

Prepared for:

Queensland Water Supply Regulator,

Department of Energy and Water Supply

## Public Report

# CHINCHILLA BENEFICIAL USE SCHEME

## WATER QUALITY REPORT

**Period: 01 October - 31 December 2013**

**Date:** January 2014

**Project:** P-ASWP-0036-AA-01



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## 1.0 SUMMARY

The Chinchilla Beneficial Use Scheme involves the use of coal seam gas (CSG) water that has been treated at the Kenya Water Treatment Plant (WTP). The overall scheme and pipeline component are managed by SunWater, while the treatment plant operation is managed by QGC Pty Ltd.

SunWater is a bulk water infrastructure developer and manager playing a key role in Australia's water industry, owning and managing around \$7 billion in water infrastructure assets, and supplying approximately 40% of all water used commercially in Queensland.

QGC, a wholly owned subsidiary of the BG Group, is developing CSG fields in the Surat Basin. CSG is transported to a Liquefied Natural Gas (LNG) facility on Curtis Island, prior to export, while the CSG water is treated at WTPs for reuse.

The Chinchilla Beneficial Use Scheme involves the release of treated water to a pipeline and then to the Chinchilla Weir, mainly for use by irrigators. The release of treated water into Chinchilla Weir is regulated under the approved Interim Recycled Water Management Plan (RWMP), which commenced 18 July 2013. The conditions of the approved interim RWMP require the release of quarterly reports covering water quality analysis. The interim RWMP is administered by the Queensland Water Supply Regulator (QWSR).

This report presents a summary of the available water quality monitoring results obtained during the 4<sup>th</sup> quarter of 2013 for the Chinchilla Beneficial Use Scheme. It covers the period 01 October -31 December 2013.

During the quarter, no exceedences to the limits stipulated in the RWMP were observed.

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This report has been produced in accordance with the 'Public Reporting Guideline for Recycled Water Schemes' (DEWS 2011) and the *Water Supply (Safety and Reliability) Act 2008* (the Act).

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## 2.0 INTRODUCTION

During the process of coal seam gas (CSG) extraction, groundwater is released as a by-product, known as CSG water. The quality and quantity of CSG water released through the gas extraction process varies over time and according to the unique geological attributes of a given area. The CSG water quality is generally low, with limited applications for its direct use. To ensure this resource can be beneficially reused, the CSG water is treated to a standard suitable for irrigation, stock watering and augmentation of drinking water supplies. The WTP treats the CSG water to a high standard as per the interim RWMP, through a multi-stage robust treatment process, as detailed in Section 3.

The Kenya WTP and the Kenya to Chinchilla (K2C) Pipeline produce and deliver treated CSG water to agricultural customers for beneficial use as part of the Chinchilla Beneficial Use Scheme. Beneficial use of the treated CSG water occurs along the K2C pipeline and within the existing Chinchilla Weir Water Supply Scheme (between 743.6km and 643km AMTD of the Condamine River) by two groups of customers; agricultural use (irrigation and stock watering); and augmentation of the water supply for the Chinchilla township. The majority of the treated CSG water is used beneficially by irrigators for crop production. Refer Figure 1 for an overview of the Scheme.

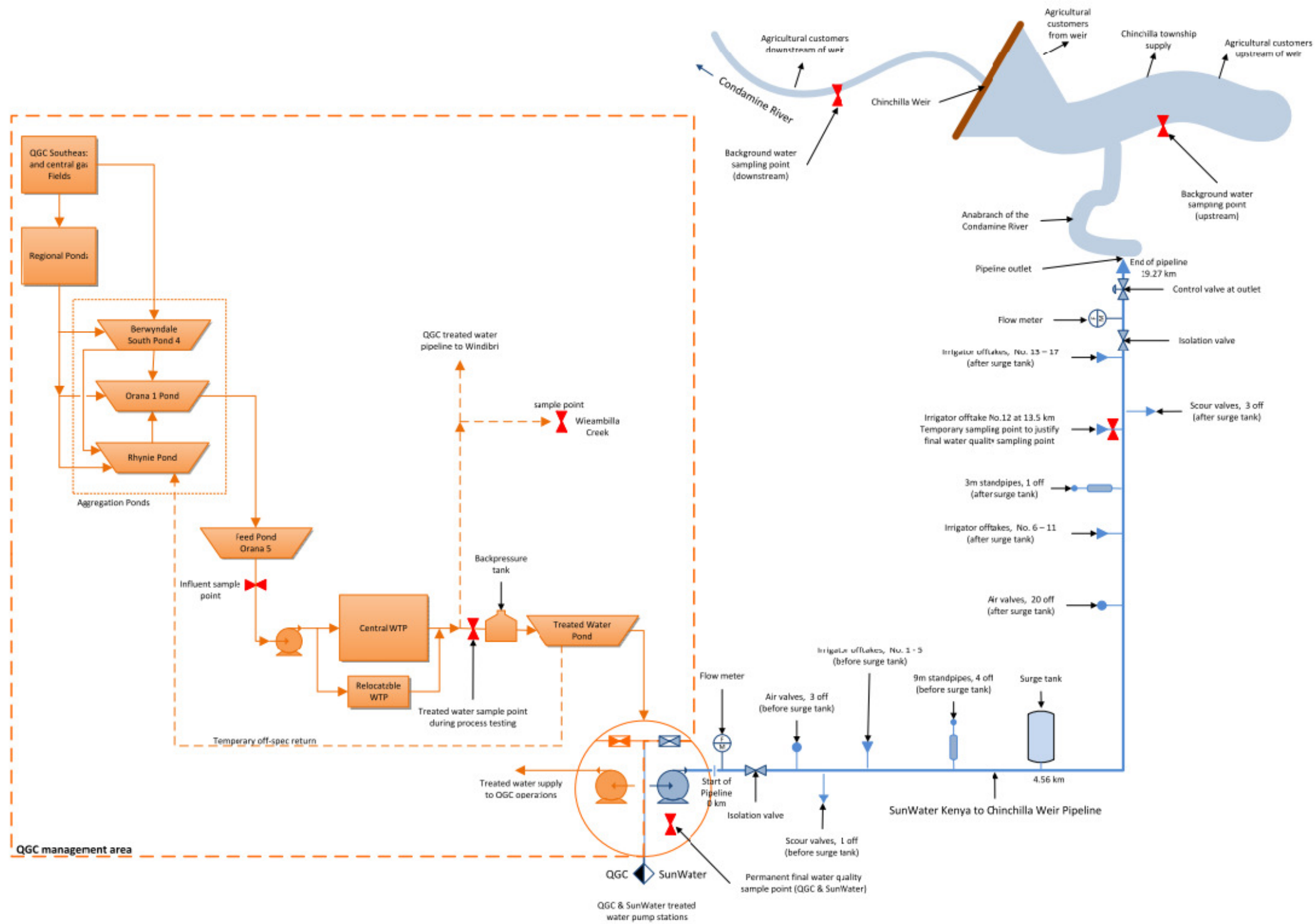


Figure 1: Chinchilla Reuse Scheme overview

The water is distributed to customers in a manner that ensures it does not pass beyond the boundaries of the scheme. This ensures that the Chinchilla Beneficial Use Scheme is operated in a way that preserves and protects the existing cultural and economic values of the receiving environment. The majority of CSG water customers extract water from the Chinchilla Weir. Discharge to the Chinchilla Weir is via the approved discharge point under the RWMP, while monitoring occurs at both the WTP outlet (at the Treated Water Pump Station) and prior to discharge into the Weir.



**Figure 2: Kenya to Chinchilla Weir pipeline outfall location**

To ensure the quality of the water provided to SunWater is consistently of a standard that protects public health and safety, water quality samples are taken weekly and sent to a NATA accredited laboratory for independent analysis and reporting. The suite of analytes monitored in each sample is in accordance with the conditions of the RWMP, which groups analytes into weekly, quarterly and annual monitoring requirements.

This report summarises the results of the weekly and quarterly monitoring conducted during the period 01 October to 31 December 2013. SunWater is presenting this information in a format consistent with the Interim RWMP requirements to provide

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transparency in its operations and providing the community of the Western Downs with relevant information.

This report will be made publicly available and can be viewed and downloaded from the SunWater website at [www.sunwater.com.au](http://www.sunwater.com.au). Any further queries relating to this report can be made by calling 13 15 89.



### 3.0 KENYA WATER TREATMENT FACILITY DESCRIPTION

The Kenya WTP utilises a multiple barrier treatment process including Ultra filtration (UF), Ion Exchange (IX) and Reverse Osmosis (RO). These steps ensure that the water can safely and reliably be produced to a quality suitable for discharge into the Chinchilla Weir. Key steps used in the treatment process include:

- Aggregation & Feed ponds;
- Ultra Filtration
- Ion Exchange;
- Reverse osmosis; and
- Conditioning.

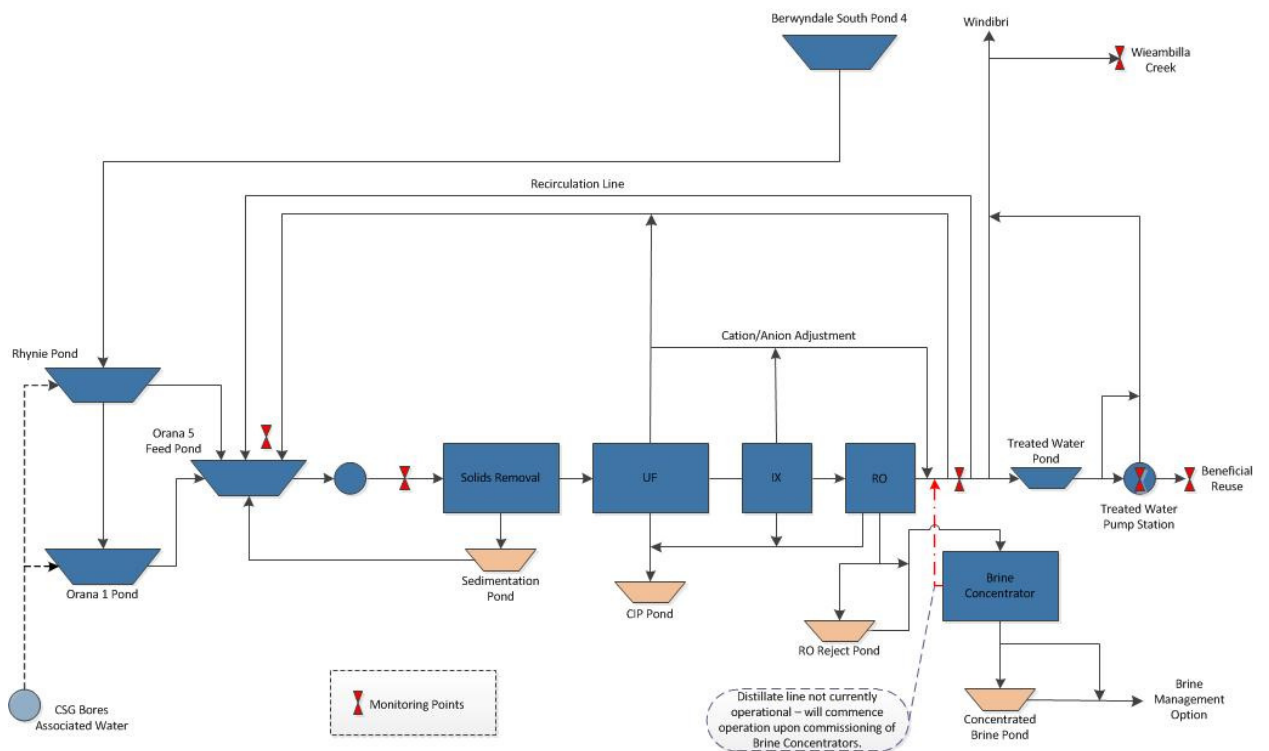


Figure 3: Schematic of Kenya Water Treatment Plant

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### **3.1 AGGREGATION & FEED PONDS**

The water extracted during the CSG extraction process is stored in aggregation ponds before being delivered to the feed pond prior to the Kenya WTP. During the process of storage natural processes take place that alter the characteristics of the water.

### **3.2 ULTRA FILTRATION**

Before being fed to the ultra filtration units, the water passes through disc filters to remove large solids and all other contaminants which could cause irreversible fouling to downstream water treatment processes, excessive frequency of cleaning or premature degradation of the RO membranes. The water may also be dosed with additives to prevent bio-fouling, scaling and aid in coagulation.

The ultra filtration units remove all particulate material, by using a hollow fibre membrane with ultra fine pores.

### **3.3 ION EXCHANGE**

During the Ion Exchange process divalent and trivalent metal ions, such as calcium and magnesium are removed, that would otherwise scale the RO membranes.

### **3.4 REVERSE OSMOSIS**

Water is then passed through the RO process where the water is passed at high pressure through fine membranes. This removes most of the dissolved salts and other trace elements.

At this point the water is then transferred for conditioning prior to being sent into the treated water pond.

### **3.5 CONDITIONING**

Prior to entering the treated water pond the pH of the treated water is adjusted if required to meet stipulated guideline limits (6.5 to 8.5 pH units). At this stage calcium

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and magnesium are also added to ensure the required Sodium Adsorption Ratio (SAR) value is obtained. This is done in accordance with the Beneficial Use Approval (environmental protection requirements) and to ensure suitability with intended reuse objectives.

## 4.0 APPROVALS

In order to discharge into the Chinchilla Weir, SunWater have secured two separate approvals. A notice of approval of a resource for beneficial use (ENBU02701811) was granted on 1 August 2011. This approval is managed under the Queensland Government's Department of Environment and Heritage Protection (DEHP). The Beneficial Use Approval is in place to ensure that the water is appropriately reused and carefully managed to minimise any risk of environmental harm.

On 18 July 2013 SunWater, as Scheme Manager for the multiple-entity Chinchilla Beneficial Use Scheme was issued an approval from the Department of Energy and Water Supply for its interim Recycled Water Management Plan (RWMP). The RWMP is in place to ensure that there will be no adverse effects on a community's water supply.

During the 2013 fourth quarter reporting period no water quality non-compliances were recorded.

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## 5.0 WATER QUALITY MONITORING

### 5.1 EXTERNAL WATER QUALITY MONITORING

Treated water is sampled on a weekly and quarterly basis in the Treated Water Pump Station for the parameters stated in Table 1 of SunWater's interim RWMP approval. Each quarter, one of the weekly sampling events will test for all parameters detailed in Table 1 of the CSG interim RWMP approval, representing a quarterly monitoring round.

During the period of this report, sampling was undertaken on the following dates:

Quarterly Sampling: 14/10/13

Weekly Sampling: 08/10/13, 21/10/13, 31/10/13, 04/11/13, 11/11/13, 18/11/13, 25/11/13, 02/12/13, 09/12/13, 16/12/13, 23/12/13, and 30/12/13.

### 5.2 TREATED WATER TESTING RESULTS

The treated water testing results for the 4<sup>th</sup> quarter of 2013 reporting period are summarised in Table 1. A more detailed listing of the monitoring results is contained in appendix A. All results were compliant with the specified limits specified in the interim RWMP.

**Table 1: Treated Water Monitoring Results Summary for 4th Quarter 2013**

Parameter Group	Parameter	CAS Number	Compliance with Water Quality Limit	Water Quality Limit	Unit	Maximum Detected Concentration for Treated CSG Water
Endocrine Disrupting Compounds	Nonylphenol	25154-52-3	100%	500	µg/L	ND
Disinfection By-Products	Bromochloroacetonitrile	83463-62-1	100%	0.7	µg/L	0.1
	Bromodichloromethane	75-27-4	100%	6	µg/L	ND
	Bromoform	75-25-2	100%	100	µg/L	1.8
	Chloroform(Trichloromethane)	67-66-3	100%	200	µg/L	ND
	Dibromochloromethane (DBCM)	124-48-1	100%	100	µg/L	ND
	Dichloroacetonitrile	3018-12-0	100%	2	µg/L	0.8
Industrial Organics	Bisphenol A	80-05-7	100%	200	µg/L	ND
Inorganics	Bromide	24959-67-9	100%	7000	µg/L	450
	Cyanide – Total	57-12-5	100%	80	µg/L	ND
	Fluoride	16984-48-8	100%	1500	µg/L	100
	Iodide	20461-54-5	100%	100	µg/L	ND
	Sulfate	14808-79-8	100%	500000	µg/L	ND
Metals	Aluminium – Total	7429-90-5	100%	200	µg/L	34
	Antimony – Total	7440-36-0	100%	3	µg/L	2
	Arsenic – Total	7440-38-2	100%	7	µg/L	ND
	Barium – Total	7440-39-3	100%	700	µg/L	3
	Boron – Total	7440-42-8	100%	4000	µg/L	610
	Cadmium – Total	7440-43-9	100%	2	µg/L	0.3
	Chromium – Total	7440-47-3	100%	50	µg/L	1
	Copper – Total	7440-50-8	100%	2000	µg/L	1
	Iron – Total	7439-89-6	100%	300	µg/L	70
	Lead – Total	7439-92-1	100%	10	µg/L	ND
	Manganese – Total	7439-96-5	100%	500	µg/L	2
	Mercury – Total	7439-97-6	100%	1	µg/L	ND
	Molybdenum – Total	7439-98-7	100%	50	µg/L	ND
Nickel – Total	7440-02-0	100%	20	µg/L	ND	

Parameter Group	Parameter	CAS Number	Compliance with Water Quality Limit	Water Quality Limit	Unit	Maximum Detected Concentration for Treated CSG Water
	Selenium – Total	7440-49-2	100%	10	µg/L	ND
	Silver – Total	7440-22-4	100%	100	µg/L	ND
	Strontium – Total	7440-22-4	100%	4000	µg/L	19
	Vanadium – Total	7440-62-2	100%	50	µg/L	ND
	Zinc – Total	7440-66-6	100%	3000	µg/L	8
Nitrosamines	NDMA (n-Nitrosodimethylamine)	62-75-9	100%	0.1	µg/L	ND
Nutrients	Ammonia (as N) – Total	7664-41-7	100%	500	µg/L	50
Polycyclic Aromatic Hydrocarbons	Benz[a]anthracene	56-55-3			µg/L	ND
	Benzo[a]pyrene	50-32-8			µg/L	ND
	Benzo[b+j]fluoranthene	205-99-2 + 205-82-3			µg/L	ND
	Benzo[k]fluoranthene	207-08-9			µg/L	ND
	Chrysene (Benzo[a]phenanthrene)	218-01-9			µg/L	ND
	Dibenzo[a,h]anthracene	53-70-3			µg/L	ND
	Indeno[1,2,3-cd]pyrene	193-39-5			µg/L	ND
	PAH (as B(a)P TEF)		100%	0.01	µg/L	ND
Radionuclides	Lead-210	14255-04-0			Bq/L	ND
	Polonium-210	13981-52-7			Bq/L	ND
	Radium-226	7440-14-4			Bq/L	ND
	Radium-228	15262-20-1			Bq/L	ND
	Total estimated Radiological Dose (Gamma)		100%	0.5	mSv/yr	ND
Total Petroleum Hydrocarbons	C6-C9 Hydrocarbons				µg/L	ND
	C10-C14 Hydrocarbons				µg/L	ND
	C15-C28 Hydrocarbons				µg/L	ND
	C29-C36 Hydrocarbons				µg/L	ND
	Total Petroleum Hydrocarbons		100%	200	µg/L	ND
Volatile Organic Compounds	Benzene	71-43-2	100%	1	µg/L	ND
	Ethylbenzene	100-41-4	100%	300	µg/L	ND
	Meta & Para Xylenes	108-38-3/106-42-3	100%	600	µg/L	ND

Parameter Group	Parameter	CAS Number	Compliance with Water Quality Limit	Water Quality Limit	Unit	Maximum Detected Concentration for Treated CSG Water
	Ortho-Xylene	95-47-6	100%	600	µg/L	ND
	Toluene	108-88-3	100%	800	µg/L	ND
	Total Xylene	1330-20-7	100%	600	µg/L	ND
CAS: Chemical Abstracts Service ND: Indicates that the parameter has not been detected						

### 5.3 NON COMPLIANCES

There were no non compliances recorded between 01 October 2013 and 31 December 2013.

## 6.0 ABBREVIATIONS & ACRONYMS

<b>Term/Abbreviation/Acronym</b>	<b>Definition</b>
µg	Micrograms (1 x 10 <sup>-6</sup> grams)
AMTD	Adopted middle thread distance
BG	British Gas
Bq	Becquerel(s)
CAS	Chemical abstracts service
CSG	Coal seam gas
DERM	Department of Environment and Resource Management
DEHP	Department of Environment and Heritage Protection
DEWS	Department of Environment and Water Supply
IX	Ion exchange
L	Litre(s)
LNG	Liquefied natural gas
LOR	Practical limit of reporting.
mSv	Millisievert (measure of radiation dose)
NATA	National Association of Testing Authorities
ND	Not detected
pH	Power of hydrogen
QGC	Queensland Gas Company
QWSR	Queensland Water Supply Regulator
RO	Reverse Osmosis
RWMP	Recycled Water Management Plan
SAR	Sodium absorption ratio
TEF	Toxicity equivalence factor
the Act	Water Supply (Safety and Reliability) Act 2008
TPH	Total petroleum hydrocarbon(s)
TWPS	Treated water pump station
UF	Ultra filtration
WTP	Water treatment plant



## **APPENDIX A**

# **SUMMARY OF WEEKLY AND QUARTERLY TREATED CSG WATER QUALITY MONITORING FOR 4<sup>TH</sup> QUARTER 2013**

Parameter Group	Parameter	CAS Number	Compliance with Water Quality Limit	Water Quality Limit	Unit	Min	Mean	Max	Count of Samples	Count of positives	Required Testing Frequency
Endocrine Disrupting Compounds	Nonylphenol	25154-52-3	100%	500	µg/L	ND	ND	ND	1	0	Quarterly
Disinfection By-Products	Bromochloroacetonitrile	83463-62-1	100%	0.7	µg/L	ND	0.009	0.1	11	1	Quarterly
	Bromodichloromethane	75-27-4	100%	6	µg/L	ND	ND	ND	1	0	Quarterly
	Bromoform	75-25-2	100%	100	µg/L	1.8	1.8	1.8	1	1	Quarterly
	Chloroform(Trichloromethane)	67-66-3	100%	200	µg/L	ND	ND	ND	1	0	Quarterly
	Dibromochloromethane (DBCM)	124-48-1	100%	100	µg/L	ND	ND	ND	1	0	Quarterly
	Dichloroacetonitrile	3018-12-0	100%	2	µg/L	ND	0.073	0.8	11	1	Quarterly
Industrial Organics	Bisphenol A	80-05-7	100%	200	µg/L	ND	ND	ND	1	0	Quarterly
Inorganics	Bromide	24959-67-9	100%	7000	µg/L	ND	205.385	450	13	12	Weekly
	Cyanide - Total	57-12-5	100%	80	µg/L	ND	ND	ND	13	0	Weekly
	Fluoride	16984-48-8	100%	1500	µg/L	ND	30.769	100	13	3	Weekly
	Iodide	20461-54-5	100%	100	µg/L	ND	ND	ND	13	0	Weekly
	Sulfate	14808-79-8	100%	50000	µg/L	ND	ND	ND	13	0	Weekly
Metals	Aluminium - Total	7429-90-5	100%	200	µg/L	ND	9	34	13	8	Weekly
	Antimony - Total	7440-36-0	100%	3	µg/L	ND	0.167	2	12	1	Quarterly
	Arsenic - Total	7440-38-2	100%	7	µg/L	ND	ND	ND	13	0	Weekly

Parameter Group	Parameter	CAS Number	Compliance with Water Quality Limit	Water Quality Limit	Unit	Min	Mean	Max	Count of Samples	Count of positives	Required Testing Frequency
	Barium - Total	7440-39-3	100%	700	µg/L	ND	0.538	3	13	3	Weekly
	Boron - Total	7440-42-8	100%	4000	µg/L	ND	457.692	610	13	12	Weekly
	Cadmium - Total	7440-43-9	100%	2	µg/L	ND	0.023	0.3	13	1	Weekly
	Chromium - Total	7440-47-3	100%	50	µg/L	ND	0.077	1	13	1	Weekly
	Copper - Total	7440-50-8	100%	2000	µg/L	ND	0.154	1	13	2	Weekly
	Iron - Total	7439-89-6	100%	300	µg/L	ND	9.231	70	13	2	Weekly
	Lead - Total	7439-92-1	100%	10	µg/L	ND	ND	ND	13	0	Weekly
	Manganese - Total	7439-96-5	100%	500	µg/L	ND	0.538	2	13	5	Weekly
	Mercury - Total	7439-97-6	100%	1	µg/L	ND	ND	ND	13	0	Weekly
	Molybdenum - Total	7439-98-7	100%	50	µg/L	ND	ND	ND	13	2	Weekly
	Nickel - Total	7440-02-0	100%	20	µg/L	ND	ND	ND	13	0	Weekly
	Selenium - Total	7440-49-2	100%	10	µg/L	ND	ND	ND	1	0	Quarterly
	Silver - Total	7440-22-4	100%	100	µg/L	ND	ND	ND	1	0	Quarterly
	Strontium - Total	7440-22-4	100%	4000	µg/L	6	9.385	19	13	13	Weekly
	Vanadium - Total	7440-62-2	100%	50	µg/L	ND	ND	ND	1	0	Quarterly
Zinc - Total	7440-66-6	100%	3000	µg/L	ND	2.846	8	13	6	Weekly	
Nitrosamines	NDMA (n-Nitrosodimethylamine)	62-75-9	100%	0.1	µg/L	ND	ND	ND	13	0	Weekly

Parameter Group	Parameter	CAS Number	Compliance with Water Quality Limit	Water Quality Limit	Unit	Min	Mean	Max	Count of Samples	Count of positives	Required Testing Frequency
Nutrients	Ammonia (as N) - Total	7664-41-7	100%	500	µg/L	ND	3.846	50	13	1	Weekly
Polycyclic Aromatic Hydrocarbons	Benz[a]anthracene	56-55-3	Limits apply to summed total of Concentration X TEF.		µg/L	ND	ND	ND	13	0	Weekly
	Benzo[a]pyrene	50-32-8			µg/L	ND	ND	ND	13	0	Weekly
	Benzo[b+j]fluoranthene	205-99-2 + 205-82-3			µg/L	ND	ND	ND	13	0	Weekly
	Benzo[k]fluoranthene	207-08-9			µg/L	ND	ND	ND	13	0	Weekly
	Chrysene (Benzo[a]phenanthrene)	218-01-9			µg/L	ND	ND	ND	13	0	Weekly
	Dibenzo[a,h]anthracene	53-70-3			µg/L	ND	ND	ND	13	0	Weekly
	Indeno[1,2,3-cd]pyrene	193-39-5			µg/L	ND	ND	ND	13	0	Weekly
	PAH (as B(a)P TEF)		100%	0.01	µg/L	ND	ND	ND	13	0	Weekly
Radionuclides	Lead-210	14255-04-0	Limits apply to summed total.		Bq/L	ND	ND	ND	1	0	Quarterly
	Polonium-210	13981-52-7			Bq/L	ND	ND	ND	1	0	Quarterly
	Radium-226	7440-14-4			Bq/L	ND	ND	ND	1	0	Quarterly
	Radium-228	15262-20-1			Bq/L	ND	ND	ND	1	0	Quarterly
	Total est Radiological Dose (Gamma)		100%	0.5	mSv/yr	ND	ND	ND	1	0	Quarterly

Parameter Group	Parameter	CAS Number	Compliance with Water Quality Limit	Water Quality Limit	Unit	Min	Mean	Max	Count of Samples	Count of positives	Required Testing Frequency
Total Petroleum Hydrocarbons	C6-C9 Hydrocarbons		Limits apply to summed total.		µg/L	ND	ND	ND	13	0	Weekly
	C10-C14 Hydrocarbons				µg/L	ND	ND	ND	13	0	Weekly
	C15-C28 Hydrocarbons				µg/L	ND	ND	ND	13	0	Weekly
	C29-C36 Hydrocarbons				µg/L	ND	ND	ND	13	0	Weekly
	Total Petroleum Hydrocarbons		100%	200	µg/L	ND	ND	ND	13	0	Weekly
Volatile Organic Compounds	Benzene	71-43-2	100%	1	µg/L	ND	ND	ND	13	0	Weekly
	Ethylbenzene	100-41-4	100%	300	µg/L	ND	ND	ND	13	0	Weekly
	Meta & Para Xylenes	108-38-3/106-42-3	100%	600	µg/L	ND	ND	ND	13	0	Weekly
	Ortho-Xylene	95-47-6	100%	600	µg/L	ND	ND	ND	13	0	Weekly
	Toluene	108-88-3	100%	800	µg/L	ND	ND	ND	13	0	Weekly
	Total Xylene	1330-20-7	100%	600	µg/L	ND	ND	ND	13	0	Weekly
<p>Note *1: The mean has been calculated by interpreting results either not detected (ND) or less than Limit of Reporting (&lt;LOR) as zero in line with section 2.5.2 of the Public Reporting Guideline for Recycled Water Schemes.</p> <p>Note *2: 'Count of positives' indicates results recorded above the detection limit.</p>											