AUSTRALIA PACIFIC LNG

Public Report

Q-8220-15-RP-001

Spring Gully Water Treatment Facility Discharge Water Quality Report

Contents

1. Summary

Australia Pacific LNG is a joint venture between Origin, ConocoPhillips and Sinopec, to deliver a CSG to LNG project which will deliver gas to domestic and overseas markets.

Australia Pacific LNG is the leading CSG producer in Queensland, supplying more than 40% of the State's domestic gas requirements.

The SGWTF has been designed using the best available technology to treat water produced as part of the gas extraction process so that it can be put to a number of beneficial uses primarily for irrigation of a 300 hectare pongamia plantation; and operations and construction activities. Any surplus treated CSG water is discharged into Eurombah Creek, which flows in to the Dawson River. The Dawson River is a source of public drinking water.

Further, Australia Pacific LNG is also proposing to undertake a trial to inject treated CSG water into the precipice sandstone aquifer.

The following reports a summary of water quality monitoring undertaken at Australia Pacific LNG's Spring Gully Water Treatment Facility (SGWTF) to demonstrate that the discharge of treated CSG water will not have a material impact on any sources of drinking water.

2. Introduction

Coal seam gas (CSG) production relies on the removal of water from the coal seams allowing the flow of gas so that it can be readily extracted. The removed water is referred to as CSG water.

CSG water is brackish and highly alkaline in nature and therefore has very few applications for use. However, after treatment through a desalination process, CSG water can be put to effective and beneficial use.

The Spring Gully Water Treatment Facility (SGWTF) is one of Australia Pacific LNG's major installations where CSG water is treated. The SGWTF uses the best available technologies to treat the water to a high standard.

Once treated, the CSG water is used onsite for Australia Pacific LNG's business activities including a 300 hectare Pongamia irrigation plantation and construction activities. This reduces Australia Pacific LNG's reliance on other water resources.

The potential to develop an aquifer injection project close to the SGWTF is also been considered as an alternative use for the treated CSG water. The trials for this project are due to start in the last quarter of 2011.

Finally, the treated CSG water is also discharged to the Eurombah Creek, which flows in to the Dawson River. The River is an essential resource to the local communities and landowners in the region. It is the principal drinking water supply for the Cracow, Theodore, Moura, Baralaba, and Duaringa Townships located two hundred kilometres downstream from the SGWTF, as well being used for agricultural irrigation and to support local industries. Protection is therefore vital to ensure its long term sustainable use.

Figure 1 – SGWTF Discharge Location

To ensure the safety and reliability of the treated CSG water entering possible sources of drinking water, Australia Pacific LNG undertook a comprehensive monitoring program of water quality sampling, testing and reporting. This report summarises the results of that monitoring conducted during the first half of 2011.

In presenting this information Australia Pacific LNG honours its commitment to providing transparency and ensuring the community, landowners and other key stakeholders have confidence that the treated CSG water can safely be discharged into a source of drinking water.

All the reporting is publically available and can be viewed and downloaded from the Australia Pacific LNG website at www.aplng.com.au. Any enquiries relating to this report should be made to toll free number 1800 526 369.

Alternatively, general enquires can be made by email (contact@aplng.com.au) or mail to Australia Pacific LNG Pty Limited, GPO Box 148, Brisbane, QLD, 4001.

3. Spring Gully Water Treatment Facility Scheme Description

The SGWTF uses a series of water screening, filtration and desalination processes to remove impurities from the CSG water to ensure its safety and reliability for supply into a drinking water source and beneficial uses. The key treatment processes include:

- Feed pond;
- Filtration;
- Reverse osmosis; and
- Treated CSG water conditioning.

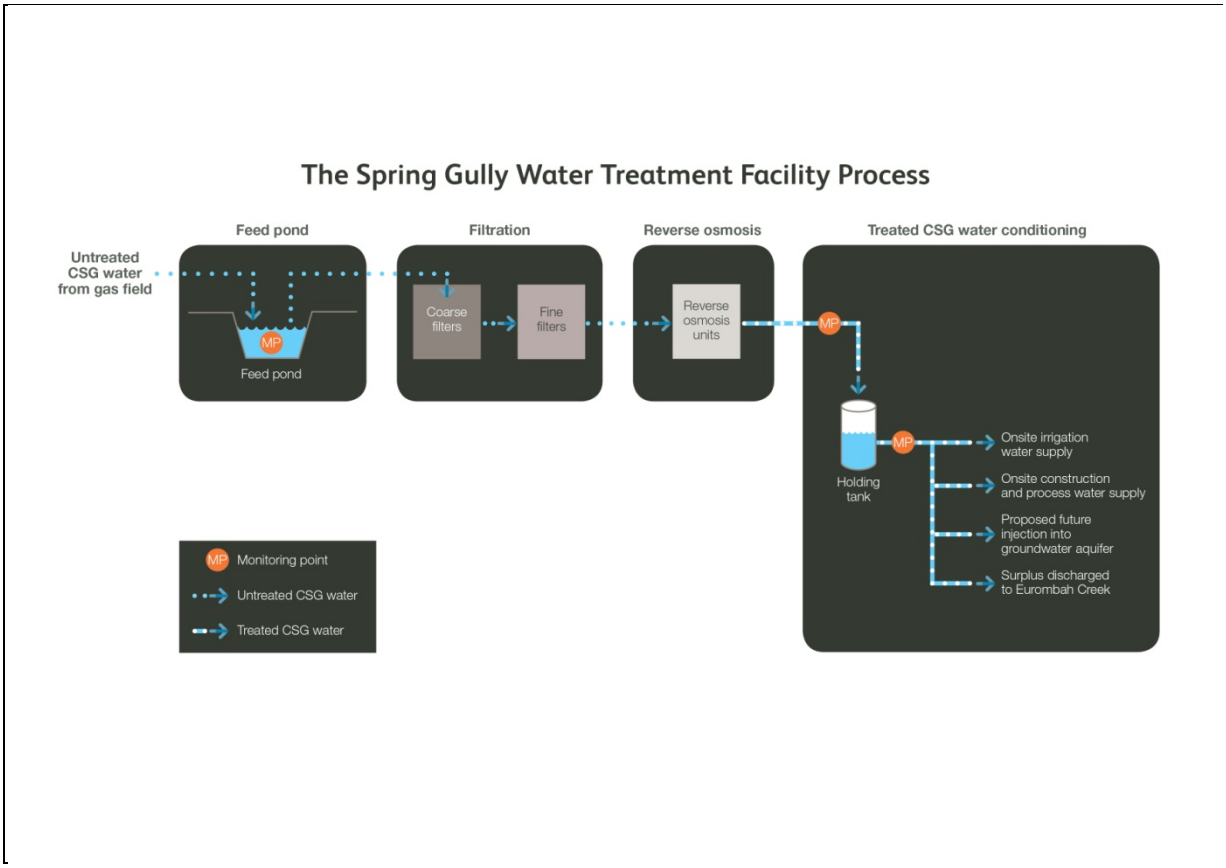

Figure 2 – SGWTF Process Schematic

3.1. Feed Pond

Untreated CSG water gathered from the gas field is temporarily stored in a feed pond prior to its treatment by the SGWTF. The feed pond holds the CSG water for a few weeks. This allows the settlement of coarse suspended sediments and provides opportunity for the CSG water to aerate and oxygenate.

3.2. Filtration

The CSG water is then passed through a coarse filter and then a fine filter to remove any particles or suspended sediments that have not settled within the feed pond. A disinfectant commonly used in domestic water treatment facilities is also add during filtration process to protect the membranes used in the following reverse osmosis process.

3.3. Reverse Osmosis

Reverse osmosis involves passing the CSG water through fine membranes at high pressure. This removes most of the dissolved salts and other trace elements. At this point the water is either transferred to beneficial reuse applications on site or discharged.

3.4. Treated CSG Water Conditioning

The pH and conductivity of the treated CSG water is continuously monitored to ensure it is safe to use or discharge. Where the treated CSG water is discharged to Eurombah Creek, a calcium salt is added. This conditioning is undertaken to ensure a minimum level of this element is present in Eurombah Creek. Calcium is normally present at much higher concentrations in river waters and municipal drinking water supplies.

4. Monitoring, Approvals and Results

To be able to discharge into a source of public drinking water, Australia Pacific LNG had to gain approval from the Queensland Government's Department of Environment and Resource Management (DERM). Regular and comprehensive water quality monitoring is currently undertaken to guarantee the ongoing effectiveness of the SGWTF in treating CSG water.

This monitoring includes:

- periodic external, independent testing of the untreated and treated CSG water quality; and
- continuous live monitoring throughout various stages of the SGWTF process to ensure operational performance against the plant's design specifications.

4.1. External Laboratory Monitoring

The CSG water and treated CSG water is periodically sampled and sent to an independent laboratory for testing. The sampling takes place at two monitoring locations:

- at the feed pond; and
- on exit from the desalination process (immediately prior to discharge).

The samples are tested for a comprehensive range of parameters and a summary is shown in Attachment 1 provided at the end of this report.

This water quality monitoring is undertaken using an industry-wide protocol developed by Standards Australia and DERM. Following these standards ensures the water samples are correctly obtained, stored and transported to allow accurate and representative testing in the laboratory.

The water is tested at the Queensland Health Forensic and Scientific Services laboratory. This laboratory is independent to Australia Pacific LNG's operations and is National Association of Testing Authorities (NATA) accredited.

"NATA is the authority that provides independent assurance of technical competence through a proven network of best practice industry experts for customers who require confidence in the delivery of their products and services" – NATA website.

During the first half of 2011, there were ten sampling occasions where treated CSG water was being discharged to Eurombah Creek, with the majority of treated CSG water being used for irrigation of the pongamia plantation. On all ten sampling occasions, the treated CSG water met all the discharge water quality limits set by DERM prior to its discharge to Eurombah Creek.

The monitoring of untreated CSG water showed that after the initial process of settlement, aeration and oxygenation in the feed pond only 8 parameters were found to be above the discharge water quality limits. After treatment by the SGWTF, all 8 parameters were below the water quality limits. This is summarised in the table further below.

Those parameters that were detected in the treated CSG water are notably less than the discharge water quality limits. This confirms the SGWTF processes are both safe and reliable at treating CSG water prior to its discharge into a source of drinking water.

A complete summary of the monitoring data is provided in Attachment 1 of this report along with a glossary of the parameters analysed.

Table 1 - Summary of the Characterisation Testing - Showing Detected Maximum Concentrations

Parameter		Water Quality Limit	Unit	Maximum Detected Concentration Untreated CSG Water (Feed pond)	Maximum Detected Concentration Treated CSG Water (prior to discharge)
Inorganic Compounds	Bromine	7000	µg/L	11000	210
	Fluoride	1500	µg/L	8200	150
	Iodide	500	µg/L	3500	ND
Metals	Aluminium	200	µg/L	780	120
	Barium	700	µg/L	4100	180
	Boron	4000	µg/L	5000	530
	Strontium	4000	µg/L	4700	53
Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons	200	µg/L	385	140

Notes:

ND – Not detected by the Laboratory

4.2. SGWTF Online Indicator Monitoring

The SGWTF has a number of online test probes located throughout the treatment process. These provide real-time data about water quality. The online monitoring looks at a number of fundamental indicator parameters including pH, turbidity and conductivity.

It is not practical to continually test all of the parameters that are externally monitored; however the indicators checked by the online system provide a view of the performance of the facility. Should any of these indicators vary from their expected limits, the onsite use and discharge to any source of drinking water supply is suspended immediately until further investigation and monitoring is undertaken and any required corrections made.

Attachment 1: Summary of Weekly Treated CSG Water Quality Monitoring Results

The following section presents a summary of the weekly monitoring undertaken on the treated CSG water discharged to Eurombah Creek. The monitoring results have been summarised to show the following:

Parameter – This lists the public health water quality parameters tested at the point of discharge. An explanation of the parameters is provided in the Glossary.

Water Quality Limit – This shows the limits set by DERM.

Unit –This shows the corresponding parameter unit of measurement. It is presented in micro-grams (µg)) per litre (L) unless otherwise stated. This unit can also be represented as 'parts per billion' (ppb). Exceptions to this are listed in the reporting tables.

Maximum Detected Concentration Untreated CSG Water – Shows maximum concentration recorded for samples taken within the feed pond.

Maximum Detected Concentration Treated CSG Water – Shows the maximum concentration recorded for samples taken immediately prior to discharge to Eurombah Creek. It should be noted that for the first half of 2011, there were only ten sampling occasions where discharge to Eurombah Creek was occurring. For the remaining time, treated CSG water was primarily being used for irrigation of the pongamia plantation.

Parameter		Water Quality Limit	Unit	Maximum Detected Concentration Untreated CSG Water (Feed pond)	Maximum Detected Concentration Treated CSG Water (prior to discharge)
BTEX	Benzene	1	µg/L	ND	ND
	Ethylbenzene	300	µg/L	ND	ND
	Toluene	800	µg/L	ND	ND
	Xylene (m & p)	600	µg/L	ND	ND
	Xylene (o)	600	µg/L	ND	ND
	Xylene Total	600	µg/L	ND	ND
Chlorinated Hydrocarbons	Bromochloroacetonitrile	200	µg/L	Refer Note 1	ND
	Dichloroacetonitrile	2	µg/L	Refer Note 1	ND
Endocrine-Disrupting Chemicals and Hormones	Bisphenol A	200	µg/L	0.09	0.01
	Nonylphenol	500	µg/L	0.18	ND
Inorganic Compounds	Bromine	7000	µg/L	11000	210
	Calcium	>5000	µg/L	11000	74000
	Cyanide Total	80	µg/L	ND	ND
	Fluoride	1500	µg/L	8200	150
	Iodide	500	µg/L	3500	ND
Inorganic Compounds	pH (Lab)	6.5-9.0	-	9.37	7.99
	Sulphate	500000	µg/L	ND	ND

Parameter		Water Quality Limit	Unit	Maximum Detected Concentration Untreated CSG Water (Feed pond)	Maximum Detected Concentration Treated CSG Water (prior to discharge)
Metals	Aluminium	200	µg/L	780	120
	Antimony	3	µg/L	0.40	ND
	Arsenic	7	µg/L	5.00	0.3
	Barium	700	µg/L	4100	180
	Boron	4000	µg/L	5000	530
	Cadmium	2	µg/L	0.30	ND
	Chromium (hexavalent)	50	µg/L	0.90	0.20
	Copper	2000	µg/L	2.00	ND
	Lead	10	µg/L	1.20	0.3
	Manganese	500	µg/L	64.0	1.2
	Mercury	1	µg/L	ND	ND
	Molybdenum	50	µg/L	2.10	ND
	Nickel	20	µg/L	1.70	ND
	Selenium	10	µg/L	2.00	ND
	Silver	100	µg/L	ND	ND
	Strontium	4000	µg/L	4700	53
	Uranium	20	µg/L	1.00	ND

Parameter		Water Quality Limit	Unit	Maximum Detected Concentration Untreated CSG Water (Feed pond)	Maximum Detected Concentration Treated CSG Water (prior to discharge)
Metals	Vanadium	50	µg/L	5.10	ND
	Zinc	3000	µg/L	23	13
Nitrosamines	N-Nitrosodimethylamine (NDMA)	0.1	µg/L	Refer Note 1	ND
Poly Aromatic Hydrocarbons	Benzo(a) pyrene	0.01	µg/L	ND	ND
Radiological Products	Alpha Emitters	0.5	Bq/L	0.20	ND
	Beta Emitters	0.5	Bq/L	ND	0.14
	Radon	0.5	Bq/L	0.30	0.10
Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons	200	µg/L	385	140
Trihalomethanes	Total Trihalomethanes	200	µg/L	ND	ND

Notes:

ND – Not detected by the Laboratory.

1. Untreated CSG water is not analysed for these parameters as they are a by-product of adding disinfectant and are therefore not expected to occur in these samples.

Glossary

Whilst this document reports the quality of the discharged treated CSG water, extensive and weekly sampling is undertaken across the Facility, including testing the water pre and post treatment.

This allows Australia Pacific LNG to understand the composition of the CSG water and treat it to ensure it can be discharged to a source of drinking water.

The parameters set by DERM consider a wide chemistry associated with the petrochemical, oil and gas and water treatment industries. A brief definition of the sets of parameters contained within the reported information is provided below.

BTEX – BTEX is an acronym representing benzene, toluene, ethylbenzene, and xylenes. These are compounds that may be associated with oil and gas production. BTEX are generally not associated with CSG production, although may occur at trace levels.

Chlorinated Hydrocarbons – These are organic compounds that may be generated as a by-product of chlorination. They are considered commonplace in everyday life and can occur naturally, in some animals or as the by-product of fires.

Endocrine-Disrupting Chemicals (EDCs) and Hormones – The two relevant compounds include Bysphenol A (BPA) and Nonylphenol. BPA is often associated with moulded plastic. Nonylphenol can be found in commercial detergents.

Inorganic Compounds – These compounds relate to the branch of chemistry where two or more non-carbon based elements are combined. In terms of drinking water chemistry they include compounds such as ammonia, alkalinity (calcium carbonate), chloride, electrical conductivity, fluoride and total dissolved solids.

Metals – These naturally occur in drinking water due to the water passing through metal-enriched rock. Certain metals are essential for life. Also specific metal-based salts, namely calcium is added to the treated CSG water prior to discharge to the Creek.

Nitrosomines – These compounds are commonly associated with water treatment facilities that utilise choramines for disinfection.

Poly Aromatic Hydrocarbons (PAH) – PAH occur in oil, coal and tar products and may be associated with water extracted from coal seams at low levels. They are naturally occurring and do not readily dissolve in water.

Total Petroleum Hydrocarbons (TPH) – TPH is the term given to a mixture of hydrocarbons (compounds that contain hydrogen and carbon) that occur naturally and in oil, coal and tar products. TPH is associated with CSG water at low levels.

Trihalomethanes – These include the branch of chemical compounds that may be formed as a by-product of disinfecting drinking water with chorine or monochloramine.

Radiological Products – These occur naturally in drinking water at extremely low concentrations via contact with certain rock such as granite.

This Report has been produced in accordance with the Queensland Government's *Public Reporting Guideline for Recycled Water Schemes* (DERM, 2011) and the *Water Supply (Safety and Reliability) Act 2008* (the Act). Australia Pacific LNG is currently seeking an 'exclusion decision' under the Act to demonstrate it has no material impact on drinking water supplies for either the discharge of treated CSG water to Eurombah Creek or proposed injection in to the precipice sandstone aquifer.