AGL UPSTREAM INVESTMENTS PTY LTD

CAMDEN GAS PROJECT

Quarterly Produced Water Quality Monitoring Report

Reporting Period: 4th Quarter FY13 - May 2013

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Foreword

PREMISES	Rosalind Park Gas Plant Lot 35 Medhurst Road GILEAD NSW 2560
LICENCE DETAILS	Environment Protection Licence 12003
LICENCEE	AGL Upstream Investments Pty Limited (AGL)
LICENCEE'S ADDRESS	Locked Bag 1837, North Sydney, NSW 2060
MONITORING DATE	4th Quarter FY13– May 2013
MONITORING BY	AGL
ANALYSIS BY	ALS Laboratory, Smithfield (Work order number ES1312255)
REPORT DATE	18 June 2013
REPORT PREPARED BY	Nicola Fry, Hydrogeologist

Introduction

The Camden Gas Project (CGP) is owned and operated by AGL and is located in the Macarthur region 65 km southwest of Sydney, in the Wollondilly, Camden and Campbelltown Local Government Areas (Figure 1). The CGP has been producing gas for the Sydney region since 2001 and currently consists of 144 gas wells, low-pressure underground gas gathering pipes and a gas plant facility. Not all production wells are currently operational. The production wells are licensed with Water Access Licences, Works Approvals and Use Approvals under the *Water Management Act 2000* (NSW), including an allocation of 30 ML per year for the existing CGP and associated dewatering activities from the coal seams.

This Monitoring Report relates to the groundwater monitoring activities specified in Part 5, Monitoring and Recording Conditions, of the Environment Protection Licence. The Licence conditions stipulate groundwater monitoring is required to be carried out at the locations as shown in Table 1 and Figure 1. The specific analytes and frequency tested are shown in Table 2.

The monitoring points that are the subject of this report are part of the CGP groundwater monitoring network, as described in AGL's CGP Groundwater Management Plan (2012). Water samples are taken from each gas well at the separator. The deep groundwater (when brought to the surface) is known as produced water. The water quality samples are analysed by an external NATA certified laboratory (ALS Environmental, Smithfield), in accordance with the EPA Approved Methods Publication "*Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales".*

This report is prepared in accordance with the *Requirements for Publishing Pollution Monitoring Data* (EPA, March 2012) (Publication Requirements).

Table 3 displays the results of this quarter's monitoring.

Produced water from the coal seams at CGP ranges in quality, as a result of localised natural variations within the coal. Electrical conductivity (which is a measure of salinity) typically varies between about 7,000 and 15,000 µS/cm. However, it is not unusual to see values outside of this range. Low water producing wells frequently show very low electrical conductivity values as a result of evaporation and condensation processes occurring in the well bore. These very low values are not representative of formation water samples.

More information on the hydrogeology and groundwater of the CGP is available in the Hydrogeological Summary (AGL, 2013) which can be viewed at the CGP website: http://agl.com.au/Camden

Table 1- Groundwater quality monitoring points (as per EPL 12003)

EPA Identification no.	Location
8	EM40
9	SF08
10	RB10
11	MT05
12	MP12
13	MP30
14	RP12
15	SL03

Table 2 – Analytes monitored and frequency (as per EPL 12003)

Analyte	Units of measure	Frequency	Sampling Method
Aluminium	milligrams per litre	Quarterly	Grab sample
Ammonia	milligrams per litre	Yearly	Grab sample
Arsenic	milligrams per litre	Quarterly	Grab sample
Barium	milligrams per litre	Quarterly	Grab sample
Benzene	milligrams per litre	Yearly	Grab sample
Beryllium	milligrams per litre	Quarterly	Grab sample
Bicarbonate	milligrams per litre	Quarterly	Grab sample
Boron	milligrams per litre	Quarterly	Grab sample
Bromide	milligrams per litre	Quarterly	Grab sample
Cadmium	milligrams per litre	Quarterly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample
Carbonate	milligrams per litre	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample
Chromium	milligrams per litre	Quarterly	Grab sample
Cobalt	milligrams per litre	Quarterly	Grab sample
Copper	milligrams per litre	Quarterly	Grab sample
Electrical conductivity	microsiemens per centimeter	Quarterly	Grab sample
Ethyl benzene	milligrams per litre	Yearly	Grab sample
Fluoride	milligrams per litre	Quarterly	Grab sample
Iron	milligrams per litre	Quarterly	Grab sample
Lead	milligrams per litre	Quarterly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample
Manganese	milligrams per litre	Quarterly	Grab sample
Mercury	milligrams per litre	Quarterly	Grab sample
Methane	milligrams per litre	Yearly	Grab sample
Molybdenum	milligrams per litre	Quarterly	Grab sample
Nickel	milligrams per litre	Quarterly	Grab sample
Nitrate	milligrams per litre	Yearly	Grab sample
Nitrite	milligrams per litre	Yearly	Grab sample
Phenols	milligrams per litre	Yearly	Grab sample
Polycyclic aromatic	milligrams per litre	Yearly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample
Reactive Phosphorus	milligrams per litre	Yearly	Grab sample

Selenium	milligrams per litre	Quarterly	Grab sample
Silica	milligrams per litre	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample
Strontium (dissolved)	milligrams per litre	Quarterly	Grab sample
Sulfate	milligrams per litre	Quarterly	Grab sample
Toluene	milligrams per litre	Yearly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample
Total petroleum hydrocarbons	milligrams per litre	Yearly	Grab sample
Uranium	milligrams per litre	Quarterly	Grab sample
Vanadium	milligrams per litre	Quarterly	Grab sample
Xylene	milligrams per litre	Yearly	Grab sample
Zinc	milligrams per litre	Quarterly	Grab sample

Groundwater Monitoring Results

Table 3 - Produced water monitoring results for 4th Quarter FY13

Monitoring point	8	9	10	11	12	13	14	15
Location	EM40	SF08	RB10	MT05	MP12	MP30	RP12	SL03
Sampled Date	Not sampled as recirculating water	High suspended solids –not able to sample	Not enough water to sample	Not enough water to sample	Not enough water to sample	Not enough water to sample	Not enough water to sample	29/5/2013

	Analyte	Units	Limit of reporting								
Physical	**Electrical conductivity *(lab)**	µS/cm	1								11,800
	Total Dissolved Solids (measured)	mg/L	10								7790
	TSS	mg/L	5								5
Major Cations	**Calcium (Filtered)**	mg/L	1								4
	Magnesium (Filtered)	mg/L	1								4
	Potassium (Filtered)	mg/L	1								10
	Sodium (Filtered)	mg/L	1								3030
	Cations Total	meq/L	0.01								132
Major Anions	**Alkalinity (Bicarbonate as CaCO3)**	mg/L	1								6540
	Alkalinity (Carbonate as CaCO3)	mg/L	1								147
	Alkalinity (Hydroxide) as CaCO3	mg/L	1								<1

	Alkalinity (total) as CaCO3	mg/L	1									6690
	Chloride	mg/L	1									287
	Anions Total	meq/L	0.01									142
	Ionic Balance	%	0.01									3.41
Dissolved Metals	**Aluminium (Filtered)**	mg/L	0.01									<0.01
	Arsenic (Filtered)	mg/L	0.001									0.004
	Barium (Filtered)	mg/L	0.001									9.85
	Beryllium (Filtered)	mg/L	0.001									<0.001
	Boron (Filtered)	mg/L	0.05									0.06
	Cadmium (Filtered)	mg/L	0.0001									<0.0001
	Chromium (III+VI) (Filtered)	mg/L	0.001									0.001
	Cobalt (Filtered)	mg/L	0.001									<0.001
	Copper (Filtered)	mg/L	0.001									<0.001
	Iron (Filtered)	mg/L	0.05									0.13
	Lead (Filtered)	mg/L	0.001									<0.001
	Manganese (Filtered)	mg/L	0.001									0.007
	Mercury (Filtered)	mg/L	0.0001									<0.0001
	Molybdenum (Filtered)	mg/L	0.001									0.007
	Nickel (Filtered)	mg/L	0.001									0.004
	Selenium (Filtered)	mg/L	0.01									<0.01

	Strontium (Filtered)	mg/L	0.001									3.42
	Uranium (Filtered)	mg/L	0.001									<0.001
	Vanadium (Filtered)	mg/L	0.01									<0.01
	Zinc (Filtered)	mg/L	0.005									0.005
Other	**Bromine (dissolved) (Filtered)**	mg/L	0.1									0.6
	Fluoride	mg/L	0.1									1.3
	Iodine (dissolved) (Filtered)	mg/L	0.1									<0.1
	Silica	mg/L	0.1									9.6
	Sulfate (Filtered)	mg/L	1									<1

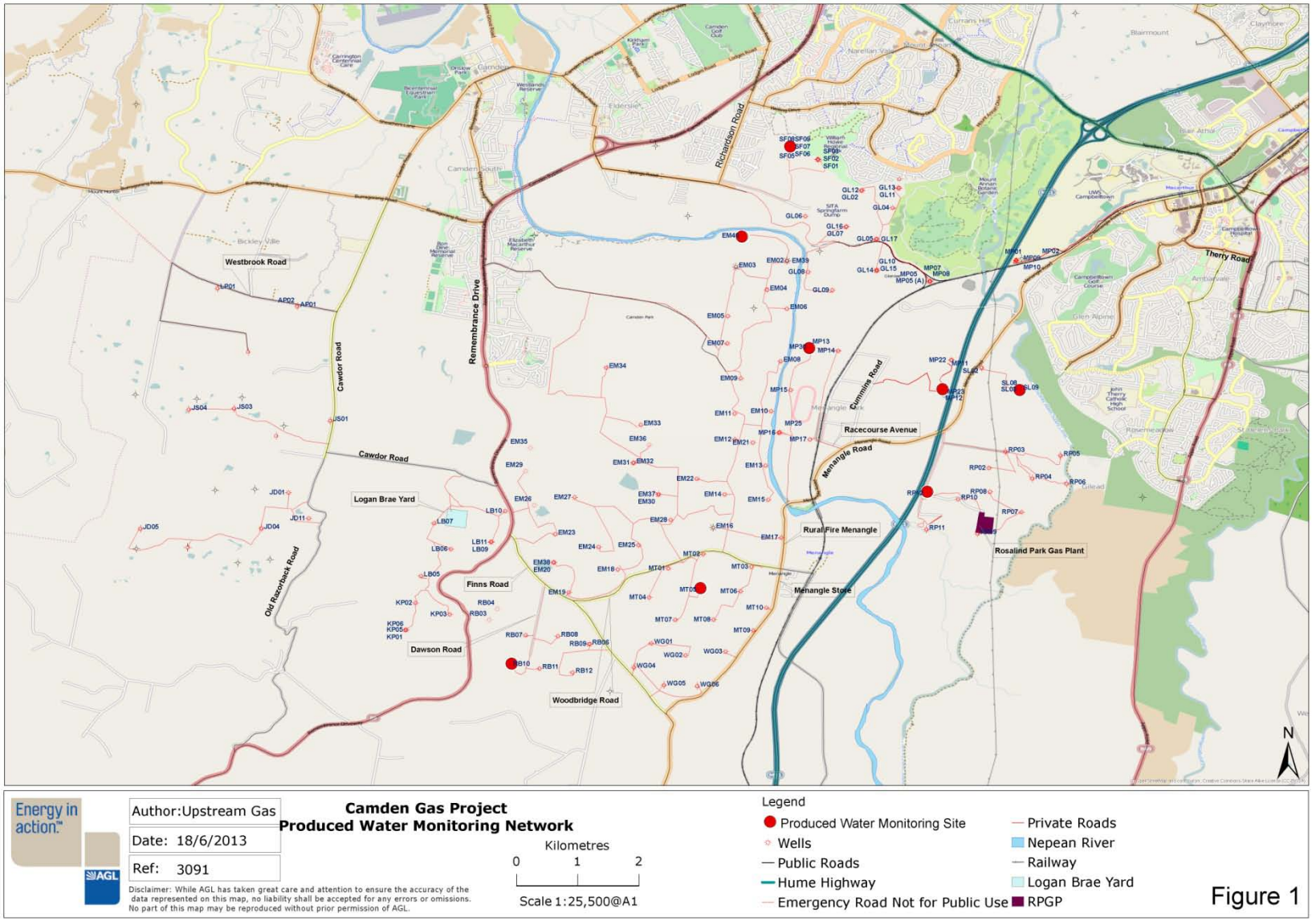

Figure 1- CGP and produced water monitoring locations as listed in EPL12003 (CSG wells)

References

AGL, 2012. Groundwater Management Plan. AGL document. Last revised November 2012. Available online: http://agk.com.au/camden/assets/pdf/Apr2013/AGL_GMP_Camden_V2-4_20121116.pdf

AGL, 2013. Hydrogeological Summary of the Camden Gas Project area. 31st January 2013. Available online: http://agk.com.au/camden/assets/pdf/Apr2013/2013_Camden-Hydrogeological_summary_Final.pdf