



Public Report

Q-8220-15-RP-007

Spring Gully Water Treatment Facility Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)

| | |
|------------------------|---|
| Version: | Rev 1 |
| Released: | 16/02/2012 |
| Document Owner: | Manager - Land, Environment and Stakeholder |
| Review Date: | N/A |

*Please see Document control section for more information

Once printed, this is an uncontrolled document
unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)



Contents

| | |
|---|-----------|
| 1. Summary | 3 |
| 2. Introduction | 3 |
| 3. Spring Gully Water Treatment Facility Scheme Description | 5 |
| 3.1. Feed Pond | 5 |
| 3.2. Filtration | 6 |
| 3.3. Reverse Osmosis | 6 |
| 3.4. Treated CSG Water Conditioning | 6 |
| 4. Approvals, Monitoring and Results | 6 |
| 4.1. External Laboratory Monitoring | 7 |
| 4.2. SGWTF Online Indicator Monitoring | 8 |
| Attachment 1: Summary of Weekly Treated CSG Water Quality Monitoring Results | 9 |
| Glossary | 13 |
| ABBREVIATIONS & ACRONYMS | 14 |
| Document Control | 15 |

Controlled Q-8220-15-RP-007
Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document
unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)



1. Summary

Australia Pacific LNG is a joint venture between Origin, ConocoPhillips and Sinopec, to deliver a coal seam gas (CSG) to liquefied natural gas (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 Spring Gully Water Treatment Facility (SGWTF) has been designed using the best available technology to treat water produced as part of the gas extraction process. The treated water is used primarily for irrigation of a 300 hectare pongamia plantation. During periods of high rainfall where irrigation is not required, surplus treated CSG water is discharged into Eurombah Creek, which flows into the Dawson River.

To further reduce the requirement to discharge treated CSG water into Eurombah Creek, Australia Pacific LNG is undertaking reinjection trials. This project is currently in the evaluation phase. Trials to inject treated CSG water into the Precipice sandstone aquifer are due to start in the first quarter of 2012.

The following reports a summary of water quality monitoring undertaken at Australia Pacific LNG's SGWTF during the fourth quarter of Year 2011.

2. Introduction

CSG production relies on the removal of water from the coal seams allowing gas to be readily extracted. The removed water is referred to as CSG water.

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

The 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 being considered as an alternative use for the treated CSG water. The trials for this project are due to start in the first quarter of 2012.

Surplus treated CSG water is discharged to the Eurombah Creek, which flows in to the Dawson River. The Dawson 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 greater than two hundred kilometres downstream from the SGWTF, as well as being used for agricultural irrigation and to support local industries. Protection is therefore vital to ensure its long term sustainable use. Modelling has shown that the treated CSG water discharged from SGWTF, on average makes

Spring Gully Water Treatment Facility Quarterly Discharge Water Quality Report (1 October to 31 December 2011)



up less than 1% of the total flow at the closest drinking water supply (i.e. at the Gylanda Weir).



Figure 1 - SGWTF Discharge Location

To ensure the safety and reliability of the treated CSG water entering potential 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 fourth quarter (i.e. from 1 October to 31 December) Year 2011. .

In providing 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 Eurombah Creek.

All the reporting is publicly 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.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)

3. Spring Gully Water Treatment Facility Scheme Description

The SGWTF uses a series of water screening, filtration and reverse osmosis 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.

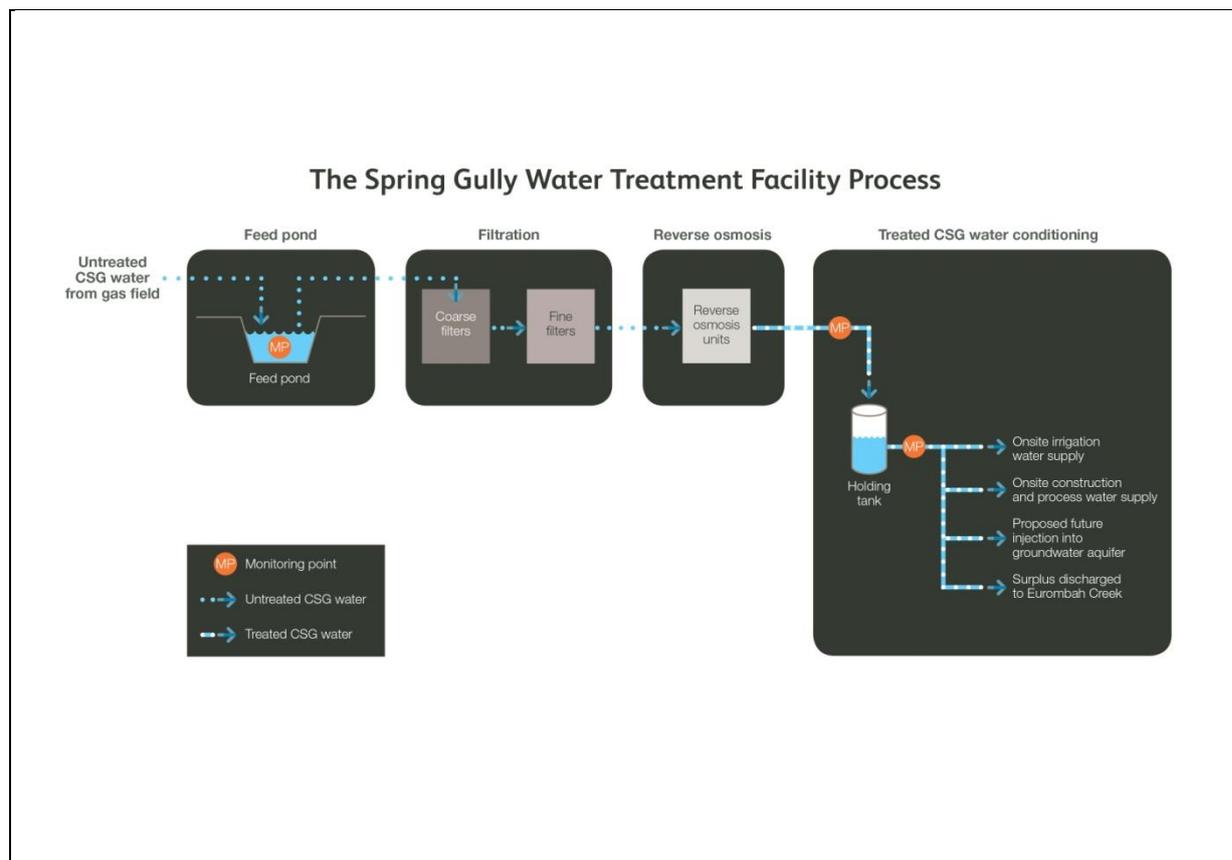


Figure 2 – SGWTF Process Schematic

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 untreated CSG water for approximately one to two weeks. This allows the settlement of coarse suspended sediments and provides opportunity for the untreated CSG water to aerate and oxygenate.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)



3.2. Filtration

The untreated 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 added after the filtration process to protect the treatment system and membranes used in the following reverse osmosis process.

3.3. Reverse Osmosis

Reverse osmosis involves passing the untreated 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, calcium is added. This conditioning is undertaken to ensure a minimum level of this element is present in Eurombah Creek to protect the environment. Calcium is normally present at much higher concentrations in river waters and municipal drinking water supplies.

4. Approvals, Monitoring and Results

In order to discharge to Eurombah Creek, Australia Pacific LNG gained approval from the Queensland Government's Department of Environment and Resource Management (DERM). The approval was granted under two separate pieces of the Queensland legislation; the Environmental Protection Act (1994) and the Water Supply (Safety and Reliability) Act 2008.

Regular and comprehensive water quality monitoring is required by the *Water supply (Safety and Reliability) Act 2008* to assess 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.

On the 9th of January 2012, Australia Pacific LNG received an exclusion decision under the *Water Supply (Safety and Reliability) Act 2008* for the discharge of treated CSG water to Eurombah Creek. This exclusion decision was made on the basis that Australia Pacific LNG is not likely to have a material impact on any downstream drinking water supplies. The content of future quarterly reports will reflect the reporting requirements outlined within this exclusion decision

DERM has also approved the use of treated CSG water from the SGWTF for the proposed aquifer injection project trial. The aquifer injection trial is expected to commence in the first quarter of Year 2012.

Controlled Q-8220-15-RP-007
Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document
unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)



4.1. External Laboratory Monitoring

The treated CSG water is periodically sampled and sent to an independent laboratory for testing. The sampling takes place at the exit from the desalination process immediately prior to discharge. In cases where the sampling point immediately prior to the discharge point is inaccessible or no water is discharged to Eurombah Creek, samples are collected after the holding tank.

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.

The monitoring of treated CSG water from the SGWTF, showed that all parameters were below the water quality limits for the reporting period. This is summarised in the Table 1. A complete summary of the monitoring data is provided in Attachment 1 of this report along with a glossary of the parameters analysed.

Those parameters that were detected are notably less than the discharge water quality limits, indicating the SGWTF complied with its discharge limits during the reporting period.

Spring Gully Water Treatment Facility
 Quarterly Discharge Water Quality Report
 (1 October to 31 December 2011)



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

| Parameter | | Water Quality Limit | Unit | Maximum Detected Concentration of Treated CSG Water (prior to discharge) |
|----------------------------|-----------|---------------------|------|--|
| Inorganic Compounds | Bromide# | 7000 | µg/L | 300 |
| | Cyanide | 80 | µg/L | 20*^ |
| | Fluoride | 1500 | µg/L | 120 |
| | Iodide | 500 | µg/L | 100* |
| | pH (Lab) | 6.5-9.0 | - | 7.91 |
| Metals | Aluminium | 200 | µg/L | 9 |
| | Barium | 700 | µg/L | 38 |
| | Boron | 4000 | µg/L | 640 |
| | Strontium | 4000 | µg/L | 52 |

Notes:

Note 1: DERM approval requires monitoring of Bromine. This does not exist in this form in water but does exist as Bromide. Therefore, results have been reported as Bromide.

ND – Not detected by the Laboratory

* Detected on one occasion during the fourth quarter of 2011

^ Not all cyanide compounds are toxic. There are many different cyanide compounds that can occur in both an inorganic and organic form. Cyanide compounds occur commonly in nature, being produced by certain plants, bacteria, fungi and algae.

4.2. SGWTF Online Indicator Monitoring

It is not possible to continually test all of the parameters that are externally monitored. Water quality indicators, such as pH, turbidity and conductivity are monitored by an online monitoring system to provide a real time overview of the performance and integrity of the treatment process within the facility.

Should any of these indicators vary from their expected ranges, the onsite use and discharge of water to Eurombah creek is suspended immediately. No discharge occurs until further investigation, monitoring and corrections are made to ensure the final water quality is safe. This process ensures the quality of water from the TWTF is maintained at the highest level possible.

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 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 fourth quarter of Year 2011, there were only seven 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.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)



| Parameter | | Water Quality Limit | Unit | Maximum Detected Concentration of Treated CSG Water (prior to discharge) |
|--|-------------------------|---------------------|------|--|
| BTEX | Benzene | 1 | µg/L | ND |
| | Ethylbenzene | 300 | µg/L | ND |
| | Toluene | 800 | µg/L | ND |
| | Xylene Total | 600 | µg/L | ND |
| Disinfection Byproducts | Bromochloroacetonitrile | 200 | µg/L | ND |
| | Dichloroacetonitrile | 2 | µg/L | ND |
| Endocrine-Disrupting Chemicals and Hormones | Bisphenol A | 200 | µg/L | ND |
| | Nonylphenol | 500 | µg/L | ND |
| Inorganic Compounds | Bromide ¹ | 7000 | µg/L | 300 |
| | Calcium | >5000 | µg/L | 16000 |
| | Cyanide Total | 80 | µg/L | 20*^ |
| | Fluoride | 1500 | µg/L | 120 |
| | Iodide | 500 | µg/L | 100* |
| | pH (Lab) | 6.5-9.0 | - | 7.91 |
| | Sulphate | 500000 | µg/L | ND |
| Metals | Aluminium | 200 | µg/L | 9 |
| | Antimony | 3 | µg/L | ND |

Controlled Q-8220-15-RP-007
Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)



| Parameter | | Water Quality Limit | Unit | Maximum Detected Concentration of Treated CSG Water (prior to discharge) |
|---------------------|-------------------------------|---------------------|------|--|
| | Arsenic | 7 | µg/L | ND |
| | Barium | 700 | µg/L | 38 |
| | Boron | 4000 | µg/L | 640 |
| | Cadmium | 2 | µg/L | ND |
| | Chromium (hexavalent) | 50 | µg/L | 0.9 |
| | Copper | 2000 | µg/L | 5* |
| | Lead | 10 | µg/L | 0.1* |
| | Manganese | 500 | µg/L | 0.4 |
| | Mercury | 1 | µg/L | ND |
| | Molybdenum | 50 | µg/L | ND |
| | Nickel | 20 | µg/L | 0.2 |
| | Selenium | 10 | µg/L | ND |
| | Silver | 100 | µg/L | ND |
| | Strontium | 4000 | µg/L | 52 |
| | Uranium | 20 | µg/L | ND |
| | Vanadium | 50 | µg/L | 0.1* |
| | Zinc | 3000 | µg/L | 6 |
| Nitrosamines | N-Nitrosodimethylamine (NDMA) | 0.1 | µg/L | ND |

Controlled Q-8220-15-RP-007
Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 October to 31 December 2011)



| Parameter | | Water Quality Limit | Unit | Maximum Detected Concentration of Treated CSG Water (prior to discharge) |
|-------------------------------------|------------------------------|---------------------|------|--|
| Poly Aromatic Hydrocarbons | Benzo(a) pyrene | 0.01 | µg/L | ND |
| Radiological Products | Alpha Emitters | 0.5 | Bq/L | ND |
| | Beta Emitters | 0.5 | Bq/L | ND |
| | Radon | 0.5 | Bq/L | 0.3 |
| Total Petroleum Hydrocarbons | Total Petroleum Hydrocarbons | 200 | µg/L | ND |
| Trihalomethanes | Total Trihalomethanes | 200 | µg/L | ND |

Notes:

Note 1: DERM approval refers to Bromine. This does not exist in this form in water but does exist as Bromide. Therefore results have been reported as Bromide.

Note 2: 13 samples collected; 6 samples taken from monitoring point immediately prior to the discharge point to Eurombah Creek, with the remaining 7 taken from after the holding tank. This was due to the treated CSG water being sent to Pongamia plantation and not Eurombah Creek. On 1 occasion (08 of December 2012), flooding prevented access to the discharge point.

* Detected on one occasion during the fourth quarter of 2011.

^ Not all cyanide compounds are toxic. There are many different cyanide compounds that can occur in both an inorganic and organic form. Cyanide compounds occur commonly in nature, being produced by certain plants, bacteria, fungi and algae.

ND – Not detected by the Laboratory.

Controlled Q-8220-15-RP-007
Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 July to 30 September 2011)



Glossary

The parameters required to be monitored by Australia Pacific LNG by DERM are in many cases not found within treated CSG water or the water treatment industry. The monitoring undertaken by Australia Pacific LNG is designed to provide a conservative level of assurance to ensure the protection of public health. 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.

Disinfection By-products – Disinfectants are routinely used in water treatment facilities to remove biological contaminants (predominantly algae and bacteria) that may decrease the efficiency and integrity of the water treatment process. Disinfectants may react with naturally-occurring matter to form by-products.

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

Haloacetic acids – These can be a by-product of drinking water chlorination or chloramination (that is the use of disinfectant). These are routine methods used for disinfection of drinking water to remove bacteria and other microbiological organisms.

Inorganic Compounds – These compounds are non-carbon based elements. In terms of drinking water chemistry they include compounds such as ammonia, bromide and fluoride.

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 to ensure a minimum level is present to protect the environment.

Nitrosamines – These compounds are commonly associated with water treatment facilities that utilise chloramines for disinfection and include N-Nitrosodiethylamine (NDEA) and N-Nitrosodimethylamine (NDMA).

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.

Controlled Q-8220-15-RP-007
Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document
unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility

Quarterly Discharge Water Quality Report

(1 July to 30 September 2011)



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

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

ABBREVIATIONS & ACRONYMS

| Term/Abbreviation/Acronym | Definition |
|---------------------------|---|
| µg | Micrograms (1 x 10 ⁻³ grams) |
| Australia Pacific LNG | Australia Pacific LNG Pty Limited |
| Bq | Becquerel |
| CSG | Coal seam gas |
| DERM | Department of Environment and Resource Management |
| L | Litre |
| LNG | Liquefied natural gas |
| NATA | National Association of Testing Authorities |
| ND | Not detected |
| QLD | Queensland |
| SGWTF | Spring Gully Water Treatment Facility |
| the Act | <i>Water Supply (Safety and Reliability) Act 2008</i> |

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 has received an 'exclusion decision' under the Act for both the discharge of treated CSG water to Eurombah Creek and the use of this water for reinjection trials. The content of future quarterly reports will reflect the reporting requirements of this exclusion decision.

Spring Gully Water Treatment Facility
 Quarterly Discharge Water Quality Report
 (1 July to 30 September 2011)



Document Control

| Author (To whom any changes are to be recommended) | | | |
|---|---------------|--------------------|-------------------------|
| Position | | Incumbent | |
| Senior Environmental Advisor- Technical | | Matt Kerne | |
| Stakeholders and other contributors | | | |
| Position | | Incumbent | |
| | | | |
| | | | |
| Reviewed by | | | |
| Position | | Incumbent | Review date |
| Manager- Environmental Approvals and Strategy | | Rob ully | |
| Communications Manager, Exploration & Production and Australia Pacific LNG | | Karen Cottier | |
| Approved by | | | |
| Position | | Incumbent | Approval date |
| Manager – Land, Environment and Stakeholder | | Rebecca Pickering | |
| History | | | |
| Date | Author | Version | Nature of change |
| 16/02/2012 | MAK | 1 | Revised issue |
| Related documents | | | |
| Title | | Review Date | |
| | | | |
| | | | |
| Review Requirements | | | |
| Review not required. | | | |
| Controlled document location | | | |
| | | | |
| Key Document (Refer definitions in Key Documents Directive to determine) | | | |
| This document is not an Australia Pacific LNG Key Document | | | |

Controlled Q-8220-15-RP-007
 Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document unless issued and stamped Controlled Copy.

Spring Gully Water Treatment Facility
Quarterly Discharge Water Quality Report
(1 July to 30 September 2011)



Controlled Q-8220-15-RP-007
Released on 14/02/2012 – Rev 1

Once printed, this is an uncontrolled document
unless issued and stamped Controlled Copy.