Environmental Assessment Scoping Report – Expansion of Stage 2 of the Camden Gas Project

19 October 2006

Prepared for:
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On behalf of Camden Gas Project Joint Venture

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19 October 2006

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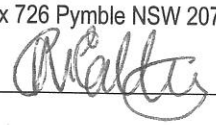

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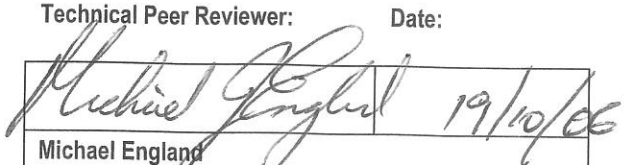

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1 INTRODUCTION

1.1 Background

1.1.1 The Proponent

The Proponent of the project outlined in this EASR is AGL Gas Production (Camden) Pty Limited (AGL Camden) as the operator for the Camden Gas Project Joint Venture (CGPJV) between Sydney Gas (Camden) Operations Pty Limited (Sydney Gas) and AGL Camden.

Together, Sydney Gas and AGL Camden are responsible for the exploration, development and production of coal seam gas for the NSW market. Sydney Gas is generally responsible for the exploration component of this project, while AGL Camden is responsible for the development and production of the gas asset. Both parties of this joint venture believe that coal seam methane provides a safe and superior alternative energy supply for the NSW market that is clean, efficient and environmentally friendly when compared with other fossil fuel energy options.

1.1.2 Petroleum Exploration Licence and Petroleum Production Licences

The Camden Gas Project is a major coal seam methane (CSM) project involving the extraction of coal seam methane gas located within the Southern Coalfield of the Sydney Basin. It forms part of Petroleum Exploration License 2 (PEL 2) which is a strip of land extending from Newcastle to Wollongong (see **Figure 1**).

Within PEL 2, three areas have been granted Petroleum Production Licences (PPLs) to gather and distribute the petroleum gas found within PEL 2. These areas are known as PPL1, PPL2, and PPL4 which were issued to the Proponent by the Minister for Primary Industries pursuant to the *Petroleum (Onshore) Act 1991*. The majority of the Stage 2 area subject of this proposal is located within PPL4.

1.1.3 Existing Wells and Infrastructure

Stage 1 of the Camden Gas Project was approved in 2002, and currently consists of 22 wells, the Ray Beddoe Gas Treatment Plant (RBTP) and an in-field gas gathering system in the Cawdor area. Stage 1 has entered into gas production pursuant to PPL 1 and PPL 2.

Stage 2 of the Camden Gas Project was approved in 2004, and initially comprised 43 wells, the Rosalind Park Gas Plant (RPGP) and gas gathering system in the Menangle and Menangle Park areas. Stage 2 has entered into production pursuant to PPL4.

Since the original approval for Stage 2 was issued in 2004, three subsequent development consents have been granted by the Minister for Planning (the Minister) for extensions to the Stage 2 area, namely for:

- an additional 15 wells at Mt Taurus and Harness Racing at Menangle Park;
- an additional 6 wells at Glenlee and Elizabeth Macarthur Agricultural Institute (EMAI) Stage 1; and
- an additional 7 wells at Sugarloaf.

A further development application (DA) for an extension of 10 wells on the El Bethel property was approved on 25 March 2006 (DA171-7-2005). An additional 6 wells were also approved

subject to the granting of Section 96 modifications on 16 May 2006 (5 wells as extensions to the Stage 2 project, 1 well as an extension to the Stage 1 project).

In addition to this, Project applications pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) have been submitted in respect of a further 14 wells in the EMAI property and 10 wells in the adjacent Razorback area.

An overview of the existing and proposed well fields within Stage 2 of the Camden Gas Project is provided as **Figure 2**, while a more detailed view of the infrastructure within the existing and proposed well fields in Stage 2 of the Camden Gas Project is provided as **Figure 3**.

1.1.4 Proposed Wells and Infrastructure

The Proponent is seeking to develop further well fields including wells and supporting infrastructure within Stage 2 of the Camden Gas Project. The new wells would enable the Proponent to access gas resource both within and from the Stage 2 Concept Plan area . As part of this proposal all surface disturbance associated with the proposed infrastructure would be located within the PPL4 boundaries.

This report outlines the Proponent's intention to lodge a Concept Plan application pursuant to Part 3A of the EP&A Act for the development of new well fields and infill wells supported by associated infrastructure, together with post development operational activities including the installation of in-field compression and undertaking refracing activities in Stage 2 of the Camden Gas Project. In addition, concurrent Project approval pursuant to Part 3A of the EP&A Act is being sought for proposed works, involving the development of wells, gas gathering and water pipelines within the Spring Farm and Menangle Park areas (see **Figures 2, 3, 5 and 6**).

At a future date, and following the development of the additional Stage 2 works (in particular the Spring Farm and Menangle Park areas) the Camden Gas Project is proposed to be extended to include Stage 3 (located to the north of Stage 2) and Stages 4 and 5 (located to the west of Stage 3).

This EASR provides an overview of the works proposed within Stage 2 for which Concept Plan and Project approval will be sought. Applications supported by a single Environmental Assessment (EA) will be prepared and submitted to the Department of Planning (DoP) for consideration of the Stage 2 Concept Plan and the concurrent Spring Farm and Menangle Park Project approval within Stage 2.

1.2 Project Context

On 13 June 2003, the Minister declared the Camden Gas Project as State Significant development, and the existing Stage 2 works of the Camden Gas Project were considered pursuant to Part 4 of the EP&A Act.

On 1 August 2005, planning reforms were introduced to the EP&A Act. Of significance to this project was the introduction of Part 3A of the Act which provides the assessment framework for major projects, previously classified as State Significant development, and other projects declared by the Minister.

The Minister, on 10 October 2005, advised that a Concept Plan must be submitted for the remainder of the development within Stage 2 and for future development of Stages 3, 4 and 5, prior to (or concurrently with) seeking Project approval for any part of the development, pursuant to Part 3A of the EP&A Act.

As the Minister has advised that the project meets the criteria for a major project, approval will be sought for this project pursuant to the provisions of Part 3A of the Act.

Discussions with representatives of DoP on the approvals process to be implemented having regard to the Minister's advice of 10 October 2005, confirmed the following Approvals Strategy:

- Further works within Stage 2 would require a Concept Plan approval.
- Concurrent Project approval for the wells, and gas gathering and water lines within Spring Farm and Menangle Park would be sought.
- Separate Concept Plan applications, and subsequent Project applications would be sought for works within Stages 3, 4 and 5 at a later date.

As discussed previously, a single Environmental Assessment (EA) would be prepared providing the necessary level of detail to support the Concept Plan approval for the further Stage 2 works and concurrent Project approval for specific works (including wells and gas gathering lines) within Spring Farm and Menangle Park.

1.3 Location

1.3.1 Stage 2 Concept Plan

Stage 2 of the Camden Gas Project which is the subject of the Concept Plan application is situated approximately 65 kilometres south-west of Sydney in the Camden, Campbelltown and Wollondilly Local Government Areas (LGAs). The Nepean River runs through the Concept Plan area, from the north-western corner to the south of the Stage 2 area. The area extends from the suburbs of Narellan and Currans Hill in the north to south of Menangle, extending across to Glen Alpine and Ambervale in the east, and Camden in the west (see **Figure 2**). The Concept Plan area includes proposed new well fields identified as Spring Farm, Menangle Park, Mount Gilead and Kay Park Stage II.

1.3.2 Spring Farm and Menangle Park Project Approval

Concurrent Project approval is also being sought for the construction of wells and the installation of gas gathering and water pipelines within the Spring Farm and Menangle Park well fields.

The area known as Spring Farm is located within the Camden LGA, approximately 65 km south west of Sydney. The Spring Farm area is located east of Camden and is situated south of the Camden by-pass. The Nepean River adjoins the south west boundary of the area, while the suburb of Spring Farm borders the north/north eastern boundary of the area. Land in the area is allocated to support future urban development growth.

The Spring Farm area is located between the existing well fields of Glen Lee and EMAI to the south east and south west (see **Figure 2**).

The Menangle Park area falls within the Campbelltown LGA. The land is situated south of the proposed Spring Farm well site area. The Menangle Park area is bounded by the Hume Highway to the east, with the exception of a small portion of the site which is situated east of the Hume Highway and north of Menangle Road. The Nepean River adjoins the western and southern boundaries of the area (see **Figure 2**).

1.4 Approval Regime

The proposal involves the recovery of coal seam methane which requires drilling and operation of petroleum wells, associated gas gathering lines and ancillary works. The proposal falls under the definition of a 'major development' under Group 6 of Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005* (SEPP 2005).

Group 6 of Schedule 1 to SEPP (Major Projects) 2005 identifies classes of development which are defined as 'major projects' and includes projects related to petroleum (oil, gas and coal seam methane), being:

> *'Development for the purpose of drilling and operation of petroleum wells (including associated pipelines) that:*
>
> *c) Is in the local government areas of Camden, Wollondilly, Campbelltown City, Wollongong City, Wingecarribee, Gosford City, Wyong, Lake Macquarie City, Newcastle City, Maitland City, Cessnock City, Singleton or Muswellbrook, but only if the principle resource sought is coal seam methane.*

The recovery of coal seam methane involves the drilling and operation of well sites, associated gas gathering lines and ancillary works. The proposal involves well site development for coal seam methane extraction within Stage 2 of the Camden Gas Project, which is situated in the Camden, Campbelltown and Wollondilly LGAs. Therefore the proposal falls within the definition under Group 6 of Schedule 1 of SEPP (Major Projects) 2005.

The Proponent will therefore be seeking the following approvals pursuant to Part 3A of the EP&A Act:

- Concept Plan approval for the development of new well fields (Spring Farm, Menangle Park, Mount Gilead and Kay Park Stage II) and infill wells within the existing well fields in Stage 2 with associated infrastructure, and post development operational activities including the installation of in-field compression and refracing activities within the Stage 2 area; and
- Concurrent Project approval for the proposed wells, and gas gathering and water lines at Spring Farm and Menangle Park.

A single EA will be prepared to support the works proposed as part of the Concept and concurrent Project approval.

1.5 Purpose of this EASR

This EASR forms the preliminary environmental assessment of the proposed works. The purpose of the EASR is to provide the Minister with outline information and background environmental data on the site and the proposed project, sufficient to establish the key environmental issues of significance and the level of environmental assessment required for the application.

1.6 Structure of Report

To inform relevant government agencies and the local councils of the level of environmental assessment required, the EASR has been structured to provide information on broad areas as outlined in **Table 1**.

Table 1: Outline of Report Structure

Section	Issues Addressed
Section 1	Provides a background to the project, including information about the Proponent.
Section 2	Outlines a description of the subject site and the project proposed.
Section 3	Provides a categorisation of the proposed development as a “major project” and describes relevant legislation and Environmental Planning Instruments (EPIs) to be addressed.
Sections 4 and 5	Reports on the environmental implications in terms of physical and biological effects, including the baseline situation and anticipated impacts.
Section 6	Examines the likely impacts of the project on resources (community, infrastructure, natural and transport).
Section 7	Outlines the potential community effects, including the social, heritage and cultural, and economic implications.
Section 8	Prioritises environmental issues for the EA.
Section 9	Presents a summary of the findings, a prioritisation of issues for the project and subsequent environmental assessment, and recommendations in respect of the level of assessment and approvals process.

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2 DESCRIPTION OF PROJECT

2.1 Introduction

The Proponent is seeking Concept Plan approval for a range of works relating to the remainder of development within the Stage 2 area of the Camden Gas Project. Concurrent Project approval is also being sought for works within the proposed Spring Farm and Menangle Park well fields. The Proponent's objective for this project is to provide greater certainty of the future ability to access the gas resource across the Stage 2 area.

In this section the description of the proposed project has been split between the Concept Plan and Project approval where applicable. The scope of activities for the Project approval generally includes the same activities which are proposed under the Concept Plan, therefore the description of the Project approval will be referenced to the Concept Plan description. Some of the post development operational activities for which approval is being sought are limited to the Concept Plan, as noted in **Sections 2.4 to 2.7** of this report.

2.2 Overview of Proposed Activities

The works proposed under both the Concept Plan and Project Approval involve the construction and subsequent operation of a number of gas wells, together with associated infrastructure and post development operational activities to enable the collection and delivery of gas to the existing RPGP.

Concept Plan and concurrent Project approval is being sought for the range of activities which can be divided into the following:

- Construction: The activities required to physically develop the wells and supporting infrastructure, through to production testing, which occurs prior to wells entering the production phase;
- Production: Production of gas from the wells and delivery of gas from well sites to the RPGP via gas gathering lines;
- Post Development: Ongoing maintenance and/or operational activities which may be needed to ensure ongoing production levels are fully utilised. It is anticipated that this might include the upgrading of existing gas gathering pipelines as a result of increased production, the installation of in-field compression and refracing of existing and new wells. These activities were not detailed as part of previous approvals within Stage 2, and are required to ensure the efficiency of gas production is maintained; and
- Closure and Rehabilitation.

Sections 2.2.1 and 2.2.2 provide an overview of the proposed activities which form part of the Concept Plan and concurrent Project approval, including **Table 2** which provides a breakdown of the tasks by activity.

A more detailed description of key activities associated with implementing the proposed works in Stage 2 of the Camden Gas Project has been structured into activity based sections (see **Sections 2.4 to 2.7**).

2.2.1 Stage 2 Concept Plan

The Concept Plan proposal relates to the area identified in **Figure 2** and **Figure 3**. **Table 2** below provides a breakdown of the tasks proposed as part of the Concept Plan by activity.

Table 2: Breakdown of Task by Activity

Construction	Production	Post Development / Operation Activities	Closure and Rehabilitation
• Preparation of access roads, drill pads and environmental controls. • Construction and drilling of wells. • Construction of water transfer and gas gathering systems. • Hydraulically fracturing the coal seam i.e. fracing (where required). • Installing the well completion, wellhead and surface equipment to enable the production of water and gas. • Connecting the wells to the trunk gathering system. • Production testing	• Operation of the wells in accordance with Petroleum Production Licence. • Production and metering of methane gas.	• Upgrade/installation of gas gathering lines along existing routes due to increased production. • Installation of in-field or wellhead compression (where required). • Refracing of existing wells (where required). • Maintenance of wells (work over).	• Rehabilitation of areas cleared during construction and drilling activities. • Decommissioning wells, plugging and abandoning wells at the conclusion of production. • Removal of wellhead assemblies and rehabilitation of sites to restore to pre-development conditions.

A significant component of the construction activities described above are related to the installation of new wells. There are various types of well drilling technologies that could be employed as part of the proposed activities. These types of drilling are described in greater detail in **Table 4**.

Utilising these various technologies the wells proposed as part of the Concept Plan can be allocated into three groups as follows:

- new well fields in areas identified as Spring Farm, Menangle Park, Mount Gilead and Kay Park Stage II (see **Figure 2** and **Figure 3**). Works within the new well fields would involve the construction of wells and associated infrastructure including gas gathering and water pipelines and access roads. The type of wells proposed are described in greater detail in **Table 4**;

- co-locating new wells within the pad of existing wells in existing well fields within Stage 2 to access additional resource from currently disturbed areas through the installation of a new well head and bore; and
- infill wells with associated infrastructure (including gas gathering and water pipelines and access roads) to be located within existing well fields within Stage 2 where the gas reserve is not able to be accessed from existing well head locations.

Approval is also sought for the subsequent production and transportation of gas from new well sites to the RPGP.

Concept Plan approval is also sought for post development operational activities including upgrading of existing gas gathering lines, the installation of in-field compression and refracing of existing and new wells. These activities were not detailed as part of previous approvals within Stage 2, and are required to ensure the efficiency of gas production is maintained. A greater level of detail on post development operational activities proposed as part of the Concept Plan is provided in **Section 2.6** of this report.

2.2.2 Spring Farm and Menangle Park Project Approval

In addition to the works proposed as part of the Concept Plan, concurrent Project approval is being sought for the new wells, gas gathering and water pipelines and access roads proposed within the Spring Farm and Menangle Park well fields, situated within Stage 2 of the Camden Gas Project.

The activities proposed under the Project approval are the same as those described in **Table 2**. However, the Project approval does not include the installation of in-field compression or refracing of wells. As the requirement for these activities within the entire Stage 2 area is not certain these will be assessed as part of the Concept Plan, and therefore any future requirement to conduct these activities will require a separate Project approval.

The application seeks approval for the construction of up to 4 surface well locations within the Spring Farm area and up to 12 surface well locations in the Menangle Park area. The proposed wells comprise a mix of horizontal, directional and SIS horizontal drilled wells, the indicative locations of which are illustrated in **Figures 5** and **6**.

2.3 Location of Proposed Works

2.3.1 Stage 2 Concept Plan

As indicated earlier in this report, the project area is located in the Camden/Campbelltown region of NSW, approximately 65 kilometres south-west of Sydney, and straddles a number of different LGAs. Numerous properties are likely to be affected by the proposed works, as illustrated by the Concept Plan boundaries in **Figure 2.**

Given the size of the area and the lead time involved in identifying suitable locations for new wells and supporting infrastructure (linked to geology, resource availability, environmental constraints and land access issues), with the exception of the Spring Farm and Menangle Park well fields, the Proponent is not in a position to identify the exact positions of new wells/infrastructure at the Concept Plan stage. This level of detail would be provided as part of subsequent Project applications.

The boundary of the Stage 2 area for the purposes of the Concept Plan is shown in **Figure 2** and has been determined based upon the location of well fields developed to date and areas within which activities will be carried out within the coming years.

Table 3 describes the approach to locating the various elements of infrastructure proposed as part of the Stage 2 Concept Plan.

Table 3: Locational Principles for Stage 2 Concept Plan Works

Development Type	Description of Potential Locations within Stage 2 Concept Plan Area
New Wells	• Wells could be co-located at existing well platforms so as to minimise new land disturbance. An overview and detailed view of the existing and proposed well fields within Stage 2 Concept Plan area are shown in **Figure 2** and **Figure 3**. The detailed view includes the location of existing wells and gas gathering infrastructure within the Stage 2 area, including works which have received planning approval but are not yet constructed, and works within the EMAI and Razorback areas (see **Figure 3**); • New well fields are proposed within Stage 2. **Figure 2** and **Figure 3** show the new well fields proposed i.e. Spring Farm, Menangle Park, Mount Gilead and Kay Park Stage II; • Surface well locations as part of this proposal would be located within the PPL2 and PPL4 boundary (except in the case of Menangle Park and Kay Park Stage II). Drilling technologies such as directional drilling and SIS allow the resource to be accessed outside the PPL4 boundary, however this would be subject to a new production licence from the Department of Primary Industries (DPI). • The development of new wells may require the construction of supporting gas gathering and water pipelines to connect into existing network. These would be located in existing disturbed areas wherever possible. • Access roads would also be required from existing roads to new well sites.

Development Type	Description of Potential Locations within Stage 2 Concept Plan Area
Infill Wells	• Infill wells would potentially be located in areas of existing well fields where the gas resource has not been extracted to date and surface constraints do not prevent access to the resource. • AGL has developed an example plan illustrating the approach which would be undertaken to locate infill wells and supporting infrastructure within existing well fields (see **Figure 4**). The areas identified for potential infill works are those which are located outside a 250 metre radius around existing wells (representing the distance at which gas reserves can be accessed by a conventional vertical coal seam gas well) and not affected by obvious environmental constraints or land access issues such as houses. This map does not represent proposed works within the area shown. Any proposed works would be subject to a separate Project approval and consultation with relevant landowners.
Infrastructure	• If required, increasing the capacity of the existing gas gathering system would be carried out along established gas gathering routes. • If required, in-field compression would be located either at existing well head locations or along gas gathering routes. • If required, refracing of wells would occur at existing well head locations within the Stage 2 area. The feasibility of refracing would be subject to environmental considerations at the time.

This approach is intended to provide agencies and the community with an understanding of where the future works may occur, whilst providing the flexibility and time for the Proponent to determine precise locations. The Concept Plan represents a strategic overview of future works likely within the Stage 2 area. By illustrating the areas in which future infrastructure may be located, and explaining the nature of the works likely to occur, it is intended to provide sufficient information to enable an understanding of Stage 2 of the Camden Gas Project.

The assessment of environmental effects associated with the Concept Plan will be based on a more strategic approach to assessment which is anticipated to include:

- Utilising existing and/or GIS information to identify environmental constraints.
- Developing guiding principles for the location of wells.
- Undertaking an environmental assessment based on a description of the activities proposed, and, where relevant, assessment of surface disturbance based on a defined footprint; and
- Identifying appropriate management measures to be implemented for each activity based on locational scenarios.

In the event Concept Plan approval is granted for the works in Stage 2, a greater level of detail would be submitted with a subsequent Project application(s) (with the exception of Spring Farm and Menangle Park for which detail will be included as part of the EA).

2.3.2 Spring Farm and Menangle Park Project Approvals

Section 1.3.2 provides a description of the areas covered by the Spring Farm and Menangle Park Project approval. The proposed works within the Spring Farm and Menangle Park areas are shown on **Figure 5** and **Figure 6** respectively. The locations of the proposed wells, gas gathering and access routes provide indicative locations only. These locations will be reviewed in light of specialist studies which will be carried out as part of the EA for the concurrent Project approval of works within Spring Farm and Menangle Park.

2.4 Construction

This section describes in greater detail the construction activities which will be assessed as part both the Stage 2 Concept Plan and the concurrent Spring Farm and Menangle Park Project approval EA.

2.4.1 Well Sites

The construction of well sites for works under both the Concept Plan and concurrent Project approval typically includes the following:

- A construction footprint of approximately 70 metres x 100 metres.
- A drill pit measuring up to some 25 metres x 25 metres, and excavated to a depth of approximately 2 metres. The drill pit is provided to retain drilling debris and associated water for the drilling process, and is lined with polyethylene.
- Fencing of the operations area around the wellhead during construction.
- Rehabilitation of the surplus construction area.
- A cut-back, flat operating area where wells are constructed on slopes. This construction generally includes an up-slope diversion drain around the site to manage excessive surface flow. The profile is returned (as near as possible) to the original profile during rehabilitation.

Once the well has been drilled and completed, the fenced area is reduced to only the immediate wellhead infrastructure area of approximately 3 metres x 6 metres, and the surplus construction area is rehabilitated. A photograph of typical wellhead facilities is included as **Plate 1**. In addition, AGL has been investigating a new enclosed well surface and metering facility, intended to have a small footprint and low visual impact, sound insulation and security from vandalism (see **Plate 2**).

2.4.2 Drilling Activities

There are a variety of technologies used for the drilling of wells, taking into consideration land access constraints, aboriginal/heritage and other environmental issues and geological technical issues. **Table 4** provides a summary of the different technologies available for drilling wells in Stage 2 of the Camden Gas Project.

Table 4: Summary of Drilling Options

Drilling Option	Characteristics/Requirements
Underbalanced Vertical Drilling	• Standard wells in Camden program and currently represents 95% of wells drilled; • Penetration rates are maximised through the shallow abrasive sands with medium hardness by underbalanced percussion drilling; • Daily meterages of 300 metres plus can be achieved; • Requires a drilling rig equipped with 2 air compressors and booster package for fluid circulation. Drilling action employed uses a percussion air hammer, button bit and drill collars to provide the impacts to break up formations.
Overbalanced Vertical Drilling	• Allows drilling of wells where land access constraints or environmental features limit the use of drill pits. • Improvements are being made to the rate of penetration to a level which is comparable with underbalanced drilling. • Equipment includes a drilling rig and equipment required to focus on drill fluid circulation and solid control systems with operating capacity of 1800 litres per minute. The drilling relies on applied weight on bit and rotation to penetrate and remove formations. Weight is provided by running drill collars behind the bit with rotation provided by the rig's top drive or a downhole motor.
Directional Drilling	• Major advantage of directional drilling is that bottom hole locations can be located up to 400 metres away from the surface location (depending on the vertical depth of the seam). Therefore, wells can be drilled into areas that do not permit a vertical well intersecting a desired target. • Multiple wells can be drilled from a single location and gas reserves that are stranded by surface developments can be accessed from outside of the developed areas. • Similar surface equipment is required to that used for overbalanced drilling, however directional equipment is added to the downhole equipment to allow control of drilling angle and direction.

Drilling Option	Characteristics/Requirements
Surface to Inseam (SIS) or Horizontal Drilling	• The mother bore of the well is drilled to just above the seam at an angle of about 78 degrees and is cased and cemented back to surface. A smaller hole is subsequently drilled through the casing and into the seam for up to some 1500 metres. • Horizontal wells are used to increase the drainage area of a reservoir and provide a means of stimulating the reservoir through the drilling process. • If technique is successful in Camden (3 trial wells will be established), the number of surface locations would be reduced along with the ability to access stranded gas reserves more than 1500 metres away from the well site location. • Technique is more complex and requires drilling operations to be conducted 24 hours a day, 7 days a week for certain sections of the well.

2.4.3 Fracing

Upon completion of drilling, the well is cased off with steel casing which is pressure cemented in place to ensure zonal isolation behind the pipe. The well is then perforated across the selected coal seam intervals and is subsequently hydraulically fractured (known as 'fracing') through the injection of a slurry of sand and water at sufficient pressure to create a conductive pathway into the coal reservoir. This process mechanically stimulates the gas-bearing zone to facilitate the mobility of the gas and water from the coal seam, allowing the gas and water to flow up the well bore to the surface. Fracing is not required for SIS wells.

2.4.4 Well Completion

There are a number of technologies available for well completion, as summarised in **Table 5**.

Table 5: Well Completion Techniques

Well Completion Option	Characteristics/Requirements
Under-reaming Completion	• Wells are drilled conventionally with fibreglass casing installed across the coal seams of interest. The under-reaming tool is run in hole on conventional drillpipe and hinged cutting arms are opened through rotation. Current tools are able to under-ream a 178mm cased hole out to a maximum of 2000mm. • Best suited to high permeability coals where the reservoir connectivity to the wellbore is high prior to the under-reaming. The under-reaming will remove any near wellbore skin damage and maximise the well's contact area with the reservoir.

Well Completion Option	Characteristics/Requirements
Fracture Stimulation Completion	• Upon completion of drilling, the well is cased off with steel casing which is pressure cemented in place to ensure zonal isolation behind the pipe. The well is then perforated across the selected coal seam intervals and is subsequently hydraulically fractured (known as 'fracing') through the injection of a slurry of sand and water at sufficient pressure to create a conductive pathway into the coal reservoir. This process mechanically stimulates the gas-bearing zone to facilitate the mobility of the gas and water from the coal seam, allowing the gas and water to flow up the well bore to the surface. • Best suited for low to medium permeability reservoirs to increase gas production rates by enhancing the drainage radius around the well and creating a delta pressure drop between the fracture and coal seam. • Fracing is not required for SIS wells.
Surface to Inseam – Horizontal Well.	• Wells are drained inseam or within the coal seam for distances of up to 1500 metres thus stimulating the coal seam as it is being drilled. A 50mm polyethylene liner is inserted in the open hole completion of the coal section thus ensuring a conductive flow path for the life of the well.

2.4.5 Drill and Frac Water Management

Drilling and fracing water is delivered from previous drilling and fracing campaigns or from licensed stand-pipes in the local area. The delivered volume required for fracing a well is in the order of 500 kilolitres (kL) and the constructed drill pit capacity (25 x 25 x 2 metres polyethylene lined) has a capacity of some 750 kL to allow free space for rainfall events.

Following fracing, the waters are removed from the coal seam either to future drilling and fracing campaigns or are transported to licensed disposal facilities due to the saline nature of the formation waters mixed with the fracing water. Disposal at licensed facilities is in accordance with Department of Environment and Conservation (DEC) guidelines.

For over-balanced, directional and SIS wells, water and drilling mud is used in the construction of the well. The volume of water required for the drilling process varies depending on the type of drilling. The largest volume of water is required for the SIS option. Based on experience, up to 70 kL of water would be required to construct an SIS well. Drilling mud and water is pumped from the well following construction and stored in tanks prior to reuse or disposal at a licensed facility.

Dewatering pumps are used in approximately 20% of wells to remove the injected fracture stimulation water and the formation water, which reduces reservoir pressure and allows gas desorption of the coal seam methane wells.

To facilitate water collection and to minimise the impact of trucking water around the properties, the Proponent proposes to install a water distribution network located within the gas gathering line trenches to allow water to be moved to centralised storage pits that can act as offsite transport points.

Produced water from wells during the dewatering and early production phases of the wells will be transferred via an automatic dump valve from the wellhead separators into the water transport lines. The water transport lines will be 63mm HDPE lines running in the gas gathering line trenches.

The produced water from the wells will be collected at storage points located at well sites that are easily accessible and have landowners consent. These storage points are the lined drill pits utilised during drilling and fracing or 75 kL litre storage tanks. The waters will then be transported to future drilling/fracing operations or disposed of to licensed facilities. It is expected that the storage points will be required for a period of some six months following the completion of the wells.

Current data from wells drilled and operating in the Camden Gas Project indicates that the formation waters produced during dewatering will be approximately ten per cent of the fracing volume, that is, a total of approximately 550 kL will be returned to the surface over the establishment life of the well. Evidence suggests that approximately one third of the volume of formation water will be produced over the first one to two weeks, the second third will be produced over the subsequent one to two months and the final third will be produced over the subsequent three to six months. Transfer or disposal of these waters will be managed to ensure sufficient rainfall freeboard.

2.4.6 Drill Cuttings Management

Drill cuttings are collected and stored in the drill pit. Once the drilling and fracing operations are completed, the drill pit is dewatered and desiccated. The drill cuttings are then buried and covered with excavated soils and rehabilitated.

The drill cuttings normally contain sandstone and coal so there is very little sulphidic mineralisation to cause acid rock drainage. The drill cuttings are buried under some two metres of cover at completion. This is below the root zone of crops or proposed revegetation species.

2.4.7 Gas Gathering System

The construction of the gas gathering lines for the Concept Plan and concurrent Project approval involves the following works:

- Survey of pipeline route;
- Clear and grade ‘Right of Way’ pipeline route including stripping of topsoil (where required);
- Stringing of pipe;
- Butt welding of pipe;
- Trenching and underboring where necessary;
- Lowering-in of pipe strings (including trench preparation, padding and shading);
- Install 2 pair tracer line (for pipe tracing) as PE pipe is non conductive;
- Install gas marker tape 300 to 400mm above PE gas pipe;

- Backfilling and compaction of trench;
- Pressure testing of pipeline;
- Rehabilitation of ground along pipeline route; and
- Installation of gas line signposts to mark and identify pipeline location.

The gas gathering system route is designed, and will be constructed and operated, in accordance with the requirements of *Australian Standard AS 3723-1989 Installation and Maintenance of Plastic Pipe Systems for Gas*. The gas gathering system will be buried to a minimum depth of 750mm and up to 1200mm in some areas, including unsealed and sealed road crossings, and creek and drainage line crossings.

The route of the gas gathering system route for Stage 2 will be selected to utilise previously or currently disturbed land areas wherever possible.

All work will be conducted in accordance with the Gas Gathering System Construction Environmental Health and Safety Management Plan (EHSMP). The ancillary water transfer system will be co-located in the trenches for the gas gathering system and installed simultaneously.

2.4.8 Production Testing

Production testing of the coal seam methane resource would be undertaken for all new wells. Production testing is carried out over 90 days to ascertain the quantities of gas that will flow from the well. Daily checks of gas flow rates are carried out at each well site.

2.4.9 Timing and Resourcing

A summary of the approximate timing and resourcing of each of the construction activities is provided in **Table 6** below.

Table 6: Indicative Duration and Resourcing of Activities

Event	Average Days (days/well)	Required Personnel	Typical Equipment
Underbalanced Drilling	8 days	6	1 rig, 1 compressor trailer, 3 semi loads of equipment, 3 4WD
Overbalanced Drilling	12 days	7	1 rig, 5 semi loads of equipment, 3 4WD
Directional Drilling	20 days	7	1 rig, 6 semi loads of equipment, 3 4WD
Surface to Inseam Drilling	30 days critical directional/inseam drill work performed 24 hrs/day seven days/week	15	1 rig, 8 semi loads of equipment, 5 4WD
Perforation	4.5	4	Crane, logging unit, 2 4WD

Event	Average Days (days/well)	Required Personnel	Typical Equipment
Underbalanced Drilling	8 days	6	1 rig, 1 compressor trailer, 3 semi loads of equipment, 3 4WD
Overbalanced Drilling	12 days	7	1 rig, 5 semi loads of equipment, 3 4WD
Directional Drilling	20 days	7	1 rig, 6 semi loads of equipment, 3 4WD
Surface to Inseam Drilling	30 days critical directional/inseam drill work performed 24 hrs/day seven days/week	15	1 rig, 8 semi loads of equipment, 5 4WD
			vehicles
Fracture Stimulation	4	15	8 truck and trailer loads, 1 van, 8 frac tanks, 4 4WD
Work over	24 (1 day)	6	1 rig, 1 semi load of equipment, 2 4WD
Pump Installation	12	4	1 rig or crane, 1 semi load of equipment, 2 4WD
Air Lift	4	2	1 air compressor trailer, 1 4WD
Well Testing	12	4	1 crane, 1 truck, 1 4WD

AGL's development schedule for delivery of the Camden Gas Project identifies that the drilling of wells within Spring Farm is currently scheduled for the period May 2007 to February 2008 contingent on land access, approvals and plant capacity. The drilling of wells in Menangle Park is currently scheduled to start in October 2007 and continue into the 2007/2008 year, again, contingent on land access, approvals and plant capacity. Works as part of the Stage 2 Concept Plan are not likely to start before the second half of 2007, subject to obtaining the appropriate Project approval.

AGL's development schedule is a dynamic document which is subject to change due to one or more of the following factors:

- Land access and approvals;
- Geological model;
- Equipment availability and contractors; and
- Operational issues.

2.4.10 Construction Hours

With the exception noted below, construction hours during the construction phase of the works as part of the Concept Plan and Project approval would be 7.00am to 6.00pm, Monday to Friday and 8.00am to 1.00pm Saturday with no work on Sunday or Public Holidays unless authorised by DEC for safety reasons.

Drilling of SIS wells would require 24 hour drilling activities, seven days a week. The location of such wells would be carefully selected having regard to the distance to adjoining residences to ensure the impact associated with drilling activities is minimised.

2.4.11 Services and Amenities

Temporary portable toilets and amenities would be provided on site for use by construction workers during the drilling of wells and construction of the gas gathering system.

Electricity would be provided by portable generating units. Non potable water required for construction and drilling activities would be provided from previous drilling activities in the area.

2.5 Production

This section describes in greater detail the production activities which will be assessed as part both the Concept Plan and the concurrent Spring Farm and Menangle Park Project approval EA.

During the production phase, gas is transported via pipeline to the RPGP for compression and sale. Operator involvement at the well site is minimised by the installation of various automated and remotely operated functions.

Operational activities at each well site will include:

- Routine daily/weekly inspections;
- Formation water disposal
  - 0-6 months – weekly
  - 6-12 months – monthly;
- Well work over maintenance (see **Section 2.6.1**); and
- Removal of surface facilities and plugging and abandonment of the well at the end of the well's life (see **Section 2.7**).

2.6 Post Development Operational Activities

This section describes in greater detail the post development operational activities which will be assessed as part both the Concept Plan and the concurrent Spring Farm and Menangle Park Project Approval EA. Some of the proposed activities apply to only the scope of the Concept Plan as noted.

2.6.1 Maintenance/Work over

During the operational phase, the wells require an occasional 'work over' to maintain the efficiency of gas production. The work over involves a trailer mounted rig to run or remove pipe for clearing the well bore of any fill (typically frac sand) or obstructions. Work over activities

generally take a single day per well, and based on experience at other wellfields in Camden, it is estimated that a work over will be required for each well as follows:

- twice in the first year;
- once in the third and fifth years; and
- once every five years thereafter.

2.6.2 Upgrade of Gas Gathering Lines (Concept Plan)

As new well fields within the Camden Gas Project are brought into production an increased amount of gas will be delivered into the existing gas gathering system prior to reaching the RPGP. In some areas it is anticipated that the existing gas gathering pipework may not have sufficient capacity to handle the increased production. Consequently there may be a need to increase the capacity of parts of the network to allow for this increased production.

Increasing the capacity of the existing gas gathering pipework would most likely require the duplication ("twinning") of pipes within the affected sections of the gas gathering network. Duplication of the pipes would be carried out along existing gas gathering routes.

2.6.3 In-field Compression (Concept Plan)

From experience with existing wells in Camden, AGL anticipates that during the production phase of existing wells, the initial high gas pressure at the wellheads will decrease over time. As a result, pressure drops for gas flow from wellhead to plant across the gas gathering system will reduce over time resulting in reduction in production rates from the wells. In order to maintain gas production from the RPGP, AGL may need to boost the pressure in the gathering system by in-field compression within the Stage 2 area prior to delivery to the RPGP.

In addition, the current plan to drill more wells may also require in-field compression owing to the distance from the RPGP to achieve higher gas flow rate through the main pipeline. The higher gas flow rate through the existing 18" steel gathering line will require a higher pressure at the inlet of the pipeline to achieve the throughput through the pipeline to the RPGP.

The method for providing in-field compression will be developed as the requirements within the system arise over time. Options include providing compression at existing wellhead locations or at distribution nodes within the gas gathering system.

The Concept Plan application therefore seeks approval for the installation of in-field compression at the wellhead and gas gathering system.

2.6.4 Refracing (Concept Plan)

Refracing of the wells may be required after a period of operation, and would involve a process not dissimilar to fracing of the wells, where the well is hydraulically fractured through the injection of a slurry of sand and water at sufficient pressure to create a conductive pathway into the coal reservoir. It is noted that refracing of the wells would only be undertaken where a production issue is identified, and is therefore unlikely to be undertaken at all well locations.

The refracing process would involve the use of equipment similar to the fracing process, i.e. approximately 8 truck and trailer loads, 1 van, 8 frac tanks and 4 4WDs. Similar to the fracing process, the refracing process would take in the order of 4 hours per well, however would take 1 to 2 days for equipment setup and removal.

2.7 Closure and Rehabilitation

This section describes in greater detail the closure and rehabilitation activities which will be assessed as part both the Concept Plan and the concurrent Spring Farm and Menangle Park Project approval EA.

On completion of operations, all areas will be cleaned up and rehabilitated to return the land to pre-operational use and condition. This work will involve:

- sealing/plugging drill holes;
- removing plant and equipment from wellheads and removal of fenced compounds;
- filling in any excavation; and
- rehabilitation, contouring, and regrassing/revegetation.

2.8 Monitoring

AGL has developed EHSMPs which provide a process for continuous improvement of the environmental management of the project through ongoing monitoring and receipt of complaints from the community concerning environmental impacts.

The Camden Gas Project incorporates ongoing monitoring of operational issues and also provides a telephone hotline for the reporting of complaints, which informs the management.

2.9 Options Considered

For the works proposed under both the Concept Plan and the concurrent Project approval (Spring Farm and Menangle Park) AGL will consider in further detail in the EA options for these developments. **Section 2.9.1** and **Section 2.9.2** describe options considered to date.

2.9.1 Do Nothing

Should the "Do Nothing" option be pursued, a valuable resource which provides an extension to the existing Camden Gas Project providing convenient and competitive natural gas supply to the NSW energy market would remain undeveloped. In the longer term, this could result in a shortfall in gas supply for the NSW market, and lead to social and economic impacts. If the gas resource is not exploited, the use of alternative fuels with higher greenhouse gas emissions (such as coal) could result in increased environmental impacts.

2.9.2 Alternative Sites

The exploratory investigations that are carried out assist in defining the geological characteristics of the area, which together with consideration of environmental and locational constraints, assist with nominating preferred locations for the gas wells. Background studies and assessment undertaken to determine preferred well site locations include the following:

- Geological constraints;
- Environmental and site specific constraints, including consideration of environmentally sensitive areas, proximity to existing residences, sediment and erosion hazards, visual and acoustic amenity, flora and fauna constraints;

- Social and cultural constraints, including future land use, archaeological and heritage constraints; and
- Operational requirements, including access and proximity to plant.

Considerable research into drilling techniques has been undertaken by AGL to enable flexibility in the siting of wells and to minimise the number of well sites, in order to reduce potential impacts on environmentally sensitive areas and minimise potential land use conflicts while retaining access to the coal seam methane resource located in the area of the Camden Gas Project.

3 STATUTORY PLANNING

3.1 Local Matters

The Spring Farm, Menangle Park and remaining Stage 2 works straddle three different LGAs, being:

- Camden;
- Campbelltown; and
- Wollondilly.

There are a variety of Environmental Planning Instruments (EPIs) which apply to the land, the subject of the Stage 2 works, which are identified in the following table.

Table 7: EPIs Applicable to Stage 2 Works

Local Government Area	Relevant EPIs
Camden	Camden Local Environmental Plan No. 121 – Spring Farm (LEP 121) Camden Local Environmental Plan No. 46 (LEP 46) Camden Local Environmental Plan No. 47 (LEP 47)
Campbelltown	Campbelltown Interim Development Order No. 15 (IDO 15) Campbelltown Local Environmental Plan (Urban Areas) 2002 (LEP 2002)
Wollondilly	Wollondilly Local Environmental Plan 1991 (LEP 1991)

3.1.1 Definition of the Development

Camden LEP 121 – Spring Farm

The proposed project involves the development of well sites for the recovery of coal seam methane in the Illawarra coal measures located within Stage 2 of the Camden Gas Project.

Clause 7 of LEP 121 states that the *Environmental Planning and Assessment (EP&A) Model Provisions 1980* are adopted for the purpose of the plan, except for:

> *'(a) the definitions of child care centres, home industry, home occupation, map and residential flat building in clause 4(1), and*
> *(b) clause 7, 8, 15 and 35(c).'*

The *EP&A Model Provisions 1980* (Model Provisions) were repealed on 30 September 2005. However, given the provisions of LEP 121 were made prior to the date of repeal, the Model Provisions remain applicable in this instance.

Part 2 of the Model Provisions provides definitions. The proposed development comprises a 'public utility undertaking' defined as:

> *'any of the following undertakings carried on or permitted or suffered to be carried on by or by authority of any Government Department or under the authority of or in pursuance of any Commonwealth or State Act:*
>
> *(a) railway, road transport, water transport, air transport, wharf or river undertakings,*
> *(b) undertakings for the supply of water, hydraulic power, electricity or gas or the provision of sewerage or drainage services,*
>
> *and a reference to a person carrying on a public utility undertaking shall be construed as including a reference to a council, county council, Government Department, corporation, firm or authority carrying on the undertaking.'*

The CGPJV is the holder of a production lease over the subject land issued under the *Petroleum (Onshore) Act 1991.* This lease allows the CGPJV the exclusive right to conduct petroleum mining operations in and on the land included in the lease together with the right to construct and maintain on the land such works, buildings, plant, waterways, roads, pipelines, dams, reservoirs, tanks, pumping stations, tramways, railways, telephone lines, electric powerlines and other structures and equipment as are necessary for the full enjoyment of the lease or to fulfil the lessee's obligations under it.

As the proposal is for works to be carried out for the primary purpose of the supply of gas, authorised under the *NSW Petroleum (Onshore) Act 1991*, it falls within the definition of a 'public utility undertaking' as defined in the Model Provisions.

Under the Model Provisions a 'utility installation' is defined as:

> *'a building or work used by a public utility undertaking, but does not including a building designed wholly or principally as administrative or business premises or as a showroom'.*

As the proposed development is defined as a 'public utility installation' and the definition of a utility installation involves 'a building or work used by a public utility undertaking', it considered that the proposed development may also be defined as a 'utility installation' under the Model Provisions.

Camden LEP 46

Clause 7 of LEP 46 relates to the adoption of the Model Provisions, including the definitions set out in Clause 4. Under the Model Provisions, the proposal fits within the definition of a 'public utility undertaking', as discussed above.

Camden LEP 47

Clause 7 of LEP 47 relates to the adoption of the Model Provisions, including the definitions set out under Clause 4. The proposal fits within the definition of a 'public utility undertaking' as discussed above.

Campbelltown (Urban Areas) LEP 2002

Schedule 3 of LEP 2002 provides a range of definitions including that of a 'public utility undertaking', which is the same as the definition for a 'public utility undertaking' provided in the Model Provisions (discussed above).

As also previously discussed, the CGPJV is the holder of a production lease over the subject land issued under the *Petroleum (Onshore) Act 1991.* This lease allows the CGPJV the exclusive right to conduct petroleum mining operations in and on the land included in the lease together with the right to construct and maintain on the land such works, buildings, plant, waterways, roads, pipelines, dams, reservoirs, tanks, pumping stations, tramways, railways, telephone lines, electric powerlines and other structures and equipment as are necessary for the full enjoyment of the lease or to fulfil the lessee's obligations under it.

As the proposal is for works to be carried out for the primary purpose of the supply of gas, authorised under the *NSW Petroleum (Onshore) Act 1991*, it falls within the definition of a 'public utility installation' as defined under Schedule 3 of LEP 2002.

Under Schedule 3 of LEP 2002 a 'utility installation' is defined as:

> *'a building or work used by a public utility undertaking, but does not including a building designed wholly or principally as administrative or business premises or as a showroom'.*

As the proposed development is defined as a 'public utility undertaking' and the definition of a utility installation involves 'a building or work used by a public utility undertaking', it is therefore considered that the proposed development may also be defined as a 'utility installation' under the provisions of LEP 2002.

Campbelltown Interim Development Order No. 15 (IDO 15)

Clause 3 relates to the adoption of the Model Provisions for the purposes of this order. Under the Model Provisions, the proposal fits into the definition of a 'public utility undertaking' as previously discussed.

Wollondilly LEP 1991

Clause 7 of LEP 1991 relates to the adoption of the Model Provisions, except for the definitions of:

> *'arterial road, extractive materials, home industry, home occupation, map, residential flat building and service station in clause 4 (1),'*

Under the Model Provisions, the proposal fits within the definition of a 'public utility undertaking', as discussed above.

3.1.2 Permissibility of the Development

Table 8: Permissibility of Stage 2 Works

Relevant Instrument	Land Use Zone	Permissible?	Comment
Camden LEP 121	1(a) Rural	✓	A public utility undertaking is permissible with consent
	2(d) Residential	✓	A public utility undertaking is permissible with consent
	5(b) Special Uses	✓	Permissible in accordance with Clause 35 of EP&A Model Provisions
	5(c) Special Uses – Future Arterial Road Widening	✓	Utility installations are permissible without consent

Relevant Instrument	Land Use Zone	Permissible?	Comment
	7(a) Environmentally Sensitive Land	✓	Utility installations are permissible with consent
Camden LEP 46	1(a) Rural	✓	A public utility undertaking is permissible with consent
Camden LEP 47	2(d) Residential D (Release Areas)	✓	A public utility undertaking is permissible with consent
	6(d) (Regional Open Space)	✓	Permissible in accordance with Clause 35 of EP&A Model Provisions
Campbelltown IDO 15	Non-Urban (40 ha)	✓	A public utility undertaking is permissible with consent
Campbelltown (Urban Areas) LEP 2002	10(a) Regional Comprehensive Centre	✓	A public utility undertaking is permissible with consent
Wollondilly LEP 1991	1(a) Agricultural Zone	✓	A public utility undertaking is permissible with consent
	1(a2) Rural "A2" Zone	✓	A public utility undertaking is permissible with consent
	1(b) Agricultural Landscape Zone	✓	A public utility undertaking is permissible with consent
	9(b) Arterial Road Reservation Zone	✓	Utility installations are permissible with consent

3.2 Regional Matters

Sydney Regional Environmental Plan 20 – Hawkesbury-Nepean (SREP 20) applies to certain land within the Hawkesbury-Nepean Catchment, including certain land within the LGAs of Camden, Campbelltown and Wollondilly. SREP 20 aims to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.

The plan sets out general and specific planning considerations and recommended strategies which must be taken into consideration by the consent authority determining an application. Those relevant to the proposed development are addressed below.

The general planning considerations relevant to this proposal are:

(a) the aim of this plan, and

(b) the strategies listed in the Action Plan of the Hawkesbury-Nepean Environmental Planning Strategy, and

(c) whether there are any feasible alternatives to the development or other proposal concerned, and

(d) the relationship between the different impacts of the development or other proposal and the environment, and how those impacts will be addressed and monitored.

Mitigation measures proposed as part of the development aimed at protecting the Hawkesbury-Nepean River system and surrounding environment will be set out in the EA to be prepared for the proposal, as will a discussion of the strategies listed in the Action Plan of the Hawkesbury-Nepean Environmental Planning Strategy. Feasible alternatives are outlined in **Section 2.9** of this EASR, and the potential impacts of the proposal on the environment are addressed in Sections 5 to 8 of this EASR. A greater level of detailed assessment of the impacts of the proposal together with management measures and monitoring will be addressed in the EA prepared for the project.

The relevant specific planning considerations and recommended strategies for consideration include:

- Total Catchment Management;
- Environmentally Sensitive Areas;
- Water Quality;
- Water Quantity;
- Cultural Heritage;
- Flora and Fauna; and
- Riverine Scenic Quality.

These issues and the specific strategies attached to them under SREP 20 will be considered in detail in the EA for the proposal.

SREP 20 also sets out specific development controls for certain types of development, including land uses in or near the river. These are defined as:

> *'All uses in the river or a tributary of the river, or within 40 metres of the high water mark of the river or a tributary of the river where it is tidal or within 40 metres of the bank where it is non-tidal. This includes clearing and the construction and use of piers, wharves, boat sheds or other structures which have direct structural connection to the bank or bed of the river or a tributary of the river.'*

As the study comprises lands located within 40 metres of the high water mark/bank of the Hawkesbury-Nepean River, works in these areas would be classified as 'land uses in or near the river'. SREP 20 requires that consent be obtained for such development, with the following matters to be considered by the consent authority:

'(a) *The need to locate access points where riverbanks are stable, away from river shallows and major beds of attached aquatic plants, away from fishing grounds and fish breeding areas, where the proposed activities do not conflict with surrounding recreational activities, and where significant fauna and wetland habitats will not be adversely affected.*

(b) *The need to require remedial works, such as the re-establishment of flora and fauna habitats.*

(c) *The potential for use of the land as a buffer to filter water entering the river.*

(d) *The need for an Erosion and Sediment Control Plan.*

(e) *The need for a Vegetation Management Plan.'*

The locational implications of works in relation to SREP 20, if any, will be considered in the EA for the proposal.

3.3 State Matters

3.3.1 Environmental Planning and Assessment Act 1979

The EP&A Act and the EP&A Regulation provide the framework for environmental planning in NSW and include provisions to ensure that proposals which have the potential to impact the environment are subject to detailed assessment, and provide opportunity for public involvement.

As outlined in **Section 1.2** of this EASR, approval is required for the proposed project under Part 3A of the EP&A Act, and the Minister's declaration that the project is a major project has been sought. The Minister for Planning would be the approval authority for the proposed works.

Under Part 3A, a proponent can seek a Project approval or a Concept approval. Concept approvals allow the project to be considered on the basis of a Concept Plan with the assessment focussing on the strategic issues. The proponent is able to obtain approval of the Concept Plan prior to undertaking detailed studies of the various components of the project. Further details would subsequently be submitted as part of a Project approval.

In accordance with the provisions of Part 3A of the EP&A Act, the Proponent intends to seek Concept Plan approval for the remainder of works within Stage 2 of the Camden Gas Project, and concurrent Project approval for installation of wells and associated infrastructure for the Spring Farm and Menangle Park areas.

3.3.2 State Environmental Planning Policies

There are three State Environmental Planning Policies (SEPPs) of specific relevance to the proposal.

SEPP 2005 (Major Projects)

State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005) was gazetted on 25 May 2005 and amended on 1 August 2005. It replaces all previous provisions related to former 'State significant development' in planning instruments, directions and declarations.

The primary aim of SEPP 2005 is:

> *'to identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development'.*

Group 6 of Schedule 1 to SEPP (Major Projects) 2005 identifies classes of development which are defined as 'major projects' and includes projects related to petroleum (oil, gas and coal seam methane), being:

> *'Development for the purpose of drilling and operation of petroleum wells (including associated pipelines) that:*
>
> *(c) Is in the local government areas of Camden, Wollondilly, Campbelltown City, Wollongong City, Wingecarribee, Gosford City, Wyong, Lake Macquarie City, Newcastle City, Maitland City, Cessnock City, Singleton or Muswellbrook, but only if the principle resource sought is coal seam methane.'*

The recovery of coal seam methane involves the drilling and operation of petroleum well sites, associated gas gathering lines and ancillary works. The proposal involves well site development

within Stage 2 (including Spring Farm and Menangle Park), which is located within the Camden, Campbelltown and Wollondilly LGAs. Therefore the proposal falls within the definition under Group 6 of Schedule 1 of SEPP (Major Projects) 2005.

The Minister's declaration of the project as a 'major project' has been requested.

State Environmental Planning Policy 33 - Hazardous and Offensive Development

The aims of *State Environmental Planning Policy 33 – Hazardous and Offensive Development* (SEPP 33) include the amendment of definitions of hazardous and offensive industries where used in EPIs and to require development consent for hazardous and offensive development.

The document, *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* was prepared by the then Department of Urban Affairs and Planning in 1994 to provide assistance primarily to councils (but also to industry, consultants and other government agencies) in implementing SEPP 33. The Guidelines recommend a 'risk screening' method for determining whether a proposal is hazardous and provides guidance on assessing potentially offensive development proposals. The screening process considers the class and volume of waste materials to be stored on the site and the distance of the storage area to the nearest site boundary.

The guidelines state that the first step to determining whether SEPP 33 applies to a proposal is to consider whether the proposed use falls within the definition of 'industry' adopted by the planning instrument which applies. As discussed in **Section 3.1** of this report, the proposal falls within the definition of a utility installation under the relevant LEPs. Therefore, the provisions of SEPP 33 do not strictly apply.

State Environmental Planning Policy (Sydney Region Growth Centres) 2006

State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP) was gazetted on 28 July 2006 and will predominantly affect works within future stages of the Camden Gas Project.

The Growth Centres SEPP provides land use zones, objectives and land use tables which identify the permissibility of development and matters for consideration by the consent authority.

The land use zones identify development for the purposes of 'public utility installations' as being permissible without consent.

More detailed consideration of the provisions of the Growth Centres SEPP will be provided in the EA as appropriate.

3.4 Commonwealth Matters

The *Environment Protection and Biodiversity Conservation* (EPBC) *Act 1999* came into effect in July 2000 and requires the approval of the Commonwealth Minister for the Environment and Heritage for actions that may have a significant impact on matters of National Environmental Significance (NES). Approval from the Commonwealth is in addition to any approvals under NSW legislation.

Approval under the EPBC Act is triggered by a proposal which has the potential to have a significant impact on a matter of NES or by a proposal which has the potential to have a significant impact on the environment of Commonwealth land or which involves the

Commonwealth. The EPBC Act lists eight matters of NES which must be addressed when assessing the impact of a proposal.

A search of the Department of Environment and Heritage (DEH) protected matters database was undertaken on the 21 August 2006, based on a 5km buffer around the Stage 2 Concept Plan area which incorporates the proposed Spring Farm and Menangle Park well development areas. The following provides a preliminary assessment of the proposal and its potential impacts on matters of NES.

- **World Heritage properties:** There are no world heritage properties proximate to the proposed project, or that would potentially be affected by the proposal.
- **National Heritage Places:** There are no Commonwealth Heritage Places identified within the search area, however a total of 64 places listed on the Register of the National Estate (RNE) were identified within the search area which are protected by the provisions of the Act. Guiding principles for the location of well sites and infrastructure will be detailed in the EA and will aim to minimise potential impacts on matters identified by the RNE.
- **Wetlands of National Importance:** The search identified the proposed project would be located within the same catchment as a Ramsar site, Towra Point Nature Reserve, which is located approximately 16 km south of the Sydney CBD. However given the nature of the proposal, the history of previous works for the Camden Gas Project and the distance of the site from the Towra Point Nature Reserve, it is not anticipated that there will be a significant impact on the Ramsar Wetland.
- **Commonwealth-listed Threatened species:** 31 Commonwealth listed threatened species were identified within the search area and therefore, potential exists for the project to impact on threatened species listed under Commonwealth legislation. The locations for well site and infrastructure development will be selected having regard to minimising impacts upon threatened species. A greater level of assessment will be provided within the EA, and environmental safeguards detailed to minimise potential impacts.
- **Commonwealth-listed Migratory Species:** 8 migratory species were identified within the search area. Given the nature of the proposed project, significant impacts on protected migratory species are not expected. Notwithstanding this, a greater level of assessment will be provided in the EA and appropriate mitigation measures identified if deemed necessary.
- **Nuclear Action:** The proposed project will not involve a nuclear action as defined under the EPBC Act 1999.
- **Commonwealth Marine Area:** There are no Commonwealth Marine Areas proximate to the proposed project, or that would potentially be affected by the proposal.
- **Commonwealth Land:** One Commonwealth Land site was identified within the search area. The proposed project is not on Commonwealth land, nor is Commonwealth land likely to be significantly affected by the proposal.

Based on this preliminary assessment the proposal is not anticipated to have a significant impact on matters of NES, the EPBC Act is not expected to be triggered and referral to, and approval from, the Commonwealth Minister for Environment and Heritage is unlikely to be required.

3.5 Regulation/Other Authorisations Required

3.5.1 Petroleum (Onshore) Act 1991

The proposal involves the recovery of coal seam methane through the drilling and operation of petroleum wells, associated gas gathering lines and ancillary works. The proposed wells are to be brought into production in accordance with PPL 4 for the purpose of utilising the coal seam gas resources of the Illawarra Coal Measures. PPL 4 is held by the CGPJV pursuant to the *Petroleum (Onshore) Act 1991*.

Clause 41 of the *Petroleum (Onshore) Act* relates to the rights of holders of production leases and states:

> *'The holder of a production lease has the exclusive right to conduct petroleum mining operations in and on the land included in the lease together with the right to construct and maintain on the land such works, buildings, plant, waterways, roads, pipelines, dams, reservoirs, tanks, pumping stations, tramways, railways, telephone lines, electric powerlines and other structures and equipment as are necessary for the full enjoyment of the lease or to fulfil the lessee's obligations under it.''*

Part 6 of the Act provides for consideration to be given to the protection of the environment before a petroleum licence is granted. It sets out the scope of PPLs, subject to the terms of the Act. The majority of the proposed development within the Stage 2 area, incorporating Spring Farm and Menangle Park will be carried out under the existing PPL 4. Future works in the vicinity of the EMAI and Razorback gas fields would be carried out under PPL 1. Some of the Stage 2 Concept Plan area encroaches outside the boundaries of the existing PPLs (e.g. Kay Park Stage II). In the event that future works are proposed outside the current PPLs operated by the CGPJV an application seeking an appropriate PPL would need to be lodged with the DPI for approval.

3.5.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) prohibits any person from causing pollution of waters, or air, and provides for penalties for air, water and noise pollution offences. Schedule 1 of the PEOA Act identifies "scheduled activities" which are required to be licensed by the DEC.

Stages 1 and 2 of the Camden Gas Project are operated under separate premises-based Environmental Protection Licences (EPLs) to permit petroleum refining and waste generation activities. The proposed Spring Farm and Menangle Park gas wells form part of Stage 2 of the Camden Gas Project and will be carried out under the existing EPL applying to this stage of the project.

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4 CONSULTATION

4.1 New South Wales Formal Procedures

The EA will be prepared in accordance with Part 3A of the EP&A Act and its Regulation. Part 3A of the EP&A Act ensures that the potential environmental effects of a proposal are properly assessed and considered in the decision making process.

In preparing the EA, the requirements of the Director-General will be addressed as required by Clause 75F of the EP&A Act.

4.2 Consultation with Stakeholders and Other Relevant Authorities

The Proponent has undertaken some initial consultation with key agencies including Camden, Campbelltown and Wollondilly Councils and Members of Parliament relevant to the Stage 2 area. The purpose of this initial consultation has been to provide an overview of the project, to seek local knowledge to assist with community consultation in the area, and to seek input into matters they would like to see addressed in the EA.

The proposed project is classed as a 'major project' and therefore, written comments from relevant statutory agencies are likely to be requested by DoP, to assist with the preparation of the Director-General's Environmental Assessment Requirements (EARs) and during exhibition of the EA.

4.3 Community Consultation

A Community Consultation Strategy has been developed and partially implemented, the key elements of which include the following:

- Discussions with landowners affected by the proposed works; and
- Workshops.

To date, the Proponent has engaged in initial discussions with property owners potentially affected by the proposed works within the Spring Farm and Menangle Park areas of the Stage 2 expansion works. These discussions may influence the final siting and design of the proposed wells and supporting infrastructure.

In addition, three focus workshops have been organised to provide the community with information about the project and to seek input on issues they would like to see addressed in the EA. The Camden Gas Project Community Consultative Committee (CCC) and representatives of eight separate organisations/local resident groups were invited to attend the workshops.

At each of the workshops, a presentation was provided on the following:

- Overview;
- What is Coal Seam Gas?
- Economic and Greenhouse Issues;
- Camden Gas Project – Introduction;
- Project Overview and Description;

- Approval Process and Applications;
- Project Timeframe;
- Environmental Impact Assessment Process; and
- Opportunities for Community Involvement.

Given the size of the workshop groups, the community representatives were able to ask questions throughout the presentation, which resulted in a number of questions being raised about elements of the project. Following the presentation, the community were asked if there were any specific issues they would like to see addressed in the EA. The community representatives did not raise specific issues they would like to see addressed in the EA.

5 PHYSICAL AND POLLUTION EFFECTS

5.1 Introduction

This section identifies the likely physical and pollution impacts of the proposed Stage 2 Concept Plan and concurrent Spring Farm and Menangle Park Project approval.

5.2 Air Quality

5.2.1 Existing Environment

Stage 2 of the Camden Gas Project, incorporating Spring Farm and Menangle Park comprises largely undeveloped lands within a predominantly rural landscape.

The areas the subject of the proposed project are located between 6km and 21km by vehicle from the Camden Airport (www.whereis.com) as follows:

- Stage 2 – between 6km and 17km from the airport, based on the suburb of Narellan (located in the north of the Stage 2 area) and Menangle (located in the south of the Stage 2 area);
- Spring Farm – approximately 7km southeast of airport; and
- Menangle Park – approximately 21km southeast of airport;

Data collected by the Bureau of Meteorology provides details of the climatic conditions recorded at the Camden Airport station (station 068192), and is reproduced below.

Table 9: Camden Airport Meteorological Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature (°C)													
Mean daily Max	**29.1**	**28.5**	26.7	23.7	20.4	17.6	17.1	18.9	21.6	23.8	25.7	**28.5**	
Mean Daily Min	16.6	16.7	14.8	11	7.3	4.4	**2.9**	3.9	6.6	10	12.6	15	
Rainfall (mm)													
Mean Monthly Total	94.3	**99.3**	93.9	77.5	68.7	60.5	38.9	46	43.4	70.3	78.6	56.6	828.2
Median Monthly Total	75	62	75.2	44.3	46	37.6	**35.7**	**18**	37.6	47.4	83.4	39.1	**826.8**
Mean No. of rainfall (days/month)	10.9	11	9.7	8.8	9.3	7.4	7.1	77	8.1	10.5	10.2	8.5	

Source: *Environmental Assessment EMAI Stage II Drilling Program, Camden Gas Project Joint Venture* (Data collected by the Bureau of Meteorology at station 068192 (Camden Airport)).

As indicated in **Table 9**, December, January and February are the warmest months, with a mean daily maximum temperature of approximately 28.7 degrees Celsius, while July is the coldest month with a mean daily minimum temperature of 2.9 degrees Celsius.

The average rainfall distribution based on the data collected at Camden Airport indicates an average annual rainfall of approximately 828mm, with the highest rainfall occurring between January and March, and July and August being the driest months of the year.

Wind speeds in the area throughout the year average between 0.5m/s to 12.9m/s with prevailing winds from the south in both summer and winter periods. A higher frequency of these winds occurs from the southwest and southeast.

5.2.2 Potential Impacts

Potential exists for impacts on air quality as a result of the following:

- Dust and exhaust emissions during the construction phase;
- Odour generation as a result of drilling activities; and
- Operation of equipment.

These impacts have the potential to arise as a result of activities proposed both within the Stage 2 Concept Plan and the concurrent Spring Farm and Menangle Park Project Approval. Each of these potential impacts is addressed below.

Dust during construction

The primary potential impacts on air quality as a result of the proposed works outlined in the Concept Plan and concurrent Project approval will occur during the construction phase of the project and include the following impacts:

- Dust generated from earth disturbance during the construction of drill pads, water storage ponds and access roads;
- Dust generated by vehicular movements during the construction phase; and
- Exhaust emissions generated from civil operations, including equipment and vehicles.

These impacts are not expected to have a significant effect on the surrounding environment due to the scale and nature of the construction and operation of the proposed wells. Previous well site development in Stage 2 of the Camden Gas Project has demonstrated there are relatively minor impacts during construction and this is also expected to be the case for construction of the proposed works. Management practices to prevent and minimise dust generation will include water carts for dust suppression, minimising vegetation stripping and minimising works during periods of strong wind.

AGL's approach to locating new wells within existing well fields within Stage 2 seeks to co-locate wells at existing well pads where possible, to minimise the extent of disturbance (and subsequent air quality impacts caused.

Odour

Drilling operations proposed as part of the Concept Plan and concurrent Project approval generate the potential for odour as follows:

- Oxygenation of aquifer waters, which may cause the release of H_2S ("rotten egg gas") as sulphides convert to sulphates;
- Venting of trapped natural gases in overlying formations; and
- Venting of coal bed methane gases which may include odorous gases (methane gas itself is known as an odourless gas).

The potential for the quantity of these possible odour impacts to be significant is unlikely given past experience from similar operations and the siting of wells relative to sensitive residential receivers. Guiding principles will be developed as part of the Concept Plan which require consideration of potential air quality impacts in the final siting and design of new wells. In the case of Spring Farm and Menangle Park, this issue has been taken into consideration in the selection of the proposed surface well head sites.

Equipment operation

Equipment and vehicles used during the construction and post development/operational phases of the project (as outlined for both the Concept Plan and the Project application for Spring Farm and Menangle Park) would include equipment/vehicles powered by diesel, which has the potential to impact on air quality. The Proponent will implement monitoring of equipment to comply with industry standards to minimise impacts.

Access to each of the new or infill well site locations proposed as part of the Concept Plan will be planned so as to minimise significant disturbance to existing vegetation, surrounding land uses and impacts on local traffic. These issues (as they relate to existing and future land use) have been taken into consideration in the proposed location of the well sites within Spring Farm and Menangle Park, which are proposed as part of the concurrent Project approval.

Environmental safeguards would be incorporated into the Construction Environment, Health and Safety Management Plan (CEHSMP) to ensure potential air quality impacts are minimised.

In addition, consultation with surrounding landowners and the Camden Gas Project Community Consultative Committee will increase awareness of the project, assist in identifying concerns that arise throughout various stages of construction and ensure these concerns are addressed and resolved effectively.

5.2.3 Summary and Recommendations

Due to the nature of the proposed project and its locality, with appropriate environmental safeguards implemented, the activities proposed as part of the Concept Plan and concurrent Project approval are considered unlikely to result in significant impacts on air quality.

It is noted that the Concept Plan sets out the anticipated scope of works within the Stage 2 area at a broader level, and its approval will not directly result in physical construction works being undertaken until subsequent Project applications are determined (with the exception of Spring Farm and Menangle Park). In this regard, consideration of air quality impacts arising from the proposed works in the Concept Plan is undertaken on the assumption that necessary approvals are granted which enable physical works to take place.

5.3 Water

5.3.1 Existing Environment

Surface water

The Nepean River runs through the Stage 2 Concept Plan area and consequently, areas including Spring Farm and Menangle Park (subject of concurrent Project approval) are located within close proximity to the river. Some works have the potential to be located within the Nepean River flood zone.

Groundwater

Previous reports and studies prepared for the assessment of the established well fields in the region (illustrated in **Figures 2** and **3**) indicated that the maximum depth of water supply wells in the Menangle and Cawdor area was approximately 230 metres.

The water quality of groundwater, in terms of salinity, can range from fresh to salty. Sydney Gas also identified groundwater yields within the area from records held by the Department of Natural Resources e.g. in the adjacent Menangle area indicative production values up to 1.2 litres/second were reported.

5.3.2 Potential Impacts

Potential surface water and groundwater impacts associated with the proposed activities outlined in the Concept Plan and concurrent Project approval include:

- Water, soil and wind erosion transporting sediment particles to surrounding catchment areas. This will be particularly relevant during the construction phase of the project;
- Accidental spillage of fuel, primarily during well construction and post development/operational phases of the project;
- Release of formation waters into the surface drainage, including the potential for saline waters (particularly during well construction and refracing activities);
- Impacts caused by flooding of the Nepean River system and tributaries on components of the proposed infrastructure; and
- Potential cross contamination of groundwater.

The potential impacts of flooding on above ground infrastructure would be addressed through design, taking into account the potential risk of flooding. Similarly, potential cross contamination of groundwater aquifers would be managed through casing-off and cementing the wells in accordance with the requirements of the DPI.

The Proponent would manage the potential to cause impacts from potentially saline groundwater through a program of testing to determine whether the water is suitable for its intended use. The Proponent also proposes a water management system as part of the Concept Plan and concurrent Project approval to enable collection, management and appropriate reuse of water produced as a result of the proposed development. Excess water would be disposed of to a licensed disposal facility if required.

The gas gathering pipeline and works required for the water management system involve excavation depths of 750mm – 1000mm and would not impact on groundwater.

Soil and Water Management Plans (SWMPs) and EHSMPs will be implemented to minimise potential impacts on soil and water through the construction and operational phases of the project. Appropriate mitigation measures will be identified as part of the EA.

5.3.3 Summary and Recommendations

With the appropriate environmental safeguards implemented it is anticipated that the proposed project will not have a significant adverse impact on surface water or groundwater.

As referred to in **Section 5.2.3**, approval of the Concept Plan will not directly result in physical construction works being undertaken until subsequent Project applications are determined (with the exception of Spring Farm and Menangle Park). Consideration of water related impacts arising from the proposed works in the Concept Plan has been undertaken on the assumption that necessary approvals are granted which enable physical works to take place.

5.4 Soils and Geology

5.4.1 Existing Environment

Geology

The Environmental Impact Statement (EIS) prepared by Sydney Gas for the Stage 2 area identified that the project area is located within the central part of the Permo-Triassic Sydney Basin of NSW. The Basin occupies an onshore area of approximately 49,000m^2.

The coal bearing strata of the Sydney Basin are concentrated within two major sequences of terrestrial sediments, informally known as the upper and lower coal measures and are separated by a thick interval of marine strata (Sydney Gas, June 2003).The upper coal measures in the Southern Coalfield are defined as the Illawarra Coal Measures, and contain significant coal seam methane resources in the Sydney Basin.

The Stage 2 EIS identified the major coal seams to be targeted for production as the Bulli, Balgownie, Wongawilli and Tongarra seams. The surface geology within the Stage 2 area is dominated by the Wianamatta Group.

The CGPJV is implementing a program of modelling which will increase the confidence in predicting well production rates and lead to a better understanding of the sources of gas and the contribution to surrounding formations.

In addition, surveying and seismic modelling is being conducted over Stage 2 and is expected to be completed by the end of October 2006. This survey will allow finalisation of well placement on a number of fields including Spring Farm and Menangle Park.

Soil Landscapes

A review of the Soil Conservation Service maps was undertaken to determine the distribution of soil landscapes within the area. Based on the Wollongong – Port Hacking Soil Landscape Series Map Sheet 9029-9129 and the Penrith Soil Landscape Series Sheet 9030, six soil groups apply to the study area, the characteristics of which are summarised in **Table 10 .**

Table 10: Soil Characteristics

Soil Group	Characteristics	Areas Affected
Blacktown	• The landscape is described as gentle undulating with the general fertility of the soils moderate to low. • Vegetation is described as extensively cleared eucalypt low open-forest and eucalypt low woodland with sclerophyllous shrub understorey. • Erosion hazard for non-concentrated flows is generally moderate and may range from slight to extreme.	• Stage 2 • Spring Farm • Menangle Park
Theresa Park	• Highly variable and include poorly structured orange to red silty loams, brown loams and sandy loams. • Limitations include localised flooding, seasonal waterlogging with a very high soil erosion hazard for concentrated flows. The general fertility of this soil type is low to very low with the surface soils being moderately erodible. • The landscape is described as tertiary and quaternary floodplain and terraces of the Nepean River south of Cobbitty Creek with gently undulating slopes. Vegetation is described as almost completely cleared with low open woodland (dry sclerophyll woodland with grassy understorey).	• Stage 2 • Spring Farm • Menangle Park
Luddenham	• Landscape is described as undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury sandstone. • The general fertility of the soils is low to moderate. • Vegetation is described as extensively cleared dry sclerophyll open forest. • Limitations associated with this soil type include high soil erosion hazard, localised impermeable highly plastic subsoil and moderately reactive soil materials.	• Stage 2 • Spring Farm • Menangle Park

Soil Group	Characteristics	Areas Affected
Hawkesbury	• Vegetation is described as mostly uncleared eucalypt open-woodland (dry sclerophyll) with pockets of tall open-forest (wet sclerophyll) and closed-forest (rainforest). • The landscape is described as rugged with rolling to very steep hills on Hawkesbury Sandstone. • The soil type has a very low soil fertility with landscape limitations of the soil including extreme soil erosion hazard, mass movement (rock fall) hazard, steep slopes, rock outcrop and a shallow, stony, highly permeable soil.	• Stage 2 • Menangle Park
Monkey Creek	• Landscape is defined as floodplains, valley flats and drainage depressions of the creeks draining the Cumberland Plain. • The vegetation has been extensively cleared. • Soil limitations include low permeability, reactive soils, flood hazard and low fertility.	• Stage 2
Disturbed Terrain	• Occurs within other landscapes and has been disturbed through human activities. • The original soil has been removed, gently disturbed or buried. • Most of these areas have been levelled. • Original vegetation has been completely cleared. • Limitations are dependant on the nature of the fill material (mass movement, poor drainage, low fertility).	• Stage 2 (isolated areas) • Spring Farm • Menangle Park

Studies have been undertaken by Harvest Scientific Services on behalf of Sydney Gas in the Picton and Camden areas. The Stage 2 EIS identified that the soils in the area are strongly acidic (4.5 – 5.0) with a non-saline to slightly saline character (1.7 – 2.7 dS/m). The soils were reported to vary significantly in fertility (Sydney Gas, June 2003).

5.4.2 Potential Impacts

Potential impacts on geology and soils as a result of the activities proposed as part of the Stage 2 Concept Plan and concurrent Project approval for Spring Farm and Menangle Park include:

- Temporary erosion impacts during the construction and post development/operational (construction of in-field compression) phase as a result of earthworks and site preparation;

- Potential for geotechnical impacts to the surface land as a result of drilling and fracing operations (during the construction and post development/operational phases), including:
  - changes to stability along cut and filled areas;
  - soil erosion on unprotected cut and filled areas;
  - vibration from drilling and well development; and.
- Potential for contamination of soils arising from accidental spillage of fuels, grease or other chemicals during the construction and post development/operational phases of the project.

Given the use of new technologies which enable the Proponent to access gas reserves from land constrained by surface development (e.g. SIS wells), concerns may also be raised by the community in respect of the potential for such technologies to cause subsidence (with consequent impacts to the environment and surface structures). To date there have been no issues associated with subsidence related to the Camden Gas Project, however this issue will be further addressed as part of the EA for the Concept Plan and concurrent Project approval.

Potential impacts associated with the works proposed as part of the Concept Plan will be managed through appropriate site selection having regard to geological, environmental and social constraints, together with the implementation of proven safeguards and practices (which will be detailed for the Project applications including Spring Farm and Menangle Park). A greater level of detail regarding guidelines for locating sites and mitigation measures will be detailed in the EA.

5.4.3 Summary and Recommendations

With the appropriate environmental safeguards implemented it is anticipated that the proposed project will not have a significant adverse impact on soils whilst accessing a valuable geologically formed resource.

As referred to in **Section 5.2.3**, approval of the Concept Plan will not directly result in physical construction works being undertaken until subsequent Project applications are determined (with the exception of Spring Farm and Menangle Park). Consideration of soil related impacts arising from the proposed works in the Concept Plan has been undertaken on the assumption that necessary approvals are granted which enable physical works to take place.

5.5 Noise and Vibration

5.5.1 Existing Environment

The existing environment in the Stage 2 Concept Plan area within which the new well fields, infill wells and associated infrastructure would be located is predominantly rural in nature, with sources of noise likely to be generated by farming/agricultural activities, animals and trucks.

The Spring Farm and Menangle Park areas subject of the concurrent Project approval are earmarked for future residential growth. In this regard, consideration of the co-existence of the proposed wells and infrastructure with future residential/urban development will be a key consideration for this project.

5.5.2 Potential Impacts

Noise impacts are expected as a result of activities proposed during the construction phase of the project, associated with earthmoving during site preparation and construction of access roads, well drilling procedures, well completion, vehicle movements and gas gathering line installations.

In addition, the possible construction of in-field compression and refracing activities as part of the post development/operational phase of the project (outlined in the Concept Plan) has the potential to generate noise impacts while these activities are occurring.

As part of previous stages of the Camden Gas Project, noise impact assessment has been undertaken to assess the drilling and completion activities, the focus of which was percussion drilling to total depth, setting casing, and hydraulic fracturing. These activities, and therefore the sources of noise, occur for short periods of time, with drilling (the least noisy activity) occurring for approximately between 8 and 30 days, while fracing (the noisiest activity) occurs for a few hours (Environmental Assessment, Camden Gas Project Joint Venture, Stage 2 Drilling Program, Elizabeth Macarthur Agricultural Institute Wells (EM 23 – EM36), HLA-Envirosciences, July 2006).

Previous investigations undertaken for the Camden Gas Project concluded that the noise impacts are largely dependent upon the distance between the source (drilling operations) and the receptor (a residence) (Environmental Assessment, Camden Gas Project Joint Venture, Stage 2 Drilling Program, Elizabeth Macarthur Agricultural Institute Wells (EM 23 – EM36), HLA-Envirosciences, July 2006).

The works proposed as part of the Concept Plan have the potential to generate localised ground vibration impacts from activities during construction (i.e. fracing) of proposed well sites. The siting of wells within new well fields and infill wells within existing well fields will be selected to minimise potential environmental impacts, including maintaining an appropriate distance from sensitive structures and receptors (based on potential impacts generated from construction, production and post development/operational activities). In particular, refracing of a well at a later date would be dependant upon proximity of residences to the well location.

It is however noted that based on the operation of existing wells and infrastructure within the Camden Gas Project, significant noise or vibration impacts are not expected during the production phase.

A more detailed noise impact assessment will be undertaken as part of the EA to establish background noise levels, assess the potential impact of the activities proposed as part of the Concept Plan and concurrent Project approval, and to identify guiding principles for locating future wells and carrying out works within the Stage 2 Concept Plan area. Mitigation measures will also be identified to manage potential impacts within the Project areas of Spring Farm and Menangle Park. In addition, monitoring of noise at source and at boundaries would be undertaken to ensure that regulatory requirements and industry guidelines are met.

5.5.3 Summary and Recommendations

Based on past assessments undertaken for the Camden Gas Project, potential noise and vibration impacts are expected to be able to be managed, providing guidelines for the location of wells are followed and appropriate mitigation measures developed. Further detailed assessment of this issue would be undertaken as part of the EA.

As referred to in **Section 5.2.3**, approval of the Concept Plan will not directly result in physical construction works being undertaken until subsequent Project applications are determined (with

the exception of Spring Farm and Menangle Park). However, consideration of noise and vibration related impacts associated with activities included within the Concept Plan application has been undertaken on the assumption that necessary approvals are granted which enable physical works to take place.

5.6 Hazard and Risk

5.6.1 Existing Information

Sydney Gas engaged consultants to undertake a risk assessment for previous stages of the project, the aims of which were to:

- *Identify and analyse the hazards associated with processes involved with the handling and transporting of potentially hazardous material which form part of the new development;*
- *Assess the findings against the risk criteria currently in use by PlanningNSW;*
- *Identify opportunities for cost effective risk reduction; and*
- *Make recommendations as appropriate.* (Sydney Gas, June 2003)

The risk assessment included the risks from wells below surface, the drilling and casing of wells, bringing the wells into production and the gas gathering system.

5.6.2 Potential Impacts

The production and handling of coal seam methane, a flammable gas under pressure, represents the main hazard associated with the project. Hazards may arise in wells and gas gathering lines.

In response to the ongoing development of the coal seam methane wells in NSW, the Department of Planning (formerly Department of Infrastructure, Planning and Natural Resources) produced guidelines related to hazard and risk issues associated with the siting of wells titled “Development in the Vicinity of Operating Coal Seam Methane Wells” (May 2004).

The methodology of the guidelines examines and quantifies the risk exposed by each type of well installation and compares it with established risk criteria to assess whether a particular well development is acceptable. This methodology would be used as part of the process for assessing localised constraints on the siting of new wells as part of the Concept Plan works.

The CGPJV implements safety practices/mitigation measures for the construction and operation of wells and infrastructure, which include the implementation of security arrangements, Environment, Health and Safety Management Plans, and Emergency Response Plans.

A Preliminary Risk Assessment will be undertaken to determine whether a Preliminary Hazard Analysis (PHA) is required for the Spring Farm and Menangle Park Project areas. Further details will be provided in the EA.

5.6.3 Summary and Recommendations

Based on past assessments undertaken for the Camden Gas Project, risks associated with construction and operation of the wells and infrastructure are expected to be able to be managed, providing guidelines for the location of wells are followed and appropriate mitigation measures developed. Further detailed assessment of this issue, including the potential impacts

arising from all activities proposed as part of the Concept Plan would be undertaken as part of the EA.

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6 BIOLOGICAL EFFECTS

6.1 Introduction

This section discusses the flora and fauna of significance which could occur in the Stage 2 Concept Plan and Spring Farm/Menangle Park Project areas and the likely biological impacts of the proposed project activities.

6.2 Existing Environment

The region has experienced significant clearing resulting from past and present rural land uses which have left the original ecological communities greatly modified and disturbed, particularly in the Spring Farm and Menangle Park areas.

6.2.1 Flora and Fauna

In NSW, the protection of threatened flora and fauna species is covered under the *Threatened Species Conservation Act 1995* (TSC Act). The matters protected by the TSC Act are threatened species, endangered populations, endangered ecological communities, key threatening processes and critical habitat.

Threatened ecological communities and threatened flora and fauna species are also protected at a Commonwealth level through the provisions of the EPBC Act. Communities or species identified as matters of National Environmental Significance (NES) would trigger assessment/approval requirements under the Commonwealth Act.

The on-line Atlas of NSW Wildlife (WA) is the Department of Environment and Conservation's (DEC's) database of flora and fauna records. For the purpose of this EASR, a search of the DEC on-line WA has been undertaken to identify records of flora and fauna species observed in the area which are protected by NSW legislation.

An on-line search of the Commonwealth EPBC database has also been undertaken for the purpose of this report to identify flora and fauna species within the area that are that are protected by the provisions of the EPBC Act.

As indicated earlier in this report, Stage 2 including the Spring Farm and Menangle Park areas, straddles three LGAs (Camden, Campbelltown and Wollondilly) and therefore, a search of the WA has been undertaken for each of the LGAs.

The EPBC database search has been conducted using a 5km radius surrounding the Stage 2 Concept Plan area.

The results of the WA and EPBC Database searches are summarised in **Table 11** below.

Table 11: Protected Flora and Fauna

Site	Applicable LGA	TSC Act	Status	EPBC Act	Status
Stage 2	Wollondilly	40 protected fauna species	V: 32 E: 8	16 threatened fauna species	V: 11 E: 5
Spring Farm, Stage 2	Camden	13 protected fauna species	V: 12 E: 1		
		4 protected flora species	V: 2 E: 2	15 threatened flora species	V: 10 E: 5
Menangle Park, Stage 2	Campbelltown	26 protected fauna species	V: 21 E: 5		
		12 protected flora species	V: 5 E: 7		

V = Vulnerable

E = Endangered

Existing studies have also been undertaken in relation to the Spring Farm area which provide supplementary information on the vegetative characteristics of the area. A Vegetation Assessment prepared by Anne Clements & Associates Pty Ltd (May 2002) identified five different vegetation assemblages within the Spring Farm Release Area as follows:

- Eucalypt on shale (meets the definition of Cumberland Plain Woodland);
- River-flat vegetation on Holocene alluvium (meets the definition of Sydney Coastal River-flat Forest;
- Forest/Scrub on high level alluvial sand (meets the definition of Elderslie Banksia Scrub Forest);
- Aquatic vegetation, which may have formally been present in various natural watercourses, but was largely recorded in man-made dams; and
- Predominantly non-local native assemblages, which reflect post-European settlement land uses.

The predominantly non-local native assemblages represented some 82% of the study area, while the Cumberland Plain Woodland represented around 8%. The Elderslie Banksia Scrub Forest represented approximately 3.5% and the Sydney Coastal River-flat Forest represented close to 1%.

The Vegetation Assessment identified the following protected species within the area the subject of the study:

- Three stands of *Pomaderris brunnea*, a Vulnerable species protected under the EPBC Act and the TSC Act;
- *Pimelea spicata* subsp. *spicata*, an Endangered species under the EPBC Act and the TSC Act; and
- *Eucalyptus benthamii*, a Vulnerable species under the EPBC Act and the TSC Act.

6.2.2 Biodiversity

Potential exists for two threatened ecological communities to occur within the area affected by the EPBC search (which includes the Stage 2 Concept Plan area), including the following:

- Cumberland Plain Woodland; and
- Shale/Sandstone Transition Forest.

The Cumberland Plain Woodland and Shale/Sandstone Transition Forest are both listed as endangered ecological communities (EECs).

6.2.3 Potential Impacts

The construction and operation of wells and associated infrastructure would not involve significant clearing of vegetation. The construction footprint of the well sites would be minimised and once the immediate wellhead infrastructure area is completed, the remaining disturbed areas would be rehabilitated.

Locational guidelines would be developed as part of the EA for the Concept Plan addressing the siting of wells within new well fields and infill wells within existing well fields, together with associated infrastructure. In the event threatened or protected species/communities are identified and potentially affected by the construction of wells or infrastructure, an appropriate level of environmental assessment and consideration of alternatives would be undertaken, and appropriate mitigation/management measures implemented to minimise impacts.

Proposed well locations within the Spring Farm and Menangle Park Project areas will be selected to minimise disturbance to remnant vegetation, and will be predominantly located within disturbed rural environments.

6.2.4 Summary and Recommendations

Potential exists for the siting of wells and associated infrastructure to impact on the biological values of the areas, through the clearing of vegetation and potential habitat areas to enable the construction and subsequent operation of the proposed development. However, the Proponent intends to site the proposed wells and infrastructure within disturbed areas where possible, to minimise the potential impact on ecological values. The decision making process and supporting locational guidelines will be developed as part of the Concept Plan application to demonstrate how potential impacts on flora and fauna will be managed. An appropriate level of assessment will be provided in subsequent Project applications to determine the impact on threatened or protected species/communities in the event the future physical works have the potential to impact on such species.

A gap analysis of existing information on the biological characteristics of the Spring Farm and Menangle Park Project areas will be undertaken as part of the EA, together with fieldwork to ground truth the findings and enable an assessment of impacts to be undertaken. A greater level of detail will be provided within the EA, and appropriate mitigation measures identified where appropriate.

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7 RESOURCE IMPLICATIONS

7.1 Introduction

Based on the future development of the Stage 2 Concept Plan area (including Spring Farm and Menangle Park Project areas) for gas production, an overview of the expected impacts on community, natural and transportation resources is provided in the following sections.

7.2 Community

The proposed works would have some impact on community resources, during the construction, production and post development/operational phases of the Concept Plan and Spring Farm and Menangle Park development.

During construction and post development/operational phases of the development (including construction of in-field compression and refracing activities), it is anticipated that there would be a relatively minor influx of construction workers with supporting specialised contractors to undertake the drilling and fracing of the wells. These workers would be based in the local area for a relatively short time frame during these activities, and would contribute to demand for community resources including accommodation, goods and services.

In addition, the construction and post development/operational periods of the project are expected to result in increased traffic generation, comprising trucks for deliveries of equipment and transport of water, together with employee vehicles. As a result, the construction and post development/operational activities associated with the proposed well sites and supporting infrastructure would result in a minor increase in the use of public roads.

There is not expected to be a significant increase in employment as a result of the production phase related to new gas wells and supporting infrastructure. In this regard, it is anticipated that employment requirements for the proposed works would essentially remain the same as the existing Camden operations.

Potential social and aesthetic impacts would occur primarily during the construction and post development/operational phases of the project, associated with the use of drilling and fracing/refracing equipment. Following construction, the primary social and aesthetic impacts would be limited to the sites of the proposed wells and water management system. Fencing around the proposed well sites would be designed having regard to the visual amenity of the rural and future residential/urban surroundings. Given the nature of the proposed works, these impacts are not expected to be significant.

7.3 Natural

The proposed development is seeking to extract a natural resource to produce gas for commercial supply. In this regard, the project would impact on this resource, through its proposed extraction and subsequent consumption.

The construction of gas wells and subsequent production has the potential to impact on the coal resources, and potential future coal mining. The EIS prepared by Sydney Gas for Stage 2 of the Camden Gas project identified potential issues as including:

- *Steel-cased drill holes within coal seams potential present a danger to future mining as continuous miners (or longwalls) may accidentally strike the steel casing causing damage to equipment or spark an explosion. Similarly, there*

is some risk of losing drill tools down hole with the same potential consequences;

- *Sand left in the coal seams as a result of fracing operations may sterilise the coal or at least make it more expensive to mine; and*
- *Pumping water out and subsequent depressurisation may result in mine roof subsidence.* (Sydney Gas, June 2003)

Notwithstanding these potential effects, it was concluded that Stage 2 of the Camden Gas Project would have an insignificant impact in terms of sterilisation of coal resource given that all necessary prevention measures will be undertaken where required. These measures will be described in more detail within the EA.

The construction of the well sites and production of gas has the potential to impact on water resources, however these impacts are not expected to be significant providing water management practices are implemented.

The construction of the wells and infrastructure would require the use of additional water and fuel. Water is required during the construction of the wells, however water is recycled so that it can be re-used during well construction. It is not considered that the volumes of water required are large enough to significantly impact upon the supply of natural resources for other users. The EA will describe in further detail water management practices proposed as part of the Project.

7.4 Transportation

The works proposed as part of the Concept Plan and the concurrent Spring Farm and Menangle Park Project approval would generate some additional traffic during the construction and post development/operational phases associated with construction of wells, supporting infrastructure placing additional demands on existing roads. The construction of new private roads to provide access to the well sites would also be required. Anticipated volumes of traffic to be generated during the construction and post development/operational phases of the project are expected to be relatively minor.

During the production and post development/operational phases, ongoing maintenance activities are relatively minor and there is unlikely to be a significant impact on traffic and transportation.

8 COMMUNITY EFFECTS

8.1 Introduction

This section addresses the potential socio-economic impacts of the proposed project.

Given the proposed works are located within a number of different LGAs, an overview of the characteristics of each of the LGAs is provided within the following sections to set the context within which the Stage 2 Concept Plan project sits and potential social and economic impacts can be considered.

MACROC is the association of the three local government authorities in the Macarthur region. Camden Council, Campbelltown City Council and Wollondilly Shire Council are the three member councils of MACROC.

The proposed Stage 2 Concept Plan area (including Spring Farm and Menangle Park) is located within Campbelltown, Camden and Wollondilly LGAs. Given Project approval will be sought for proposed works within Spring Farm and Menangle Park, an overview of the characteristics of both these areas is also provided is this section.

8.1.1 Campbelltown LGA

Campbelltown LGA is located in Sydney's outer southwest and is bounded by Liverpool LGA to the north, Sutherland and Wollongong LGAs to the east, the Wollondilly LGA to the south and Camden LGA to the west. Campbelltown LGA stretches over a land area of 311.53km^2 and has a density of some 4.66 persons per hectare.

Campbelltown LGA has experienced a slight increase in total population between 1996 to 2001. While there has been an increase in the number of new dwellings, the average number of persons living in each dwelling has declined. Many of the smaller areas within Campbelltown LGA experienced population decline during the period of 1996 to 2001.

The proposed Menangle Park site is located within the Campbelltown LGA, which comprises several sub-areas, one of which is identified as 'rural residential'. The rural residential area includes the Menangle Park Project area and has a total land area of some 213.45km^2 with a population density of around 0.14 people per hectare.

8.1.2 Camden LGA

Located to the southwest of Sydney, Camden LGA is bounded to the east by Campbelltown LGA, Liverpool LGA to the north and Wollondilly LGA to the south and west. Camden LGA comprises a mix of agricultural lands, country towns and new residential areas with associated commercial and industrial developments. The area of Camden is renowned for its significance in the origins of Australia's wool industry and is commonly referred to as the "Birthplace of the Wealth of the Nation".

Camden LGA has experienced rapid growth since 1981 with an annual growth rate of approximately 7.8%. It is expected significant growth in Camden will continue in the future as existing release areas are further developed.

The Camden LGA has a total land of area of some 201km^2 and a population density of around 2.2 persons per hectare.

The proposed Spring Farm Project area is located within the Camden LGA. Several sub-areas are identified within the Camden LGA, one of which is the Elderslie/Spring Farm area (including the Project area of Spring Farm).

Residential development in the Elderslie/Spring Farm area dates generally from the 1980s and 1990s. It is anticipated that the area will experience significant growth over the next 10 years with remaining areas of Elderslie and Spring Farm being released for further residential development. The Elderslie/Spring Farm area covers a total of some 11.45 km^2 and has a population density of around 2.6 persons per hectare (www.camden.nsw.gov.au, Community Profile).

8.1.3 Wollondilly LGA

Wollondilly Shire is located at the south western fringe of the Sydney Metropolitan Area, approximately 75kms from the Sydney GPO. It is bounded by the Blue Mountains and Penrith LGAs in the north, Liverpool, Camden, Campbelltown City and Wollongong LGAs in the east, Wingecarribee LGA in the south and Goulburn Mulwaree and Oberon LGAs in the west. Wollondilly Shire covers an area of approximately 2,560km^2 with a population density of around 0.04 persons per hectare (www.wollondilly.nsw.gov.au, Community Profile).

The Wollondilly LGA predominately comprises a National Park and rural areas with scattered urban areas. The rural land is mainly used for agricultural purposes, with coal mining also being a major industry in the area.

8.1.4 Population Characteristics

A review of Community Profile information relating to population and age structure for each of the LGAs (based on the 2001 Australian Bureau of Statistics Census) indicated that some 62% of the population of each of the LGAs is aged between 18 and 64 years old, with only about 0.5% of the population aged 85 years and over. The population comprises approximately 50% males and 50% females within each of the LGAs.

Campbelltown LGA had a significantly larger population than Camden and Wollondilly, with a total population of 145,294 compared with 43,779 for Camden and 36,953 for Wollondilly.

The population characteristics (population and age structure) relating to the rural residential and Elderslie/Spring Farm sub-areas, relevant to the Project areas of Spring Farm and Menangle Park suggest no significant difference between the age makeup of the population existing within the Spring Farm and Menangle Park areas.

The background/birthplace characteristics of the population within the three LGAs are generally consistent with the exception of the percentage of population born overseas and Australian born. The population within Campbelltown LGA comprises a higher number of overseas born people which in turn results in a smaller percentage of Australian born population when compared with Camden and Wollondilly LGAs.

The population within the rural-residential sub-area relevant to Menangle Park is predominantly Australian born (approximately 73%). The Elderslie/Spring Farm area which is situated in the Camden LGA also comprises a predominantly Australian born population (almost 84%).

8.1.5 Dwelling Characteristics

A review of data relating to dwelling ownership for the three LGAs (including the sub-areas representing Spring Farm and Menangle Park highlights that a lower proportion of the

population (63.5%) of Campbelltown LGA either owns or is purchasing a dwelling when compared with the Camden and Wollondilly Shire LGAs (76% and 78.6% respectively). The proportion of the population renting residential accommodation within Campbelltown is more than double that of the Wollondilly LGA.

The proportion of the population who owns or is purchasing dwellings within both sub-areas (representing the characteristics of Spring Farm and Menangle Park) is relatively high, at more than 70% of the total population.

8.1.6 Employment

Analysis of the employment status of the population for each of the LGAs (based on 2001 Census data) indicates a higher percentage of the population in Campbelltown is unemployed (8.5%) than in Camden and Wollondilly (4.1% and 5% respectively). Otherwise the employment status across all three LGAs is generally consistent.

The employment status between the two sub-areas which reflect the characteristics of Spring Farm and Menangle Park is generally similar with the rural residential area (representing Menangle Park) containing a slightly lower percentage of people who are unemployed (4.1%). A comparison between the LGA data and the sub-area data indicates that a greater proportion of the population within the rural residential area is employed than in the LGA as a whole.

8.1.7 Potential Impacts

There are no exceptional socio-economic circumstances applying to the local community within the LGAs, including the Project areas of Spring Farm and Menangle Park. The socio- economic impacts of the proposed development of gas infrastructure (including wells and gas gathering lines) relate to the direct and indirect employment impacts and benefits. Where possible the Proponent will employ personnel from the local region, however it is most likely that specialists will be required to be sourced elsewhere.

The proposed project will bring state-wide benefits through the increased supply of natural gas.

8.2 Non-Indigenous Heritage

8.2.1 Stage 2 Concept Plan Area

An internet search of the State Heritage Inventory (SHI) and the RNE relating to the Stage 2 Concept Plan area was conducted on the 23rd August 2006. Given the relatively large area covered by Stage 2 of the Camden Gas Project, several items were identified, particularly of local heritage significance. The majority of these items are listed in the relevant LEP as having heritage significance, and include old homesteads and cottages. The area identified as Camden Park also accounts for a large portion of the listed items identified in the search.

Heritage items identified within the Spring Farm and Menangle Park areas are detailed below and the potential impacts and mitigation measures to minimise impacts on these heritage items will be discussed in greater detail in the EA.

Future development of areas within the Stage 2 Concept Plan area will require further assessment of the impact on heritage items, where required, prior to Project approval being granted.

8.2.2 Spring Farm Project Area

An internet search of the SHI and the RNE conducted on 31 May 2006 of Spring Farm indicated that there is one known item of heritage significance within the Spring Farm area listed by local government and state agencies.

NESBITT is a private residential building built in the latter half of the nineteenth-century located at 196 Macarthur Road, Spring Farm. The proposed well site locations have been selected with consideration to potential impacts from the proposal on this heritage item. The proximity and nature of the proposed well site locations minimises the potential for the proposal to have a significant impact on this heritage item.

No items within Spring Farm were identified on the RNE.

8.2.3 Menangle Park Project Area

An internet search of the SHI and the RNE conducted on 31 May 2006 relating to Menangle Park indicated a total of six items of heritage significance, including one item listed under the *Heritage Act 1977*, four items listed by local or state planning instruments and three items identified on the RNE. These heritage items are listed in **Table 12** below.

Table 12: Non-Indigenous Heritage Items

Heritage Item	Address	Suburb	Listing
Glenlee, outbuildings, garden and gatelodge	Glenlee Rd	Menangle	• NSW Heritage Act • Campbelltown LEP • RNE
Glenlee	Glenlee Rd	Menangle Park	• RNE
Menangle Park Racecourse/Paceway	N/A	Menangle Park	• SREP 20
Menangle Weir	Below rail bridge, Menangle	Menangle Park	• SREP 20
Menangle House	Corner of Menangle Rd and Racecourse Ave	Menangle Park	• RNE
Menangle Railway Viaduct	Over Nepean River, between Menangle and Menangle Park.	North of Menangle	• RNE • SREP 20 • Wollondilly LEP

8.2.4 Potential Impacts

In planning the location of future wells and infrastructure as part of the Concept Plan, AGL Camden would avoid matters of heritage significance. This issue will be incorporated into the locational guidelines developed in respect of the Concept Plan works.

In Spring Farm and Menangle Park, consideration has been given to potential impacts on non-indigenous heritage in determining the location of well head facilities and the gas gathering and access road network. It is noted that the number of surface locations for wells has been

reduced significantly from that originally proposed within Spring Farm and Menangle Park to minimise potential environmental and social impacts, whilst still accessing the valuable gas reserves. Mitigation measures will be incorporated into the EA to address potential impacts on sub-surface non-indigenous archaeology.

In the event future wells or gas infrastructure within the Stage 2 Concept Plan area are to be located within the curtilage of an identified heritage item, an appropriate heritage impact assessment would be undertaken as part of future Project applications.

8.3 Indigenous Heritage

8.3.1 Stage 2 Concept Plan Area

An Aboriginal Heritage Study and Assessment has previously been undertaken on behalf of Sydney Gas for the Stage 2 area, which identified twenty-two previously recorded sites within and adjacent to the Stage 2 study area. Of these, three sites were located in the immediate area of components of the proposed infrastructure and a total of fifteen sites were identified as requiring some form of action to manage impacts.

8.3.2 Spring Farm Project Area

An Aboriginal Archaeological Assessment for the Spring Farm Release Area was prepared by Mary Dallas and Paul Irish (January 2001). The Release Area generally correlates with the Spring Farm area within Stage 2 of the Camden Gas Project.

The Aboriginal Archaeological Assessment concluded that the Release Area has been variously affected by past land uses, with some areas, such as heavily sand mined areas and landfill, containing no archaeological potential, while other areas, such as farmlands and bushlands, are likely to contain sites.

The study identified four open camp sites, a scarred tree, and an area containing potential archaeological deposit (PAD) within the Release Area. A Canoe Tree which is of importance to the local Aboriginal community was also located adjacent to the Release Area. These sites were identified at the following locations:

- On the western side of Jacks Gully on an elevated ridge crest above the Nepean River;
- On an elevated ridge crest to the north of the Jacks Gully Waste Management Centre;
- On the southern margin of Spring Creek between Richardson Road and Spring Creek; and
- On the margins of the upper reaches of Spring Creek to the east of Richardson Road.

The PAD is located on an elevated spur of Nepean River alluvium to the east of Spring Creek Dam, above flood prone-land along the river (Dallas and Irish, January 2001).

8.3.3 Menangle Park Project Area

A number of previous Indigenous Heritage studies have been undertaken in relation to the Menangle Park Release Area, which is within the area subject of the proposed works associated with the Camden Gas Project.

An Indigenous Heritage Assessment for the Menangle Park Release Area prepared by HLA (May 2004) identified a total of 10 new surface sites and 10 previously recorded sites within the area. A subsequent assessment of Indigenous heritage issues undertaken by Jo McDonald Cultural Heritage Management Pty Limited (September 2004) identified a total of twenty two surface open sites have been recorded in the area, and a number of areas with PAD can be defined in the area. This study identified areas of archaeological sensitivity within the study area, as high medium and low.

8.3.4 Potential Impacts

In planning the location of future wells and infrastructure within the Stage 2 Concept Plan area, the Proponent would seek to avoid matters of Indigenous heritage significance, as identified by existing studies that have been undertaken for the area. Principles would be incorporated into the locational guidelines for the activities proposed as part of the Concept Plan to manage potential impacts on matters of Indigenous heritage significance. Subsequent Project applications would include an appropriate Indigenous heritage assessment in the event proposed works are to be located in the proximity of an identified item or areas of significance.

Consideration has been given to potential impacts on known indigenous heritage within Spring Farm and Menangle Park in determining the location of well head facilities and the gas gathering and access road network. In addition, an Indigenous heritage assessment including an appropriate level of involvement from local Aboriginal groups will be undertaken as part of the EA to determine the likely impacts of the proposed works within Spring Farm and Menangle Park, and to identify appropriate mitigation measures.

8.4 Land Use

As indicated earlier in this report, the proposed works are generally located within areas which are currently zoned for rural, non-urban or residential purposes. However, parts of the rural/non-urban areas within the Stage 2 Concept Plan area are earmarked as future residential/urban areas (in particular, Spring Farm and Menangle Park). In this regard, it will be important for the EA to address the impact on both existing and future land uses, to develop locational guidelines which take into account potential impacts on both rural and residential/urban development, and to identify appropriate mitigation measures (such as landscaping and/or fencing/enclosures) to manage potential impacts, particularly within the Spring Farm and Menangle Park Project approval.

8.5 Visual Impacts

The Stage 2 Concept Plan area, particularly Spring Farm and Menangle Park are predominantly rural in nature. However, these lands will form part of new urban release areas, and will, in the future, become residential/urban areas, supporting a higher population of residents. The visual impact of the proposed works will therefore be an important issue to be addressed, particularly having regard to the future co-existence of the proposed works with residential receivers.

Impacts during the construction and post development/operational phases of the development will be relatively short term in nature. In addition, the proposed construction works within the Spring Farm and Menangle Park Project areas are likely to occur prior to occupation of these future residential areas. Impacts are likely to include the visual presence of the following:

- Construction equipment (including drilling rig and fracing equipment);
- Lengths of open trench and associated trench spoil associated with the construction of the gas gathering pipeline, infrastructure, temporary water storage ponds and access roads; and

- Disturbed well sites within the context of the existing landscape until rehabilitation is completed.

The gas wells themselves are moderately sized, and will be enclosed within a security area. Water storage tanks may also be located adjacent to the gas wells. Whilst the gas wells and water storage tanks will be visible, they are not expected to have a significant impact on the surrounding community. A number of options will be presented within the EA to address the potential visual impact on receivers, particularly where the wells sites are in close proximity to future residential receivers (landscaping, types of fencing).

Supporting infrastructure including the gas gathering pipelines will be located below surface level, and should therefore not have a significant visual impact once construction has been completed.

Mitigation measures will be identified in the EA to address how the potential visual impacts of the proposed project within Spring Farm and Menangle Park can be managed. Locational guidelines will be presented within the EA to manage potential visual impacts of future works proposed as part of the Concept Plan application.

8.6 Transportation

Significant traffic increases are not expected as a result of the proposed activities outlined in the Concept Plan and concurrent Project approval. However, relatively minor increases in traffic are expected during the construction and post development/operational phases as a result of the following:

- delivery of materials and equipment;
- delivery of water to and from the site (for reuse);
- vehicles associated with construction, fracing and refracing activities;
- construction employee vehicles, etc.

Minimal increases in traffic are expected as a result of production activities.

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9 FINDINGS

The EA for Stage 2 of the Camden Gas Project would focus on the key impacts of the environmental factors addressed in **Sections 5 to 8**. This EASR has identified the key environmental issues as being:

- Hazard and Risk;
- Land Use (compatibility with future land use); and
- Noise and Vibration.

9.1 Hazard and Risk

The production and handling of coal seam methane, a flammable gas under pressure, represents the main hazard associated with the project. Hazards may arise in wells and gas gathering lines.

A Preliminary Risk Assessment would be undertaken to determine whether a Preliminary Hazard Analysis (PHA) is required for the project. Further details will be provided in the EA.

Based on past assessments undertaken for the Camden Gas Project, risks associated with construction and operation of the wells and infrastructure are expected to be able to be managed, providing guidelines for the location of wells are followed and appropriate mitigation measures developed. Further detailed assessment of this issue would be undertaken as part of the EA.

9.2 Land Use

As indicated earlier in this report, the proposed works are generally located within areas which are currently zoned for rural, non-urban or residential purposes. However, parts of the rural/non-urban areas within the Stage 2 Concept Plan area are earmarked as future residential/urban areas (in particular, Spring Farm and Menangle Park). In this regard, it will be important for the EA to address the impact on both existing and future land uses, to develop locational guidelines which take into account potential impacts on both rural and residential/urban development, and to identify appropriate mitigation measures (such as landscaping and/or fencing/enclosures) to manage potential impacts, particularly within the Spring Farm and Menangle Park Project approval.

9.3 Noise and Vibration

The existing environment within which the wells and associated infrastructure will be located is predominantly rural in nature, however, the Spring Farm and Menangle Park areas are earmarked for future residential growth areas. In this regard, consideration of the co-existence of the proposed wells and infrastructure with future residential/urban development will be a key consideration for this project.

Noise impacts are primarily expected during the construction phase of the project, which is likely to occur prior to occupation of future residential areas. Impacts are expected to be associated with site preparation, construction of access roads, well drilling procedures, well completion, and truck and gas gathering line laying movements.

In addition, the possible construction of in-field compression and refracing activities proposed as part of the post development/operational phase of the project (outlined in the Concept Plan) has the potential to generate noise impacts while these activities are occurring.

The proposal also has the potential to generate localised ground vibration impacts from activities during construction (i.e. fracing) of proposed well sites, and subsequent refracing of wells during the post development/operational phase of the project (if required).

A more detailed noise and vibration impact assessment will be undertaken as part of the EA to establish background noise levels, the potential impact of the project, to identify mitigation measures and guiding principles for locating wells.

9.4 Other Environmental Issues

In addition to the key environmental issues, other environmental issues have been identified as follows:

- air quality impacts;
- water management;
- visual impact;
- soils and stability;
- flora and fauna;
- cultural heritage; and
- transport and traffic.

The impacts associated with these other environmental issues are not expected to be significant and/or are confined to the construction and post development/operational periods of the project. The impacts are likely to be able to be managed through the design of the project and the implementation of standard and proven mitigation measures.

Each of these constraints would be discussed in the EA and appropriate locational guidelines for the siting of future infrastructure proposed as part of the Concept Plan and mitigation measures would be identified in the Statement of Environmental Commitment to ensure impacts are minimised and properly managed.

9.5 Social and Economic Issues

In addition to the environmental issues, the proposed works are expected to generate interest from the local and broader community, as well as key agency stakeholders. An appropriate Consultation Strategy has been developed and partially implemented as part of the planning/development process. An appropriate level of consultation will continue to occur during preparation of the EA and a social and economic appraisal of the development would be included as part of the EA of the project.

A further key social issue identified is the co-existence of the proposed works within future residential areas, particularly relevant to Spring Farm and Menangle Park. The EA will therefore examine a suite of mitigation measures that can be implemented to manage the siting and operation of project elements in an appropriate manner.

10 PRIORITISATION OF POTENTIAL ENVIRONMENTAL ISSUES

10.1 Issues Identification

As identified in **Section 9** of this report, the list of issues associated with the Concept Plan and the concurrent Spring Farm and Menangle Park Project approval include:

- hazard and risk;
- land use (compatibility with future land use);
- noise and vibration;
- air quality impacts;
- water management;
- visual impact;
- soils and stability;
- flora and fauna;
- cultural heritage; and
- transport and traffic.
- social; and
- economic.

10.2 Prioritisation of Issues

10.2.1 Approach

The prioritisation of issues for the proposed project is based on the need to recognise that the higher the potential severity of adverse environmental effects and the greater the consequence of those unmanaged effects, the higher the degree of environmental assessment required.

Where a high potential effect was identified, the attribute or issue was allocated a higher priority for assessment.

Table 13 provides the Issues Prioritisation Matrix upon which the ranking of environmental issues has been based. This method assesses priority on the basis of the potential severity of environmental effects and the likely consequences of those potential effects if unmanaged. The potential severity and consequence of the environmental effect are each given a numerical value between 1 and 3. The numbers are added together to provide a result which is then ranked and shaded in the matrix by the level of priority being High, Medium or Low.

Table 13: Issues Prioritisation Matrix

Severity Of Effects	Consequence of Unmanaged Effects		
	3 High	2 Medium	1 Low
1 Low	**4 (Medium)**	**3 (Low)**	**2 (Low)**
2 Medium	**5 (High)**	**4 (Medium)**	**3 (Low)**
3 High	**6 (High)**	**5 (High)**	**4 (Medium)**

10.2.2 Assessment

The assessment of priorities for ranking environmental issues related to the activities proposed as part of the Concept Plan and concurrent Project approval is shown in **Table 14** . This assessment aims to allow the prioritisation of issues for assessment and does not consider the application of mitigation measures to manage environmental effects.

Table 14: Prioritisation Analysis

Issue	Severity	Consequence	Priority
Aspect: Air Quality			
Construction related impacts on air quality.	1	2	3 (Low)
Emissions to the atmosphere with the potential to result in degradation of air quality in the local area.	1	1	2 (Low)
Odour emissions as a result of drilling activities.	2	2	4 (Medium)
Community concern regarding degradation of air quality.	1	2	3 (Low)
Regional and inter-regional impacts upon air quality.	1	1	2 (Low)
Aspect: Water Management			
Impacts caused by the flooding of the Nepean River system and tributaries.	1	2	3 (Low)
Degradation of water quality in the local area during construction.	1	2	3 (Low)
Degradation of water quality in the local area during operation.	1	1	2 (Low)

Issue	Severity	Consequence	Priority
Impacts on local water resources due to water use during construction	2	2	4 (Medium)
Aspect: Soils and Geology			
Erosion and sedimentation during construction.	2	1	3 (Low)
Potential geotechnical impacts as a result of drilling and fracing operations.	2	2	4 (Medium)
Potential sterilisation of coal seams for future mining activities.	1	2	3 (Low)
Contamination and sterilisation of land for future uses.	1	2	3 (Low)
Aspect: Noise and Vibration			
Temporary noise nuisance to local residents during construction.	2	2	4 (Medium)
Noise nuisance to local residents during operation/maintenance.	2	2	4 (Medium)
Aspect: Hazard and Risk			
Exposure of surrounding land uses to risks and hazards during construction.	1	2	3 (Low)
Exposure of surrounding land uses to risks and hazards during operation.	2	2	4 (Medium)
Exposure of employees to risks and hazards.	1	2	3 (Low)
Aspect: Ecological			
Loss of habitat due to clearing and development.	1	1	2 (Low)
Reduction in biodiversity due to loss of habitat for native species.	1	1	2 (Low)
Spread of weeds and feral animals.	1	2	3 (Low)
Impact upon threatened species.	1	1	2 (Low)

Issue	Severity	Consequence	Priority
Aspect: Resource Implications			
Demand upon community, natural or transport resources.	1	1	2 (Low)
Aspect: Socio-Economic			
Impacts upon amenity of surrounding properties such as noise, visual, etc	2	2	4 (Medium)
Impacts upon demand for community resources	1	1	2 (Low)
Job creation during construction	1	1	2 (Low)
Job creation during operation	1	1	2 (Low)
Aspect: Cultural Heritage			
Impacts on Non-Indigenous heritage.	2	1	3 (Low)
Impacts on Indigenous heritage.	2	1	3 (Low)
Visual Impacts			
Visual impacts during construction.	1	2	3 (Low)
Visual impacts during operation.	1	2	3 (Low)
Aspect: Land Use			
Inappropriate use of land	1	1	2 (Low)
Incompatibility of land use with surrounding environment	1	2	3 (Low)
Incompatibility of land use with new land uses proposed for area	2	3	5 (High)
Aspect: Transport and Traffic			
Increase in traffic on local road network during construction.	1	1	2 (Low)
Increase in traffic on local road network during operation.	1	1	2 (Low)

Table 14 identifies the prioritisation of environmental issues and therefore the focus of environmental assessment for the proposed project should be as follows.

High

- Land Use (compatibility with future land use).

Medium

- Air Quality (Odour);
- Soils and Geology;
- Noise and vibration;
- Hazard and Risk;
- Socio-Economic; and
- Water Management.

Low

- Ecological;
- Resource Implications;
- Visual Impacts;
- Cultural Heritage; and
- Traffic and Transportation.

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11 RECOMMENDATIONS

11.1 Level of Assessment

This EASR has undertaken an initial appraisal of potential effects associated with the activities proposed as part of the Concept Plan and concurrent Project approval, and has identified one high priority environmental issue being land use (compatibility with future land uses). Other key environmental issues for the project include:

- hazard and risk; and
- noise and vibration.

These issues would be considered in detail in the EA. Other environmental issues would be addressed as part of the EA, although such issues are not expected to have significant effects and should be able to be managed through the implementation of appropriate consultation and mitigation measures.

An appropriate level of consultation would continue to be implemented during preparation of the EA as part of the Consultation Strategy for the project. A social and economic appraisal of the development would be included as part of the EA of the project.

11.2 Approvals Process

As discussed in **Section 3.4.1,** the proposed project meets the criteria in SEPP 2005 and therefore is a candidate for assessment under Part 3A of the EP&A Act, subject to the Minister declaring the project as a 'major project' for the purposes of Part 3A of the Act. The Minister has been requested to authorise lodgement of a Concept Plan and concurrent Project approval for the development of the Stage 2 area and Spring Farm/Menangle Park respectively.

On the basis of the Minister's decision on the EASR prepared for the project, the Director General's environmental assessment requirements for this project would be requested.

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12 REFERENCES

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Figures

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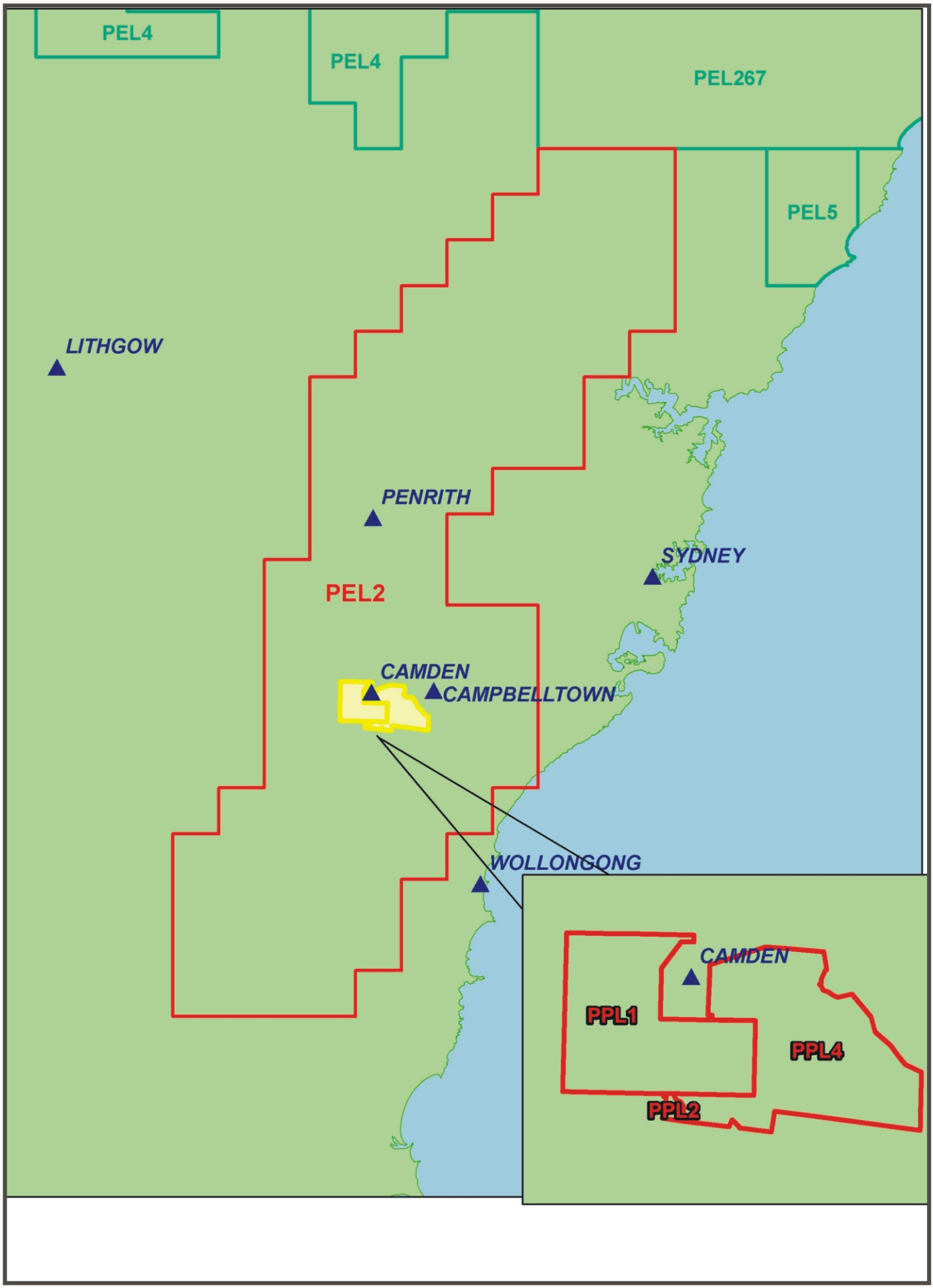


HLA

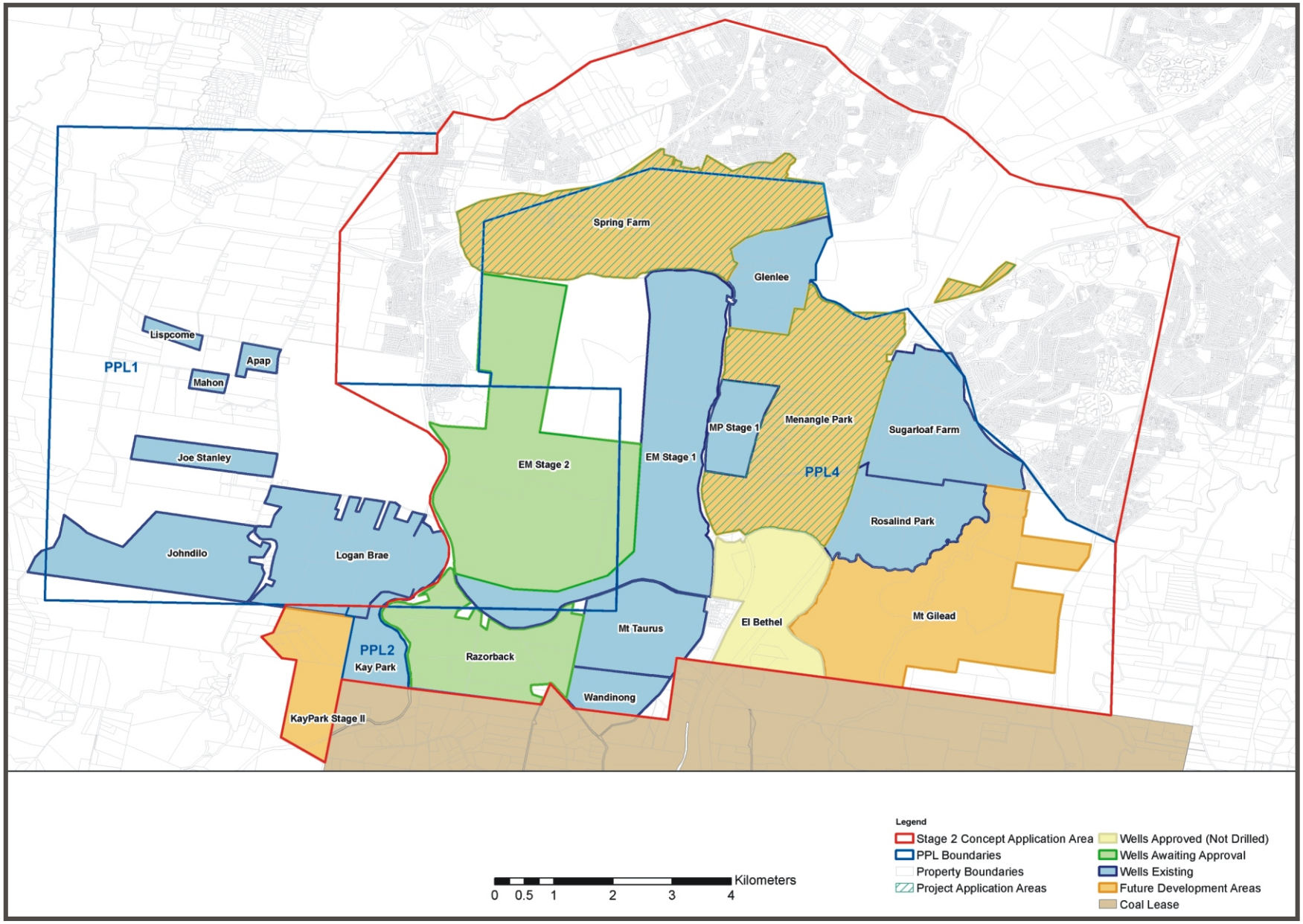
PPL Locations within PEL 2
AGL Gas Production (Camden) Pty Ltd
Environmental Assessment Scoping Report
Expansion of Stage 2 of the Camden Gas Project

TOWNS
ONSHORE
PPL
PEL2
PEL267
PEL4
PEL5

0 32km

FIGURE 1

PROJECT-FILE NAME S6044801 DATE 20 October 2006 DRAWN APPROVED



PROJECT-FILE NAME S6044801
DATE 20 October 2006
DRAWN
APPROVED

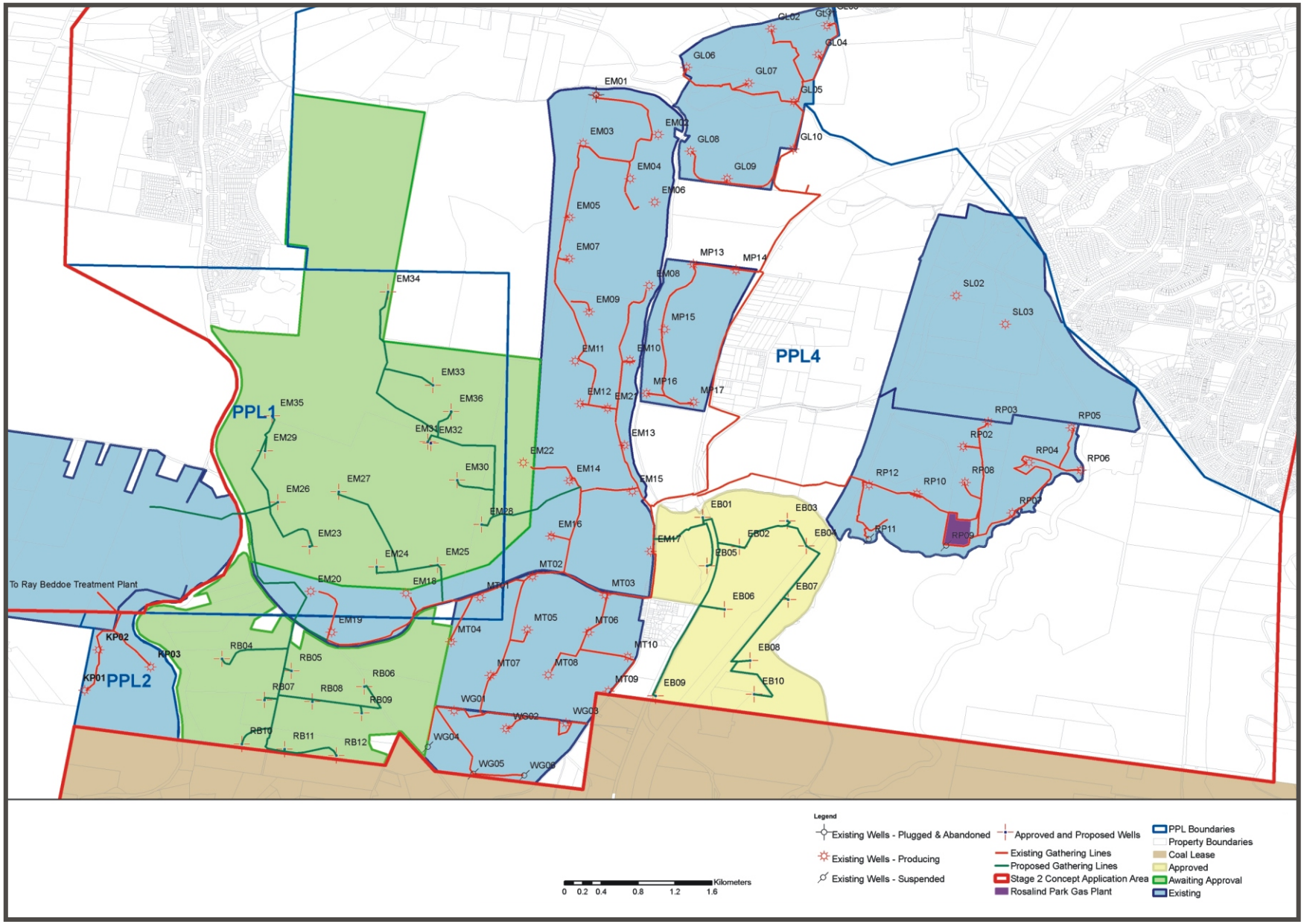
Overview of Existing and Proposed Well Fields AGL Gas Production (Camden) Pty Ltd

Environmental Assessment Scoping Report
Expansion of Stage 2 of the Camden Gas Project

HLA

Scale as Shown

FIGURE 2



PROJECT-FILE NAME **S6044801**
DATE **20 October 2006**
DRAWN
APPROVED

Detailed View of Existing and Proposed Well Fields
AGL Gas Production (Camden) Pty Ltd

Environmental Assessment Scoping Report
Expansion of Stage 2 of the Camden Gas Project

HLA

Scale as Shown

FIGURE **3**

PROJECT-FILE NAME S6044801
DATE 20 October 2006
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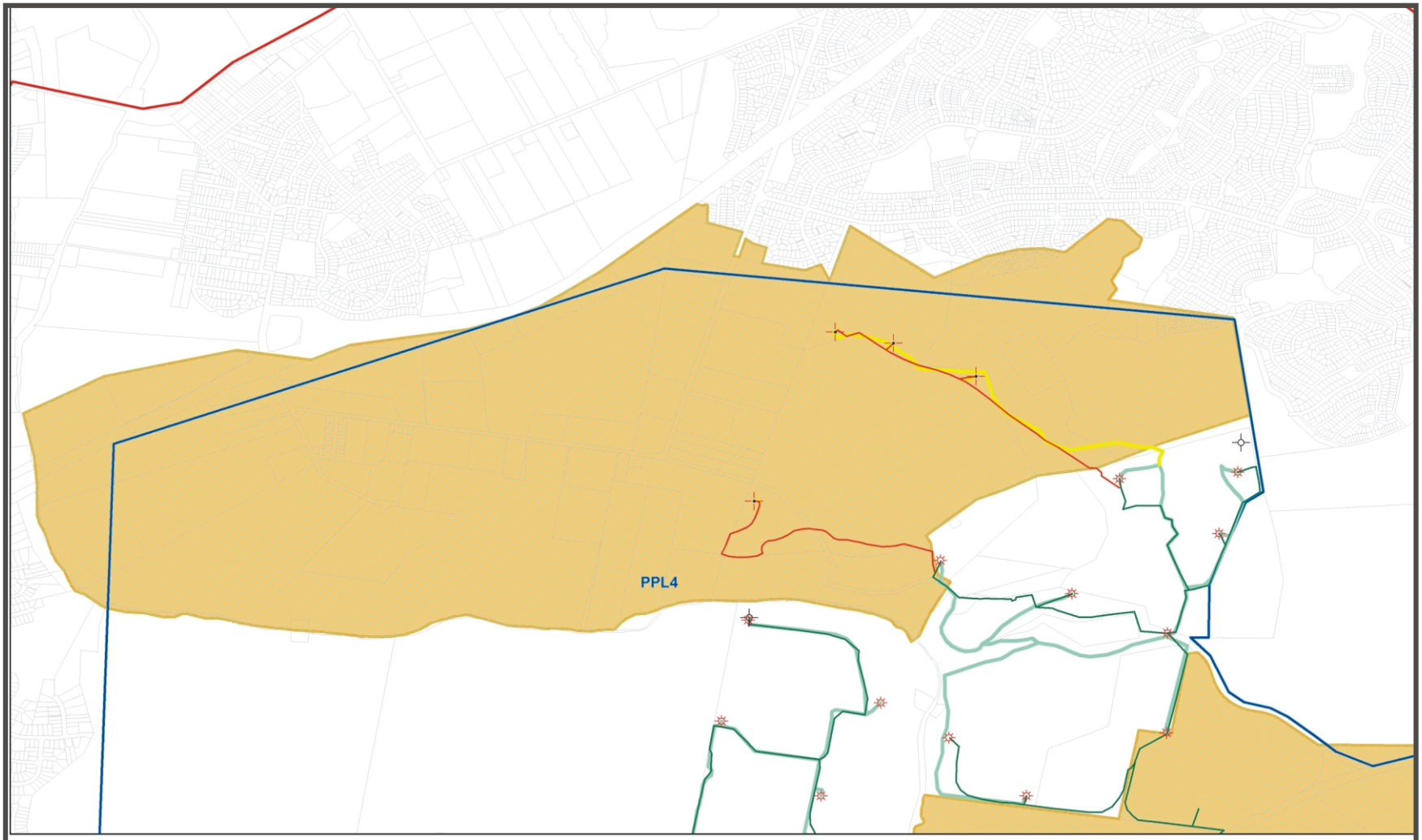
Example of Indicative Infill Well Head Locations
AGL Gas Production (Camden) Pty Ltd

Environmental Assessment Scoping Report
Expansion of Stage 2 of the Camden Gas Project

HLA

Scale as Shown

FIGURE 4



Spring Farm Project Area
Proposed Wells, Gathering Lines & Access (Indicative)

0 0.15 0.3 0.6 0.9 1.2 Kilometers

Legend

- Stage 2 Concept Application Area
- PPL Boundaries
- SUSPENDED
- PRODUCING
- Plugged and Abandoned
- Indicative Well Locations
- Property Boundaries
- Existing Gathering Lines
- Indicative Gathering Lines
- Indicative Access Roads
- Existing Access Roads
- Future Development Areas
- DrillingAreas selection 2

PROJECT-FILE NAME S6044801
DATE 20 October 2006
DRAWN
APPROVED

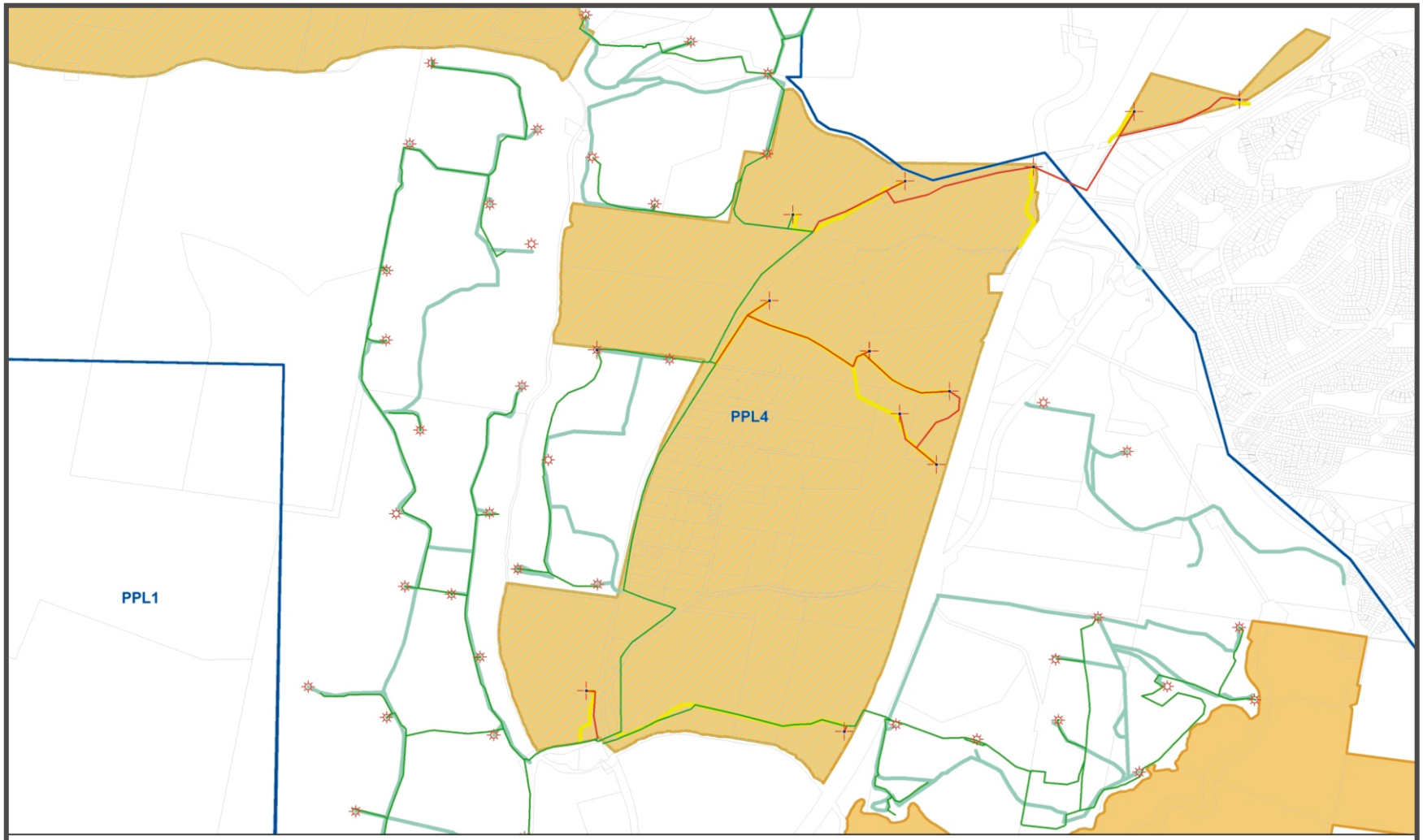
Spring Farm Proposed Works
AGL Gas Production (Camden) Pty Ltd

Environmental Assessment Scoping Report
Expansion of Stage 2 of the Camden Gas Project

HLA

Scale as Shown

FIGURE 5



Menangle Park Project Area
Proposed Wells, Gathering Lines & Access (Indicative)

0 0.2 0.4 0.8 1.2 1.6 Kilometers

Legend

- PPL Boundaries
- Property Boundaries
- Existing Access Roads
- Indicative Access Road
- Existing Gathering Lines
- Indicative Gathering Lines
- PRODUCING
- Indicative Well Locations
- Project Application Areas

PROJECT-FILE NAME	S6044801
DATE	20 October 2006
DRAWN	
APPROVED	

Menangle Park Proposed Works
AGL Gas Production (Camden) Pty Ltd

Environmental Assessment Scoping Report
Expansion of Stage 2 of the Camden Gas Project

HLA

Scale as Shown

FIGURE 6

Plates

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Plate P1: Rehabilitated Producing Well

Plate P2: Well Design Option