06	<0.01	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	2.40	23.0	5.49	1.85	----
Total Cations	----	0.01	meq/L	2.31	23.6	5.29	2.19	----
Ionic Balance	----	0.01	%	----	1.37	1.93	----	----
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	----	----	----	DRY
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	7	2	2	1	----
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	4.55	7.53	7.39	11.0	----



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				13-FEB-2015 12:50	13-FEB-2015 13:00	13-FEB-2015 08:45	13-FEB-2015 09:00	13-FEB-2015 09:15
Compound	CAS Number	LOR	Unit	EW1500529-006	EW1500529-007	EW1500529-008	EW1500529-009	EW1500529-010
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.6	6.7	6.3	6.8	6.6
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	3220	3080	1650	1690	3910
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	1940	1630	912	968	2250
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	614	483	409	240	596
Total Alkalinity as CaCO3	----	1	mg/L	614	483	409	240	596
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	215	192	104	25	278
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	753	676	256	398	875
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	136	114	109	79	177
Magnesium	7439-95-4	1	mg/L	116	87	45	46	154
Sodium	7440-23-5	1	mg/L	554	524	202	228	580
Potassium	7440-09-7	1	mg/L	<1	<1	3	2	1
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	<0.01	1.28	0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	38.0	32.7	17.6	16.5	42.4
Total Cations	----	0.01	meq/L	40.4	35.6	18.0	17.7	46.8
Ionic Balance	----	0.01	%	3.10	4.26	1.25	3.36	4.90
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	3	<1	8	<1	<1
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	2.56	2.12	3.05	2.85	4.00



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

				GMW111 Point 18	GABH01 Point 2	GABH02 Point 5	GABH03 Point 6	GABH06S Point 7
Client sampling date / time				13-FEB-2015 09:30	13-FEB-2015 12:05	13-FEB-2015 10:35	13-FEB-2015 10:20	13-FEB-2015 12:20
Compound	CAS Number	LOR	Unit	EW1500529-011	EW1500529-012	EW1500529-013	EW1500529-014	EW1500529-015
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.8	----	6.6	6.6	6.9
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2300	----	5220	5370	2990
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	1220	----	2960	3230	1600
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	444	----	1050	714	428
Total Alkalinity as CaCO3	----	1	mg/L	444	----	1050	714	428
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	96	----	165	172	220
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	472	----	1180	1320	646
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	72	----	295	337	77
Magnesium	7439-95-4	1	mg/L	66	----	194	208	75
Sodium	7440-23-5	1	mg/L	400	----	744	614	569
Potassium	7440-09-7	1	mg/L	<1	----	3	2	<1
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	----	<0.01	0.01	0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	24.2	----	57.7	55.1	31.4
Total Cations	----	0.01	meq/L	26.4	----	63.1	60.7	34.8
Ionic Balance	----	0.01	%	4.40	----	4.48	4.85	5.14
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	DESTROYED	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	<1	----	----	4	1
Nonpurgeable Organic Carbon	----	1	mg/L	----	----	7	----	----
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	6.28	----	5.02	0.57	2.38



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

				GABH06D Point 8	BH6 Point 20	----	----	----
				13-FEB-2015 12:30	13-FEB-2015 10:00	----	----	----
				EW1500529-016	EW1500529-017	----	----	----
<i>Compound</i>	<i>CAS Number</i>	<i>LOR</i>	<i>Unit</i>					
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.6	6.7	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2840	4050	----	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	1620	2400	----	----	----
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	353	716	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	353	716	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	171	262	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	644	1030	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	94	110	----	----	----
Magnesium	7439-95-4	1	mg/L	61	120	----	----	----
Sodium	7440-23-5	1	mg/L	497	916	----	----	----
Potassium	7440-09-7	1	mg/L	<1	1	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.05	0.22	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	28.8	48.8	----	----	----
Total Cations	----	0.01	meq/L	31.3	55.2	----	----	----
Ionic Balance	----	0.01	%	4.22	6.14	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	<1	5	----	----	----
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	1.90	1.34	----	----	----