

CERTIFICATE OF ANALYSIS

Work Order : **ES1620004**
Client : **ORIGIN ENERGY RESOURCES LTD**
Contact : [REDACTED]
Address : GPO BOX 2320
ADELAIDE SOUTH AUSTRALIA, AUSTRALIA 5001
Telephone : [REDACTED]
Project : BEETALOO GROUNDWATER MONITORING
Order number : 16231417
C-O-C number : ALS001_915A
Sampler : ----
Site : BEETALOO
Quote number : ----
No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 4
Laboratory : Environmental Division Sydney
Contact : EB ProjectManager
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : [REDACTED]
Date Samples Received : 09-Sep-2016 09:35
Date Analysis Commenced : 09-Sep-2016
Issue Date : 19-Sep-2016 16:37



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.

Signatories	Position	Accreditation Category
[REDACTED]	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
		Sydney Inorganics, Smithfield, NSW
	Lab technician	Sydney Inorganics, Smithfield, NSW
	Metals Teamleader	Radionuclides, Fyshwick, ACT



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.

- EG035: Poor matrix spike recovery was obtained for Mercury on sample ES1620004 #001 due to high matrix interference. Confirmed by re-analysis.
- Gross Alpha and Beta Activity analyses are performed by ALS Fyshwick (NATA Accreditation number 992).
- EP041, NIS, invalided Duplicate and Spike due to insufficient volume.
- TDS by method EA-015 may bias high for samples 1,2 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EN055: Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- EP050: The MBAS reported is calculated as LAS, mol wt ____342____.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- EA250 LSC : LOR for Gross Alpha and Beta raised due to high solid content



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BET-PW001_FF_9	BET-PW001_FF_10	----	----	----
Client sampling date / time					[06-Sep-2016]	[07-Sep-2016]	----	----	----
Compound	CAS Number	LOR	Unit		ES1620004-001	ES1620004-002	-----	-----	-----
				Result	Result		---	---	---
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.88	8.01	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		2550	2540	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		2840	2870	----	----	----
EA016: Calculated TDS (from Electrical Conductivity)									
Total Dissolved Solids (Calc.)	----	1	mg/L		1660	1650	----	----	----
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		460	449	----	----	----
EA250: Gross Alpha and Beta Activity									
Gross alpha	----	0.05	Bq/L		<0.05	<0.05	----	----	----
Gross beta activity - 40K	----	0.1	Bq/L		<0.10	<0.10	----	----	----
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		390	400	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		390	400	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		314	291	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		499	498	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		102	94	----	----	----
Magnesium	7439-95-4	1	mg/L		50	52	----	----	----
Sodium	7440-23-5	1	mg/L		125	123	----	----	----
Potassium	7440-09-7	1	mg/L		12	11	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L		0.18	0.24	----	----	----
Barium	7440-39-3	0.001	mg/L		0.058	0.061	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BET-PW001_FF_9	BET-PW001_FF_10	----	----	----
Client sampling date / time					[06-Sep-2016]	[07-Sep-2016]	----	----	----
Compound	CAS Number	LOR	Unit		ES1620004-001	ES1620004-002	-----	-----	-----
				Result	Result		---	---	---
EG020F: Dissolved Metals by ICP-MS - Continued									
Chromium	7440-47-3	0.001	mg/L		<0.001	0.002	----	----	----
Copper	7440-50-8	0.001	mg/L		0.012	0.011	----	----	----
Manganese	7439-96-5	0.001	mg/L		0.002	0.002	----	----	----
Nickel	7440-02-0	0.001	mg/L		0.001	0.002	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		0.287	0.098	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.5	0.4	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.44	0.82	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		185	193	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		185	194	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		1.63	1.69	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		28.4	28.1	----	----	----
Total Cations	----	0.01	meq/L		14.9	14.6	----	----	----
Ionic Balance	----	0.01	%		31.0	31.6	----	----	----
EP041A: Nonionic Surfactants									
Nonionic Surfactants as CTAS	----	5	mg/L		33	38	----	----	----
EP050: Anionic Surfactants as MBAS									
Anionic Surfactants as MBAS	----	0.1	mg/L		<0.1	<0.1	----	----	----