



ENVIRONMENTAL MANAGEMENT PLAN

Recommissioning and Operation of the Wallumbilla LPG Facility

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1. INTRODUCTION

1.1 Background

AGL Gas Storage Pty Ltd (AGL) acquired the existing Wallumbilla Liquefied Petroleum Gas (LPG) Facility (the Facility) from Santos QNT Pty Ltd (Santos) in April 2011. The project is referred to as the Recommissioning of the Wallumbilla LPG Facility (the Project), which comprises the recommissioning and operation of the Facility. The Project is located approximately 13 km south of the township of Wallumbilla and 42 km east-southeast of Roma, in the Darling Downs region of Queensland (Figure 1.1).

The Facility was in operation from 1984 until the purchase by AGL in 2011, however is currently 'mothballed'. AGL proposes to recommission and operate the Facility, which will include upgrades to the processing plant and supporting infrastructure, to increase the rate of gas processing towards the Facility's previously approved design capacity. The Project site is shown in Figure 1.2 with photographs of the western and eastern aspects provided in Plates 1.1 and 1.2.

AGL has engaged Coffey Environments to prepare this document (in the form of an environmental management plan (EM Plan)) to accompany the application for a site-specific environmental authority (EA) for the Project.

1.2 Context

This section summaries AGL's petroleum activities in the Surat and Bowen basins and how these activities relate to the purchase, planned upgrade and environmental permitting requirements for the Facility.

1.2.1 AGL Gas and Petroleum Assets in the Region

AGL operate the Silver Springs Underground Gas Storage Project, centred on the Silver Springs Process Plant, south of Roma. The plant was acquired by AGL as part of its acquisition of Mosaic Oil in October 2010. The plant's commissioning follows an agreement entered into between AGL and QGC Pty Limited (QGC) for AGL to develop a gas storage project at the depleted Silver Springs and Renlim gas reservoirs. The plant has been modified to allow the injection of coal seam gas into depleted conventional gas reservoirs allowing QGC to store gas in the reservoir while it develops its Queensland Curtis LNG Project. AGL will provide QGC with gas storage services for up to six years until April 2017.

AGL is the owner and operator of the Silver Springs to Wallumbilla Pipeline (SSP) being Petroleum Pipeline Licence 4 which was also purchased from Santos in April 2011. The SSP will transport QGC's gas during injection and withdrawal phase. Upon the withdrawal phase, the gas becomes laden with heavier hydrocarbon components and has the characteristic of conventional gas and will therefore require processing at the Facility to remove the heavier hydrocarbons before being exported as sales quality gas to QGC for its LNG project in Gladstone.

In addition to the Silver Springs Underground Gas Storage Project, AGL has conventional gas production assets in the Surat Basin. Gas produced from these Petroleum Leases is currently being reinjected into the Silver Springs Underground Gas Storage Project until the withdrawal phase commences. Gas from the Silver Springs Underground Gas Storage Project will be fed via the Silver Springs to Wallumbilla Pipeline to the Wallumbilla LPG Facility (i.e., the subject of this EM Plan).







Plate 1.1 Eastern aspect of the facility



Plate 1.2 Western aspect of the facility

1.2.2 Wallumbilla Gas Hub

A gas supply hub is a natural market location for gas sales and purchases. It is typically located where there is a significant concentration of gas supply (for example, a major gas basin) or a major trans-shipment point. An effective hub facilitates commercial transactions by improving the convenience of moving gas from one point in the hub to another. Fundamentally, this requires substantial physical interconnections between pipelines bringing supply into the hub and pipelines carrying supply away from the hub (AEMO, 2012).

The Wallumbilla Gas Hub is a major transit centre for natural gas in Eastern Australia, with existing infrastructure and trade connecting multiple markets. This includes transit points between three major transmission pipelines connecting Queensland, South Australia, NSW and Victoria. These pipelines are the South West Queensland Pipeline (SWQP), Roma to Brisbane Pipeline (RBP) and Queensland Gas Pipeline (QGP). Separate pipelines branch to deliver gas into pipelines to supply Gladstone and Brisbane or to flow that gas in a westerly direction to Ballera and in a southerly direction to South Australia.

In addition to AGL's Wallumbilla LPG facility (i.e., the subject of this EM Plan), the Wallumbilla Gas Hub consists of gas processing facilities operated by Epic Energy Pty Limited and Santos Ltd. In addition, GLNG Operations Pty Ltd (Santos GLNG) are proposing to construct gas processing and treatment facilities and supporting infrastructure at Wallumbilla.

1.3 Legislation and Guidelines Relevant to Recommissioning the Facility

This section summarises the key legislation, policies and guidelines relevant to the recommissioning and operation of the Facility, with reference to the approvals described in further detail in Section 1.4 of this EM Plan. AGL will continue to consult with relevant and state government agencies on the approvals required under Queensland government legislation during implementation of the Project.

A cross-check of the contents of this EM Plan against the relevant legislative and guideline requirements is provided in Appendix 1.

1.3.1 Legislation

The key acts applicable to the Project are the *Petroleum and Gas (Production and Safety) Act* 2004 (P&G Act) and the *Environmental Protection Act 1994* (EP Act). This section and Table 1.2 outline the relevance of these acts, approval requirements and EM Plan requirements prior to the introduction of the *Environmental Protection (Greentape Reduction) and Other Legislation Amendment Act 2012* (the 'Greentape Reduction Act') on 31 March 2013.

Description	Relevance to project	Likely approvals*	
Petroleum and Gas (Production and Safety) Act 2004 and Petroleum and Gas (Production and Safet Regulation 2004			
The purpose of the act is to regulate responsible petroleum activities and develop a safe and viable petroleum and gas industry.	The Project includes the recommissioning and operation of an existing LPG Facility.	A petroleum facility licence will be required for the Project.	
Environmental Protection Act 1994 a	and Environmental Protection Re	egulation 2008	
The act is the principal legislation for setting environmental conditions on petroleum activities in Queensland. The objective of the act is to protect Queensland's environment by promoting ecologically sustainable development. It also specifies environmentally relevant activities (ERAs) for which environmental authorities (EA) are required.	Most petroleum activities are categorised as an ERA under Chapter 5A of the EP Act and therefore require an EA. ERAs are potentially contaminating activities, industries or land uses that may cause environmental harm. ERAs that may be of relevance to the Project are detailed in Section 2.6 of this EM Plan.	A Level 1 Chapter 5A EA for petroleum activities will be required before the Project can proceed. The EA will also include the ERAs that are detailed in Section 2.6. An EM Plan is required under Section 310C of the EP Act as part of the application for an EA.	

 Table 1.2
 Principal legislation and project approvals

* Approval requirements prior to the introduction of the Greentape Reduction Act.

Prior to 31 March 2013, the EM Plan was also required to address any matters prescribed under an environmental protection policy or regulation. The subsections of Section 4 of this EM Plan specifically address the requirements of the:

- Environmental Protection (Air) Policy 2008 (EPP (Air)).
- Environmental Protection (Noise) Policy 2008 (EPP (Noise)).
- Environmental Protection (Water) Policy 2009 (EPP (Water)).
- Environmental Protection (Waste Management) Regulation 2000.
- Environmental Protection Regulation 2008 (EP Regulation), with reference to the Waste Reduction and Recycling Act 2011.

Other acts and regulations that inform this EM Plan include:

- Forestry Act 1959 (Qld).
- Nature Conservation Act 1994 (Qld) (NC Act).
- Nature Conservation (Wildlife Management) Regulation 2006 (Qld) (the Wildlife Regulation).
- Queensland Heritage Act 1992 (Qld).
- Strategic Cropping Land Act 2011 (Qld) (SCL Act).
- Vegetation Management Act 1999 (Qld) (VM Act).

The requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) have also been considered. AGL has undertaken a self-assessment and determined that the recommissioning of the Facility is unlikely to have a significant impact on any matters of national environmental significance. As such, this legislation has not been considered further.

On 31 March 2013, the Greentape Reduction Act came into effect, which amended the EP Act and the EP Regulation to introduce an integrated approval process for environmentally relevant activities (ERAs) that is proportional to the environmental risk. Under the new approval process, the Project will require a site-specific EA to proceed.

1.3.2 Guidelines

The Queensland Department of Environment and Heritage Protection (EHP) guideline 'Preparing an Environmental Management Plan for Petroleum Activities' (EM705) was provided by EHP to inform this EM Plan and the EA application.

The guideline is generically applicable to all Level 1 petroleum activities, including coal seam gas exploration or production (including extraction, piping and processing), and it is followed for this site-specific EA application under the new approval process (post-Greentape Reduction Act). Therefore, this EM Plan includes those matters recommended by the guideline that are relevant and applicable to the recommissioning and operation of the Facility, as described in Section 2 of this EM Plan and AGL's Concept Selection Report (AMEC, 2012).

The EM Plan does not require consideration of those matters recommended by the guideline applicable to other stages of the LPG production. For example, matters within the guideline relating to the low hazard or regulated dams, management of coal seam gas water or stimulation activities are not applicable to this Facility.

The structure of this EM Plan follows the recommendation of Part 2 of the guideline and includes:

- Identification of environmental values, as defined in Section 9 of the EP Act, where the activity is to occur, with reference to any applicable environmental protection policies (EPPs).
- Identification of potential adverse or beneficial impacts of the Project activities on the identified environmental values.
- Proposed environmental protection commitments, objectives and control strategies, with measurable indicators and provision for monitoring to ensure that the environmental objectives are achieved.
- Supporting documentation.

The content of this EM Plan follows the recommendation of Part 3 of the guideline. Section 4 of this EM Plan provides the detailed content for those activities relevant to the Project, which includes a summary of environmental protection commitments. These commitments are complemented by the proposed EA conditions for the Project listed in Appendix 2. The conditions are based on the EHP guideline 'Draft Coal Seam Gas Model Conditions' for a Level 1 EA Chapter 5A petroleum activity. Only those model conditions that are relevant and applicable to the recommissioning and operation of the Facility are included.

Since the introduction of the amendments associated with the Greentape Reduction Act, additional guidelines have been issued:

- Application requirements for activities with impacts to air (EM960).
- Application requirements for activities with impacts to land (EM961).
- Application requirements for activities with noise impacts (EM962).
- Application requirements for activities with impacts to water (EM963).
- Application requirements for activities with waste impacts (EM964).

These guidelines have been taken into account in preparing this application. This application has been prepared on the basis of both the pre-existing and new legal requirements under the Greentape Reduction Act.

1.4 Purpose of the EM Plan

This EM Plan was initially prepared to support the application of an EA for Chapter 5A activities as required under s. 310C of the EP Act. The Facility is defined under this section of the act as performing the environmentally relevant activities of greenhouse gas storage and petroleum storage.

Section 310D of the EP Act further states that the purpose of an EM Plan is to:

...propose environmental protection commitments to help the administering authority decide the conditions of the environmental authority (Chapter 5A activities).

Since the introduction of the amendments associated with the Greentape Reduction Act, the preparation of an EM Plan is no longer formally required. The EM Plan structure and format has nonetheless been maintained by AGL for this EA application, as it is an appropriate way to provide the information required to assess the recommissioning of the Facility.

The key objectives of the EM Plan are to:

- Demonstrate a commitment by AGL to operate the Facility with minimal adverse impacts on identified environmental values by selecting and applying management and monitoring measures that avoid or reduce impacts to levels that are as low as reasonably practical.
- Ensure best practice environmental management is achieved where practical.
- Provide a baseline document that can be referred to, and reviewed as required, over the operational life of the Facility.

1.5 Scope of the EM Plan

AGL commissioned Coffey Environments to prepare this EM Plan. The environmental management and protection commitments contained in the EM Plan are based on:

- Coffey Environments specialist knowledge and experience in developing best practice environmental and social management measures.
- AGL's prior knowledge and experience in performing petroleum and gas exploration, production and processing activities within the Surat and Bowen basins.
- An understanding of the Facility layout and operation, and potential environmental impacts gained during a site visit to the Facility by AGL and Coffey Environments in September 2012. An overview of the historic Facility operation was obtained from an AGL staff member whom was the site manager while the Facility was under Santos ownership.

The scope of the EM Plan includes the following:

- Explanation of the requirements for the EM Plan under the EP Act and statutory approvals required under the P&G Act.
- Outline of key stakeholders involved in the approvals process.
- Summary of the Project activities.

- Overview of AGL's environmental management system for management of the Facility.
- Description of the existing environment in the area of the Facility, including relevant environmental values.
- Identification of the potential issues and potential adverse and beneficial impacts associated with the recommissioning and operation of the Facility (including site rehabilitation upon decommissioning).
- Development of measureable and auditable management, monitoring and reporting measures, and environmental protection commitments that AGL will implement.
- Preparation of draft EA conditions that complement the environmental protection commitments that AGL will implement.

1.6 Relevant Petroleum Tenure and Authority

1.6.1 Petroleum Facility Licence

The P&G Act regulates petroleum and gas activities in Queensland. Under the act, the tenure requirement for the Facility is a Petroleum Facility Licence (PFL). AGL submitted a PFL application to the Department of Natural Resources and Mines (NRM) in January 2013, which was issued as PFL 27. The Project area for PFL 27 is wholly contained on BIM Identification Map (BIM) sub-block CHAR2367G (see Figure 1.2).

A PFL is issued with an associated EA, depending on preliminary assessment of the potential for environmental impacts. As an existing Facility, and with regard to the proposed upgrades and volume of sales gases to be processed, recommissioning of the Facility would previously have been assessed as triggering a Level 1 (Chapter 5A activities) EA. Since the introduction of the amendments associated with the Greentape Reduction Act, projects are no longer assessed as a Level 1 or Level 2 activity. The recommissioning of the Facility will now be assessed as a site-specific resource activity.

As mentioned in Section 1.4, while an EM Plan is no longer required to accompany an EA application, AGL has prepared this EM Plan to provide the necessary information to inform the assessment of the application.

1.6.2 Financial Assurance

The EP Act specifies that all applications for a Level 1 (Chapter 5A activities) EA must also be accompanied by a calculation of financial assurance. Financial assurance ensures that funds are available to the administering authority (EHP) should the project default on environmental requirements.

EHP is currently performing a review of the guidelines used to calculate financial assurance for Chapter 5A activities. The draft guideline 'Calculating Financial Assurance for Level 1, Chapter 5A Petroleum Activities' was made available by EHP to support the EA application for this Project. The financial assurance calculation or the project followed this draft guideline (Appendix 3).

A total financial assurance of \$1,622,110 will be lodged with EHP.

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2. FACILITY DETAILS

This section provides an outline of the Project and the stakeholders involved with the Project.

2.1 Proponent

AGL Gas Storage Pty Ltd (AGL) is a wholly owned subsidiary of AGL Energy Limited. The latter is one of Australia's largest energy companies which has been operating for more than 175 years in Australia and has a diverse portfolio of energy generation infrastructure utilising both traditional and renewable energy sources. AGL Energy Limited was listed as a member of the Dow Jones Sustainability World Index in 2007 and was the first Australian energy company to provide its customers with an accredited green energy product. AGL Energy Ltd has committed to a 6% reduction in carbon emissions (based on 1998 and 2001 levels) and is a member of the Chicago Climate Exchange.

AGL Energy Limited is an experienced operator of coal seam gas production facilities, petroleum production facilities and high pressure gas transmission pipelines. AGL Energy Limited has vast experience and expertise in approving, designing, constructing, commissioning and operating petroleum production facilities and high pressure gas transmission pipelines in Australia.

2.2 Historic Facility Operations

The Wallumbilla LPG Facility was constructed in 1984 and operated thereafter by Santos. AGL purchased the Facility from Santos in April 2011. The Facility has historically produced sales quality natural gas, propane, butane and condensate.

Santos operated the Facility under a project EA (No. PEN 100385309), which provided umbrella authority for a number of their petroleum activities in the region. As the Facility formed part of this approval, the EA was unable to be transferred in order to continue operation of the Facility. Soon after the sale was completed, AGL mothballed the Facility by ceasing gas processing and reducing operational requirements to a low level of caretaker maintenance. AGL proposes to recommission the Facility as an integral component to support the withdrawal phase of the Silver Springs Underground Gas Storage Project to process the gas removing the propane, butane and condensate in order to provide sales quality gas to QGC to support its Queensland Curtis LNG Project.

Recommissioning will include upgrades to components of the processing plant and supporting infrastructure on site. The objective of the upgrades is to provide AGL with the option of sustaining periods of high gas processing towards the design capacity of the Facility. In September 2012, a concept selection report for the upgrade of plant components was prepared. A new EA in accordance with Chapter 5A of the EP Act is required to operate the Facility, as detailed in Section 1.4.

2.3 Proposed Facility Operations

Following AGL's purchase of the Facility, AMEC Australia (AMEC) performed an audit of the Facility to determine its suitability for use during the 'withdrawal phase' of the AGL Silver Springs Storage Project. AMEC generally found the plant to be in good condition and considered that the plant had been well maintained with no known major operational issues while the plant had previously been operational (AMEC, 2012). The Facility layout is shown in Figure 2.1.



2.3.1 Plant and Facility Upgrades

The plant was initially designed and approved with a capacity of 40 terajoules (TJ)/day of export gas, however it had been operating at approximately half that capacity for much of its operation. AGL will be replacing multiple components of the plant to de-bottleneck it and enable it to operate at 40 TJ/day upon recommissioning; the plant components being replaced or upgraded are outlined in Table 2.1.

Plant component	Reason for replacement or upgrade	Trigger for replacement or upgrade
Gas/ gas/liquid exchanger (HE 15.01)	Increase current processing capacity from less than 25 to 40 TJ/d.	Capacity
Turbo-expander compressor		
Re-compressors	Major service and vibration survey is required.	Reliability
Regeneration heater (HT 14.01)	Replace molten salt with other fluid, or look at improving process if possible.	Reliability
De-ethaniser pumps	Service pumps and complete vibration survey.	Reliability
Flare and relief system	Design review to determine modification and or improvements required to the flare system.	Safety, Environmental
Flare pit	No longer required as it will be removed as a planned improvement to the flare system, which will replace the horizontal flare with a vertical flare.	Environmental
Anti-surge control valve	Confirm suitable for 40 TJ/d, complete service as required.	Reliability
Control valves replace	Replace or overhaul the following plant control valves: LV 625, LV 625A, TDV 875A, TDV 875B.	Reliability
Closed drain systems and oily water management	Review and confirm integrity and functionality of existing system. Recommended dedicated closed drain tank to contain all closed drain fluids for removal by tanker and off- site disposal.	Safety, Environmental
Field instrumentation	Recalibrate all field instrumentation.	Reliability
Pressure vessels	Complete statutory inspections on all pressure vessels and pressure equipment.	Safety
Pressure safety valves	Re-test all pressure safety valves and maintain as required.	Safety
Insulated piping	Inspect lagged pipe for external corrosion.	Safety
Control system	Replace Foxboro system with Emerson Delta V DCS.	Safety
Control room/operator houses	Relocate control room away from immediate plant boundary. Review options for relocation to front of property.	Safety
Review previous HAZOPs, risk studies	Conduct new HAZOP.	Safety
Communications	Reconnect to Telstra.	Reliability

Table 2.1 List of replacements and upgrades to the processing plant

Source: AMEC, 2012

Following the initial scoping of potential Facility upgrades, AGL commissioned AMEC to undertake a concept selection study, to recommend replacements and upgrades to the plant. The scope of the study addressed the following components of the Facility:

- Gas-gas liquid heat exchanger (HE-15.01).
- Relief system/flare.
- Closed drain system.
- Safety system.
- Condensate handling and storage.
- Mercury removal/molecular sieve.
- Plant isolation.
- Regeneration gas heater heating medium.
- WOPRA safety case.
- Instrumentation and controls.

Facility upgrades that will lead to improvements in the environmental performance of the Facility include:

- Replacement of the ground-level, horizontal flare tip (Plate 2.1) with a vertical flare stack approximately 20 m in height, subject to detailed engineering design, which will be of a similar height to the existing stacks of the Facility and the adjacent facilities within the Wallumbilla hub.
- Decommissioning and rehabilitation of the flare pit (Plate 2.2), as it would no longer be required following installation of a vertical flare tip. Remedial works would be focussed on the removal of any gross contaminants (i.e., free hydrocarbons) and significantly impacted surface soils.
- Upgrade of the closed drain (Plate 2.3) and oily water management, with liquid wastes (predominantly hydrocarbon-based) collected to storage tanks for collection and transport offsite by an approved contractor.
- Installation of a non-regenerable mercury guard bed on the regeneration gas return line to reduce the concentration of mercury into the sales gas, with used guard bed material to be transported off-site.

2.3.2 Supporting Infrastructure

The Facility has existing administration offices, staff facilities (rest rooms, ablutions, first aid quarters etc.), workshops, and storage areas that will also be covered by the PFL and will be upgraded to service the refurbishment and operational staff.

It is proposed to duplicate the control room to the houses at the front of the block to minimise operator time spent in the control room inside the plant.

2.3.3 Production Method and Rates

AGL has entered into a commercial agreement with QGC to store up to 30 TJ/day of gas, with withdrawal commencing in April 2014. AGL completed the Silver Springs Storage Project in 2011 and commenced a three-year injection phase under its contract with QGC. As part of the Silver Springs Gas Storage Project, AGL purchased and mothballed the Wallumbilla LPG Facility from Santos to secure the ability to process the withdrawal gas. AGL must commence supplying withdrawal phase gas to QGC in January 2014 at a rate of 30 TJ/d.



Plate 2.1 The existing horizontal flare tip

Plate 2.2 The existing flare pit

Plate 2.3 Section of the existing closed drain network leading to the flare tip

The gas process method first requires processing of the gas at the Silver Springs process plant, which may include pressure cut from the well head, 3-phase separation, compression and dehydration. The gas will then flow via the Silver Springs Pipeline to the Wallumbilla LPG Facility, where heavier hydrocarbon components (propane, butane and condensate) are removed, with the result being sales gas compliant to AS4564-2005: *Specification for General Purpose Natural Gas*.

The Wallumbilla LPG Facility was originally constructed to exploit the surrounding conventional gas reservoirs to produce sales gas, propane, butane and stabilised condensate. The Facility is a cryogenic gas plant employing the use of turbo expander technology to take a deep cut of the Natural Gas Liquids (NGLs) in the feed fluid.

The Facility includes a 3-phase separator for bulk liquid/gas/water separation. The separated gas is then dehydrated with the use of molecular sieves and then pre-cooled in a Printed Circuit Heat Expander cold box before being directed to the expander/compressor. The produced liquids from the expander are then directed to the fractionation train which includes a rectifier column; de-ethaniser; de-propaniser and de-butaniser. The separated bulk liquids from the 3-phase separator are dehydrated with molecular sieves and then directed to the de-ethaniser column.

The produced propane and butane will either be exported via the existing pipeline to the Elgas 'bullets' (pressure vessels) located at the township of Wallumbilla (similar to when the Facility was previously operated by Santos) or stored in the existing pressure vessels located on site and then transported off-site by a third party, using tankers that collect the product via a load out facility. The sales gas will be directed to the Roma to Brisbane Pipeline, and the condensate will be trucked from site (similar to when operated by Santos).

A schematic of the LPG production process for the recommissioned Facility is shown in Figure 2.2.

2.3.4 Workforce

The workforce during the refurbishment stage will be undertaken by a suitably qualified contractor that is preferably from the local region. The operational workforce will be a mixture of existing AGL employees and new employees. The peak site workforce during operations will be approximately five personnel.

The workforce during the refurbishment will be accommodated at either private residences or commercial accommodation, such as local motels and caravan parks. Staff will provide their own private transport to and from site.

The operational workforce will be on call 24 hours per day, 7 days per week to attend to operational issues with the Facility and will therefore be accommodated no further than the nearby township of Wallumbilla in a private residence. Staff will travel to from site in a 4WD vehicle.



2.4 Project Stakeholders

The following stakeholders have been identified as having a direct interest in the recommissioning and operation of the Facility:

- State regulatory agencies.
- Local government.
- Neighbouring landowners/occupier and petroleum tenement holders.
- Nearby local residents and business owners at Wallumbilla, Yuleba, Roma and Surat.
- Utilities operators.

Key stakeholders relevant to the Project are listed in Table 2.2.

Stakeholder category	Organisation/agency		
Regulatory authorities	Department of Environment and Heritage Protection (EHP)		
	Department of Natural Resources and Mines (NRM)		
Other state government	Department of Transport and Main Roads		
	Department of Community Safety:		
	• Fire and Rescue.		
	Ambulance.		
	Rural Fire Service.		
	State Emergency Service.		
	Queensland Police Service		
Local government	Maranoa Regional Council		
Land owners / occupiers	Residents in the immediate vicinity		
	Holders of adjacent petroleum tenements		
	Nearby local residents and business owners of Wallumbilla, Yuleba, Roma and Surat		
Utility operators	Telephone/ telecommunications Electricity		

Table 2.2Relevant stakeholders

Stakeholders will be informed on the nature of the Facility recommissioning, its parameters and timelines. This will be done on an individual basis and will continue on a regular basis for the duration of the Project as follows:

- Regulatory authorities have been informed through pre-lodgement meetings held with EHP on 10 October 2012, and with NRM on 1 November 2012. Following completion of the approvals process and the granting of the EA and PFL for the Facility, environmental monitoring and audit reports will be completed during the operational phase (as required by EA conditions) and subsequently provided to regulatory authorities.
- Access to the region is provided by the national and state road network; local access to the
 Facility is by Wallumbilla South Rd, which is under the jurisdiction of the Maranoa Regional
 Council. Recommissioning and operation of the Facility will require on-site deliveries of new
 plant and equipment and consumables, and routine off-site deliveries of liquid waste (e.g. oils
 and liquid waste from the closed drainage system) and sales quality condensate.

- AGL will liaise with the Petroleum Safety division of NRM to provide regular updates as to the performance and operation of the Facility.
- AGL will consult all adjacent landholders who may be impacted by the Project, and has already engaged with residents at the three closest sensitive receptors as part of the background noise monitoring.
- AGL will liaise with utility operators if AGL's activities as part of the refurbishment may potentially impact their assets.

2.5 Area of Disturbance

The footprint of the existing Facility is located wholly on Lot 227 on Plan WV1826, which consists of a parcel of land approximately 8.5 ha. The Facility upgrades described in Section 2.3.1 will not extend outside the existing area of disturbance of the Facility. Rehabilitation of the flare pit will see a minor reduction in the footprint of the Facility.

2.6 ERA Activities

Environmentally relevant activities (ERA) for the resource activities are listed under Schedule 2A of the EP Regulation, with associated prescribed ERAs listed under Schedule 2 of the EP Regulation.

The resource activity relevant to the Facility, as listed under Schedule 2A, is:

a petroleum activity, other than a petroleum activity mentioned in items 1 to 7, that includes 1 or more prescribed ERAs for which an aggregate environmental score is stated.

The prescribed ERAs relevant to the Facility, as listed under Schedule 2, includes:

- ERA 9 Hydrocarbon Gas Refining. Trigger (3)(a): Refinement in a year of less than 200,000,000 m³ of natural gas.
- ERA 10 Gas Producing. Trigger (1): Manufacturing, processing or reforming gas 200 t or more per year.
- ERA 15 Fuel Burning. Trigger (1): The Facility has a combined fuel burning capacity of greater than 500 kg/hour.

2.7 Notifiable Activities

Notifiable activities are activities listed under Schedule 3 of the EP Act that have the potential to cause land contamination. Under the EP Act, the administering authority (EHP) decides whether the land has been used for notifiable activities, or is contaminated land that must be recorded on the Queensland Environmental Management Register (EMR) so that any potential impacts can be identified, assessed and managed.

A search of the EMR conducted in February 2013 for land occupied by the Facility (i.e., Lot 227/WV1826) identified:

• That the site is subject to one notifiable activity (in accordance with s. 374 of the EP Act):

PETROLEUM PRODUCT OR OIL STORAGE - storing petroleum products or oil:

- (a) In underground tanks with more than 200 L capacity; or
- (b) In above ground tanks with:

(i) For petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code – more than 2,500 L capacity; or

(ii) For petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code – more than 5,000 L capacity; or

(iii) For petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia – more than 25,000L capacity.

• That the site is not listed on the Contaminated Lands Register.

2.8 Facility Life

Beyond the expiry of the QGC contract which completes in April 2017, AGL intend to continue operating the Silver Springs Gas Storage Facility in order to improve domestic gas supply security particularly during high demand periods where gas can be withdrawn to beat the growing energy needs of the state. As outlined above, the Wallumbilla LPG Facility plays a crucial role during the withdrawal phase to process the gas to meet export sales quality.

Therefore, the Facility is expected to operate for a maximum of 30 years which is consistent with the operational life of Silver Springs Gas Storage Facility within PL 446. AGL have sought a PFL for the maximum time possible (i.e., 30 years).

3. HEALTH, SAFETY AND ENVIRONMENT SYSTEMS

3.1 AGL Management System

The AGL Health, Safety and Environment (HSE) Policy is presented in Appendix 4. This policy governs the development of AGL's HSE management system, known as 'Life Guard' (AGL, 2004), which together are the key tools used to manage environmental responsibilities, issues and risks. The HSE management system is designed to direct the establishment and implementation of a framework of requirements, policies, standards, compliance guides and management practices for consistent and continuous improvement in AGL's HSE performance.

The main objectives of the Life Guard HSE management system are:

- To ensure the environment is protected from activities.
- To keep people well and safe.
- To continuously improve performance in these areas.

The HSE continuous management improvement approach ensures that the level of HSE performance continuously improves and that best practice is regularly incorporated into the system and shared by all users (AGL, 2004).

The principles of the HSE management system are implemented through a hierarchical documented system, which includes documentation such as corporate policies, strategies and standards as well as operational compliance guides, procedures, plans, audits and risk assessments.

The environmental standards and processes within the HSE management system are aligned with the international standard AS/NZS ISO14001:2004 Environmental management systems— Requirements with guidance for use. The HSE management system has been established to ensure that each business unit within AGL identifies environmental risks and implement controls throughout all stages of every activity. This EM Plan forms part of this environmental management framework.

3.2 Roles and Responsibilities

Within AGL, responsibility for overall environmental management of PFL 27 lies with the Production Manager. Each individual is responsible for ensuring that their work complies with all regulatory requirements, AGL commitments and the appropriate procedures.

Some positions within AGL have specific responsibilities and obligations in terms of managing HSE matters associated with PFL 27 operations. These key personnel and their responsibilities are outlined in Table 3.1.

Role	Accountabilities		
Production Manager	• Responsible for the fulfilment of commitments contained in this EM Plan and for ensuring contractors comply with the environmental objectives and the EM Plan.		
Head of Gas Operations	 Responsible for the management of the field development and production activities, including implementation of environmental management. Reports to the Group General Manager Upstream Gas. 		
Land and Approvals Manager	Responsible for obtaining environmental and other regulatory approvals for this Project.		
	Responsible for landowner consultation and notification.		
	• Reports to the Head of Land and Approvals with a dotted line to the Head of Gas Operations regarding compliance with the Facility's approvals.		
Environment Manager	• Responsible for the overseeing and fulfilment of commitments contained in this EMP.		
	• Provides advice to the workforce, through the Head of Gas Operations and Production Manager, regarding the implementation of the EM Plan. Coordinates the monitoring and audit program.		
	• Conducts regular review of the environmental performance of each site and of site personnel.		
	• Responsible for environmental reporting and compliance activities across the operations.		
Health and Safety Manager	• Responsible for health and safety of staff and contractors working on site are responsible to ensure compliance with AGL's HSE Contractor Management System. Responsible to ensure a safe work culture is being adhered to on site in order to achieve zero lost time.		
Production Engineer	 Responsible for the fulfilment of commitments contained in this EM Plan. Reports to the Production Manager regarding the operations environmental performance and due diligence. 		
Field Supervisor	 AGL's representative on site providing guidance and operational support to all subcontractors. Responsible for assisting in the implementation of EMP including reporting, monitoring and auditing as required. Reports to the Production Manager regarding the operations environmental performance and due diligence. 		
Subcontractors	 Responsible for ensuring that works are in compliance with the EM Plan, meeting regulatory requirements, and ensuring that all environmental objectives contained in the contracts are attained. Report to the Field Supervisor. 		
Environmental Auditors/Specialists	 External to AGL and contracted to conduct periodic audits according to the principles of this EM Plan and relevant environmental legislative compliance. Provide guidance on environmental areas where specialised monitoring is provided for a single provide guidance on environmental areas where specialised monitoring 		

 Table 3.1
 Wallumbilla LPG Facility organisation and accountabilities

3.3 Inductions and Training

All personnel, including contractors, must attend a HSE induction. All personnel will be made aware during the induction of relevant environmental obligations and the need to perform all activities in an environmentally responsible manner. Inductions and training will aim to outline a range of HSE issues including:

- Every person's general duty of environmental care in accordance with S. 319 and S. 320 of the EP Act.
- AGL's Environmental Policy and regulatory requirements.
- The significance and potential environmental effects associated with their work requirements.
- Personnel roles and responsibilities for environmental performance.
- The relevant objectives and requirements of the EM Plan, EA and other associated documents.
- Emergency response system and incident reporting protocols.

Job-specific training will also be undertaken, where applicable, and will cover general environmental management issues such as:

- Stormwater management.
- Erosion prevention and control.
- Pest plant and animal management.
- Spill prevention, containment and equipment.
- Management of hazardous substances.
- Environmental monitoring.
- Corrective actions and continual improvements.

It is the responsibility of each contractor to prepare and implement an induction and job specific training program appropriate to their methods of work that comply with AGL's requirements.

Approval from AGL shall be obtained prior to implementation, and all training will be recorded in a training register to ensure that all personnel are trained prior to commencing work.

3.4 Inspection, Monitoring and Reporting

Inspection, monitoring and reporting for the Project in the context of AGL's HSE management system is detailed below.

3.4.1 Inspection

During refurbishment and operation of the Facility, work sites will be regularly inspected by an AGL representative and findings reported to AGL to ensure compliance with the EM Plan and EA conditions. The contractor's environmental personnel will be required to report on compliance with environmental requirements.

During environmental inspections, specific attention will be paid to aspects such as:

- Any complaints received and the management and close-out of complaints.
- Results from any potential air emissions monitoring undertaken as required by the EA conditions.
- Results from any potential noise monitoring undertaken as required by the EA conditions.
- Integrity and function of stormwater, erosion and sedimentation control measures.
- Housekeeping, cleanliness of the site and appropriate waste disposal.

- Appropriate storage and handling of fuel and chemicals.
- Evidence of soil contamination / spills.
- Restriction of activities to designated work sites.
- Gas leak detection.
- Presence of pest plants and animals.

Actions arising from audits conducted during the construction phase will be reviewed by the Construction Project Manager and AGL project representatives. Any corrective actions shall be recorded and monitored by contractors and closed out in accordance with action requirements.

Additional on-site inspections or investigations will be undertaken in the event of significant environmental incidents. The Environment Manager (or delegate) will be responsible for regular review of the environmental performance of each site and of site personnel.

Audits will be undertaken to ensure compliance with the EM Plan and EA. This will enable nonconformances to be identified and preventative action implemented to prevent recurrence.

3.4.2 Monitoring

Specific monitoring, recording and reporting as required by the conditions of the EA will be undertaken. Environmental monitoring may also be undertaken in response to complaints. Specific monitoring, in accordance with recognised Australian standards and EHP guidelines, may be required in relation to:

- Gas metering and monitoring gas pressures to test for gas leaks.
- Air quality (for example, dust and odour) nuisance (in response to a request by the EHP or reasonable complaints).
- Noise nuisance (in response to a request by the EHP or reasonable complaints).

Monitored activities during recommissioning and operation of the Facility are outlined in the environmental protection commitments sections against environmental values identified for the Facility:

- Air and Greenhouse Gas Section 4.1.3.
- Land and Ecology Section 4.2.3.
- Noise Section 4.3.3.
- Water Section 4.4.3.
- Chemical Storage and Waste Section 4.5.3.
- Community and Heritage Section 4.6.3.

3.4.3 Reporting

Environmental recording, reporting and auditing will be conducted in accordance with EA conditions. Environmental records may include but are not limited to:

- Remedial actions taken following incident and non-conformance reports and complaints.
- Inspection reports.
- Training and induction attendance.
- Consultation records and meeting notes.
- Audit reports.

- Monitoring results
- Annual reporting.

AGL will also report environmental results as required by the following legislation:

- Greenhouse gas and energy consumption for the Facility according to the *National Greenhouse and Energy Reporting Act 2007* (Cwlth).
- Pollution inventory for the Facility according to Chapter 6 of the EP Regulation.
- Energy efficiency according to the *Energy Efficiency Opportunities Act 2006* (Cwlth). This will be pooled data across AGL operations since the Facility as an individual operation does not trigger an obligation under the act.

3.5 Incidents and Emergencies

Incident reporting will be implemented as per AGL's Incident Reporting and Management procedure (LG-HSE-CP-006 Incident Management and Reporting Procedure). Incidents shall initially be reported via radio or phone and followed with a written report recorded on an incident report form.

All such incidents shall be investigated by the nominated lead investigator trained in AGL's Incident Management and Investigation process (ICAM) and where a major environmental incident occurs, an investigation team will be appointed and will include the Environment Manager and Production Manager as a minimum. Incidents shall be reported as per the statutory timeframes set out in Schedule 2 of the Petroleum and Gas (Production and Safety) Regulation 2004 where relevant and the required notification timeframes under s. 320 of EP Act and/or specific EA requirements. All relevant stakeholders will be consulted as part of this process and in accordance with the statutory requirements above.

In this context, an emergency is any incident involving PFL 27 infrastructure and all associated equipment, plant, personnel and vehicles that has caused, or has the potential to cause injury or damage and requires immediate corrective action. AGL recognises that emergencies arising from PFL 27 activities could have serious and long term HSE impacts.

Environmental emergencies could include:

- Fire and explosion.
- Gas leaks.
- Chemical spills, including oil.
- Grassfire.

AGL has an emergency response plan (ERP), in accordance with legislative requirements under the P&G Act, designed to address emergency situations. The plan details the immediate corrective actions to be implemented in response to an emergency situation should one occur. It is the responsibility of the Production Manager, Health and Safety Manager and Environment Manager to develop, implement and monitor the ERP and ensure that operators and visitors are aware of their responsibilities in case of an emergency. Emergency response exercises and training drills are critical to test and practice crews in effective emergency response, notification, escalation and investigation. AGL ensures that:

- Desktop exercises are conducted at least every three months to test and validate emergency response procedures.
- Fire and emergency response drills are to be completed once per month per shift.
- Emergency response crews are trained to respond to potential real life situations that involve multiple events.

3.6 Complaint Management

A complaint management system will be established and maintained to register, investigate and resolve all valid complaints alleging environmental nuisance (such as noise, dust and odour) made directly by a complainant or referred to AGL by the administering authority (EHP) as soon as practicable. The Production Manager (or delegate) will be responsible for managing this system.

The system will be implemented in accordance to AGL's operating procedures, and be capable of recording the following details:

- Name, address and contact number for valid complainant.
- Time and date of valid complaint.
- Reasons for the complaint as stated by the valid complainant.
- Referral of the complaints to the suitable responsible officer within AGL.
- Investigations undertaken in response to the valid complaint, including referral to monitoring records relevant to the issue, or the results of new monitoring undertaken (at sensitive places, within a reasonable and practicable timeframe) to resolve the complaint.
- Analysis and interpretation of monitoring results and conclusions formed.
- Actions taken to resolve the valid complaint such as:
 - A negotiated outcome with the complainant.
 - Mediation or alternative dispute resolution processes used in the event that the complaint is not able to be resolved.
- Abatement or attenuation measures implemented to avoid further environmental nuisance.
- Any abatement measures implemented to mitigate the cause of the valid complaint.
- Name and contact details of the person responsible for resolving the valid complaint.

The complaints register must be provided as part of the Facility's licenced reporting process or made available to the administering authority on request.

4. ENVIRONMENTAL VALUES AND PROTECTION COMMITMENTS

This section provides a summary of the environmental values of the Project area, Project impacts on these values, and environmental protection commitments.

4.1 Air and Greenhouse Gas

This section describes the approach to managing potential environmental impacts on the local and regional air quality and at sensitive receptors shown in Figure 4.1. The assessment considers the potential impacts associated with recommissioning the Facility, as well as the cumulative impact from other gas processing facilities within the Wallumbilla gas hub.

Katestone Environmental Pty Ltd was commissioned by Coffey Environments, on behalf of AGL, to undertake modelling of air quality pollution and greenhouse gas production likely to result from the operation of the recommissioned Facility. A copy of this report is presented in Appendix 5.

4.1.1 Existing Environment and Environmental Values

The air quality in the vicinity of the Facility is predominantly influenced by the industrial sources of air pollutants within the Wallumbilla Gas Hub. The existing air quality is therefore atypical for its setting in a rural environment with low population density.

The range of activities that influence air quality in the area include:

- Emissions from other facilities within the Wallumbilla Gas Hub (i.e., from the EPIC Energy and Santos gas processing facilities).
- Vehicle and equipment exhaust fumes.
- Vehicle movements.
- Dust and odour from nearby agricultural and activities.
- Environmental factors including wind-borne dust, smoke, pollen and seeds.

The environmental value relevant to the Project is the rural air environment, conducive to suitability for the health and wellbeing of humans (i.e., nearby residents and staff of the Facility and other neighbouring gas processing facilities) and health and biodiversity of ecosystems. The relevant EPP (Air) air quality objectives are outlined in Table 4.1.

Table 4.1Air quality objectives

Indicator	Environmental Value	Averaging Period	Air Quality Objective (µg/m³)	No. of days of exceedance allowed per year
Nitrogen	Health and wellbeing	1-hour	250	1
dioxide	Health and biodiversity of	1-year	62	N/A
	ecosystems	1-year	33	N/A
Carbon monoxide	Health and well being	8-hour	11,000	1


The existing emission sources of the Facility include the three generators, three compressors, a hot oil heater and a regeneration heater – these are shown in Plates 4.1 to 4.3, with locations shown on Figure 2.1.

4.1.2 Potential Impacts

Dust and greenhouse gases will be emitted into the atmosphere from earthwork machinery and vehicle movement during recommissioning activities. These sources will temporarily increase the local concentrations of particulate matter and combustion gases but are likely to be short-term and localised.

Air emissions of NO_2 and CO gases during normal operation of the Facility are expected from several primary point sources including exhaust from the three on-site gas-powered generators, three gas-driven compressors, the hot oil heater, and the regeneration heater. The vertical flare may also be used in emergency situations.

The predicted ground-level nitrogen dioxide (NO_2) and carbon monoxide (CO) concentrations at air quality sensitive receptors during normal continuous operation of the Facility (and the adjacent EPIC Energy and Santos facilities) is presented in Table 4.2 and shown in Figures 4.2 and 4.3 respectively. The predicted concentrations do not exceed the air quality objectives outlined in Table 4.1.

Receptor	Nitrogen di	Carbon monoxide (CO)	
	1-hour average fa(µg/m³)	Annual average (μg/m³)	8-hour average (μg/m³) [†]
R1	116	4.23	85.4
R2	127	11.6	118
R3	126	13.7	121
R4	174	39.5	187

 Table 4.2
 Predicted air pollution concentrations at sensitive receptors

* Measured as the 99.9th percentile.

† Measured as a maximum.

The total annual fuel burning capacity of the Facility is estimated to be 5,016,456 kg. This fuel is required to run the generators, compressors, hot oil heater and regeneration heater, and represents a combined fuel burning rate of 572.7 kg/hr.

The estimated annual emission rate of greenhouse gases from the Facility is 13.5 kilo-tonnes of CO2 equivalent (CO2-e) assuming fuel gas consumption rates for future years are comparable with 2010 fuel gas consumption. Using the most recent published inventories, the Facility emissions represent:

- 0.002% of Australia's estimated 551 million tonnes of CO2-e greenhouse gas emissions for the year to March.
- 0.01% of Queensland's estimated 157.3 million tonnes of CO2-e annual emissions (for the 2009/2010 period).



Plate 4.1a Existing air emission point - generator units



Plate 4.1b Existing air emission point - generator units



Plate 4.2 Existing air emission point - compressors



Plate 4.3 Existing air emission points - hot oil heater and regeneration heater





4.1.3 Environmental Protection Commitments

Management and mitigation measures will be adopted to minimise the risk of environmental nuisance at identified sensitive receptor locations. The objectives and mitigation measures proposed for managing air quality are outlined in Table 4.3.

AGL will address the management of air quality impacts, such as dust and odour, through a complaints-based process in the first instance (see Section 3.6).

Environmental Protection	• To achieve air quality objectives of the Environmental Protection (Air) Policy 2008 during recommissioning and operation.			
Objectives	 To minimise the potential for recommissioning and operations activities to adversely affect sensitive receptors. 			
	 To maintain acceptable limits of vehicular and machinery operating emissions. 			
	 To minimise gaseous and greenhouse gas emissions. 			
Control Strategies	 Relevant legislative and Australian Standard design requirements will be adhered to where appropriate. 			
	 Access routes will be maintained to minimise traffic dust. 			
	 Vehicles and machinery will be regularly maintained and fitted with appropriate exhaust systems and devices. 			
	 Maintenance activities requiring purging of gas will be minimised and conducted under favourable meteorological conditions (to facilitate rapid atmospheric dispersion). 			
	 Install standard leak detectors for hazardous area installations. 			
	 Any detected leaks will be repaired as a high priority. 			
Performance	No receipt of air quality-related complaints from neighbouring sensitive receptors.			
Indicators	Documentation of regular servicing/maintenance of all vehicles and plant components.			
Monitoring, Reporting &	 Non-compliance and incident reporting will be closed out by senior management to ensure prompt rectification and change management as required. 			
Corrective	 Landholder complaints will be recorded and closed out. 			
Actions	 Regular reporting and audits will be undertaken by the Production Manager in accordance with the requirements of the Petroleum and Gas (Production and Safety) Regulation 2004, including the results of leaks detection and estimates of the volume of any gas vented, and recommendations and corrective actions shall be implemented. 			
	Audit of vehicle servicing records.			
	Audit of the plant maintenance records for leaks detection and repair.			

Table 4.3Environmental protection commitments – air quality

4.2 Land and Ecology

This section describes the approach to managing potential impacts on existing environmental values associated with landform, soil, flora and fauna, areas of high ecological significance and other environmentally sensitive areas.

4.2.1 Existing Environment and Environmental Values

The region is characterised by hot summers and cool winters; the average maximum and minimum temperatures are 34.4°C and 20.4°C respectively in January, compared to 19.6°C and 4.1°C respectively in July (BOM, 2013). The region has an average annual rainfall of approximately 600 mm (BOM, 2013).

The land in the vicinity of the Project site is mapped within the Balonne-Maranoa land system (Galloway et.al, 1974). The weathered, lowland sediment soils are characterised by duplex soils,

cracking clays with some Gilgai. The generally flat and gently undulating land, is largely cleared for agricultural pasture grassland, primarily for beef cattle grazing.

A search of the trigger maps for strategic cropping land (SCL), under the SSL Act, shows that the Facility is within the Western Cropping Zone but that no SCL occurs on the Project site (Figure 4.4).

There are two small ephemeral watercourses close (but external) to the site; both flow from north to south and are tributaries of the Balonne River. Approximately 1 km to the east of the Facility is Wallumbilla Creek, and approximately 1 km to the west of the Facility is Pickanjinnie Creek, a small tributary of Wallumbilla Creek. Both watercourses have narrow bands of riparian vegetation described as Brigalow Belt bioregional ecosystem, regional ecosystem (RE) 11.3.25/ RE 11.3.2 (80:20 ratio). The REs are described as *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines with *E. populnea* woodland on alluvial plains, and are classified under the VM Act as of-concern sub-dominant (Figure 4.5).

Two small patches of remnant vegetation occur in the vicinity of the Facility, each approximately 3 ha, including one patch approximately 1 km to the southwest, and the other patch approximately 1 km to the northeast. Neither of these small patches is mapped as remnant vegetation under the VM Act, and both are external to the Facility site.

A search of the EHP Wildlife Online database was conducted, which indicated that two native species listed under the NC Act have been recorded within 5 km of the Facility:

- The near threatened rough collared frog (Cyclorana verrucosa).
- The vulnerable brigalow scaly-foot (*Paradelma orientalis*).

A range of pest plants and animals may occur within the vicinity of the Project site. The identified pest animals include: cane toad (*Bufo marinus*), cat (*Felis catus*), European rabbit (*Oryctolagus cuniculus*), pig (*Sus scrofa*), and fox (*Vulpes vulpes*). The identified weeds include 20 species of national significance, as well as prickly acacia (*Acacia nilotica subsp. Indica*), parthenium (*Parthenium hysterophorus*), and mesquite (*Prosopis* spp.).

There is one state significant biodiversity value (as defined in Appendix 1 of the Queensland Biodiversity Offset Policy) is located approximately 1 km from the Facility – the RE 11.3.2 (as it is an of concern RE, and is therefore listed under Schedule 2 of the Vegetation Management Regulation 2000). There are no Category A, B or C environmentally sensitive areas (as listed in s. 25 of the EP Regulation) in the immediate vicinity of the Facility.

4.2.2 Potential Impacts

As the Project involves recommissioning an existing Facility, there is very little disturbance of land or soils involved. The only disturbance will be from the rehabilitation of the flare pit, and this will be minor and temporary, and will have a positive effect on the soil as it is designed to address any contamination that may have occurred in the past as a result of its use as a flare pit. As such, the potential to adversely impact land and soils resources or disturb existing contaminated land and cause land contamination is minimal.





No vegetation clearing is proposed for the Project activities and no direct disturbance to wildlife is anticipated as a result of the recommissioning or operations activities. Native wildlife that may occasionally occur in the vicinity of the Facility, particularly at the nearby offsite watercourses, may be disturbed by lighting, noise and vehicle and personnel movement. Any disturbance is unlikely to differ from the magnitude of disturbance during the previous operation of the Facility, particularly in the context of the continued operation of the adjacent gas processing facilities, and current and proposed developments (such as the new Santos facility). Security fencing will be used to exclude wildlife from the Facility site.

The Nature Conservation (Wildlife Management) Regulation 2006 (the Wildlife Regulation) contains regulations concerning the tampering of animal breeding places. The Project does not require the tampering of animal breeding places so the Wildlife Regulation will not apply.

The Project does not require the clearing of native vegetation; therefore no approvals are required under the NC Act or VM Act for clearing and no environmental offsets will be required in accordance with the Queensland Government Environmental Offsets Policy.

Transport activities associated with the movement of workforce, vehicles and machinery may risk the introduction and spread of weeds, or plant and animal pathogens. There is an existing weed washdown facility in Wallumbilla, which can be used to reduce the risk of introducing weeds to the site. Pest animals may occasionally stray into or nearby to the Project site, although this will be reduced with the use of security fencing.

4.2.3 Environmental Protection Commitments

The objectives and mitigation measures proposed for managing land and ecological resources are outlined in Table 4.4.

Environmental	Land and Soil Resources
objectives	To avoid or minimise soil disturbance.
	Flora and Fauna Resources
	• To avoid or minimise the adverse effects on terrestrial ecology values during the recommissioning and operation of the Facility.
	 To prevent the introduction and spread of new or existing weeds, or plant and animal pathogens.
Control Strategies	 Rehabilitation of potentially contaminated soil within the flare pit.
	• Avoiding clearing of remnant vegetation. Essential activities such as wildfire control at the Facility perimeter and the rehabilitation of disused facility infrastructure may require some minor vegetation cutting.
	• Exclusion of wildlife from the Facility site with the use of 6 ft-high security fences.
	 Vehicle washdown completed on vehicles on a regular basis (period of every month in Wallumbilla township – if not based at LPG plant) and for any vehicle not local to the area including all construction vehicles.
Performance Indicators	 Gross contaminants (i.e., free hydrocarbons) and significantly impacted surface soils removed from flare pit and appropriately disposed of or remediated.
	No remnant vegetation cleared.
	No new weed species introduced to site.
Monitoring,	 Testing of soils within the flare pit following rehabilitation.
Reporting & Corrective Actions	Monitoring of presence of weed species.

Table 4.4	Environmental protection commitments – land and ecology
	Environmental protection communents hand and ecology

Given the nature of the Project and its locations, EA conditions relating to soil management plan, acid sulfate soils environmental management plan, ground-truthing surveys, mapping validation, or disturbance to environmentally sensitive areas are not proposed for the Project.

4.3 Noise

This section describes the approach to managing potential impacts on existing environmental values due to noise associated with the operation of the recommissioned Facility, including the Facility's contribution to cumulative local noise impacts.

4.3.1 Existing Environment and Environmental Values

The existing background noise environment in the vicinity of the Facility is typical of rural areas, with generally low levels of background noise dominated by incidental mobile noise sources such as livestock, farm machinery operation, and traffic. Neighbouring the Facility are two operational gas processing plants that contribute to the background (i.e., ambient) noise.

The area is not densely settled; there are very few residences within 1 km of the Facility. The nearest township, Wallumbilla, is approximately 13 km to the north.

On the basis that the Facility is an existing Facility, was the subject of a previous EA, and will have similar noise emissions as previously operated, noise modelling was considered to be unnecessary.

To inform the EM Plan, AGL commissioned Coffey Environments to conduct background noise monitoring at sensitive receptors in the vicinity of the Facility. Monitoring was conducted over a nine day period from 9 January to 18 January 2013.

Background noise was recorded at three sensitive receptor locations (R1, R2 and R3, as shown in Figure 4.1). One noise logger was set up at each of the sensitive receptor sites. It should be noted that at the commencement of sampling the noise from neighbouring gas facilities was not audible at any of the three receptors sites. The two nearby gas processing facilities are understood to have been operational for the duration of the monitoring period.

Noise levels were not monitored at a Santos temporary workers' camp located to the north of the Facility, on the basis that the Facility will operate at the same noise level as it did when previously operated by Santos. Santos selected the location of the camp while they were the operator of the Facility, and would therefore have taken into consideration the proximity of the Facility, and the Wallumbilla Gas Hub in general, as an occupational health and safety issue.

The following parameters were recorded at 15 minute intervals:

- L_{Aeq} the equivalent continuous sound (average) for the measurement period, which would contain the same sound energy as the actual sound fluctuating with time.
- L_{Amax} the maximum value recorded during the measurement period.
- L_{Amin} the minimum value recorded during the measurement period.
- L_{A01} the noise level exceeded for 1% of the measurement period.
- L_{A10} the noise level exceeded for 10% of the measurement period.
- L_{A50} the noise level exceeded for 50% of the measurement period.

- L_{A90} the noise level exceeded for 90% of the measurement period. Generally used to quantify the background noise level, i.e., the underlying level of noise which is present even during the quieter parts of the measurement period.
- L_{A95} the noise level exceeded for 95% of the measurement period.

The environmental values relevant to the Project constitute a local rural acoustic environment conducive to the wellbeing of:

- The community, including its social and economic amenity.
- An individual, including the opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

The relevant policies and guidelines that were used to develop acoustic quality objectives are:

- Environmental Protection Regulation 2008.
- Environmental Protection (Noise) Policy 2008 (Qld).
- World Health Organisation Guidelines for Community Noise (Berglund et al., 1999).

These policies and guidelines prescribe acoustic quality objectives for enhancing or protecting the environmental values of health and wellbeing. The acoustic quality objectives for dwellings during different times of the day are outlined in Table 4.5.

Sensitive receptor	Time of day	Indoor acoustic quality objectives (L _{Aeq}) – dB(A)	Outdoor acoustic quality objectives (L _{Aeq}) – dB(A)	Environmental value
Dwelling (for outdoors)	Daytime and evening (7am to 10pm)	N/A	50	Health and wellbeing
Dwelling (for indoors)	Daytime and evening 35 50 (7am to 10pm)		50	Health and wellbeing
Dwelling (for indoors)	Night-time (10pm to 7am)	30	45	Health and wellbeing, in relation to the ability to sleep

Table 4.5 Acoustic quality objectives

A summary of the range and average background noise level measurements for each site over the nine day sampling period is presented in Table 4.6 and discussed in further detail in Appendix 6.

Location	Time of	Total	Background noise level						
	uay	recorded	L _{Aeq} (dB(A))			L _{A90} (dB(A))			
			Number of exceedences*	Min	Max	Avg	Min	Max	Avg
R1	Daytime & evening	535	21	25.7	57.2	39.80	21.1	49.7	32.33
	Night-time	324	118	32.6	59.2	43.06	26.0	51.7	35.57
R2	Daytime & evening	535	165	33.7	64.0	47.02	25.9	47.3	35.06
	Night-time	324	119	34.5	69.6	44.19	32.3	50.8	37.41
R3	Daytime & evening	535	15	31.0	62	41.52	21.5	49.2	34.45
	Night-time	324	104	31.7	57.2	42.86	29.7	52.2	38.74

 Table 4.6
 Results of background noise level measurements at sensitive receptors

* Number of exceedences of the outdoor acoustic quality objectives as outlined in Table 4.5.

There was little difference between the average (L_{Aeq}) measurements during the daytime and evening (between 7 am and 10 pm) compared to night-time (between 10 pm and 7 am). At R2, the average L_{Aeq} during the daytime was higher than at night; conversely the night-time measurements were higher than the daytime measurements at both R1 and R3. R2 also had the highest average L_{Aeq} of the three sites, with R1 having the lowest during the day and R3 having the lowest at night-time.

While the average L_{Aeq} measurements were all below the outdoor acoustic quality objectives of 50 dB(A) for daytime and 45 dB(A) for night-time at all sites, several individual measurements exceeded the objective. At the sensitive receptor R2, 165 of the 535 measurements during the daytime exceeded the acoustic quality objective, compared to a maximum of 21 measurements at the other two sites. At night, the number of exceedences across the three sensitive receptor sites was relatively similar (ranging between 104 and 119 exceedences, out of the 324 measurements at night-time).

The L_{A90} measurements give an indication of the general background noise levels. The background noise during the daytime was lower than background noise during the night across all sensitive receptor sites. The results show that there was a wide variation in L_{A90} measurements, with an approximate 18 to 30 dB(A) range in measurements at all sites across both night-time and daytime.

4.3.2 Potential Impacts

The Environmental Protection Regulation 2008 places restrictions on noise from building sites, with audible noise permitted between 6:30 am and 6:30 pm Monday to Saturday. This provides an indication of acceptable working hours near residences. Replacement of Facility components will be of a much lower intensity than a typical building site, however this activity is not expected to be scheduled outside of these working hours.

The normal operation of the Facility will be 24 hours per day, 7 days per week, with periodic scheduled shut-downs for maintenance, so near-continuous noise will be emitted from the Facility from the ongoing operations. The influence that this noise will need to be considered in the context of the other existing adjacent facilities that are in operation within the Wallumbilla gas hub.

Noise generated during the recommissioning stage will be largely associated with the transit of heavy vehicles delivering and removing plant components being upgraded, and the operation of vehicles and equipment on-site. This will result in intermittent short-duration increases in noise levels within the immediate vicinity of the Facility during the daytime. Also given the temporary and transient nature of the noise there is no potential for background noise creep (i.e., gradual increase in the background noise level in an area due to changing demographics and/or new developments and activities).

4.3.3 Environmental Protection Commitments

The EPP (Noise) describes a hierarchy for the management of noise. To the extent that it is reasonable to do so, noise must be dealt with in the following order of preference:

- 1) Avoid (e.g. locating an activity in an area that is not near a sensitive receptor).
- 2) Minimise, in the following order of preference:

(i) orientate an activity to minimise noise (e.g. facing a part of an activity that makes noise away from a sensitive receptor or using a natural attenuating feature such as a gully)

- (ii) use best available technology (e.g. noise abatement barriers or enclosures).
- 3) Manage (e.g., using heavy machinery only during business hours).

AGL will address the management of noise nuisance, in the first instance, through a complaintsbased process.

Management and mitigation measures will be adopted to avoid environmental nuisance at any sensitive place. The objectives and mitigation measures proposed for managing acoustic quality are outlined in Table 4.7.

Environmental Protection Objective	 To minimise the potential for noise to adversely affect sensitive receptors during recommissioning and operation. To achieve relevant environmental acoustic quality objectives of the Environmental Protection (Noise) Policy 2008, during recommissioning and operation.
Control Strategies	 Recommissioning activities near sensitive places shall be restricted to normal working hours (typically 6:30 am to 6:30 pm, 7 days a week) unless otherwise agreed with the potentially affected stakeholder(s). Relevant legislative and Australian Standard design requirements will be adhered to where appropriate. Adequate community notice of any scheduled, atypical noise events will be provided. Equipment will be fitted with poise control devices where possible and appropriate.
Performance Indicators	 No noise related complaints received from residents and landholders. Documentation of repair and replacement of faulty equipment as soon as possible. Documentation of consultation and planning for atypically noisy events.
Monitoring, Reporting & Corrective Actions	 Landholder complaints relating to noise will be recorded and closed out. Regular audits and will be undertaken, and recommendations and corrective actions shall be implemented. Noise survey(s) will be undertaken as appropriate and upon request from the administering authority. Noise surveys at relevant nearest local residences will be undertaken as appropriate.

 Table 4.7
 Environmental protection objectives – noise

As AGL intends to manage noise effects on sensitive receptors as a complaints-based process, the model conditions relating to the preparation of a noise management plan have been excluded from the proposed EA conditions. In the event that a valid complaint is received regarding noise from the Facility, AGL proposes investigating and measuring the noise levels at that sensitive receptor against the values in the table in the proposed conditions. This table is adapted from the model conditions, with the values updated to reflect the background noise measurements obtained at the sensitive receptors in January 2013.

4.4 Water

This section describes the approach to managing potential environmental impacts on the ground and surface waters at the Facility. The assessment considers the potential erosion and sedimentation impacts associated with stormwater management at the Facility.

4.4.1 Existing Environment and Environmental Values

Surface Water

The Facility is located in the catchment of the Condamine-Balonne Rivers, which forms part of the Murray-Darling Basin. The surface water system in the vicinity of the Project area is described in Section 4.2. AGL advises that the records at the Facility indicate that it is not subject to flooding or disturbance by overland flow during rainfall.

Groundwater

The Project site is within the recharge zone for the Great Artesian Basin. Groundwater depth, quantity and quality data for the Project site are not available. There is one groundwater bore within the Facility site, which is utilised for domestic purposes on site and used to top up the fire water dam (less than 2.5 ML capacity) during prolonged dry conditions or in emergency situations.

The existing flare pit, associated with the existing flare tip, is to rehabilitated and replaced with a dedicated closed drain tank for unloading off-site by tanker. The existing flare pit will be rehabilitated to remove contaminated soils to prevent discharge of contaminants to groundwater.

The environmental values of surface water and groundwater relevant to the Project are:

- Biological integrity of nearby watercourses.
- Biological integrity of groundwater in the vicinity of the Project site.
- Suitability for agricultural use, such as water livestock.

4.4.2 Potential Impacts

Surface water quality may be impacted by ground disturbance that causes localised erosion and/or sedimentation, however as the Project is an existing facility and there will be negligible ground disturbance, erosion and sedimentation is considered unlikely.

There is the potential for accidental spills of fuels or chemicals, or leaks from plant components during their operational life, to release contaminants. If these contaminants were to become mobilised (e.g., in surface water runoff during heavy rainfall), then this could lead to contamination of the nearby surface or groundwater systems. Containment measures can be implemented to prevent the mobilisation of any released contaminants into the environment.

The rehabilitation of the flare pit pond will remove existing contaminated soil, reducing the risk of contamination of surface or groundwater systems.

4.4.3 Environmental Protection Commitments

The following section outlines the reasonable and practicable measures proposed to prevent contamination of surface or ground waters as a result of the recommissioning and operation of the Facility. The objectives and mitigation measures proposed for managing surface and groundwater are outlined in Table 4.8.

Environmental Protection Objective	 To maintain surface and groundwater quality and environmental values.
Specific Objectives	 Ensure effective management of stormwater run-off. Prevent as far as practical, sediment and contaminant transport to adjacent land/properties and nearby watercourses. Successfully rehabilitate the flare pit no longer required for the recommissioned facility.
Control Strategies	 Relevant legislative and Australian Standard design requirements will be adhered to where appropriate. Alteration to topography or drainage will be avoided during recommissioning and rehabilitation activities.
Control Strategies (cont'd)	 Land rehabilitation activities will be managed to minimise the duration of land disturbance to limit the potential for soil erosion from any unanticipated adverse weather conditions. Above ground facilities and stormwater run-off control devices (e.g., spoon drains, silt traps) will be monitored and maintained. Chemical storage areas, vehicle workshop areas and project components will have
	 bunding and/or other containment measures to capture any spills or leaks. Plant components will be regularly maintained to minimise the risk of leaks developing. An emergency spill response kit will be housed on site. Water will only be extracted from the groundwater bore for domestic purposes on site and to fill up the fire water dam during extended dry periods or emergency situations.
Performance Indicators	 No adverse impacts on soil or surface water or groundwater as the result of recommissioning or land rehabilitation activities. No uncontained spills or leaks.
Monitoring, Reporting & Corrective Actions	 Ongoing monitoring will be undertaken to assess the success and integrity of control measures, ensure appropriate follow-up rehabilitation measures are implemented to assess the ongoing stability of watercourse crossings. Regular audits and reviews will be undertaken, and recommendations and corrective actions shall be implemented. Non Compliance and Incident Reporting will be closed out by senior management to ensure prompt rectification and change management as required. Operational audits will be undertaken which will evaluate revegetation, erosion control, weed control, water course alteration prevention and success of bed and bank reprofiling. Inspection of discharge points for soil erosion, surface water sedimentation runoff into drainage areas, particularly at the site perimeter, after major rainfall events.
Proposed EA Conditions (Schedule B, Water)	 Contaminant Release Contaminants must not be directly or indirectly released to any waters except as permitted under this EA.

 Table 4.8
 Environmental protection commitments – surface and groundwater

Given the nature of the Project (particularly the negligible land disturbance), AGL does not propose preparing an erosion and sediment control plan or a groundwater monitoring program (as per the model conditions).

4.5 Chemicals Storage and Waste

This section describes the approach to managing potential environmental impacts due to the onsite storage of chemicals, including flammable substances, and management, storage and disposal of wastes associated with the recommissioning and operation of the Facility.

A key component of the upgrade of the Facility is the closed drain system to collect liquid hydrocarbons and contaminated water from the Facility and direct them to a tank, for storage and ultimate transport offsite by a licenced operator. This system replaces the previous system whereby liquid hydrocarbons and contaminated water was released into the flare pit, which will be decommissioned and rehabilitated.

4.5.1 Existing Environment and Environmental Values

The existing Facility has areas used for the storage of small quantities of fuels, chemicals and other flammable substances (Plates 4.4 and 4.5). These areas have bunding and containment measures in place (Plates 4.6 and 4.7). These sites also include emergency response facilities such as fire extinguishing hydrants and other equipment.

There are no places within the Project site listed on the Contaminated Land Register.

The environmental values relevant to the Project are:

- The life, health and wellbeing of people.
- Soil, air, and surface and groundwater quality.
- Land use capability, having regard to economic considerations.

4.5.2 Potential Impacts

During the recommissioning stage a variety of solid, hard and liquid wastes may be generated associated with the removal of old plant and the replacement of new items. These may include, for example, timber skids, fibre/nylon rope spacers, pallets, drums and scrap metals, lubrication oils, or paints.

During operation of the Facility there is potential for chemical contaminants to be exposed on the Project site, such as minor volumes of fuels, oils, paints, solvents and other regulated wastes. It is also possible that regulated waste such as low volume, low level contaminated soil/gravel (e.g., with substances such as hydrocarbons) may be generated. Relatively small amounts of domestic and industrial wastes will be generated during the recommissioning and operation of the Facility.

Waste management issues and impacts associated with project activities include the uncontrolled releases of waste through the failure to manage waste storage and containment systems, potentially leading to contamination of land or water.

Potential impacts associated with waste and waste management are dealt with under the sections dealing with specific aspects of the environment (e.g., water, land, soil and visual amenity).

4.5.3 Environmental Protection Commitments

The objectives and mitigation measures proposed for managing potential impacts due to chemicals storage and waste are outlined in Table 4.9.



Plate 4.4 Storage of combustible liquids with fire safety facility

Plate 4.5 Storage of flammable liquids



Plate 4.6 Spill containment around compressor units



Plate 4.7 Waste oil tank with triple interceptor

The waste management commitments are to be based on the objects and principles of waste management, and the waste and resource management hierarchy in the *Waste Reduction and Recycling Act 2011* (Qld) and the Environmental Protection (Waste Management) Regulation 2000 (Qld), that is, avoidance, re-use, recycling and disposal of waste.

Environmental Protection Objectives Control Strategies	 To minimise any negative impacts associated with waste generation through adoption of the waste management hierarchy. No contaminated land generated from recommissioning activities following post-phase clean-up program. No spills of hazardous waste fluids (e.g., oil). Safe and proper disposal of waste. Develop strategies for management of specific waste streams prior to recommissioning commencing. Stockpile and salvage reusable and recyclable wastes, such as timber skids, fibre/nylon rope spacers, pallets, drums and scrap metals. Store bazardous wastes in bunded areas away from watercourses
	 Collect and remove (via a contractor licensed to transport such wastes) waste oil, solvents and other toxic materials from site for recycling, reuse or disposal at facility licensed to accept such wastes. Waste oil and chemical storage areas must be suitably bunded in accordance with relevant Australian Standards and EHP requirements.
Control Strategies (cont'd)	 All bonding material and dunnage from transport vehicles and unloading areas is to be collected and transported off the site to designated disposal areas. Rehabilitation of any contaminated land caused by the Project will be in accordance with the requirements of the <i>Draft Guidelines – for the Assessment and Management of Contaminated Land in Queensland, Department of Environment, May 1998.</i> Collect and transport general refuse to local council-approved disposal sites.
Control Strategies (cont'd)	 Collect, where practicable taking into account health and hygiene issues, all food wastes for disposal off site. No on-site disposal of waste without local government and/or EHP approval. All personnel will be instructed in project waste management practices as a component of the environmental induction process. Where practical, wastes (e.g., scrap metal) will be segregated and reused/recycled. All litter and general waste disposal will be at a local municipal waste station utilising an approved waste contractor. All oils and chemical wastes (bunding as per regulatory guidelines) will be stored and handled in accordance with the relevant Australian Standards and Fire Safety regulations. Records of all controlled wastes stored, and removed from site will be maintained. Materials and equipment for responding to hazardous spill incidents will be provided and maintained.
Performance Indicators	 No evidence of uncontrolled waste (i.e., not in appropriate containers) at above ground facilities during inspections. Record of regulated waste disposal. Number of Waste Spill Reports.
Monitoring, Reporting & Corrective Actions	 Housekeeping checks to ensure waste is being stored correctly and no litter is occurring. Regular audits and reviews will be undertaken, and recommendations and corrective actions shall be implemented. Waste will be tracked and appropriately recorded. Report hazardous waste spills. Review of operations waste management procedures, and quantity of regulated wastes generated.

 Table 4.9
 Environmental protection commitments – chemical storage and waste

4.6 Community and Heritage

This section describes the approach to managing potential impacts on existing community and heritage social values associated with the recommissioning and operation of the Facility, including workforce, road transport, and scenic amenity issues.

4.6.1 Existing Environment and Environmental Values

The Facility is located in the Maranoa Regional Council local government area in the Darling Downs region of Queensland. The major regional industries are cattle and sheep grazing, cropping, forestry, natural gas production and tourism.

Roma, approximately 42 km west-northwest of the Facility, is the largest town in the region, with a population of approximately 8,000 people. Roma provides many of the services required by the region. Other population centres in proximity to the route include Wallumbilla (population approximately 300), on the Warrego Highway approximately 13 km north of the Facility, which services agricultural and gas industries and Yuleba (population approximately 200).

Major state-controlled roads in the area that may carry traffic carrying new plant, installation equipment or personnel for the recommissioning of the Facility include:

- Warrego Highway, which passes through Roma from Brisbane (National Highway, A2).
- Carnarvon Highway, from Roma to Injune (State Strategic Road, A55).
- Roma–Taroom Road (regional road).

Access to the Facility from the Warrego Highway is via a turnoff from the township of Wallumbilla, then via the Wallumbilla South Road.

Visual aspects of the region are dominated by broad, cleared rural landscapes with scattered patches and linear strips of remnant native vegetation, often associated with watercourses and fenceline windrows.

Indigenous cultural heritage is protected by the *Aboriginal Cultural Heritage Act 2003 (Qld)*. Nonindigenous cultural heritage is protected under the *Queensland Heritage Act 1992 (Qld)*. As an existing developed industrial facility and disturbed site, the Project site is unlikely to contain any places or features registered as having known indigenous or non-indigenous cultural heritage value.

The community and cultural environmental values relevant to the Project are:

- Livelihood and wellbeing of local communities, nearby residents, and the workforces or neighbouring properties and the Facility itself.
- Rural landscapes.

4.6.2 Potential Impacts

An increase in haulage vehicles delivering new plant and removing decommissioned items via local major roads will occur during the recommissioning stage. Local traffic along local roads may increase due to the transit of the Facility's workforce. Local government and the Department of Transport and Main Roads will be advised if a significant increase in heavy vehicle use on roads is expected. Given the temporary nature of recommissioning activity in a specific area, increased traffic impacts are expected to be low.

As mentioned in Section 2.3.4, the peak operational workforce will be approximately five personnel. This will result in employment opportunities for the local community, and indirect benefits through the income flow for accommodation and other services in the region.

Given the nature of the Project, there are not expected to be any adverse impacts to Indigenous or non-Indigenous cultural heritage.

As the Facility site is remote from the Warrego Highway and rural townships, potential impacts to visual amenity are negligible; the only visually noticeable difference to the existing facility will be the vertical flare.

Given that the Project constitutes the recommissioning of a previously operational facility within the Wallumbilla gas hub, any potential community impacts will not be of a scale or character unfamiliar to the local community. The broader community will benefit both directly and indirectly due to local employment opportunities and expenditure during the recommissioning and operation of the Facility.

4.6.3 Environmental Protection Commitments

The objectives and mitigation measures proposed for managing potential impacts on community and heritage values are outlined in Table 4.10.

Environmental Protection Objective	• To avoid significant impacts on the livelihood and wellbeing of the community.			
Specific Objectives	 Avoid significant adverse impacts on the livelihood and wellbeing of local farming and township communities. Minimise impacts on visual amonity. 			
Control	• A complaints register will be established and maintained and complaints followed up.			
Strategies	 Targeted consultation will be undertaken to ensure that community issues are understood and addressed. 			
	• The Project will be planned and managed to avoid negative impacts on the community.			
	• Neighbouring and nearby landholders and residents will be informed of the nature and timing of any activities likely to interfere with local amenity and lifestyle, particularly during the recommissioning stage when increased volumes of heavy traffic may occur.			
	 The transport of heavy or long/wide loads to site will be regulated by the relevant permits, and be undertaken during periods that will minimise disruption to the local community, where practicable. 			
Performance Indicators	 No complaints received from stakeholders regarding project activities. 			
Monitoring, Reporting & Corrective Actions	Any complaints received are appropriately actioned and closed out.			

 Table 4.10
 Environmental protection commitments – community and heritage values

5. REHABILITATION

The Facility is expected to continue in its current capacity processing feed gas supplied from the Silver Springs Underground Gas Storage Project, which has a Petroleum Lease granted for a 30 year period (granted in 2011). Given this anticipated long operational life of the Facility, the establishment of specific monitoring objectives within a rehabilitation plan cannot be determined until the final land use is determined.

AGL will develop a rehabilitation plan no later than two years prior to decommissioning. The rehabilitation plan will:

- Determine the final land use.
- Outline rehabilitation objectives.
- Describe how the rehabilitation objectives will be achieved.
- Design a rehabilitation monitoring program.
- Outline the final acceptance criteria.

The rehabilitation monitoring program is likely to address the following broad objectives:

- Remediate any contaminated land.
- Undertake rehabilitation to achieve the final land use indicators and completion criteria (once developed) by ensuring the site:
 - Is reshaped to a stable landform similar to that of surrounding undisturbed areas.
 - Has self-sustaining vegetation cover.
 - Is safe for human, stock and wildlife access.
 - Is non-polluting in perpetuity.
- Re-establish drainage lines, reinstate the top layer of the soil profile, control erosion and pests, and promote, establish healthy and suitable vegetation growth.
- Ensure the site is able to sustain an agreed land use.

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Appendix 1

Cross-check against legislation and guideline requirements

EP Act s. 310D	EP Act Requirement	EM Plan Reference
(2)	An environmental management plan must –	
(a)	be in the approved form	Section 1.3.2, Guidelines.
(b)	describe each of the following -	
	each relevant resource authority for the EA	Section 1.6, Relevant Petroleum Tenure and Authority.
	all relevant activities the subject of the application	Section 2, Facility Details.
	the land on which the activities are to be carried out	Section 1.6.1, Petroleum Facility Licence.
	the environmental values likely to be affected by the activities	Existing environment and environmental values in Section 4, Environmental Values and Protection Commitments.
	the potential adverse and beneficial impacts of the activities on the environmental values	Potential impacts in Section 4, Environmental Values and Protection Commitments.
(c)	state the environmental protection commitments the applicant proposes for the activities to protect or enhance the environmental values under best practice environmental management	Environmental protection commitments in Section 4, Environmental Values and Protection Commitments.
(d)	contain enough other information to allow the administering authority to decide the application and conditions to be imposed on EA (chapter 5 activities)	Section 1, Background; Section 2, Facility Details; Section 3, Health, Safety and Environment Systems.
(e)	address any other matter prescribed under an environmental protection policy or regulation	Section 4, Environmental Values and Protection Commitments.
(3)	The environmental protection commitments must include a rehabilitation program for land proposed to be disturbed under each relevant resource authority for the application.	Section 5, Rehabilitation.
(4)	The rehabilitation program must state a proposed amount of financial assurance for the EA.	Section 1.6.2, Financial Assurance.
(5)	If the application is for a coal seam gas environmental authority, the environmental management plan must also state the following—	Not applicable as the project does not entail the extraction of coal seam gas water

 Table A1.1
 Cross-check against requirements of s. 310D of the Environment Protection Act

Part	Category	EM Plan Reference
2	Identification of environmental values	Existing Environment and Environmental Values sections:
		Section 4.1.1 (Air and Greenhouse Gas)
		Section 4.2.1 (Land and Ecology)
		Section 4.3.1 (Noise)
		Section 4.4.1 (Water)
		 Section 4.5.1 (Chemical Storage and Waste)
		Section 4.6.1 (Community and Heritage)
	Potential adverse or beneficial impacts	Potential Impacts sections:
	of the project activities on the identified	Section 4.1.2 (Air and Greenhouse Gas)
	environmental values	 Section 4.2.2 (Land and Ecology)
		Section 4.3.2 (Noise)
		Section 4.4.2 (Water)
		Section 4.5.2 (Chemical Storage and Waste)
		Section 4.6.2 (Community and Heritage)
	Proposed environmental protection commitments, objectives and control	Environmental Protection Commitments sections:
	strategies	Section 4.1.3 (Air and Greenhouse Gas)
		Section 4.2.3 (Land and Ecology)
		Section 4.3.3 (Noise)
		Section 4.4.3 (Water)
		 Section 4.5.3 (Chemical Storage and Waste)
		Section 4.6.3 (Community and Heritage)
3.1 Description of	The project name and general location of the project.	Section 1, Introduction
petroleum tenures/petroleum	Identification of each relevant resource authority in the project.	Section 1.6, Relevant Petroleum Tenure and Authority
aunonnes	Identification of relevant blocks/sub- blocks.	Section 1.6, Relevant Petroleum Tenure and Authority
	Real property descriptions, including the lot on plan of any land that is required to be notified and included on the environmental management register	Section 2.5, Area of Disturbance
	Real property descriptions, including the lot on plan of any land that is State forest, timber reserves, resource reserves and/or unallocated State land.	Section 2.5, Area of Disturbance
3.1 Description of project activities	The planned project life (in years) identifying construction, operation and rehabilitation phases	Section 2.8, Facility Life
	The types of petroleum activities being carried out (e.g. coal seam gas, shale gas, shale oil, tight gas, conventional oil, conventional gas, petroleum facility, petroleum pipeline activities)	Section 2.3, Proposed Facility Operations

Table A1.2Cross-check against the requirements of the 'Preparing an environmental
management plan for petroleum activities' (EM705) guideline

Part	Category	EM Plan Reference
3.1 Description of project activities (cont'd)	Details of all petroleum infrastructure, compressor stations, power and fuel supplies and any other activities which may cause environmental harm.	Section 2.3, Proposed Facility Operations
	The scale (i.e. maximum areas) and locations of disturbance (ha) to all areas including a description of any environmental values found at these locations.	Section 2.5, Area of Disturbance
	A description of exploration and production methods, hours of operation and annual production rates, forecasts of water volumes including CSG water, formation water or any waste water.	N/A
	The planned project life (in years) identifying construction, operation and rehabilitation phases.	Section 2.8, Facility Life
	Activities that would be chapter 4 activities (i.e. environmentally relevant activities (ERA's) in Schedule 2 of the EP Regulation) if they were not being conducted as part of a chapter 5A activity.	Section 2.6, ERA Activities
	Notifiable activities (Schedule 3 of the EP Act) carried out on the site.	Section 2.7, Notifiable Activities
3.1	All relevant stakeholders.	Section 2.4, Project Stakeholders
General description of environment	Sensitive places and commercial places.	Figure 4.1, Sensitive receptor locations
	Any ESAs	Section 4.2.1, Existing Environment and Environmental Values (Land and Ecology)
	Any state-significant biodiversity values	Section 4.2.1, Existing Environment and Environmental Values (Land and Ecology)
	Other existing tenures and land uses in the near vicinity of the proposed project activities.	Section 1.2.2, Wallumbilla Gas Hub Section 4.2.1, Existing Environment and Environmental Values (Land and Ecology)
	Any endangered, vulnerable, rare or near threatened wildlife species	Section 4.2.1, Existing Environment and Environmental Values (Land and Ecology)
	Dominant ecosystems, topographic features, geology and soils	Section 4.2.1, Existing Environment and Environmental Values (Land and Ecology)
	Watercourses, wetlands, springs (including relevant environmental values), river improvement trust asset areas or wild river declaration areas	Section 4.2.1, Existing Environment and Environmental Values (Land and Ecology) Section 4.4.1, Existing Environment and Environmental Values (Water)
	Groundwater and aquifers	Section 4.4.1, Existing Environment and Environmental Values (Water)
	Floodplains	N/A
	Annual and long term climatic conditions	Section 4.2.1, Existing Environment and Environmental Values (Land and Ecology)

Table A1.2Cross-check against the requirements of the 'Preparing an environmental
management plan for petroleum activities' (EM705) guideline (cont'd)

Part	Category	EM Plan Reference	
3.1 General description of environment (cont'd)	Places/aspects potentially of interest to the administering authority or stakeholders such as places of heritage significance.	Section 4.6.1, Existing Environment and Environmental Values (Community and Heritage)	
3.1 Financial assurance	The financial assurance must include the cost of rehabilitating any disturbance to land undertaken as part of an activity on a petroleum authority.	Section 1.6.2, Financial Assurance	
3.2 Air	Description of environmental values	Section 4.1.1, Existing Environment and Environmental Values	
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 4.1.2, Potential Impacts	
	Proposed environmental protection commitments, objectives and control strategies.	Section 4.1.3, Environmental Protection Commitments	
3.3 Land	Description of environmental values	Section 4.2.1, Existing Environment and Environmental Values	
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 4.2.2, Potential Impacts	
	Proposed environmental protection commitments, objectives and control strategies.	Section 4.2.3, Environmental Protection Commitments	
3.4 Noise	Description of environmental values	Section 4.3.1, Existing Environment and Environmental Values	
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 4.3.2, Potential Impacts	
	Proposed environmental protection commitments, objectives and control strategies.	Section 4.3.3, Environmental Protection Commitments	
3.5 Community	Description of environmental values	Section 4.6.1, Existing Environment and Environmental Values	
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 4.6.2, Potential Impacts	
	Proposed environmental protection commitments, objectives and control strategies.	Section 4.6.3, Environmental Protection Commitments	
3.6 Heritage	Description of environmental values	Section 4.6.1, Existing Environment and Environmental Values	
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 4.6.2, Potential Impacts	
	Proposed environmental protection commitments, objectives and control strategies.	Section 4.6.3, Environmental Protection Commitments	

Table A1.2Cross-check against the requirements of the 'Preparing an environmental
management plan for petroleum activities' (EM705) guideline (cont'd)

Part	Category	EM Plan Reference
3.7 Waste	Description of environmental values	Section 4.5.1, Existing Environment and Environmental Values
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 4.5.2, Potential Impacts
	Proposed environmental protection commitments, objectives and control strategies.	Section 4.5.3, Environmental Protection Commitments
3.8 Water	Description of environmental values	Section 4.4.1, Existing Environment and Environmental Values
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 4.4.2, Potential Impacts
	Proposed environmental protection commitments, objectives and control strategies.	Section 4.4.3, Environmental Protection Commitments
3.9 Stimulation	Description of environmental values	N/A
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	N/A
	Proposed environmental protection commitments, objectives and control strategies.	N/A
3.10	Description of environmental values	Existing Environment and Environmental
Rehabilitation		Values sections:
		 Section 4.1.1 (All and Greenhouse Gas) Section 4.2.1 (Land and Ecology)
		 Section 4.3.1 (Noise)
		Section 4.4.1 (Water)
		Section 4.5.1 (Chemical Storage and Waste)
		Section 4.6.1 (Community and Heritage)
	Potential adverse or beneficial impacts of the project activities on the identified environmental values.	Section 5, Rehabilitation
	Proposed environmental protection commitments, objectives and control strategies.	Section 5, Rehabilitation

Table A1.2Cross-check against the requirements of the 'Preparing an environmental
management plan for petroleum activities' (EM705) guideline (cont'd)

Technical guidelines	Requirement	EM Plan Reference
Application requirements for activities with impacts to air (EM960)	Identify the environmental values of the receiving air environment including the identification of any nearby sensitive places.	Section 4.1.1, Existing Environment and Environmental Values
	Identify the possible impacts of to the proposed activity and all associated risks to the environmental values.	Section 4.1.2, Potential Impacts
	Identify the strategies to mitigate the identified risks to the environmental values.	Section 4.1.3, Environmental Protection Commitments
Application requirements for activities with impacts to land (EM961)	Identify the environmental values of the site, including any significant flora and fauna associated with the land.	Section 4.2.1, Existing Environment and Environmental Values
	Identify the possible impacts due to the proposed activity and all associated risks to the environmental values.	Section 4.2.2, Potential Impacts
	Identify the strategies to mitigate the identified risks to the environmental values.	Section 4.2.3, Environmental Protection Commitments
Application requirements for activities with noise impacts (EM962)	Identify the environmental values of the receiving acoustic environment including the identification of any nearby sensitive places.	Section 4.3.1, Existing Environment and Environmental Values
	Identify the possible impacts due to the proposed activity and all associated risks to environmental values.	Section 4.3.2, Potential Impacts
	Identify the strategies to mitigate the identified risks to the environmental values.	Section 4.3.3, Environmental Protection Commitments
Application requirements for activities with impacts to water (EM963)	Identify the environmental values of the receiving environment.	Section 4.4.1, Existing Environment and Environmental Values
	Identify the possible impacts due to the proposed activity and all associate risks to the values.	Section 4.4.2, Potential Impacts
	Identify the strategies to mitigate the identified risks to the environmental values.	Section 4.4.3, Environmental Protection Commitments
Application requirements for activities with waste impacts (EM964)	Identify the environmental values of the site.	Section 4.5.1, Existing Environment and Environmental Values
	Identify the possible impacts due to the proposed activity and all associated risks to the values.	Section 4.5.2, Potential Impacts
	Identify the strategies to mitigate the identified risks to environmental values.	Section 4.5.3, Environmental Protection Commitments

 Table A1.3
 Cross-check against requirements of technical guidelines

Question	Guideline Requirement	EM Plan Reference
3	A description of land where the activity will be carried out.	Section 4.2, Land and Ecology
23	A description of the environmental values likely to be affected by each relevant activity.	 Existing Environment and Environmental Values sections: Section 4.1.1 (Air and Greenhouse Gas) Section 4.2.1 (Land and Ecology) Section 4.3.1 (Noise) Section 4.4.1 (Water) Section 4.5.1 (Chemical Storage and Waste) Section 4.6.1 (Community and Heritage)
	Details of any emissions or releases likely to be generated by each relevant activity.	Section 4.1.2, Potential Impacts (Air and Greenhouse Gas) Section 4.3.2, Potential Impacts (Noise)
	A description of the risk and likely magnitude of impacts on the environmental values.	 Potential Impacts sections: Section 4.1.2 (Air and Greenhouse Gas) Section 4.2.2 (Land and Ecology) Section 4.3.2 (Noise) Section 4.4.2 (Water) Section 4.5.2 (Chemical Storage and Waste) Section 4.6.2 (Community and Heritage)
	Details of any management practices proposed to be implemented to prevent or minimise adverse impacts.	 Environmental Protection Commitments sections: Section 4.1.3 (Air and Greenhouse Gas) Section 4.2.3 (Land and Ecology) Section 4.3.3 (Noise) Section 4.4.3 (Water) Section 4.5.3 (Chemical Storage and Waste) Section 4.6.3 (Community and Heritage)
	Details of how the land the subject of the application will be rehabilitated after each relevant activity ceases.	Section 5, Rehabilitation
24	A description of the proposed measures for minimising and managing waste generated.	Section 4.5.3, Environmental Protection Commitments (Chemical Storage and Waste)

Table A1.4Cross-check against requirements of the site-specific application for an
environmental authority form
Appendix 2

Proposed Environmental Authority Conditions

Schedule code	Schedule Description	Addressed in Proposed EA Conditions
А	General Conditions	Yes
В	Water	Yes
BB	Groundwater	Yes
BC	Sewage Treatment >21 Equivalent Persons	No – Not applicable
BD	Release to Waters of Treated or Good Quality Coal Seam Gas Water Conditions	No – Not applicable
С	Regulated Structures	Yes
D	Land	Yes
E	Disturbance to Land	Yes
EE	Disturbance to Land with Biodiversity Values	No – Not applicable
F	Environmental Nuisance	Yes
G	Air	Yes
Н	Waste	Yes
I	Rehabilitation	Yes
J	Well Construction, Maintenance and Stimulation Activities	No – Not applicable
К	Community Issues	Yes
L	Notifications	Yes
М	Definitions	No – intended as per model conditions.

Summary of schedules included in the proposed EA conditions

SCHEDULE A GENERAL CONDITIONS

Authorised Petroleum Activity

(A1) In the carrying out of the petroleum activity, the number and maximum size for each of the specified petroleum activities listed in Schedule A, Table 1 – Authorised Petroleum Activities for each petroleum tenure must not be exceeded.

Resource Authority Number	Petroleum Activity	Number of Existing Petroleum activities	Number of Proposed Petroleum activities	Maximum size (where applicable)		
PFL 27	Gas processing facilities (for each facility)	0	Hydrocarbon gas refining	Maximum throughput of 40 TJ/day		

Schedule A, Table 1 – Authorised Petroleum Activities

Maintenance of Measures, Plant and Equipment

- (A2) The holder of the environmental authority must:
 - (a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority;
 - (b) maintain such measures, plant and equipment in their proper and effective condition; and
 - (c) operate such measures, plant and equipment in a proper and effective manner.
- (A3) No change, replacement or alteration of any plant or equipment is permitted if the change, replacement or alteration materially increases, or is likely to increase, the environmental harm caused by the petroleum activity.

Operational Plan

- (A4) An Operational Plan must be developed within 6 months following the commencement of any petroleum activity. This plan shall be certified by a suitable qualified person and provide detailed information about the petroleum activity to be carried out under this environmental authority.
- (A5) The petroleum activity identified in the Operational Plan must set out the maximum scope of the petroleum activity and incorporate the petroleum activities set out in the approved Work Program and / or Development Plan for the relevant resource authority as required under the Petroleum Act 1923 or the Petroleum and Gas (Production and Safety) Act 2004.
- (A6) The Operational Plan must include, but not be limited to:
 - (a) a stated period for the Operational Plan which is at least one (1) **year** but does not exceed three (3) years duration and which specifies an end date;
 - (b) a description of the existing and all proposed petroleum activities under the period of the Operational Plan;
 - (c) a map or series of maps that:
 - record the location of all infrastructure and its unique reference name / number that exists at the commencement of the period of the Operational Plan, including but not necessarily being limited to:
 - (a) water and gas gathering and flow lines;
 - (b) power lines;

- (c) gas processing facilities (including generators and compressors);
- (d) tracks and roads.
- (A7) The Operation Plan must contain a record of significant disturbance to land as a result of existing and programmed and approved infrastructure during the period of the Operational Plan, which must include, but not necessarily be limited to the following:
 - (a) as at the commencement of the Operational Plan period:
 - (i) minimum undisturbed area;
 - (ii) maximum existing disturbed area;
 - (iii) total areas(s) of disturbance to the primary protection zone of, and within Category A, B and C Environmentally Sensitive Areas by area type (e.g. Of concern RE, Endangered RE, State Forest);
 - (iv) total areas(s) of disturbance to State Significant Biodiversity Values;
 - (v) total area(s) of disturbance to in high value regrowth and remnant vegetation areas that are not environmentally sensitive areas; and
 - (vi) total area(s) rehabilitated;
 - (vii) identification of rehabilitated areas by category (e.g. age, status);
 - (viii) maps showing rehabilitated areas by category;
 - (ix) the results of the Rehabilitation Monitoring Program undertaken on rehabilitation carried out under the previous Operational Plan(s) and an assessment in relation to the requirements and acceptance criteria set out in this environmental authority; and
 - (b) programmed and approved infrastructure for the current Operational Plan period:
 - (i) maximum area(s) to be disturbed;
 - a description of each area(s) to be disturbed including tenure, coordinates, general site characteristics and disturbance types (e.g. well lease, flow lines, access track);
 - (iii) existing land use(s) of each area(s) to be disturbed; and
 - (iv) forecasted total area to be rehabilitated for the period of the Operation Plan.
- (A8) The Operational Plan must include a calculation of financial assurance for the maximum proposed and existing disturbance during the period of the Operational Plan.
- (A9) The commencement of the first Operational Plan period is the date of submission of the Operational Plan.
- (A10) A subsequent Operational Plan must be prepared not less than 20 **business days** prior to the expiry of the current Operational Plan.

Third Party Audit

- (A11) A **third party auditor**, nominated by the holder of this environmental authority, must audit compliance with the conditions of this environmental authority at a minimum frequency of every three (3) years.
- (A12) Notwithstanding condition (A11) and prior to undertaking the third party audit, the scope and content of the third party audit can be negotiated with the administering authority.
- (A13) An audit report must be prepared and certified by the third party auditor presenting the findings of each audit carried out.
- (A14) Any recommendations arising from the audit report must be acted upon by:
 - (a) investigating any non-compliance issues identified; and

- (b) as soon as reasonably practicable, implementing measures or taking necessary action to ensure compliance with the requirements of this environmental authority.
- (A15) A written response must be attached to the audit report detailing the actions taken or to be taken on stated dates:
 - (a) to ensure compliance with this environmental authority; and
 - (b) to prevent a recurrence of any non-compliance issues identified.

Contingency Plan for Emergency Environmental Incidents

- (A16) A Contingency Plan for Emergency Environmental Incidents must be developed prior to the carrying out of the petroleum activity.
- (A17) The Contingency Plan for Emergency Environmental Incidents must include, but not necessarily be limited to:
 - (a) a clear definition of what constitutes an environmental emergency incident or near miss for the petroleum activity authorised to be carried out under this environmental authority;
 - (b) identification of the types of environmental incidents that may occur, including but not limited to flooding impacts, relevant to the petroleum activity authorised to be carried out under this environmental authority;
 - (c) response procedures to minimise the extent and duration of environmental harm caused by environmental emergency incidents;
 - (d) the resources to be used in response to environmental emergency incidents;
 - (e) procedures to avoid / minimise discharges resulting from any overtopping or loss of structural integrity of a dam;
 - (f) procedures to investigate the cause of any incidents including releases or near misses, and where necessary, the remedial actions to be implemented to reduce the likelihood of recurrence of similar events;
 - (g) the practices and procedures to be employed to restore the environment or mitigate any environmental harm caused;
 - (h) procedures for accessing monitoring locations during emergency environmental incidents;
 - a receiving environment monitoring program, to be specifically implemented in the event of a release to waters or land to examine / assess environmental impacts. For monitoring of waters, this program must include upstream, downstream and impact site monitoring procedures. For soils monitoring, a soil assessment plan must be prepared by a suitably qualified person.
 - (j) communication procedures and lines of communication within and beyond the organisation, including but not limited to Local Government, to be employed in responding to environmental emergency incidents;
 - (k) the provision and availability of documented procedures to staff attending any emergency environmental incident to enable them to effectively respond;
 - training of staff that will be called upon to respond to emergency environmental incidents to enable them to effectively respond;
 - (m) timely and accurate reporting of the circumstance and nature of emergency environmental incidents to the administering authority and any affected landholder, occupier and / or their nominated representative in accordance with conditions of this environmental authority.

Infrastructure

- (A18) The following infrastructure must be clearly and permanently marked for the life of the petroleum activity with a unique reference name / number in such a way that it is clearly observable:
 - (a) authorised discharge points to air and waters;
 - (b) any bulk chemical storage facility (e.g., condensate tanks);
 - (c) gas processing facilities (e.g., generators and compressors).

Monitoring

- (A19) All monitoring required under this environmental authority must be undertaken by a suitably qualified person.
- (A20) All laboratory analyses and tests required to be conducted under this environmental authority must be carried out by a laboratory that has NATA accreditation for such analyses and tests, except as otherwise authorised by the administering authority.
- (A23) Any management or monitoring plans, systems, programs or procedures required to be developed and implemented by a condition of this environmental authority must be reviewed for performance and amended as required but not less than once every three (3) years in accordance with the requirements for the particular plans, systems, programs and procedures in the conditions of this environmental authority.
- (A24) If monitoring conducted in accordance with this environmental authority indicates a circumstance, condition or contaminant level has caused, or has potential to cause, environmental harm, the holder of this environmental authority must, as soon as is practicable, take the necessary actions to rectify the circumstance, condition or contaminant level so as to avoid or minimise environmental harm.
- (A25) An annual report must be prepared each year and submitted to the administering authority upon request by the administering authority. This report must include but not necessarily be limited to:
 - (a) the results of calculated ground level concentrations and/or point source air monitoring that is required by the conditions of this environmental authority;
 - (b) if prepared for the subject annual return period, any audit report and written response to said report that is required by this environmental authority;
 - (c) a comparison of the previous 12 **months** monitoring results to both the limits set in this environmental authority and to relevant prior results including data analyses and interpretation to assess the nature and extent of any contamination and the level of environmental harm caused as a result of the contamination and the environmentally relevant activity; and
 - (d) details of any exceedences with the conditions of this environmental authority and the dates and times these exceedances were reported to the administering authority;
 - (e) an outline of actions taken to minimise the risk of environmental harm from any circumstance, condition or elevated contaminant level identified by the monitoring or recording programs as required by condition (A24).

Noise Sampling Methodology

(A26) If required by condition (F2), noise must be measured in accordance with the prescribed standards in the *Environmental Protection Regulation 2008.*

Air Sampling Methodology

(A27) The method of measurement of point source contaminant releases to air must comply with the latest edition of the *Queensland Air Quality Sampling Manual* and/or **Australian Standard 4323** as amended from time to time.

Documentation and Records Management

- (A28) A record of all documents required by this environmental authority must be kept for a minimum of five (5) years.
- (A29) All plans and monitoring programs required by this environmental authority must be certified by a suitably qualified person.
- (A30) All plans and monitoring programs required under this environmental authority must be implemented.

SCHEDULE B WATER

Contaminant Release

(B1) Contaminants must not be directly or indirectly released to any waters.

SCHEDULE BB GROUNDWATER

(BB1) The extraction of groundwater as part of the petroleum activity from underground aquifers must not directly or indirectly cause environmental harm to any **watercourse**, **lake**, **wetland** or **spring**.

SCHEDULE C REGULATED STRUCTURES

(C1) Regulated structures are not permitted.

SCHEDULE D LAND

General

(D1) Contaminants must not be directly or indirectly released to land.

SCHEDULE E DISTURBANCE TO LAND

Site Planning

(E1) Prior to carrying out petroleum activities, the holder of this environmental authority must make all relevant staff, contractors or agents carrying out those petroleum activities, aware of the location of any areas of State Significant Biodiversity Value and the requirements of this environmental authority.

Impacts to State Significant Biodiversity Values

(E2) Impacts to State Significant Biodiversity values are not permitted.

SCHEDULE F ENVIRONMENTAL NUISANCE

Odour, dust and other airborne nuisance

(F1) The release of odour, dust or any other airborne contaminant(s), or light from the petroleum activity must not cause an environmental nuisance at any sensitive place.

Nuisance monitoring

- (F2) When the administering authority advises of a complaint alleging nuisance, the holder must investigate the complaint as soon as practicable. The investigation is to include monitoring of environmental nuisance at any sensitive place within a reasonable and practical timeframe as specified by the administering authority.
- (F3) The administering authority must be advised in writing of the results of the investigation (including an analysis and interpretation of the monitoring results) and actions proposed or undertaken to resolve the complaint within five (5) business days of completing the complaint investigation, unless a longer time is agreed to in writing by the administering authority.
- (F4) If the investigation or monitoring in accordance with condition (F2) indicates that emissions exceed the limits set in this environmental authority or are causing environmental nuisance, then:
 - (a) the complaint must be addressed including the use of alternative dispute resolution services if required; and / or
 - (b) abatement or attenuation measures must be implemented so that the authorised petroleum activity does not result in further environmental nuisance.
- (F5) Noise monitoring and recording required under this environmental authority must include, but not necessarily be limited to:
 - (a) LAN,T (where N equals the statistical levels of 1, 10 and 90 and T=15 mins);
 - (b) LAeq adj, 15 mins;
 - (c) background noise level as LA 90, 15 mins;
 - (d) Max LpA, 15 mins;
 - (e) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to measured noise levels;
 - (f) atmospheric conditions including temperature, relative humidity and wind speed and directions;
 - (g) effects due to any extraneous factors such as traffic noise;
 - (h) location, date and time of monitoring.
 - (i) if the complaint concerns low frequency noise, Max LpZ, 15 mins; and
 - (j) if the complaint concerns low frequency noise, one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range for both the noise source and the background noise in the absence of the noise source.

Noise

(F6) The emission of noise from the petroleum activity authorised under this environmental authority must not result in levels greater than those specified in Schedule F, Table 1 – Noise Limits at Sensitive Receptors in the event of a valid complaint about noise being made to the administering authority.

Time Period	Metric	Short Term Noise Event	Medium Term Noise Event	Long Term Noise Event
7:00 am – 10:00 pm	L _{Aeq,adj,15} min	57 dBA	55 dBA	52 dBA
10:00 pm – 6:00 am	L _{Aeq,adj,15} min	47 dBA	45 dBA	42 dBA

Schedule F, Table 1 – Noise Limits at Sensitive Receptors

1. The noise limits in Table 1 have been set based on the following deemed **background noise levels** (L_{ABG}):

7:00 am - 10:00 pm: 47 dBA

10:00 pm - 7:00 am 44 dBA

(F7) If the noise subject to a complaint is tonal or impulsive, the adjustments detailed in Schedule F, Table 2 – Adjustments to be Added to Noise Levels at Sensitive Receptors are to be added to the measured noise level(s) to derive LAeq, adj, 15 min.

Schedule F, Table 2 – Adjustments to be Added to Noise Levels at Sensitive Receptors

Noise Characteristic	Adjustment to Noise
Tonal characteristic is just audible	+ 2 dBA
Tonal characteristic is clearly audible	+ 5 dBA
Impulsive characteristic is just audible	+ 2 dBA
Impulsive characteristic is clearly audibly	+ 5 dBA

(F8) Where alternative arrangements are in place with an affected person(s) at a sensitive receptor, the noise limits in Schedule F, Table 1 – Noise limits at Sensitive Receptors do not apply at that sensitive receptor for the duration for which the alternative arrangements are in place.

Low Frequency Noise

(F9) If noise subject to a complaint is low frequency noise, monitoring for low frequency noise must be undertaken as required by condition F5 (i) and (j), and investigated in accordance with condition s F2 to F4.

SCHEDULE G AIR

Fuel Burning or Combustion Equipment - General

- (G1) Contaminant releases to air emitted from fuel burning and combustion equipment point sources that are capable of burning at least 500 kg in an hour must be directed vertically upwards without any impedance or hindrance (except for rainhats).
- (G2) A register of fuel burning and combustion equipment that is capable of burning at least 500 kg of fuel in an hour must be developed and maintained that includes, as a minimum, the following information for each piece of equipment:
 - (a) fuel burning or combustion equipment name and location;
 - (b) stack emission height (metres);
 - (c) minimum efflux velocity (m/s);
 - (d) mass emission rates (g/s); and
 - (e) contaminant concentrations (mg/Nm³ @ x %O₂ dry gas at 0°Celsius and 1 atmosphere).
- (G3) The information contained in the register of fuel burning and combustion equipment must be certified by the chief executive officer for the holder of this environmental authority, or their delegate, as being accurate and correct.
- (G4) Fuel burning or combustion equipment must have proper and effective pollution control equipment to ensure that the maximum ground level concentration criteria specified in Schedule G, Table 1 are not exceeded at any sensitive receptor.

Indicator	ator Averaging Air Quality Period Objective (μg/m³)		No. of days of exceedance allowed per year			
Nitrogen	1-hour	250	1			
dioxide	1-year	62	N/A			
Carbon monoxide	8-hour	11,000	1			

Schedule G, Table 1 - Maximum Ground Level Concentration Criteria

Point Source Air Monitoring

(G5) A monitoring program of contaminants released to the atmosphere must be implemented at each release point and at the frequencies specified in Schedule G, Table 3 – Monitoring Frequency for Contaminants.

Schedule G, Table 3 – Monitoring Frequency for Contaminants

Contaminant	Monitoring frequency
NOx as nitrogen dioxide	Within three (3) months after commissioning of any fuel burning equipment;
	if after twelve months of monitoring, the maximum ground level concentration criteria in Schedule G, Table 1 are not exceeded at any sensitive receptor location, then monitoring must be conducted
Carbon monoxide	annually thereafter.

(G6) The Point Source Air Monitoring Program must include, but not necessarily be limited to:

 testing and sampling at each release point stated in Schedule G, Table 2 - Release of Contaminants to Air at the frequencies specified in Schedule G, Table 3 – Monitoring Frequency for Contaminants, for the following:

- (i) gas velocity, volume and mass flow rate;
- (ii) contaminant concentration and mass emission rate;
- (iii) temperature;
- (iv) water vapour concentration (for non-continuous sampling);
- (b) representative samples of the contaminants discharged when operating under maximum operating conditions; and
- (c) the collection of production rate and plant status during sampling periods.

SCHEDULE H WASTE

General

- (H1) All general waste must only be removed from the site and sent to a recycling facility or disposal facility licensed to accept the waste under the *Environmental Protection Act 1994*.
- (H2) All regulated waste must only be removed from the site by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994* and sent to a recycling facility or disposal facility licensed to accept the waste.
- (H3) Waste must not be burned on the site, unless it is vegetation and is authorised in writing under the *Forestry Act 1959*.

SCHEDULE I REHABILITATION

Decommissioning of buried pipelines

(I1) All buried pipelines must be decommissioned in accordance with the requirements of **Australian Standard 2885**, as amended from time to time.

Decommissioning of dams

- (I2) Dams must not be abandoned but be either:
 - (a) decommissioned and rehabilitated to achieve compliance with rehabilitation objectives; or
 - (b) be left in-situ for a **beneficial use** provided that it:
 - (i) no longer contains contaminants that will migrate in to the environment; and
 - (ii) contains water of a quality that is demonstrated to be suitable for all its intended beneficial uses; and
 - (iii) the administering authority and the landholder agree in writing that the dam will be used by the landholder following the cessation of the petroleum activity.

Rehabilitation Plan

- (I3) A Rehabilitation Plan must be developed no later than two years prior to decommissioning of the petroleum activity. The Rehabilitation Plan must:
 - (i) determine the final land use;
 - (ii) outline rehabilitation objectives;
 - (iii) describe how the rehabilitation objectives will be achieved;
 - (iv) design a rehabilitation monitoring program; and
 - (v) outline the final acceptance criteria.

SCHEDULE K COMMUNITY ISSUES

- (K1) A record of all valid complaints and incidents causing environmental harm, and actions taken in response to the valid complaint or incident must be kept.
- (K2) The following details for all valid complaints received must be recorded:
 - (a) name, address and contact number for valid complainant;
 - (b) time and date of valid complaint;
 - (c) reasons for the complaint as stated by the valid complainant;
 - (d) investigations undertaken in response to the valid complaint;
 - (e) conclusions formed;
 - (f) actions taken to resolve the valid complaint;
 - (g) any abatement measures implemented to mitigate the cause of the valid complaint; and
 - (h) name and contact details of the person responsible for resolving the valid complaint.

SCHEDULE L NOTIFICATION

- (L1) The Department of Environment and Heritage Protection Pollution Hotline must be notified as soon as reasonably practicable, but within 24 hours after becoming aware of:
 - (a) any non-compliance with conditions relating to significance disturbance to land
 - (b) any unauthorised release of contaminants, other than those circumstances in condition (L2); or
 - (c) a potential or actual loss of structural or hydraulic integrity of a dam; or
- (L2) The Department of Environment and Heritage Protection Pollution Hotline must be notified as soon as reasonably practicable, but within 24 hours after becoming aware of the following releases (or their mixtures):
 - (a) releases of any volume of contaminants to water;
 - (b) release of volumes of contaminants to land greater than 200 L of hydrocarbons.
- (L3) The notification of emergencies or incidents as required by condition (L2) must be submitted to the administering authority using a *Notice Duty to Notify Harm (EM468)*.
- (L4) Unless a longer time is agreed to in writing by the administering authority, a written report must be provided to the administering authority within 10 business days of notification under conditions (L1) and (L2) including the following (where relevant to the emergency or incident):
 - (a) the root cause of the emergency or incident;
 - (b) the confirmed quantities and types of any contaminants involved in the incident;
 - (c) results and interpretation of any analysis of samples taken at the time of the emergency or incident (including the analysis results of any impact monitoring);
 - (d) a final assessment of the impacts from the emergency or incident including any actual or potential environmental harm that has occurred or may occur in the longer term as a result of the release;
 - (e) the success or otherwise of actions taken at the time of the incident to prevent or minimise environmental harm;
 - (f) results and current status of landholder consultation, including commitment to resolve any outstanding issues / concerns; and
 - (g) actions and / or procedural changes to prevent a recurrence of the emergency or incident.

Appendix 3

Financial assurance calculation

Summary Financial Assurance Cost Calculation

Recommissioning of the Wallumbilla LPG Facility

Tenement(s)	FL 27
Proponent: AC	GL Gas Storage Pty Ltd
Current Security:	- Date of Last Financial Assurance Review:
Contact: St	tuart Galway
Position:	and and Approvals Manager Upstream Gas
Address: Le BF 40	evel 6, 144 Edward St RISBANE QLD 000
Phone: 07	7 3023 2489 email: sgalway@agl.com.au

Disturbance Types / Activity	Financial Assurance Deposit
Decommissioning Activities	\$1,399,322
Sub-Total (Decommissioning Activities)	\$1,399,322
3rd Party Tender Preparation and Assessment	\$5,000
Development of Unplanned Closure Plan	\$25,000
Inflation	\$41,980
Post rehabilitation environmental monitoring and maintenance.	\$73,565
Project Management fee	\$77,243
Sub-Total (Sundry Items)	\$222,788
Total Financial Assurance Deposit for the Project (excl. of GST)	\$1,622,110

Note: GST is not included in the above calculation

Decommissioning Costs Per Day

Labour Rates			
Description	No.	Day Rate	Cost
Supervisor	1	\$ 1,457.06	\$ 1,457.06
General Labouring	2	\$ 913.11	\$ 1,826.22
Fitter/Welder with no trade certification	2	\$ 1,047.97	\$ 2,095.94
Plant Operator	2	\$ 1,047.97	\$ 2,095.94
Prime Mover or Articulated Drive	0.2	\$ 1,104.07	\$ 220.81
Project Manager	0.2	\$ 1,753.62	\$ 350.72
Total Labour			\$ 8,046.70

Equipment Rates

Truck 13t Hiab	1	\$ 639.21	\$ 639.21
Truck Dump Truck - 30Tonne	1	\$ 2,193.51	\$ 2,193.51
Vehicle 4WD Landcruiser (ivms)	1	\$ 229.68	\$ 229.68
Vehicle 4WD Landcruiser (ivms)	1	\$ 229.68	\$ 229.68
Crane 16 tonne Franna	0.5	\$ 1,083.06	\$ 541.53
Excavator 12t	1	\$ 730.73	\$ 730.73
Grader 12G	0.5	\$ 1,202.08	\$ 601.04
Crane 50 tonne	0.1	\$ 1,730.19	\$ 173.02
Truck Prime Mover	0.2	\$ 936.87	\$ 187.37
Total Equipment			\$ 5,525.77

Labout + Equipment Rates

Total Labour		\$ 8,046.70
Equipment Costs (per day)		\$ 5,525.77
Total Decommissining Cost Per Day		\$ 13,572.47

Decommissioning Activities

Itom	Activity	Quantity	Unit	Cost Per Day	Total Cost	Description / Notes
1	Flare Pit and flare	3.0	day	\$13,572.47	\$40.717.41	Description / Notes.
2	Knock out drum	0.4	dou	\$10 570 47	£5 429 00	
2		0.4	uay	\$13,372.47	<i>\$</i> 3,420.35	
3	Flare Pipe rack	2.0	day	\$13,572.47	\$27,144.94	
4	Hot oil heater	0.3	day	\$13,572.47	\$3,393.12	
5	Regen Gas heater	0.8	day	\$13,572.47	\$10,179.35	
6	Rain water tank 3000 and 1500	0.2	dav	\$13 572 47	\$2 714 49	
		0.2		\$10,072.17	\$2,1 14140	
1	Air compressor	0.4	day	\$13,572.47	\$5,428.99	
8	Generators and shelter	2.5	day	\$13,572.47	\$33,931.18	
9	General oil tank	0.5	day	\$13,572.47	\$6,786.24	
10	Qil tank	0.5	dav	\$13.572.47	\$6,786,24	
44	Oil costs bund	0.5	dou	\$10,570,47	\$6 786 04	
		0.5	uay	\$13,572.47	\$0,780.24	
12	Pipe racks and piping	4.0	day	\$13,572.47	\$54,289.88	
13	Fire monitor	0.4	day	\$13,572.47	\$5,428.99	
14	CM11.03 compressor package	5.0	day	\$13,572.47	\$67,862.36	
15	CM11.01 Comproseer package	5.0	dav	\$12,572,47	\$67 962 26	
15		5.0	uay	\$10,072.47	\$01,002.00	
16	CM11.02 Compressor package	5.0	day	\$13,572.47	\$67,862.36	
17	Inhibitor tanks and 1300 x 1200 pumps	1.0	day	\$13,572.47	\$13,572.47	
18	Fin fans x 2	1.0	day	\$13,572.47	\$13,572.47	
19	Fractionation skid	4.0	dav	\$13 572 47	\$54 289 88	
				010,072.17	\$01,200.00	
20	Compressor shelter	3.0	day	\$13,572.47	\$40,717.41	
21	Debutainizer V103	3.0	day	\$13,572.47	\$40,717.41	
22	Coolers	1.0	day	\$13,572.47	\$13,572.47	
23	Depropanizer V101	3.0	dav	\$13.572.47	\$40.717.41	-
		0.0		\$40,570,47	40 =1 4 40	
24	Analyzer Hut	0.2	day	\$13,572.47	\$2,714.49	
25	Propane/Butane delivery pumps	1.0	day	\$13,572.47	\$13,572.47	
26	Propane storage vessel	2.0	day	\$13,572.47	\$27,144.94	
27	Butane storage vessel	3.0	dav	\$13.572.47	\$40.717.41	
	Closed drain teals	0.2	dou	\$10 F70 47	\$4.074.74	
28	Closed drain tank	0.5	uay	\$13,572.47	\$4,071.74	
29	Pig Launcher	0.3	day	\$13,572.47	\$4,071.74	
30	Vessel V01	2.0	day	\$13,572.47	\$27,144.94	
31	Filter Coalescer	1.5	day	\$13,572.47	\$20,358.71	
32	Load out pump, shed and bollards	0.4	dav	\$13 572 47	\$5 428 99	
32		0.4	uay	\$15,572.47	\$3,420.35	
33	Fire system deluge valve assembly	0.2	day	\$13,572.47	\$2,714.49	
34	De-Ethanizer PV-16.05	3.0	day	\$13,572.47	\$40,717.41	
35	Rectifier	2.0	day	\$13,572.47	\$27,144.94	
36	Randall skid	4.0	dav	\$13.572.47	\$54,289,88	
	010	10	4	640 570 47	¢40,570,47	
37	6103	1.0	uay	\$13,572.47	\$13,572.47	
38	Regeneration Gas Bed	2.0	day	\$13,572.47	\$27,144.94	
39	Switch Room	1.0	day	\$13,572.47	\$13,572.47	
40	Control room	2.0	day	\$13,572.47	\$27,144.94	
41	1700 used oil storage	0.5	dav	\$12 572 47	\$6 796 24	
		0.5	uay	\$10,072.47	ψ0,7 00.24	l
42	2200 waste oil tank	0.5	day	\$13,572.47	\$6,786.24]
43	Drum storage	0.3	day	\$13,572.47	\$3,393.12	
44	Flammable liquids store	0.4	day	\$13,572.47	\$5,428.99	1
45	Chemical shed	0.5	dav	\$13,572.47	\$6,786.24	1
40	Containor	0.2	deu	\$12,570,47	60.744.40	
46		0.2	uay	\$13,372.47	\$2,114.49	
47	3000 rain tank	0.2	day	\$13,572.47	\$2,714.49	
48	Store parts shed	1.0	day	\$13,572.47	\$13,572.47	
49	Workshop roof and shelter	2.0	day	\$13,572.47	\$27,144.94	1
50	Air compressor	0.3	veh	\$13 572 47	\$3 393 12	l
	Delete eteree	0.0		040 570 ·-	- 0,000.12	Į
51	roision storage	0.3	day	\$13,572.47	\$3,393.12	
52	Fire water pump and shelter	0.8	day	\$13,572.47	\$10,179.35	
53	3000 x 3000 shed	1.0	day	\$13,572.47	\$13,572.47	1
54	Earth bunds	2.0	dav	\$13,572.47	\$27,144.94	1
55	Underground bining and electrical	4.0	deu	\$12 570 47	\$54 200 00	
55		4.0	uay	\$13,372.47	φJ4,∠03.88	l
56	Fire dam	3.0	day	\$13,572.47	\$40,717.41	<u> </u>
57	Residence 1 and 2 including water SWER and power	6.0	day	\$13,572.47	\$81,434.83	
58	Storage tank	2.0	day	\$13,572.47	\$27,144.94	
59	Earthworks to restore existing contour and rehab	3.0	dav	\$13.572.47	\$40,717.41	1
		2.0		¢ 10 E70 47	¢ 40, 747, 44	
00	internar / external tences, remove or replace	3.0	day	\$13,572.47	\$40,717.41	
		Brooingt Sool	with Donocit			

Total Security Deposit for the "Activity"

\$1,399,321.76

Third Party Project Management & Contingencies

ltem	Activity / Description	Quantity	Unit	Cost	Total Cost	Description / Notes:
			Su	b-Total (Activities)	\$1,399,322	
Third Party Project Management	3rd Party Tender Preparation and Assessment	1	@	\$5,000.00	\$5,000	The Financial Assurance Report contains a 3rd Party Cost Estimate of rehabilitation costs.
	Development of Unplanned Closure Plan	1	@	\$25,000.00	\$25,000	
	Inflation	3%	%	\$41,979.65	\$41,980	% of the subtotal for all 'activities'. This is the inflation for the first year of the project, and will require recalculation annually.
				Sub-Total	\$1,471,301	
	Post rehabilitation environmental monitoring and maintenance.	5%	%	\$73,565.07	\$73,565	% of the subtotal for 'Activities' plus inflation.
	Sub-Total	for Inflatio	on an	d monitoring costs	\$145,545	
	Project Management fee	10%	%	\$77,243.32	\$77,243	% of the subtotal of inflation costs and monitoring costs.
Sub-To			otal (Sundry Items)	\$222,788		
Financial As				surance	\$1,622,110	exclusive of GST

Sub-Total Rehabilitation Estimate for "Activities"	\$1,399,322
Total Rehabilitation Estimate for "Sundry Items"	\$222,788
Total Financial Assurance Estimate	\$1,622,110 exclusive of GST

Appendix 4

AGL Health, Safety and Environment (HSE) Policy



Objectives

AGL's aspiration for Health, Safety and Environment is Zero Harm to our people and to the environment we operate in. Our Health, Safety and Environmental (HSE) Management System, Life Guard, assists us to achieve this.

Our HSE policy objectives are to:

- provide a safe and healthy workplace and eliminate work related injuries and illnesses, and
- actively demonstrate a commitment to sustainable growth, including the protection of the environment.

Strategy

We will achieve these objectives by:

- Giving safety, health and environmental considerations equal priority with other business objectives.
- Meeting or exceeding the requirements of legislation.
- Performing our work safely and with proper regard for the environment.
- Ensuring that our people have sufficient resources for the management of HSE activities, and that these activities are managed consistently and constantly.
- Leading, training and motivating our people and our contractors to work in a safe and responsible manner.
- Managing non-conformance to HSE rules and procedures in a fair and consistent way, in order to prevent injuries or environmental harm.
- Improving our HSE performance by establishing HSE goals at all levels within the company.
- Consulting with our people and the community on health, safety and environmental issues.
- Using resources and energy efficiently, and minimising waste, emissions and pollution from our activities.
- Actively participating in the policy debate on energy and related environmental matters, through engaging with Government, the energy sector, the community, employees and other stakeholders.

This policy applies to all employees, contractors, products and services, and joint ventures under AGL's operational control.

buchoel Froe

Michael Fraser Managing Director September 2012

Appendix 5

Air quality assessment of the Wallumbilla LPG Facility upgrade

Air Quality Assessment of the Wallumbilla LPG Facility Upgrade

Prepared for Coffey Environments

April 2013

FINAL

Prepared by Katestone Environmental Pty Ltd

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Revision	Date	Approved	Signature
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Glossary

Term	Definition				
Air EPP	Environmental Protection (Air) Policy 2008				
API	American Petroleum Institute				
µg/m³	micrograms per cubic metre				
μm	microns				
٥C	degrees Celsius				
CER	Clean Energy Regulator				
CH ₄	Methane				
CO	Carbon monoxide				
CO ₂	Carbon dioxide				
DCCEE	Commonwealth Department of Climate Change and Energy Efficiency				
DRET	Department of Resources, Energy and Tourism				
EEO	Energy Efficiency Opportunities				
EHP	Department of Environment and Heritage Protection				
EP Act	Environmental Protection Act 1994				
Gensets	Generator sets				
GHG	Greenhouse gas				
GWP	Global warming potential				
HFCs	Hydrofluorocarbons				
IPCC	Intergovernmental Panel on Climate Change				
km	kilometre				
LPG	Liquid Petroleum Gas				
LULUCF	Land Use, Land Use Change and Forestry				
m	metre				
m/s	metres per second				
m ²	square metres				
m ³	cubic metres				
m³/s	cubic metres per second				
mg	milligram				
MMscf	Million standard cubic feet				
Mol%	Mole percent				
NGA	National Greenhouse Accounts				
NGER	National Greenhouse and Energy Reporting				
NGER Act	National Greenhouse and Energy Reporting Act 2007				
NO ₂	Nitrogen dioxide				
N ₂ O	Nitrous oxide				
NO _x	Oxides of nitrogen				
PFCs	Perfluorocarbons				
PJ	Petajoules				
SF ₆	Sulphur hexafluoride				

Term	Definition
ТАРМ	The Air Pollution Model
tCO ₂ -e	tonnes of CO ₂ equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile organic compounds
Wt%	Weight percent
Wt%C	Weight percent carbon

Executive Summary

Katestone Environmental Pty Ltd (Katestone) has been commissioned by Coffey Environments on behalf of AGL Gas Storage Pty Ltd (AGL) to conduct an air quality and greenhouse gas assessment as part of the upgrade to Wallumbilla LPG Facility, located approximately 12 kilometres south of Wallumbilla in central southern Queensland.

The LPG Facility currently consists of three gas generators, three gas compressors, a hot oil heater, salt bath heater and a horizontal flare. AGL has purchased the Facility from Santos QNT Pty Ltd and requires government approval to commence operations again. AGL will be re-commissioning and upgrading / expanding various components during this process. The components of relevance to this study include the replacement of a horizontal flare with a vertical flare and the replacement of the salt bath heater with a regen heater. The stack characteristics of the generators have also been upgraded.

The following conclusions can be drawn from the air quality assessment for normal operations of the Wallumbilla LPG Facility in conjunction with background sources:

- The predicted 99.9th percentile 1-hour average ground-level concentrations of NO₂ are below the Air EPP objective of 250 μg/m³ at all sensitive receptor locations
- The predicted annual average ground-level concentrations of NO₂ are below the Air EPP objective of 62 μg/m³ at all sensitive receptor locations
- The predicted maximum 8-hour average ground-level concentrations of CO are well below the Air EPP objective of 11,000 µg/m³ at all sensitive receptors locations

The following conclusions can be drawn from the air quality assessment for non-normal operations i.e. operation of the emergency flare, of the Wallumbilla LPG Facility:

 The predicted 99.9th percentile 1-hour average ground-level concentrations of NO₂ are well below the Air EPP objective of 250 μg/m³ at all sensitive receptor locations

The following conclusions can be drawn from the greenhouse gas assessment:

 The annual estimated emission rate of greenhouse gases from the Wallumbilla LPG Facility is 13.5 ktCO₂-e/y, which is equivalent to 0.002% of Australia's estimated GHG emissions for the year to March 2012 and 0.01% of Queensland's annual emissions

1. Introduction

Katestone Environmental Pty Ltd (Katestone) has been commissioned by Coffey Environments on behalf of AGL Gas Storage Pty Ltd (AGL) to conduct an air quality and greenhouse gas assessment for the upgrade to Wallumbilla LPG Facility, located approximately 12 kilometres south of Wallumbilla in central southern Queensland.

Katestone understands that the LPG Facility currently consists of three gas generators, three gas compressors, a hot oil heater, salt bath heater and a horizontal flare. AGL has purchased the Facility from Santos QNT Pty Ltd (Santos) and requires government approval to commence operations again. AGL will be re-commissioning and upgrading / expanding various components during this process. The components of relevance to this study include the replacement of a horizontal flare with a vertical flare and the replacement of the salt bath heater with a regen heater. The stack characteristics of the generators have also been upgraded.

The air quality and greenhouse gas assessment has considered the potential impacts associated with the upgrade as well as the potential cumulative impact of the upgrade with other nearby gas processing facilities.

2. Overview of Assessment Methodology

The air quality impact assessment for the project is based upon a dispersion modelling study that couples air pollutant emission rates and source characteristics with meteorology representative of conditions experienced at the site. The assessment has followed industry accepted methodologies and uses industry recognised techniques for the assessment of air quality impacts.

This assessment is based on the use of the dispersion model AUSPLUME (EPA Victoria, 2000). The details of the modelling methodology can be found in Section 5.

The air quality objectives presented in the *Environmental Protection (Air) Policy 2008* (Air EPP) were adopted for the assessment. Predicted ground-level concentrations of air pollutants have been compared to these objectives.

Stack characteristics and emission rates for the compressors are based on design information and monitoring reporting as supplied by Coffey Environments.

A greenhouse gas assessment has compiled an inventory of projected future greenhouse gas emissions that are attributable to the project. Greenhouse gas emissions have been expressed as a total mass as tonnes of equivalent carbon dioxide ($CO_2 - e$) and as a proportion of Queensland's and Australia's annual greenhouse gas emissions. The greenhouse gas assessment is detailed in Section 8.

3. Air Quality Criteria

The *Environmental Protection Act 1994* (EP Act) provides for the management of the air environment in Queensland. The legislation applies to government, industry and individuals and provides a mechanism for the delegation of responsibility to other government departments and local government and provides all government departments with a mechanism to incorporate environmental factors into decision-making.

The EP Act gives the Minister of the Department of Environment and Heritage Protection (EHP) the power to create Environmental Protection Policies that identify, and aim to protect, environmental values of the atmosphere that are conducive to the health and well-being of humans and biological integrity. The initial Environmental Protection (Air) Policy was gazetted in 1997. The Air EPP was revised and reissued in 2008. The administering authority must consider the requirements of the Air EPP when it decides on an application for an environmental authority, amendment of a licence or approval of a draft environmental management plan. Schedule 1 of the Air EPP specifies air quality indicators and objectives for Queensland. Indicators and objectives from the Air EPP that are relevant for this study are reproduced in Table 1.

Indicator	Environmental value	Averaging period	Air quality objective ¹ (µg/m³)	Number of days of exceedance allowed per year
	Health and wellbeing	1-hour	250	1
Nitrogen dioxide	ricaliti and wellbeing	1-year	62	N/A
	Health and biodiversity of ecosystems	1-year	33	N/A
Carbon monoxide	Health and wellbeing	8-hour	11,000	1
Note: ¹ Air quality objective at 0 ⁴ N/A: Not applicable	² C			<u>.</u>

Table 1 A	ir EPP ambient	air quality	objectives
-----------	----------------	-------------	------------

4. Project Overview

4.1 Local terrain and surrounding landuse

The Wallumbilla LPG Facility is located in a flat rural area in central southern Queensland. There is also existing industry located within close proximity to The Wallumbilla LPG Facility. The LPG Facility is situated 12 kilometres south of Wallumbilla. There is minimal vegetation in the region surrounding the subject site.

There are four sensitive receptors chosen because they are nearest to the LPG Facility. One of these receptors is an accommodation camp for workers from an adjacent facility operated by Santos QNT Pty Ltd. Figure 1 is map of the Wallumbilla study area with the locations of the sensitive receptors identified.

Table 2 summarises the location and nature of each receptor.

Discrete	GDA94 zone 55S	coordinates (m)	Distance from	Direction from	
Receptor	Easting Northing		Facility (km)	Facility	
R1	715840	7047028	2.2	NW	
R2	718907	7047109	1.8	NNE	
R3	717153	7043899	1.6	S	
R4 (Santos Accommodation Camp)	718051	7046181	0.6	Ν	

Table 2Sensitive receptor locations for the Wallumbilla LPG Facility

4.2 Existing air quality

The main industrial sources of air pollutants in the region are facilities associated with the gas industry. The Wallumbilla Compressor Station operated by Epic Energy and the Wallumbilla Gas Treatment Facility operated by Santos, are both located adjacent to the Wallumbilla LPG Plant.

These three facilities are the most dominant sources of oxides of nitrogen in the area. The Wallumbilla LPG Plant is not operating at this time.

4.3 Source characteristics and emissions

The sources of air pollutant emissions at the Wallumbilla LPG Facility are:

- Normal operations:
 - 3 gas compressors
 - o 3 gas-fired generators
 - only 2 generators will operate simultaneously at any given time however three have been included within this assessment to demonstrate the worst-case impacts
 - o A hot oil heater
 - o Regen heater
- Non-normal operations:
 - o An emergency flare

4.3.1 Normal operations

Emissions of air pollutants associated with the existing compressors, generators, hot oil heater and regen heater have been estimated using:

- Data supplied by AGL
- Data contained in the Heath Safety Environment (HSE) Australia Stack emissions testing report, conducted 17 May 2010

The assessment for normal operations has assumed that normal operations were occuring during the stack emissions testing conducted during May 2010.

Source characteristics and air pollutant emission rates associated with normal operations are shown in Table 3.

Parameter	Compressor 1	Compressor 2	Compressor 3	Generator 1	Generator 2	Generator 3	Hot oil heater	Regen heater
Co-ordinates (m) ¹	717722, 7045548	717732, 7045548	717741, 7045545	717758, 7045542	717762, 7045546	717765, 7045546	717785, 7045543	717790, 7045541
Stack height (m)	10 ²	10 ²	8 ²	4.2 ¹	4.2 ¹	4.2 ¹	11 ²	9 ²
Internal stack diameter (m)	0.35 ²	0.35 ²	0.35 ²	0.1016 ¹	0.1016 ¹	0.1016 ¹	0.8 ²	0.6 ²
Stack gas exit velocity (m/s) ²	28	28	52	19.7	29.6	23.4	1.3	1.5
Stack gas temperature (°C) ²	620	640	612	423	480	407	220	150
Exhaust volume flow rate (m ³ /sec) ²	2.6	2.5	5	0.4	0.7	0.5	0.64	0.42
Exhaust volume flow rate (Nm ³ /sec) ³	0.63	0.60	1.21	0.16	0.24	0.19	0.30	0.26
Oxygen content (%)	1	0.2	0.3	2.1	1.1	2.1	6.4	20.3
Moisture content (%)	19	19	20	19	20	19	14	1
Oxides of nitrogen emission concentration (mg/Nm ³)	3,700	3,700	4,500	4,600	5,300	8,600	45	8
Carbon monoxide emission concentration (mg/Nm ³)	5,500	1,900	2,500	400	550	460	44	1.2
Oxides of nitrogen emission rate (g/s)	2.35 ³	2.20 ³	5.46 ³	1.3 ²	1.3 ²	1.6 ²	0.0136 ³	0.0021 ³
Carbon monoxide emission rate	3.49 ³	1.13 ³	3.03 ³	0.064 ²	0.13 ²	0.09 ²	0.0133 ³	0.0003 ³

 Table 3
 Source characteristics and emission rates of air pollutants from normal operations at the Wallumbilla LPG Facility

Parameter	Compressor 1	Compressor 2	Compressor 3	Generator 1	Generator 2	Generator 3	Hot oil heater	Regen heater
(g/s)								
Table note: 1 Provided by Coffey Environments 2 Value taken from the Heath Safety Environment (HSE) Australia Stack emissions testing report 3 Calculated by Katestone								

4.3.2 Non-normal operations

The Wallumbilla LPG Facility has an emergency flare. Table 4 shows the source characteristics of the flare during non-normal operations. Table 5 shows the emission rates, calculated using USEPA emission factors from the flare during non-normal operations.

The flare will only operate in the event of an emergency, for example a fire. No other sources would be operational at this time.

To enable a dispersion model to adequately model the flare, the characteristics of the plume need to be modified to account for the buoyancy correctly. The nominal stack height and diameter are the actual height and diameter of the physical stack, while the effective height is the stack height entered into the model, along with the effective stack diameter, to account for the thermal buoyancy generated by the flare combustion zone at the flare tip. The USEPA approved SCREEN3 method (USEPA, 1995) has been used in conjunction with information supplied by AGL in calculating source and emission characteristics required for the modelling of the emergency flare during non-routine (upset/maintenance) conditions.

The SCREEN3 method calculates plume rise for flares based on an effective buoyancy flux parameter. It was assumed that 55% of the total heat is lost due to radiation, with the remaining 45% released as sensible heat that contributes to the buoyancy of the plume. The height of the combustion zone is equivalent to the difference between the effective and nominal stack heights. The effective diameter accounts for the assumption that the flame may be bent over to a 45 degree angle from the vertical due to the wind. This provides for a potential worst case plume extent at its release point.

Table 4	Source	characteristics	and	emission	rates	of	air	pollutants	from	non-
	normal	operations at the	e Wal	lumbilla Li	PG Fac	ility	,			

Parameter	Units	Single emergency flare
Peak energy out	GJ/hr	3,452.2
Gas mass flow rate ¹	kg/hr	69,954
Gross heating value ¹	kJ/kg	49,350
Nominal stack height above ground ²	m	20
Effective stack height above ground ³	m	44.7
Effective flare tip diameter ³	m	7.95
Plume temperature after combustion ⁴	°C	1,000
Plume vertical velocity at stack top after combustion ⁴	m/s	20
Location ⁵	m	717895, 7045542
Table note:		

Table note:

¹Amec Manufacturer specifications for a Vertical Flare

² Information provided by AGL ³ Calculated by Katestone using USEPA SCREEN3 Method

⁴ USEPA SCREEN3 Method assumption

⁵ MGA coordinates referenced to GDA94 (Zone 56) (in metres)

 Table 5
 Emission rates for the flare during non-normal operations

Parameter	Emission Factor ¹ (g/GJ)	Single emergency flare ² (g/s)
Oxides of nitrogen (as NO ₂)	29.235	7.01
Carbon monoxide	159.073	38.14
Total hydrocarbons	60.190	14.43
Table note: ¹ From AP 42 Emission Factors ² The total emissions are based on the flare approximately 15 minutes. These emissions exercise. Emissions of fine particulate matter are assumption.	operating an emergency situation. It is have been spread across a whole ho umed to be zero due to the use of smo	s anticipated that emissions would occur for ur for the purposes of the modelling keless flares.

5. Assessment Methodology

5.1 Meteorology

The CSIRO model TAPM (Version 4.0.1, 2008) was used in this assessment to generate a meteorological model of the region. This is a prognostic model that uses detailed data on terrain, synoptic meteorology, land use and soil moisture to calculate wind flows and other meteorological variables.

TAPM was developed by the CSIRO and has been validated by the CSIRO and Katestone Environmental for various sources and regions (see <u>www.dar.csiro.au/TAPM/</u> for more details on the model and validation results from the CSIRO).

TAPM was setup as follows:

- 40 x 40 grid point domain with an outer grid of 30 kilometres and nesting grids of 10 kilometres, 3 kilometres and 1 kilometre
- 25 vertical levels
- Australian Geosciences 9 second Digital Elevation Model (DEM) terrain data
- The TAPM defaults for soil type and sea surface temperature
- Default options selected for advanced meteorological inputs
- The synoptic data used in the simulation is for the year 2008

The site-specific meteorological file extracted from TAPM at the study site has been used as input into the dispersion modelling.

The modelled meteorology used for this assessment is analysed in Section 6.

5.2 Dispersion modelling

Atmospheric dispersion modelling was carried out using the AUSPLUME Version 6.0 dispersion model (Victorian EPA). AUSPLUME is a Gaussian plume dispersion model and is accepted for use by EHP.

The modelling was conducted assuming constant operations of each source over twelve months of modelled meteorological data. This encompasses all weather conditions likely to be experienced at the site during a typical year, including worst case dispersion conditions.

Key features of AUSPLUME used to simulate dispersion:

- Gridded receptor area of 100 by 100 grid points at 40 m spacing
- 366 days (1 January 2008 to 31 December 2008)
- AUSPLUME meteorological file generated using TAPM
- No terrain impacts
- Building wakes were calculated using PRIME algorithms
- Horizontal dispersion curves for sources < 100m high calculated using the Pasquill Gifford option
- The Irwin rural exponent scheme for wind profiles
- Surface roughness of 0.1 m to account for surrounding land use (flat terrain and minimal vegetation apart from low lying shrubs and grassland)
- Default temperature gradients
- Discrete receptors were modelled explicitly

All other options set to default.

5.3 Method for the conversion of oxides of nitrogen to nitrogen dioxide

Oxides of nitrogen (NO_x) are formed during high-temperature combustion processes from the oxidation of nitrogen in the fuel and combustion air. NO_x consists of nitrogen oxide (NO) and nitrogen dioxide (NO₂). The NO_x produced by combustion is predominantly in the form of NO. After emission from the stack, NO is transformed to NO₂ through oxidation with atmospheric ozone (O₃).

The oxidation of NO to NO₂ in the atmosphere can be assessed by various methods.

This assessment has used the USEPA's Ozone Limiting Method (OLM) (Cole and Summerhays, 1979 and Tivart, 1996) to predict ground-level concentrations of NO_2 . This method assumes that all the available ozone in the atmosphere reacts with NO in the plume until either all the O_3 or all the NO is used up. However in reality this process would not happen instantaneously and would occur over a number of hours.

Equation 1 is used to convert NO_x to NO_2 using the OLM.

Equation 1

 $[NO_2]_{total} = \{0.1 \times [NO_x]_{pred}\} + MIN\{(0.9) \times [NO_x]_{pred} \text{ or } (46/48) \times [O_3]_{bkgd}\} + [NO_2]_{bkgd}\}$

Where:

[NO ₂] _{total}	=	the predicted concentration of NO ₂ in μ g/m ³
[NO _x] _{pred}	=	the dispersion model prediction of the ground-level concentration of NO_x in $\mu g/m^3$
MIN	=	the minimum of the two quantities within the braces
[O ₃] _{bkgd}	=	the background ambient O_3 concentration in μ g/m ³
(46/48)	=	the molecular weight of NO ₂ divided by the molecular weight of O_3
[NO ₂] _{bkgd}	=	the background ambient NO2 concentration in μ g/m ³

5.3.1 Calculation of a background ambient ozone concentration

Ozone is not measured at any EHP monitoring stations in the study area around Wallumbilla.

For this assessment a background ozone concentration of $[O_3]_{bkgd} = 85.6 \,\mu g/m^3$ was used, based on EHP monitoring data from Toowoomba. An analysis of the monitoring data obtained from the EHP monitoring station at Toowoomba for O_3 is shown in Table 6. The highest 75th percentile was selected as a background value for O_3 at the study area.

Dercentiles	Year of measurements					
Percentiles	2010	2009	2008	2007		
Maximum	130.5	132.7	134.8	ND		
99 th	117.7	124.1	109.1	ND		
98 th	107.0	124.1	102.7	ND		
95 th	89.9	111.3	92.0	ND		
90 th	83.5	102.7	85.6	ND		
75 th	72.8	83.5	74.9	85.6		
Note:						
Note: ND indicates that no data	12.0	03.5	74.9	0.00		

Table 6	Historical measured	l ozone concentrations in Toowoomba (µ	Jg/m³)
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5.4 Background air quality

Background ambient air quality monitoring data in the project region are not available due to the remote location of the Wallumbilla LPG Facility. In order to undertake a cumulative assessment, Katestone has modelled stack sources at the Epic Energy Wallumbilla Compressor Station and the Santos Wallumbilla Gas Treatment Facility to provide background pollutant concentrations. These plants are both adjacent to the AGL Wallumbilla LPG Plant and may be assumed to produce essentially all of the relevant background pollutant levels. Details of the modelled background sources are presented in the following two sections.

Building wakes were not considered in the assessment of background sources because this level of detail is not warranted in the modelling of sources to provide representative background levels. For the purpose of the modelling, it has been assumed that all equipment associated with the modelled background sources will operate 24 hours per day, 365 days per year. This assumption will provide an overestimate of background levels.

5.4.1 Epic Energy Wallumbilla Compressor Station

The Wallumbilla Compressor Station is owned and operated by Epic Energy. As there are no direct measurements available for this Facility, Katestone has derived emission rates of oxides of nitrogen from the operating licence, publicly available for the Wallumbilla Compressor Station. Emission rates of carbon monoxide have been derived from the ratio of oxides of nitrogen to carbon monoxide emissions reported for the Wallumbilla Compressor Station in the NPI for 2010-2011.

Table 7 presents the source characteristics and air pollutant emissions included in the modelling of the Wallumbilla Compressor Station for the cumulative assessment.

Model input data	Unit Measurement	Gas Compressors 1 to 3	Gas Compressors 4 to 6
		717244, 7045517	717225, 7045508
		717258, 7045515	717215, 7045509
Stack location	m AMG	717271, 7045513	717205, 7045510
Number of units ¹		3	3
Stack height ¹	m	10.9	6.9
Stack diameter	m	0.35	0.35
Exit velocity ¹	m/s	31	28.9
Temperature	°C	624	624
Concentration of NOx ¹	mg/Nm ³ @ 3% O ₂	840	178
Emission rate of NOx per unit ¹	g/s	0.93	0.46
Emission rate of CO per unit	g/s	0.13	0.06
Note: ¹ Epic Energy licence - Integrated Author	ity No. PEN100114007		

Table 7Source characteristics and air pollutant emissions for the Wallumbilla
Compressor Station

5.4.2 Santos Wallumbilla Gas Treatment Facility

The Wallumbilla Gas Treatment Facility is owned and operated by Santos at a site adjacent to the AGL Wallumbilla LPG Plant, as shown on Figure 1. The emissions and stack characteristics for this facility have been taken from the Air Quality Impact Assessment for the Wallumbilla Gas Treatment Facility Project (Parsons Brinckerhoff, 2012).

Table 8 presents the source characteristics and air pollutant emissions included in the modelling of the Wallumbilla Gas Treatment Facility for the cumulative assessment.

Table 8	Background source	characteristics	and a	ir pollutant	emissions	for	the
	Wallumbilla Gas Trea	itment Facility					

Model input data	Unit of Measurement	Compressor engine	Generator	Fuel gas heater
Stack easting	~ ^\\C	717483	717483	717483
Stack northing	III AMG	7045689	7045689	7045689
Number of units ¹		2	1	1
Stack height ¹	m	10	4.7	11
Stack diameter ¹	m	0.33	0.2	0.8
Exit velocity ¹	m/s	30.4	9.66	13
Temperature ¹	°C	470	573	196
Emission rate of NOx per unit ¹	g/s	0.47	0.06	0.029
Emission rate of CO per unit ¹	g/s	1.7	0.11	0.022
Note:				

¹ Taken from the Air Quality Impact Assessment for the Wallumbilla Gas Treatment Facility Project (Parsons Brinckerhoff, 2012).

6. Meteorology

6.1 Background

The nearest meteorological monitoring station to the site of the Wallumbilla LPG Facility is operated by the Bureau of Meteorology at Roma, approximately 40 kilometres to the west. This station records meteorological parameters such as wind speed, wind direction and temperature. However, there is insufficient data available from the Roma monitoring station to calculate stability class or mixing height. The nearest upper level meteorological monitoring station located in Brisbane, approximately 394 kilometres away. The upper level meteorology at Roma due to topographical differences and the relative distances of the sites from the coast.

Where local meteorological data are insufficient for the purpose of dispersion modelling EHP accept the use of a meteorological model to generate site specific meteorological data required by the dispersion model. The meteorological model TAPM has been used to develop a site-specific meteorological data file for the subject site. The meteorological data file has been developed using the following data:

- Wind speed, wind direction, temperature, solar radiation and mixing height generated from TAPM
- Stability classification using the solar radiation/ delta T methodology which has been calculated using the TAPM generated meteorological data

6.2 Wind speed and wind direction

Wind roses generated from TAPM for the Wallumbilla LPG Facility site are presented in Figure 2 to Figure 4, for all hours, based on time of day and based on season for data covering the period from 1 January 2008 to 31 December 2008.

The figures illustrate that in the early hours of the morning moderate winds are predominately from the north to northeast and from the southwest. During the hours of 6am to midday, moderate winds are predominantly from the north. In the afternoon however the predominant wind direction is from the southwest. Southwesterly winds occur typically in winter, while moderate to strong north to northeasterly winds prevail in summer and spring.

6.3 Stability class and mixing height

Stability classification is a measure of the stability of the atmosphere. The stability classes range from Class A, which represents very unstable atmospheric conditions that may typically occur on a sunny day to Class F stability, which represents very stable atmospheric conditions that typically occur during light wind conditions at night. Unstable conditions (Classes A-C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for the most frequently occurring Class D conditions are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface. During the nighttime the atmospheric conditions are generally stable (often Classes E and F). Table 9 shows the percentage of stability classes at the compressor station site.

Table 9Frequency of occurrence of surface atmospheric stability conditions for
the Wallumbilla LPG Facility site

Pasquill-Gifford Stability Class	Frequency (%)	Classification
A	3.6	Extremely unstable
В	16.7	Unstable
С	18	Slightly unstable
D	29	Neutral
E	9	Slightly stable
F	23.7	Stable

The extent of the mixing height and the strength of the temperature inversion are very important features that can limit the degree of dispersion of pollutants. The height of the mixed layer changes with time of day and season. Shallow mixing heights occur at night under stable atmospheric conditions. Generally lower mixing heights occur during winter when stronger temperature inversions and reduced solar radiation restrict the growth of the mixing depth until later in the morning. The degree of dispersion or mixing within the mixed layer is determined by the atmospheric stability.

Figure 5 shows the calculated mixing heights versus hour of day generated by the TAPM model for the subject site. The mixing heights show a typical diurnal profile increasing from 9 am and reducing from 4 pm. The highest average mixing heights are predicted from 1 pm to 3 pm, which is typical of strongly convective conditions.

7. Air Quality Assessment

7.1 Normal operations

This section summarises the dispersion modelling results for normal operations of the Wallumbilla LPG Facility both in isolation and including other existing and approved facilities as a background.

Predicted 99.9th percentile 1-hour average and annual average ground-level concentrations of NO₂ at the sensitive receptors for the Wallumbilla LPG Facility in isolation and including the background are presented in Table 10.

Contour plots of predicted 99.9^{th} percentile 1-hour average ground-level concentrations of NO₂ in isolation and with the background are presented in Figure 6 and Figure 7 respectively.

Receptor	99.9 th perce average NO ₂ (ntile 1-hour concentration	Annual av concer	erage NO ₂ stration
-	In isolation	With background ^a	In isolation	With background ^a
R1	114	116	3.41	4.23
R2	127	127	10.1	11.6
R3	126	126	11.5	13.7
R4 (Santos Accommodation Camp)	174	174	36.9	39.5
Air EPP Objective	250	250	62/33 ^b	62/33 ^b

Table 10Predicted ground-level concentrations of NO2 at sensitive receptors for
normal operations (µg/m³)

Note:

^a The background sources include the Epic Energy Wallumbilla Compressor Station and Santos Wallumbilla Gas Treatment Facility

^b The Air EPP objective for health and wellbeing is 62 μ g/m³. The objective for health and biodiversity of ecosystems is 33 μ g/m³

Predicted maximum 8-hour average ground-level concentrations of CO at the sensitive receptors for the Wallumbilla LPG Facility in isolation and including the background are presented in Table 11. Contour plots of predicted maximum 8-hour average ground-level concentrations of CO in isolation and with the background are presented in Figure 8 and Figure 9, respectively.

Receptor	Maximum 8-hour average CO concentration			
	In isolation	With background ^a		
R1	61.1	85.4		
R2	103	118		
R3	114	121		
R4 (Santos Accommodation Camp)	185	187		
Air EPP Objective	11,000	11,000		

Table 11Predicted ground-level concentrations of CO at sensitive receptors for
normal operations (µg/m³)

The modelling results for normal operations of the Wallumbilla LPG Facility in conjunction with the background sources show that:

- The predicted 99.9th percentile 1-hour average ground-level concentrations of NO₂ are below the Air EPP objective of 250 μg/m³ at all sensitive receptor locations
- The predicted 99.9th percentile 1-hour average ground-level concentrations of NO₂ exceed the Air EPP objective of 250 μ g/m³ in an area around and approximately centred on the Wallumbilla LPG Facility
- The predicted annual average ground-level concentrations of NO₂ are below the Air EPP objective of 62 μ g/m³ at all sensitive receptor locations
- The predicted annual average ground-level concentrations of NO₂ exceed the Air EPP objective of 33 µg/m³ for health and biodiversity of ecosystems at R4, the Santos accommodation camp. R4 is not regarded as an area of sensitive ecosystem.
- The predicted maximum 8-hour average ground-level concentrations of CO are well below the Air EPP objective of 11,000 µg/m³ at all sensitive receptors locations
- The predicted maximum 8-hour average ground-level concentrations of CO exceed the Air EPP objective of 11,000 µg/m³ in a small area on the northern boundary of the Wallumbilla LPG Facility site

7.2 Non-normal operations

This section summarises the dispersion modelling results for non-normal operations of the Wallumbilla LPG Facility in isolation. Wallumbilla LPG Facility has a flare and the flare will only operate in the event of an emergency, for example a fire. No other sources would be operational at this time.

The flare would only operate for approximately 15 minutes and therefore any impacts would be short-term in nature. It should also be noted that particulate emissions are not expected from the flare.

Predicted 99.9th percentile 1-hour average ground-level concentrations of nitrogen dioxide at the sensitive receptors for the Wallumbilla LPG Facility in isolation are presented in Table 12.

Table 12	Predicted ground-level concentrations of NO ₂ at sensitive receptors for								
	non-normal	operations	of	the	Wallumbilla	LPG	Facility	in	isolation
	(µg/m³)								

Receptor	99.9 th percentile 1-hour average NO ₂ concentration
R1	0.37
R2	0.61
R3	0.34
R4 (Santos Accommodation Camp)	0.46
Air EPP Objective	250

The modelling results for non-normal operations of the Wallumbilla LPG Facility in isolation show that:

 The predicted 99.9th percentile 1-hour average ground-level concentrations of NO₂ are well below the Air EPP objective of 250 µg/m³ at all sensitive receptor locations

8. Greenhouse Gas Assessment

8.1 Background

This GHG assessment considers the potential impact of the Wallumbilla LPG Facility on the global climate system by changes that it may cause to net GHG emissions. Climate change is an environmental concern at a global level. Any source or sink of greenhouse gases has a nominally equivalent effect no matter where it occurs in the world. While few if any individual projects would make a noticeable change to the Earth's climate, the summation of human activities increasing the concentrations of greenhouse gases in the upper atmosphere does. Governments and the global scientific community have established conventions for accounting for GHG emissions to enable pollution control among all global jurisdictions. This assessment employs these established conventions so that the relative impact of the current project can be properly understood.

The term greenhouse gases comes from the 'greenhouse effect', which refers to the process whereby naturally occurring greenhouse gases in the atmosphere absorb and re-radiate the Sun's warmth, and maintain the Earth's surface temperature at a level necessary to support life (Mapstone, 2011). Human activity, especially burning fossil fuels like natural gas, is increasing the concentration of greenhouse gases and hence increasing the concentrations of the gases that trap heat. This is the enhanced greenhouse effect, which is contributing to warming of the Earth due to human-caused (anthropogenic) GHG emissions. Even a small increase in long-term average surface temperatures has numerous direct and indirect consequences for climate.

The main greenhouse gases influenced directly by human activities and included in carbon accounting are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and synthetic gases, such as sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (Raupach and Fraser 2011; pp. 15-20). These gases vary in effect and longevity in the atmosphere, but scientists have developed a system called Global Warming Potential to allow the effect of each gas to be described in equivalent terms to CO₂ (the most prevalent GHG) called equivalent carbon dioxide emissions (CO₂-e). A unit of one tonne of CO₂-e is the basic unit used in carbon accounting. An emissions inventory, or 'carbon footprint', is calculated as the sum of the emission rate of each GHG multiplied by the global warming potential. For example:

 CO_2 -e emissions = (CO_2 emissions x 1.0) + (CH_4 emissions x 21) + (N_2O emissions x 310)

 CO_2 and CH_4 are part of the carbon cycle, which refers to the natural movement of carbon among the ocean, plants, soil and the atmosphere. Fossil fuels such as coal, oil and natural gas are the product of ancient deposits of organic matter. When combusted, their stored carbon is released again to the atmosphere at an extremely rapid rate in comparison to the rate at which it was stored.

Burning fossil fuels always causes GHG emissions and energy from fossil fuels underpins the global economy and the human development gained from it. Consequently, changing this pattern to reduce emissions and protect climate is extremely difficult. The need for a global solution to this problem has led to the United Nations Framework Convention on Climate Change (UNFCCC), the associated Kyoto Protocol and the world scientific body, the Intergovernmental Panel on Climate Change (IPCC). In 2009, governments agreed to hold any increase in global temperature to below two degrees Celsius (UNFCCC, 2009). Australia is an active participant in these global arrangements and this has a strong effect on domestic economic and environmental policy.

8.2 Australian policy and regulation

8.2.1 Australian international commitments

The following discussion of Australia's global commitments to respond to anthropogenic (human-caused) climate change is derived from information published by the Commonwealth Department of Climate Change and Energy Efficiency (DCCEE) on its website (DCCEE, 2012a).

The United Nations Framework Convention on Climate Change (UNFCCC) provides the basis for global action 'to protect the climate system for present and future generations'. Australia ratified the Convention in 1992. The Convention entered into force in 1994 after a requisite 50 countries had ratified it. There are now 193 Parties to the UNFCCC - almost all of the members of the United Nations.

Parties to the Convention have agreed to work towards stabilising 'greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'.

Under the convention, Australia is committed to:

- Submitting a national inventory of emissions and removals of greenhouse gases
- Implementing national programs to mitigate climate change and adapt to its impacts
- Conducting research related to the climate system and promoting relevant technologies
- Raising public awareness about climate change
- Submitting comprehensive National Communications (i.e. reports).

The Kyoto Protocol is an international agreement created under the UNFCCC in Kyoto, Japan in 1997. Australia's ratification of the protocol came into effect on 11 March 2008. The protocol aims to reduce the collective GHG emissions of developed country Parties by at least five per cent below 1990 levels during 2008 to 2012 - referred to as the first commitment period. Australia has a target for emissions of 108 percent of estimated emissions for 1990 or 591.5 Mt CO₂-e.

At the United Nations climate change negotiations in Durban, South Africa in 2011, Parties to the Kyoto Protocol decided to establish a second commitment period from 1 January 2013. On 9 November 2012, the Australian Government announced its intention to join a second commitment period under the Kyoto Protocol, conditional on a number of factors to be negotiated at the Doha Conference of the Parties in late 2012. All countries that are party to the UNFCCC are negotiating a new global agreement that is intended to have legally binding commitments for all major emitters. This agreement is due for finalisation by 2015 and will come into effect in 2020 (Combet, 2012).

The Australian Government has a constitutional power to ensure that Australia meets its international commitments, including those made under the UNFCCC. There are two related national policies, statutes and regulations that are important to the ongoing operation of the Wallumbilla LPG Facility, including:

• The National Greenhouse and Energy Reporting (NGER) Act 2007 and regulations – AGL will continue to participate in the national emissions reporting process and have reporting obligation triggered by the energy consumption at the LPG Facility.

 The Energy Efficiency Opportunities Act 2006 – AGL may have to identify, evaluate and report publicly on cost effective energy savings opportunities relating to the LPG Facility.

This legislation is enforced by Australian Government agencies and penalties apply for noncompliance.

8.2.2 National Greenhouse and Energy Reporting

The National Greenhouse and Energy Reporting Act 2007 (NGER Act) established a national framework for corporations to report scope 1 and scope 2 GHG emissions and energy consumption. Registration and reporting is mandatory for corporations that have energy production, energy use or GHG emissions that exceed specified thresholds.

The Wallumbilla LPG Facility has been estimated to use 235 TJ of energy per year. This energy consumption is in excess of the Facility threshold of 100 TJ. In terms of annual GHG emissions the estimate is 13.5 ktCO_2 -e which is lower than the Facility threshold of 25 ktCO₂-e per year. As a result based on energy consumption, the Wallumbilla LPG Facility as a Facility will continue to have ongoing reporting obligations.

Registered corporations are required to report by 31 October following the reporting year, and must submit an NGER Report for every year that it remains registered (Clean Energy Regulator, 2012). The NGER Act is now administered by the Clean Energy Regulator and the scheme will also be the basis for the *Clean Energy Act 2011* and associated carbon pricing mechanism (i.e. emissions trading).

8.2.3 Energy Efficiency Opportunities

The Energy Efficiency Opportunities (EEO) program encourages large energy-using businesses to improve their energy efficiency. It does this by requiring businesses to identify, evaluate and report publicly on cost effective energy savings opportunities (DRET, 2011). Participation in EEO is mandatory for corporations that use more than 0.5 petajoules (PJ) of energy per year.

The Wallumbilla LPG Facility estimated energy use of 0.235 PJ is lower than the EEO threshold. As a result on a Facility basis the LPG Facility does not trigger an obligation under EEO, however may be included in AGL's overall EEO reporting.

8.2.4 Clean Energy Act (Carbon Pricing Mechanism)

The *Clean Energy Act 2011* has established a carbon emissions trading system for Australia including a fixed price period, a 'ceiling' period and full emissions trading from 1 July 2015, where the market will determine prices (with some restrictions). Emissions covered under the Act are essentially those that the Facility directly emits (scope 1), excluding transport fuels that are currently covered under the fuel excise or tax credit schemes.

Based on existing operations AGL is already a 'liable entity' under Section 20 of the Act because it has 'operational control' of facilities with 'covered emissions' (s. 30) that exceed the threshold of 25,000 tonnes per year CO_2 -e.

Scope 1 emissions arising from the Wallumbilla LPG Facility do not exceed the Facility threshold and as result will make no change to AGLs obligations under the Act.

8.2.5 Reporting tools

DCCEE monitors and compiles databases on anthropogenic activities that produce greenhouse gases in Australia, and has published GHG emission factors for a range of these activities. The emission factors are combined with a Facility's operating information and energy usage to calculate GHG emissions. The DCCEE methodology for calculating GHG emissions is published in the National Greenhouse Accounts (NGA) Factors workbook (DCCEE, 2012b) and is based on Australian data. This workbook is updated regularly to reflect current compositions in fuel mixes and evolving information on emission sources.

Emissions are reported according to scopes, which are determined by the level of control an organisation has over the emissions. The NGA also categorises emissions factors by scope. Scope 1 emissions are direct emissions from activities within the organisation's boundary and control. Scope 2 emissions arise principally from 'purchased electricity'; that is, emissions caused by the generation of electricity that is used by an organisation but generated by another party.

Higher level calculations methods can be used where appropriate. In this instance methodology presented in the API Compendium (API, 2009) has been applied to account for the non-standard characteristics of the fuel gas being combusted.

Emissions estimated for this Facility relate to the direct application of fuel (plant fuel gas) in compressor packages and generator sets (gensets). The proponent has indicated that electricity consumption for the LPG Facility is not significant and has not been considered for the purposes of this assessment. As a result, all direct emissions associated with the Upgrade Project can be categorised as scope 1.

Scope 3 emissions occur as an indirect result of an activity. For an example, scope 3 emissions are those that occur due to the production of fuel. This analysis excluded scope 3 emissions.

8.3 Sources of greenhouse gas emissions

8.3.1 Natural gas consumption

Sources of greenhouse gases associated with the LPG Facility are principally due to the combustion of plant fuel gas used to power gas compressors as well as gas fired gensets.

The annual fuel gas consumption for the LPG Facility based on 2010 daily consumption figures of 5,016,456 kg of fuel has been determined to be 217.47 MMscf. The fuel usage rate would be approximately 572.7 kg/hr assuming a constant requirement for fuel.

The fuel gas characteristics including composition and heating value are summarised in Table 13.

Compound	mol%	Wt%	
Methane	84.4%	70.2%	
Ethane	7.4%	11.5%	
Propane	3.0%	6.9%	
i-Butane	1.0%	3.0%	
n-Butane	0.7%	2.1%	
i-Pentane	0.2%	0.8%	
n-Pentane	0.1%	0.4%	
n-Hexane	0.1%	0.3%	
n-Heptane	0.0%	0.1%	
n-Octane	0.0%	0.0%	
CO ₂	0.3%	0.6%	
N ₂	2.9%	4.2%	
H ₂ O	0.0%	0.0%	
Net Heating value**	46820	kJ/kg	

Table 13 Wallumbilla LPG Facility Fuel Gas Characteristics*

8.3.2 Venting

Venting of gas (including the GHG, methane) is undertaken periodically for Facility maintenance and may occur as part of normal operations. Small volumes of gas may be released. This activity usually occurs during testing and inspection of relief valves. Major shutdowns typically occur only very infrequently. Emissions due to venting have not been considered further in this assessment.

8.4 Method used to estimate greenhouse gas emissions

The API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (API Compendium) published by the American Petroleum Institute (API) provides sector specific methodologies for higher level calculation of greenhouse gas emissions relating to activities specific to the oil and natural gas sector. The API Compendium is currently at its third release since it's pilot in 2001. This guide is updated regularly through a regular review process that considers the most up to date emission factors and methodologies.

Fuel gas combusted in the LPG Facility is non-standard and as a result cannot be directly associated with emission factors published in the NGA factors workbook (DCCEE, 2012b). The composition of this gas has been estimated and methods detailed in the API Compendium (API, 2009) have been used to determine the carbon dioxide emissions from first principles assuming complete combustion of the fuel gas. The carbon content of the fuel gas is summarised in Table 14.

Table 14Wallumbilla LPG Facility Fuel Gas Carbon Content

Compound	Wt%C
Methane	52.5%
Ethane	9.2%
Propane	5.7%
i-Butane	2.4%
n-Butane	1.8%
i-Pentane	0.7%
n-Pentane	0.3%
n-Hexane	0.2%
n-Heptane	0.0%
n-Octane	0.0%
CO2	0.2%
N2	0.0%
H2O	0.0%
TOTAL	73.1%

Emission factors have been applied to determine the annual emissions of methane and nitrous oxide. The GHG emissions relating to CH_4 and N_2O from each proposed activity have been calculated using the simplified equation as follows:

Where:

- GHG: Annual greenhouse gas emissions in tonnes of carbon dioxide equivalent (tCO₂-e)
- *E:* Annual energy use (GJ/y)
- *EF:* Emission factors for CH_4 and N_2O (kg CO_2 -e/GJ)

The total annual CO_2 -e emissions are the sum of the individual CO_2 -e emissions of CO_2 , CH_4 and N_2O . The emission factors that have been used to calculate GHG emissions are presented in Table 15.

Table 15	Greenhouse gas emission factors for emission sources
----------	--

Emission Source	Emission Factor						
	Unit	CH₄	N ₂ O	Source			
Fuel gas combustion*	kg/TJ	1.0	0.1	Table 4-6 of API Compendium (2009)			
*Assumed equivalent to natural gas/refinery gas							

8.5 Greenhouse gas inventory

The annual GHG emissions estimated for the Wallumbilla LPG Facility are summarised in Table 16. These figures cover scope 1 emissions. Grid electricity will not be sourced for the Wallumbilla LPG Facility resulting in no scope 2 emissions.

Table 16	Estimated annual GHG emissions (t CO ₂ -e/	V)
		y)

Emission source	CO ₂	CH ₄	N ₂ O	TOTAL CO ₂ -e
Fuel Gas	13,438	4.9	7.3	13,451

The annual estimated emission rate of greenhouse gases is 13.5 ktCO_2 -e/y assuming fuel gas consumption rates for future years are comparable with 2010 fuel gas consumption. Using the most recent published inventories, the Wallumbilla LPG Facility emissions represent:

- 0.002 percent of Australia's estimated GHG emissions for the year to March, 2012 (551 Mt CO₂-e) (DCCEE, 2012c)
- 0.01 percent of Queensland's annual emissions. The total GHG emissions reported for Queensland were 134.3 Mt CO₂-e in the 2009/2010 reporting period (DCCEE, 2012d), excluding emissions and removals from Land Use, Land Use Change and Forestry (LULUCF). With the inclusion of emissions and removals from LULUCF, the total Queensland GHG emissions were 157.3 Mt CO₂-e

8.6 Mitigation of greenhouse gas emissions from the Project

There are several actions that have potential to manage and reduce GHG emissions from the Wallumbilla LPG Facility. These include:

- Avoidance of natural gas leakage in view of the high global warming potential of the methane fraction
- Selection of appropriately sized and energy efficient equipment
- Incorporation of waste heat recovery when practical and beneficial
- Compliance with operations and maintenance procedures recommended by the Original Equipment Manufacturer
- Monitoring compressor/genset fuel consumption efficiency to identify any deterioration in performance
- Monitoring of technology developments, periodically evaluate the feasibility of equipment upgrades and undertake replacements if/when investment hurdles would be achieved based on greater efficiencies

Other important matters concerning the management of GHG emissions with this project are:

 Implementing rigorous data capture and data management systems for reporting of energy use and GHG emissions that support mandatory reporting under NGER, EEO and provide for effective management oversight of emissions.

9. Conclusions

An air quality assessment has been conducted for an upgrade of the Wallumbilla LPG Facility in central southern Queensland. The assessment has been done in accordance with industry standard models and analysis techniques. A cumulative assessment of the upgraded Wallumbilla LPG Facility operating in conjunction with the existing Epic Energy Wallumbilla Compressor Station and the Santos Wallumbilla Gas Treatment Facility has also been undertaken.

The following conclusions can be drawn from the air quality assessment for normal operations of the Wallumbilla LPG Facility in conjunction with the background sources:

- The predicted 99.9th percentile 1-hour average ground-level concentrations of NO₂ are below the Air EPP objective of 250 µg/m³ at all sensitive receptor locations
- The predicted annual average ground-level concentrations of NO₂ are below the Air EPP objective of 62 µg/m³ at all sensitive receptor locations
- The predicted maximum 8-hour average ground-level concentrations of CO are well below the Air EPP objective of 11,000 µg/m³ at all sensitive receptors locations

The following conclusions can be drawn from the air quality assessment for non-normal operations of the Wallumbilla LPG Facility:

 The predicted 99.9th percentile 1-hour average ground-level concentrations of NO₂ are well below the Air EPP objective of 250 µg/m³ at all sensitive receptor locations

The following conclusions can be drawn from the greenhouse gas assessment:

 The annual estimated emission rate of greenhouse gases from the Wallumbilla LPG Facility is 13.5 ktCO₂-e/y, which is equivalent to 0.002% of Australia's estimated GHG emissions for the year to March 2012 and 0.01% of Queensland's annual emissions

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Appendix 6

Background noise report





BACKGROUND NOISE MONITORING DATA REPORT

Wallumbilla LPG Facility

May 2013 CR 9084_5_v3 WAGL Energy in action®



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Appendices

A Raw data spreadsheets

Background Noise Monitoring Data Report Wallumbilla LPG Facility

> Coffey Environments 9084_5_v3 ii

1. INTRODUCTION

1.1 Background

AGL Energy Ltd (AGL) acquired the existing Wallumbilla Liquefied Petroleum Gas (LPG) Facility in March 2011. The facility is located approximately 13 km south of the township of Wallumbilla, near Roma, Queensland. The facility has been mothballed since its purchase; AGL proposes to upgrade and recommission the facility to recommence the production of propane, butane and condensate. Recommissioning of the facility triggered the requirement for a Level 1 Environmental Authority (Chapter 5A Activities) and a supporting environmental management plan (EM Plan) under the *Environmental Protection Act 1994* (Qld) (EP Act).

Coffey Environments were commissioned by AGL to conduct background noise monitoring at sensitive receptors in the vicinity of the facility, to inform the preparation of the EM Plan.

1.2 Sampling and Analysis Procedure

The ambient noise was recorded at the three sensitive receptor sites using a Rion NL21 noise logger. The three sensitive receptor sites are listed in Table 1.1 and shown in Figure 1.1. One noise logger was set up at each of the sensitive receptor sites for a nine day period from midday 9 January to midday 18 January 2013.

Site	Location	Northing	Easting	Plate	
R1	Private dwelling	26°40'52.66"S	149°10'08.69"E	Plate 1.1	
R2	Private dwelling	26°40'48.35"S	149°11'59.52"E	Plate 1.2	
R3	Private dwelling	26°42'33.59"S	149°10'58.09"E	Plate 1.3	

Table 1.1 Noise monitoring locations

Noise levels were not monitored at a Santos Ltd temporary workers' camp located between the project area and sensitive receptor R2, as noise at this location is an occupational health and safety issue to be addressed by Santos Ltd. The camp is not anticipated to be a source of complaints about noise levels, given its direct involvement in the industry.

It should be noted that at the commencement of sampling, the noise from neighbouring gas facilities was not audible at any of the three receptors sites. The two nearby gas processing facilities are understood to have been operational for the duration of the monitoring period.

The following parameters were recorded at 15 minute intervals:

- L_{Aeq} the equivalent continuous sound (average) for the measurement period, which would contain the same sound energy as the actual sound fluctuating with time.
- L_{Amax} the maximum value recorded during the measurement period.
- L_{Amin} the minimum value recorded during the measurement period.





Plate 1.1 Noise logger at sensitive receptor R1

Plate 1.2 Noise logger at sensitive receptor R2

Plate 1.3 Noise logger at sensitive receptor R3

- L_{A01} the noise level exceeded for 1% of the measurement period.
- L_{A10} the noise level exceeded for 10% of the measurement period.
- L_{A50} the noise level exceeded for 50% of the measurement period.
- L_{A90} the noise level exceeded for 90% of the measurement period. Generally used to quantify the background noise level, i.e., the underlying level of noise which is present even during the quieter parts of the measurement period.
- L_{A95} the noise level exceeded for 95% of the measurement period.

All noise measurements were undertaken in accordance with Australian Standard AS 1055.1 – 1997. For example, the noise loggers were located in direct line-of-sight to the major noise sources (i.e., the gas processing plants) and more than 3.5 m away from reflective sources, with the microphones all located between 1.2 m and 1.5 m above ground level. Landholder preferences for location of the noise loggers were also taken into account.

1.3 Guidelines Used for Comparison

The relevant policies and guidelines that were used to develop acoustic quality objectives included:

- Environmental Protection (Noise) Policy 2008 (Qld).
- World Health Organisation Guidelines for Community Noise (Berglund et al., 1999).

These policies/guidelines prescribe acoustic quality objectives for enhancing or protecting the environmental values of health and wellbeing. The acoustic quality objectives for dwellings during different times of the day are outlined in Table 1.2.

Sensitive receptor	Sensitive Time of Indoor acou receptor day quality objec (L _{Aeq}) – dB		Outdoor acoustic quality objectives (L _{Aeq}) – dB(A)	Environmental value		
Dwelling (for outdoors) Daytime and evening (7am to 10pm)		N/A	50	Health and wellbeing		
Dwelling (for indoors)	Daytime and evening (7am to 10pm)	35	50	Health and wellbeing		
Dwelling (for indoors)	Night-time (10pm to 7am)	30	45	Health and wellbeing, in relation to the ability to sleep		

Table 1.2 Acoustic quality objectives

To achieve the 30 dB(A) L_{Aeq} inside a dwelling at night in relation to the ability to sleep, the World Health Organisation suggests that the equivalent noise level outside a bedroom window should be limited to 45 dB(A). This level is based on the assumption that the noise reduction from outside to inside with the window partly open is 15 dB(A) (Berglund et al., 1999). Similarly, it is suggested that to achieve the 35 dB(A) L_{Aeq} indoors during the daytime, the sound pressure level outside the dwelling should not exceed 50 dB(A) L_{Aeq} .

1.4 Limitations

Sampling was undertaken over an isolated nine day period. Sampling may therefore not have captured spikes that may have exceeded acoustic quality objectives, on days outside the monitoring period.

Other influences outside the control of the monitoring program may also have influenced the data recorded, such as meteorological conditions, incidental mobile noise sources (e.g., livestock, traffic). The influence of these factors have not been analysed in this report.

2. RESULTS

A summary of the ambient noise level measurements for each site over the nine day sampling period is presented in Table 2.1. The full dataset is provided in Appendix A.

Location	Time of day	Total measurements recorded	Ambient noise level						
			L _{Aeq} (dB(A))				L _{A90} (dB(A))		
			Number of exceedences*	Min.	Max.	Average	Min.	Max.	Average
R1	Daytime and evening	535	21	25.7	57.2	39.80	21.1	49.7	32.33
	Night- time	324	118	32.6	59.2	43.06	26.0	51.7	35.57
R2	Daytime and evening	535	165	33.7	64.0	47.02	25.9	47.3	35.06
	Night- time	324	119	34.5	69.6	44.19	32.3	50.8	37.41
R3	Daytime and evening	535	15	31.0	62	41.52	21.5	49.2	34.45
	Night- time	324	104	31.7	57.2	42.86	29.7	52.2	38.74

 Table 2.1
 Results of ambient noise level measurements

* Number of exceedences of the outdoor acoustic quality objectives as outlined in Table 1.2.

There was little difference between the average (L_{Aeq}) measurements during the daytime and evening (between 7am and 10pm) compared to at night (between 10pm and 7am). At R2, the average L_{Aeq} during the daytime was higher than at night; conversely the night-time measurements were higher than the daytime measurements at both R1 and R3. R2 also had the highest average L_{Aeq} of the three sites, with R1 having the lowest during the day and R3 having the lowest at night.

The L_{Aeq} measurements for each of the three sensitive receptor sites are shown in Figure 2.1 against the outdoor acoustic quality objectives of 50 dB(A) for daytime and 45 dB(A) for night-time. While the average LAeq were all below these objectives for all sites, several individual measurements exceeded the objective. At the sensitive receptor R2, 165 of the 535 measurements during the daytime exceeded the acoustic quality objective, compared to a maximum of 21 measurements at the other two sites. At night, the number of exceedences across the three sensitive receptor sites was relatively similar (ranging between 104 and 119 exceedences, out of the 324 measurements at night).

The L_{A90} measurements give an indication of the general background noise levels. The background noise during the daytime was lower than background noise during the night across all sensitive receptor sites. The results show that there was a wide variation in L_{A90} measurements, with an approximate 18 dB(A) to 30 dB(A) range in measurements at all sites across both night and daytime. These are shown in Figure 2.2.





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