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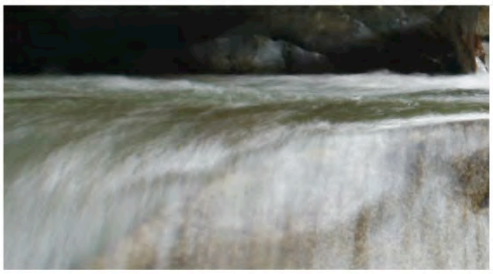
ENVIRONMENTAL ASSESSMENT

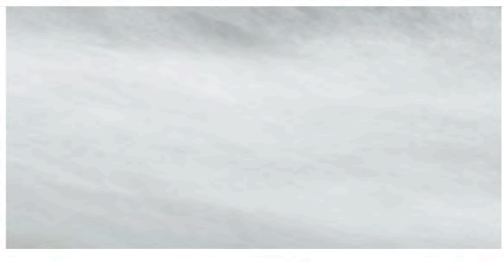
Newcastle Gas Storage Facility Project

Major Project Application Number 10-0133

Volume 4: Appendices 8 – 13

May 2011





Appendices

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2 Preliminary Contamination Assessment – Hexham
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CR 6023_8_v3

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Version:	**Details:**	**Approved:**	**Date:**
CR 6023_8_v1	Initial draft to client	CB	14/02/2011
CR 6023_8_v2	Second draft to client and Department of Planning	CB	24/02/2011
CR 6023_8_v3	Final to client	CB	23/05/2011

Appendix 8

Bush Fire Threat Assessment

ecobiological

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Bush fire Threat Assessment

Newcastle Gas Storage Facility Project
Old Punt Road, Tomago, NSW.

Bush Fire Threat Assessment:

Newcastle Gas Storage Facility Project

Old Punt Road, Tomago, NSW.

Assessed as BCA Class 10 building.

Report prepared for AGL Energy Limited.

January 2011

Prepared by:
ecobiological

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Reviewed By:

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Executive Summary

The following Bush Fire Threat Assessment has been undertaken to inform AGL Energy Limited of bush fire planning and design requirements for the construction and operation of the gas plant site and access and utility roads and pipeline corridor of the Newcastle Gas Storage Facility (GSF) at Lot 105 DP 1125747, accessed from the TAC northern access road (a private road owned by Tomago Aluminium Company) in the Port Stephens Local Government Area (LGA).

The Project will be assessed under Part 3A of the EP&A Act, and as such takes into account bush fire risk by considering aims and objectives of the Planning for Bush Fire Protection guidelines (PBP 2006).

The industrial infrastructure is considered as 'Other Development' in the Planning for Bush Fire Protection. In general, the Building Code of Australia (BCA) fire safety construction provisions for such buildings are taken as acceptable building solutions.

The gas plant site, access road and utility corridor components have significant safety issues relating to bush fire. The surrounding forest vegetation has potential to support a maximum intensity fire and put at risk the safety of staff and attending emergency personnel, and with potential to damage the integrity of the constructions.

The bush fire mitigation measures pertaining to the gas plant site, access road and utility corridor components have been recommended in order to meet the aims of Planning for Bush Fire Protection, such that the development will provide protection to human life and minimises impacts on assets from the threat of bush fire. The objectives of Planning for Bush Fire Protection have been achieved through:

- Providing a recommended 25m Asset Protection Zone to the gas plant site, which would provide a defendable space around the structures, and avoid flame contact and radiant heat exceeding 40kW/m2.
- Providing safe operational access and egress for emergency services and evacuating staff through the provisions of suitable access road

construction, with an alternate access path identified to the north, within the utility corridor;

- Providing services for fire-fighters through the provisions of water supplies, connections and access.
- Recommending the preparation of a Bush Fire Management Plan that incorporates ongoing management and bush fire mitigation measures; and
- Recommending the emergency response procedures for a bush fire event will be detailed in an Emergency Response Plan specifically for the gas plant site.

Further to the minimum requirements of the Planning for Bush Fire Protection document, the GSF will indicate it can comply with the reduced radiant heat requirements as directed by the NSW Department of Planning and the European LNG Code, EN 1473:2007. AGL have also requested the indication of what the potential radiant heat from a bush fire is expected at the outer storage tank. The following zones have therefore been detailed:

- An APZ of 31m has been calculated to achieve a radiant heat less than 23kW/m^2 to satisfy NSW Department of Planning requirement;
- An APZ of 43m has been calculated to achieve a radiant heat less than 15kW/m^2 to satisfy the European LNG Code, EN 1473:2007 requirement;
- A radiant heat flux of 6.21kW/m^2 at the storage tank has been calculated to inform AGL.

This report refers to the site plans and building plans supplied to the company as detailed below. This report cannot be used for any other design unless authorised and amended by the author of this report.

Table 1. Site Plan Information

Report issue	Date Received	Site Plan designer/ reference	Date	Comment
A	**19.12.2010**	**Worley Parsons 401010-00648-PM-DPP-0003 Rev A.**	**17.12.2010**	**Gas Storage Facility Tomago NSW Concept Plot Plan**
B				
C				
D				

Disclaimer:

This report is not an insurance policy. Owing to the unpredictable nature of bush fires and of weather conditions at the time of a bush fire, this report cannot be taken as a warranty that the recommended bush fire mitigation measures will protect the property or asset from damage in every possible bush fire event. Ultimately, the onus is on the land/asset owner to accept the risks associated with development on the site in light of the identified bush fire threat.

1. Introduction

Under the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002* (amends the *Environmental Planning and Assessment Act 1979*) all NSW local councils are required to ensure that all developments in bush fire prone lands conform to documented bush fire protection specifications. In NSW, the Planning for Bush Fire Protection 2006 (PBP 2006) specifies the aims, objectives and performance criteria for development on bush fire prone land.

This Bush Fire Threat Assessment has been undertaken to inform AGL Energy Limited (AGL) of bush fire planning and design requirements for the construction of the Newcastle Gas Storage Facility (GSF) at Lot 105 DP 1125747, accessed from the TAC northern access road (a private road owned by Tomago Aluminium Company), in the Port Stephens Local Government Area (LGA). The GSF project includes development (receiving station) on lands within the Newcastle LGA, at 235 Old Maitland Road, Hexham. This land is not mapped as bushfire prone. The GSF will comprise 5 major project components:

1. The gas plant (includes the storage tank);
2. Utility corridor;
3. Gas pipeline corridor;
4. Gas pipeline: and
5. Hexham receiving station.

This subject site is north of the Tomago Aluminium Smelter on land currently owned by Tomago Aluminium Company (TAC). This site is approximately 13 km northwest of the Newcastle central business district, 8 km south of Raymond Terrace and 4 km east of the Hexham industrial area (Figure 1 and 2).

The Port Stephens Council bush fire prone land maps have mapped the development area as Category 1 vegetation and buffers (Figure 3).

The project is located on lands zoned for Rural 1a and Industrial-General 4a under the Port Stephens Council's Local Environmental Plan (LEP) 2000 (Figure 4). The Hexham receiving station is zoned Industrial 4b under the Newcastle Council's LEP, 2003.

1.1. Scope

The bush fire assessment details the potential bush fire behaviour to inform AGL with respect to the aims and objectives of PBP 2006.

The gas plant site is located within a larger area of bush fire prone vegetation. The Hexham receiving station and underground pipelines will not be directly impacted from bush fire, and this assessment is related specifically to the gas plant site, and the access and utility corridor.

Measurable bush fire impact on infrastructure is considered as radiant heat and flame contact. Bush Fire Assessment and Behaviour calculations have been used to determine the estimated radiant heat and flame contact potential for the gas plant site with proposed setbacks.

Further to impact on assets, under the Rural Fires Act 1997 (NSW), the owner or occupier of bush fire prone land is obligated to take precautions to prevent the start or spread of bush fires on their land.

This assessment will evaluate the potential impact that a bush fire could have upon the proposed development and recommends mitigation measures to protect human life and property. It provides the applicant, Council, the Rural Fire Service and the Department of Planning with an independent assessment of the proposed development having regard to construction within a bush fire prone area.

Recommendations in Section 3 of this report should provide a reasonable and acceptable level of bush fire safety to the proposed development and attending fire fighters.

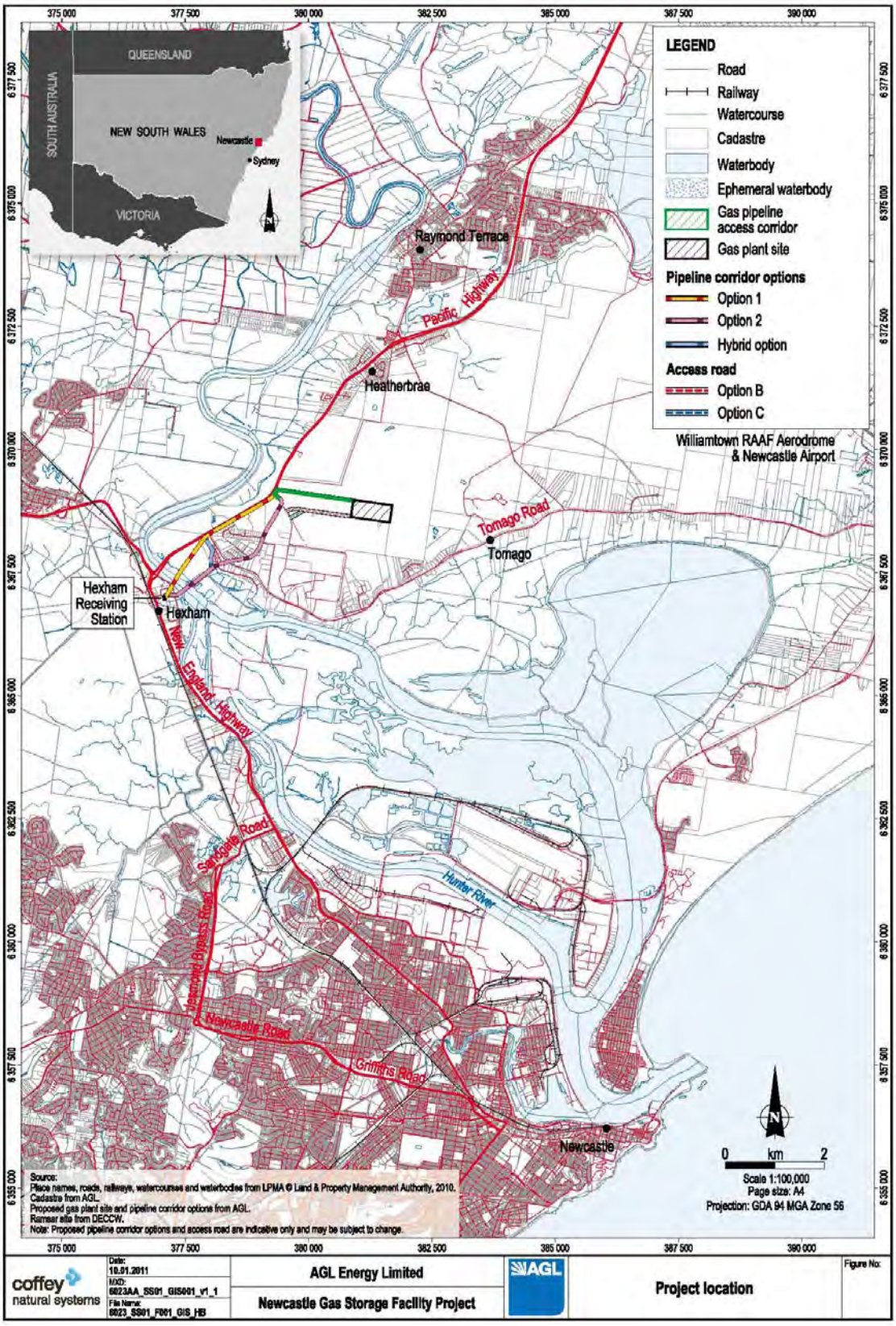
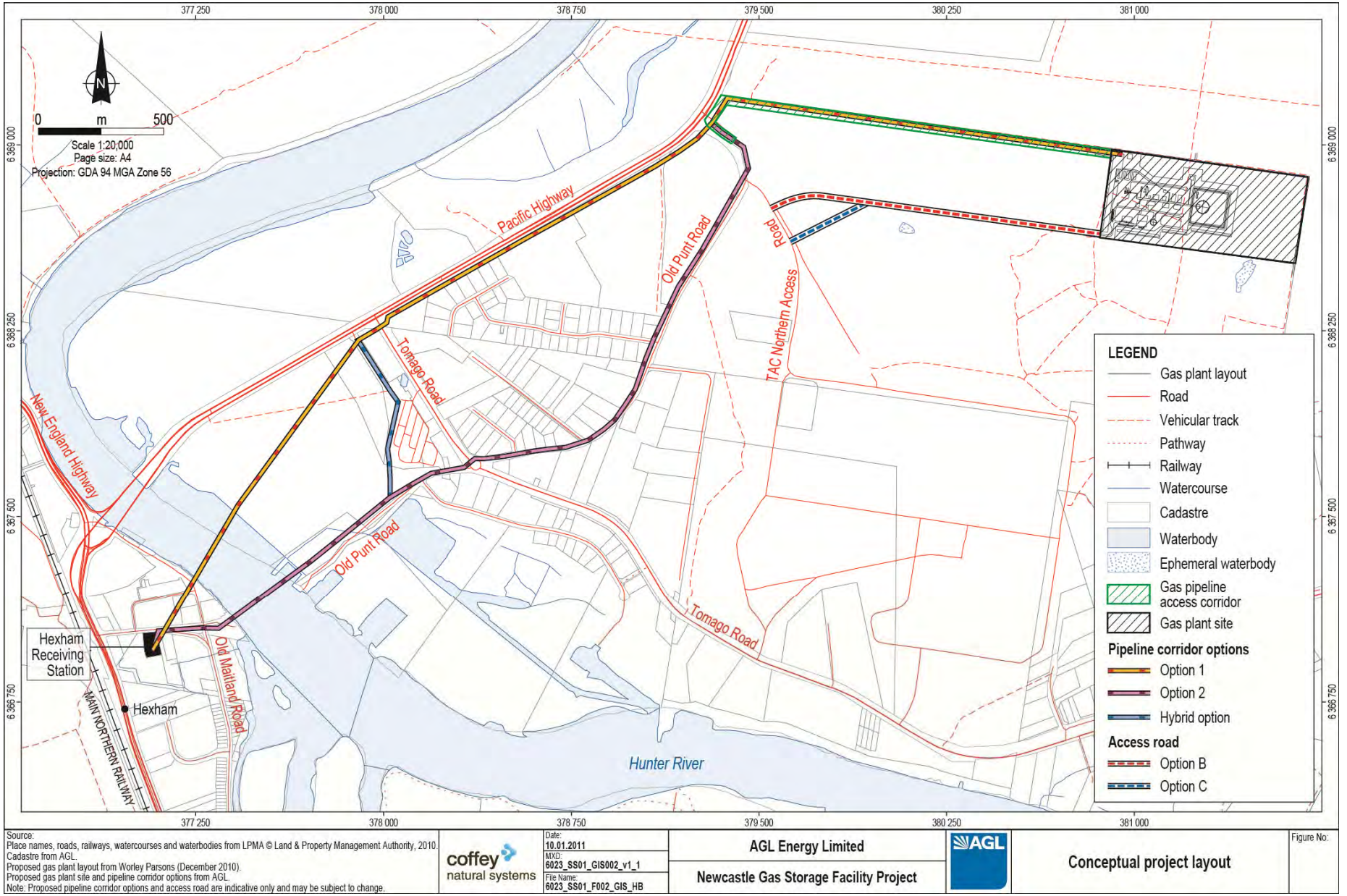


Figure 1. Locality Plan



Source:
Place names, roads, railways, watercourses and waterbodies from LPMA © Land & Property Management Authority, 2010.
Cadastre from AGL.
Proposed gas plant layout from Worley Parsons (December 2010).
Proposed gas plant site and pipeline corridor options from AGL.
Note: Proposed pipeline corridor options and access road are indicative only and may be subject to change.

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Date: 10.01.2011
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File Name: 6023_SS01_F002_GIS_HB

AGL Energy Limited

Newcastle Gas Storage Facility Project

Conceptual project layout

Figure No:

Figure 2. Conceptual project layout.

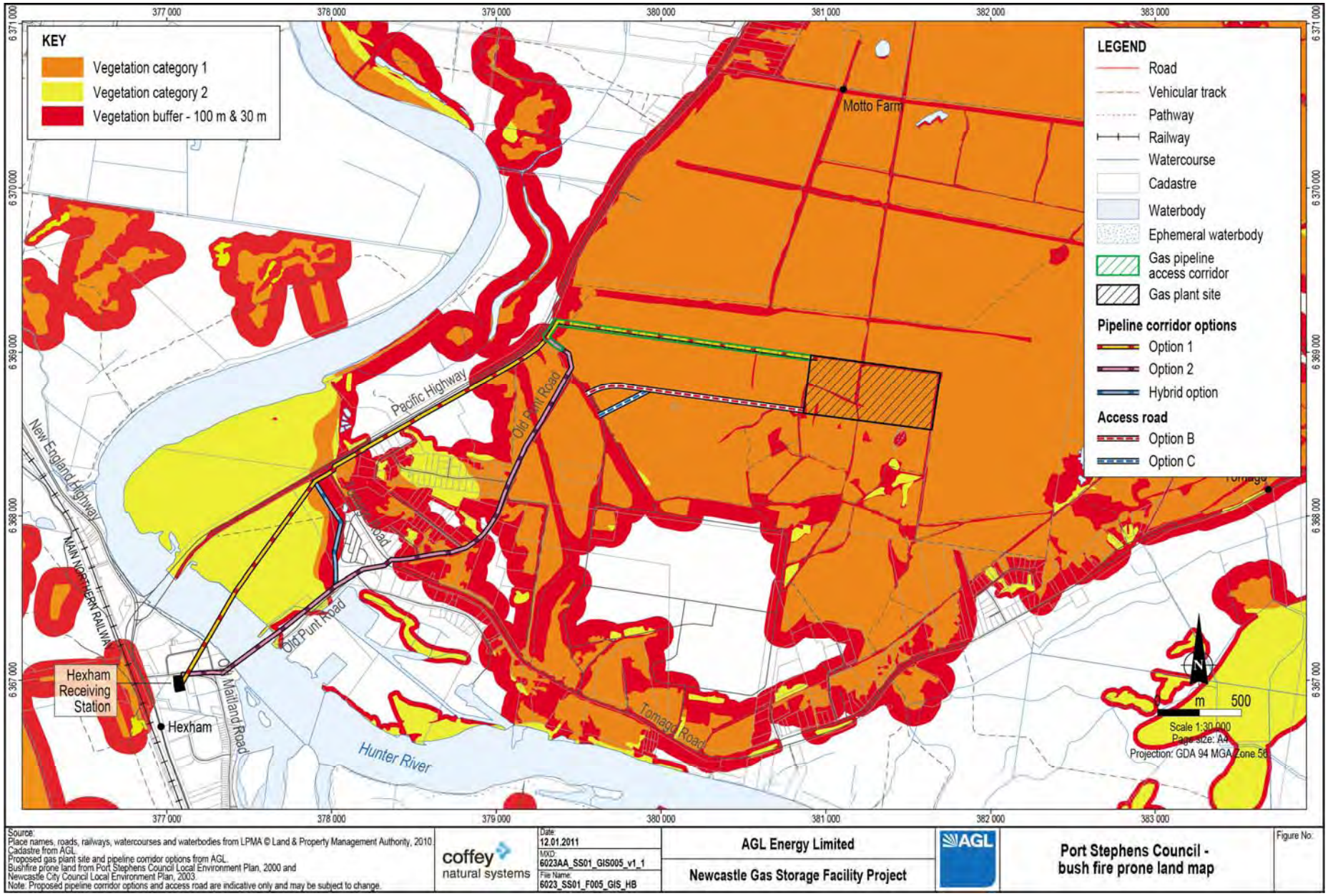

Figure 3. Development over Port Stephens Bush Fire Prone Land map.

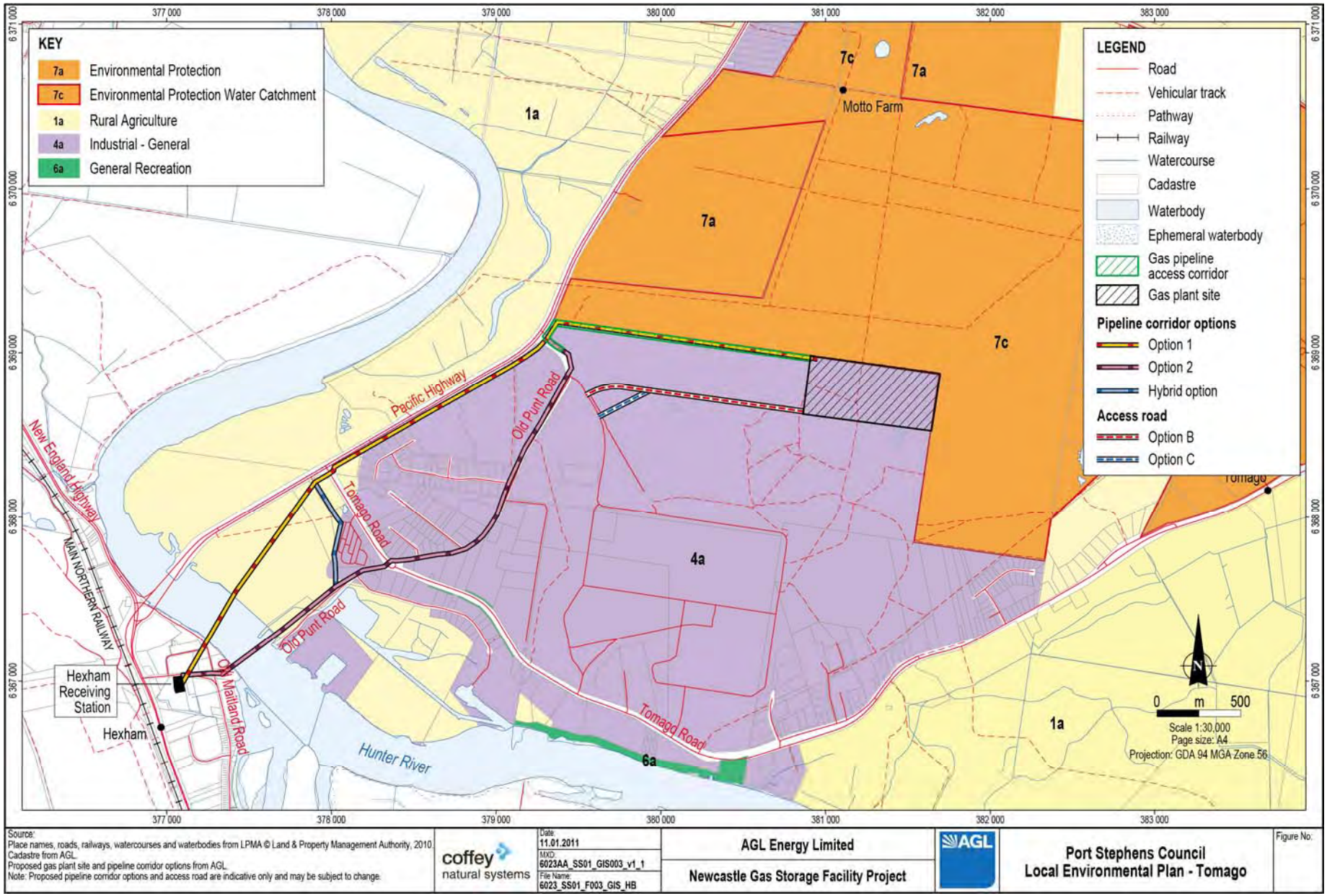

Figure 4. Land zoning map.

1.2. Proposal

The gas plant site will be located in the northeast corner of Lot 105 DP 1125747. Associated infrastructure including underground pipelines, access roads and easements are located west of the gas plant site (Figure 2). The access road and utility corridor will join the TAC northern access road (a private road owned by Tomago Aluminium Company) between 200 and 300 m south of the intersection of the TAC northern access road and Old Punt Road.

The development includes the Hexham receiving station which is located in the Newcastle LGA, however, there is no bush fire threat to this infrastructure, and this area is not considered in this assessment.

The alignment of the gas pipeline between the Hexham receiving station and the gas plant is yet to be determined. Therefore, two gas pipeline corridor options and a hybrid option are being considered (Figure 2). No above ground infrastructure is proposed within these pipeline corridors, and as such, these sections of the development are not considered as being directly impacted from bush fire.

AGL's proposal will manage and minimise potential environmental issues associated with the preconstruction phase of the project. The gas plant site and access road and utility corridor components preconstruction works comprises the initial fieldwork and site assessment stage for the overall project. Preconstruction works comprise:

- Land surveys and assessments including cultural heritage, flora and fauna;
- Pipeline and access road routing, identification of site boundaries and site location, and internal layout;
- Subsurface assessments including soils, surface water, groundwater, geotechnical, geological and land contamination;
- Stakeholder liaison including presentations and face to face meetings with local and wider community, landowners and other interested parties; and
- Other survey work including traffic, economic, air quality, noise

and vibration, flooding studies, meteorological and any other on or off site studies (i.e. bush fire) required to support a full environmental assessment of the site.

This bush fire threat assessment is integrated with the land survey and assessment, stakeholder liaison and other survey work components of the gas plant site and access road and utility corridor components preconstruction works.

The gas plant site, access road and utility corridor infrastructure is most closely defined in the Building Code Australia (BCA) as Class 5 to 8 and 10 buildings (car parks, offices, factories, fences, non-habitable buildings such as sheds or the like). The BCA does not provide for any bush fire specific performance requirements and as such AS 3959-2009 does not apply as a set of 'deemed to satisfy' (DTS) provisions. Such developments are considered under the PBP 2006 as 'other development', whereby the aims and objectives of PBP 2006 apply in relation to matters such as minimum defendable space, access, water and services, emergency planning and landscape/vegetation management.

Recommendations have been made to assist AGL in ensuring the gas plant site and associated infrastructure, and attending staff and emergency services are adequately protected from potential bush fire impact, and that after the construction and during operation of the GSF project, takes precaution to avoid the start and spread of bush fires on the site and surrounding lands.

1.2.1. PBP 2006 Aims and Objectives

All development on bush fire prone land must satisfy the aims and objectives of PBP 2006. The aims of PBP 2006 is to use the NSW development assessment system to provide for the protection of human life (including fire fighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, on-site amenity and protection of the environment.

The objectives are to:

- Afford protection for occupants of any building from exposure to a bush fire;
- Provide for a defendable space to be located around buildings;
- Provide appropriate separation between a hazard and buildings

which, in combination with other measures, prevent direct flame contact and material ignition;
- Ensure that safe operational access and egress for emergency service personnel and residents is available;
- Provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the Asset Protection Zone (APZ); and
- Ensure that utility services are adequate to meet the needs of fire fighters (and others assisting in bush fire fighting).

1.3. Legislation

The classes of buildings to be constructed for the GSF will be assessed under the provisions of section 79BA of the *Environmental Planning and Assessment Act, 1979* (EP&A Act 1979). This section of the Act requires compliance with PBP 2006.

1.3.1. Major Development

Part 3A of the EP&A Act provides for integrated assessment of development taking into account bush fire risk. The proponent should consult with PBP 2006 when selecting sites for development and undertaking environmental assessments.

1.3.2. PBP 2006 and Other Development

Other development refers to applications for developments that are not residential/ rural residential subdivisions, SFPPs or residential infill (i.e. industrial infrastructure). Compliance with section 79BA of the EP&A Act 1979 does not require referral to the NSW RFS, however, if the proponent or consent authority is concerned that development does not meet the aim and objectives of PBP 2006, then the matter may require referral to the NSW RFS for advice.

To satisfy the PBP 2006, other development should:

- Note the available bush fire protection measures;
- Satisfy the aims and objectives of PBP 2006;
- Consider any matters listed for specific purposes (Class 10 building); and
- Propose an appropriate combination of bush fire protection measures, with evidence that the intent of each measure is satisfied.

1.3.3. Planning Policies and Guidelines

- **Environmental Planning and Assessment Act**, 1979 (EP&A Act);
- **Rural Fires Act 1997** (RF Act);
- **NSW RFS Guidelines Planning for Bush Fire Protection 2006** (PBP 2006);
- **Port Stephens Local Environmental Plan 2000; and**
- **Newcastle Local Environmental Plan 2003.**
- **Australian Standards AS3959-2009 – Construction in Bushfire Prone Areas.**
- **European LNG Code, EN 1473:2007**

2. Bush Fire Hazard Assessment

This bush fire assessment for the proposed gas plant site utilises the methodology recommended in Appendix 3 of PBP 2006. Specific fire calculations have been modelled on the method detailed in Appendix B of AS3959-2009.

The assessment procedure used to determine the category of bush fire attack in accordance with PBP 2006 is as follows:

a) Determine vegetation types and classes around the site as follows:

- Identify all vegetation in each direction from the proposed building line on the development site for a distance of 140m taking into consideration canopy cover, shrub and groundcover species.
- Classify the vegetation type (from, Keith 2004) and specified fuel loads (t/ha).

b) Determine the distance between the bush fire prone vegetation (identified as the edge of the foliage cover) and the building line.

c) Determine the average slope of the land between the building or building site and the vegetation.

d) Determine the Fire Danger Index (FDI) rating from the associated council from Table A2.3.

e) Ascertain the bush fire behaviour and category of bush fire attack applicable to the site by assessing the relevant FDI, determined vegetation, distance and slope classes. The determination of exact bush fire outputs can also be found using the calculations detailed in AS3959 Appendix B (Method 2).

- If the nearest vegetation is 100m or more away, the level of bush fire attack is categorised as Bush Fire attack Level (BAL) low.

f) Establish the most appropriate level of construction for the development by referring to Australian Standard AS 3959-2009 *Construction of buildings in bush fire-prone areas* (AS 3959) and/or the performance criteria and acceptable solutions in PBP 2006.

g) Apply the calculations detailed in AS3959 Appendix B (Method 2) to

detail the exact radiant heat yields and fire behaviour.

2.1. Bush Fire Hazard (Vegetation)

A flora and fauna assessment has been conducted over the subject site by **ecobiological** (2010). The summary of vegetation types on the site had recorded a total of six defined native vegetation communities (Figure 5), as well as an additional two communities along the gas pipeline routes. In addition, two rehabilitated vegetation communities were identified on the subject site. The following list details the vegetation type and classification:

- Coastal Sand Apple - Blackbutt Forest (Plate 1)- *Dry Sclerophyll Forests - (shrubby subformation)*;
- Redgum - Apple - Banksia Forest- *Dry Sclerophyll Forests - (shrubby subformation)*;
- Seaham Spotted Gum Ironbark Forest (Plate 2)- *Dry Sclerophyll Forests - (shrub/grass subformation)*;
- Freshwater Wetland Complex- *Freshwater Wetlands*;
- Swamp Mahogany - Paperbark Swamp Forest- *Forested Wetlands*;
- Tomago Sand Swamp Woodland- *Dry Sclerophyll Forests - (shrubby subformation)*.
- Heath Rehabilitation (Plate 3) – *Tall Heath*;
- Woodland Rehabilitation- *Dry Sclerophyll Forests - (shrubby subformation);*
- Alluvial Tall Moist Forest (Plate 4) - *Wet Sclerophyll Forests (Shrubby subformation)*; and
- Phragmites Rushland (Plate 5)- *Coastal Freshwater lagoon*.

2.1.1. Vegetation Type Determination

The vegetation types potentially impacting the GSF are dry sclerophyll forest vegetation with shrub and shrub/grass formations. Estimated fuel loads for this vegetation formation is 25t/ha surface fuel load and when including canopy fuel loading, totals a maximum fuel load of 35t/ha.

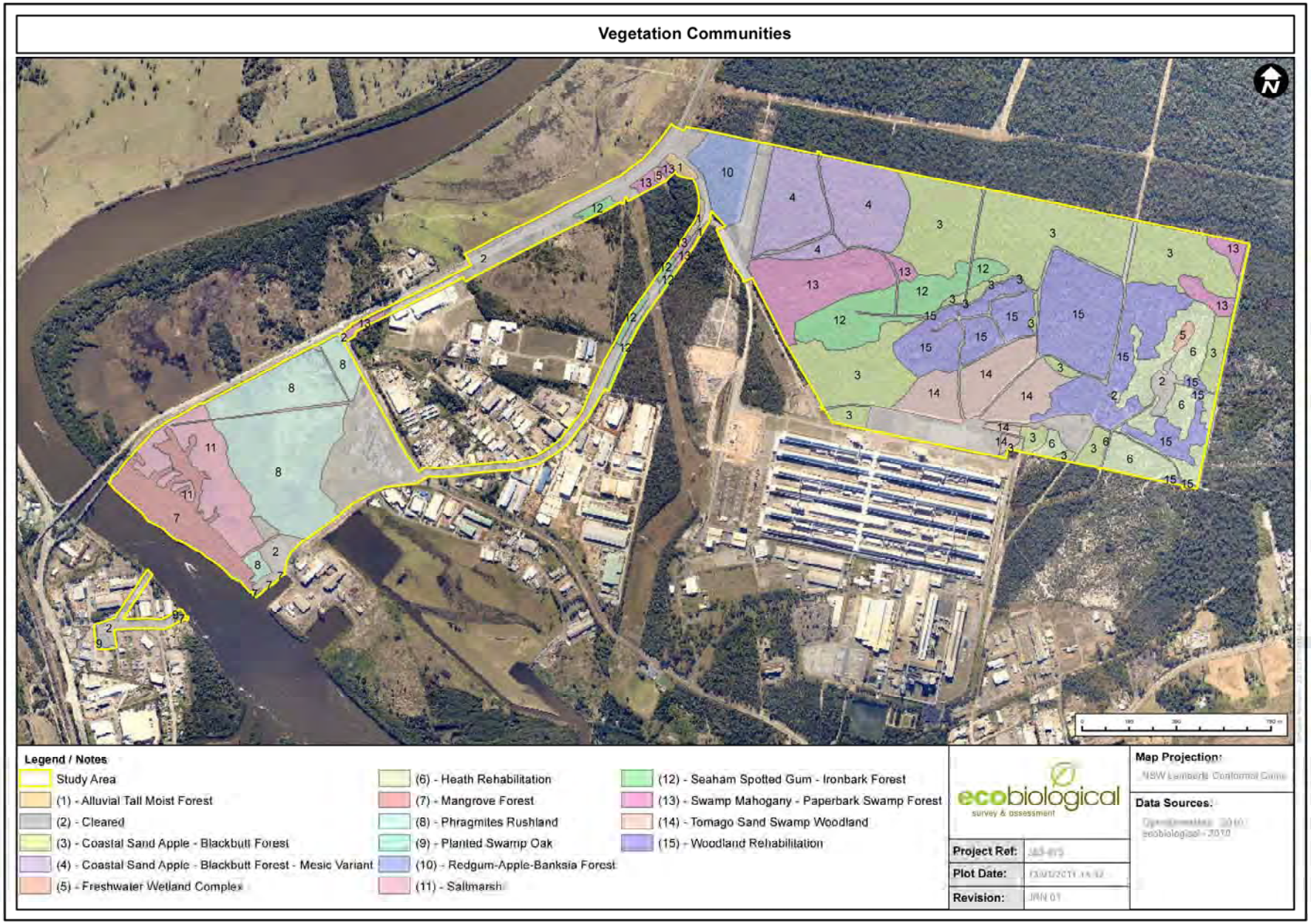

Figure 5. Vegetation map.

Plate 1: Photograph of typical Coastal Sand Apple - Blackbutt Forest on the subject site.

Plate 2: Photograph of Seaham Spotted Gum Ironbark Forest on the subject site.

Plate 3: Photograph of Heath Rehabilitation on the subject site.

Plate 4: Photograph of Alluvial Tall moist Forest along the potential gas pipeline route.

Plate 5: Photograph of Phragmites Rushland on the gas pipeline route.

2.2. Effective Slope

The effective slope is the slope of the land having bush fire prone vegetation and influencing bush fire behaviour toward the proposed development. The effective slope for the gas plant site is measured to be flat (0°).

2.3. Fire Weather

Newcastle and Port Stephens are within the Greater Hunter Region and have FDI rating set at FDI 100.

2.4. Bush Fire Behaviour

The bush fire behaviour for dry sclerophyll forest, on flat land, has been assessed using the Method 2 (Appendix B AS3959-2009) (calculations shown in Attachment 1). The outputs from this method 2 are:

- Fire intensity = 54250 kW/m;
- Rate of spread = 3km/hr;
- Flame angle = 60 degrees;
- Flame length = 23.7m.

2.5. APZ Separation and Defendable Space

APZ are buffer zones that help to ensure that a progressive reduction in fuel occurs between the bush fire hazard and building site. This area aims to provide a defendable space to manage heat intensities at the building surface.

The project has defined 4 specific heat yields that need to be assessed at constructions within the GSF, specifically the buildings, the gas plant and the LNG storage tank. These setbacks are for

1. PBP 2006 setback requirements;
2. NSW Department of Planning setback requirements;
3. European LNG Code, EN 1473:2007 setback requirements; and
4. AGL request for radiant heat flux at the outer storage tank.

The setbacks have been detailed in figure 6.

2.5.1. PBP 2006 Setback Requirements

Industrial developments do not require specified APZ setbacks which are associated with residential developments. However, the GSF project has potential to be impacted from radiant heat and flame contact, which could affect the construction integrity.

- A standard 25m APZ setback from edge of bushland to building infrastructure at the gas plant site should be provided. This level of setback has been recommended to prevent excessive radiant heat and flame contact potentially impacting the structural integrity of infrastructure.
- Flame lengths in dry sclerophyll forest vegetation shrub and shrub/grass formations on flat slope are measured at 23.7m. Therefore, a minimum 25m APZ would offer the buildings within the gas plant site sufficient space to avoid flame contact.
- The radiant heat calculated at the building surface with a 25m APZ is 29.36kW/m^2 (Method 2, Appendix 1).

2.5.2. NSW Department of Planning Setback Requirements

The NSW Department of Planning identify a radiant heat 23kW/m^2 to determine potential for propagation as a result of structural failure. The heat radiation levels of 23 kW/m^2, as the result of fire incidents at a hazardous plant, may affect a neighbouring installation to the extent that unprotected steel can suffer thermal stress that may cause structural failure (NSW Department of Planning, 2002). This may trigger a hazardous event unless protection measures are adopted. The processing plant and LNG storage tank can be considered as hazardous plant.

- An APZ of 31m has been calculated to achieve a radiant heat of 22.53 kW/m^2 (less than 23kW/m^2) at these hazardous plant structures (Method 2, Appendix 1).

2.5.3. European LNG Code, EN 1473:2007 Setback Requirements

This European Standard gives guidelines for the design, construction and operation of all onshore liquefied natural gas (LNG) installations including those for the liquefaction, storage, vaporisation, transfer and handling of LNG. Separation and plant layout is required to take into consideration the impacts of radiant heat flux, such as heat from a bush fire.

- An APZ of 43m has been calculated to achieve a radiant heat of 14.53 kW/m^2 (less than 15kW/m^2) to satisfy this standard (Method 2, Appendix 1).

2.5.4. AGL Request for Radiant Heat at Outer Storage Tank

AGL have also requested information relating to the expected radiant heat flux at the outer storage tank.

- Based on the conceptual layout, the outer LNG storage tank is measured at a point on the outside of a 60 m diameter, resulting in approximately 74m separation from bushland interface north and south. The result radianty heat flux at the outer storage tank will be 6.21kW/m^2 (see Method 2 calculation, Appendix 1).

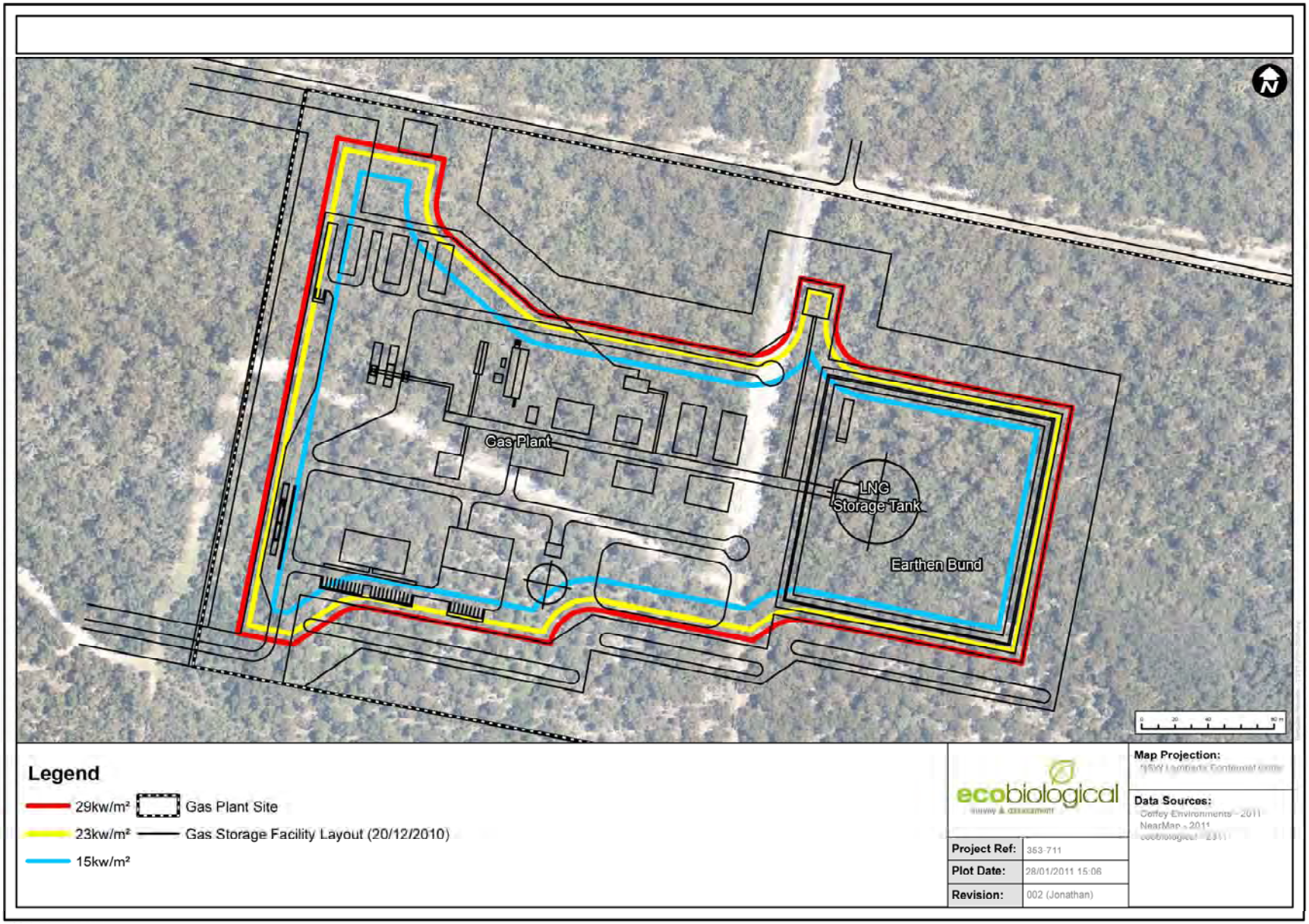

Figure 6. APZ Separation Zones and Relevant Radiant Heat Flux.

2.6. Category of Bush Fire Attack and Construction Standards

2.6.1. Category of Bush Fire Attack

The expected maximum flame length and radiant heat from the vegetation to the northeast has been estimated using the Method 2 (Appendix B AS3959-2009)(Attachment 1). The category of attack to the perimeter of the gas plant site is BAL 40.

2.6.2. Construction Standards

In general, the BCA fire safety construction provisions for this class of buildings are taken as acceptable solutions. However, the gas plant site may require protection against direct flame and radiant heat. This can be provided through APZ setbacks and considered design of the gas plant site. Construction of perimeter buildings and infrastructure within the gas plant site should meet minimum BAL 40 (AS3959-2009). BAL 29 applies after 26m separation from bushland interface.

2.7. Access

The intent of access measures is to provide safe operational access to structures and water supply for emergency services, while people are seeking to evacuate from an area.

The proposed access and utility roads and pipeline corridor provisions have been detailed in Figure 2. The proposed main access road extends east for approximately 1.4km from the TAC northern access road to the gas plant site. This access will traverse through bush fire prone vegetation. An alternative egress route is provided within the pipeline access corridor to the north of the main access road. Further to this on-site provision, the lands to the north of the subject site have significant power and water utility access roads that dissect the forested areas. These roads are constructed to carry heavy vehicles and should be made available for the NSW RFS in the event of any local bushfire.

The main access road should be constructed to allow both attending emergency vehicles and evacuating vehicles to pass unimpeded. To achieve this, the main access road construction should support a road system equivalent to the public road performance criteria and acceptable PBP 2006 solutions. Performance criteria and the acceptable solutions are detailed in

Section 4.1.3, Page 21 of the PBP 2006. The recommendations specific to road construction and design are detailed in Section 3 of this report.

The requirement for a through road or alternate access/egress provisions is proposed along the utility road and pipeline corridor easement, north of the main access road, and through existing vehicle tracks on lands to the north.

- The utility road and pipeline corridor easement alternate egress track is proposed only for emergency situations if the main access road is blocked and people need to evacuate the gas plant site. This corridor currently supports a light vehicle access track and is unlikely to require significant construction, but would be required to be maintained for light vehicle passage.

- The existing access tracks to the north of the site are formed and within cleared and managed easements. Approval to use these tracks for bush fire fighting purposes will need to be consulted with the relevant land owner (Hunter Water Corporation).

2.8. Water Supply

The conceptual gas plant layout has a specified firewater tank facility. The water volume for this firewater tank will include and exceed the minimum 20,000l water supply specific for bush fire emergency purposes.

2.9. Bush Fire Management and Emergency Response

No bush fire management plans (BMP) or emergency response planning have been prepared for the GSF project at this stage. The requirement for bush fire maintenance plans or emergency planning should be considered prior to construction and operation, and should be conducted in liaison with the proponent, local NSW RFS and Port Stephens Bush Fire Management Committee (a committee responsible for preparing, coordinating, reviewing and monitoring the Plan of Operations and Bush Fire Risk Management Plan for their area), and surrounding landholders.

The GSF project will have good access and water supplies for fire fighting and emergency response. The access road will involve a width suitable for passing and operating, and suitable turning capabilities will be constructed at the gas plant site. The utility corridor will provide an alternate

access/egress for emergency operations.

A BMP should be prepared for the GSF project. This plan will involve landscape management, identifying the monitoring and maintenance requirements. The BMP can be integrated within the landscape management plan. The management of potential bush fire fuels surrounding and within the managed lands through hazard reduction is considered as the most suitable method of bush fire risk management. By reducing the hazard adjacent to assets, the impact upon assets from a surrounding bush fire can be managed. Hazard reduction should also serve to minimise the potential for bush fire to ignite and spread from within a site, thus reducing the impact on the neighbouring and surrounding landscape.

An Emergency Response Plan should consider the response to bush fire. Such a plan should be prepared in compliance with AS3745-2002 *'Emergency control organisation and procedures for building, structures and workplaces'*.

3. Recommendations

The following measures are recommended to mitigate the risk of bush fire on the gas plant site, access and utility roads and pipeline corridor. Provided the following recommendations are implemented in full, it is our opinion that the GSF project achieves the aims and objectives of PBP 2006.

3.1. APZ Setbacks

- A minimum 25m setback from bushfire prone vegetation is recommended from buildings within the gas plant site, to ensure radiant levels do not exceed 40kW/m² at building surfaces.
- An APZ of 31m has been calculated to achieve a radiant heat less than 23kW/m² to satisfy NSW Department of Planning requirement;
- An APZ of 43m has been calculated to achieve a radiant heat less than 15kW/m² to satisfy the European LNG Code, EN 1473:2007 requirement;
- To inform AGL, at 74m setback from bushland interface, the radiant heat expected at the outer storage tank has been calculated to achieve 6.21kW/m².

The vegetation clearance on the pipeline easement is 30m wide with bush fire prone vegetation either side. The pipeline would be underground and protected from direct bush fire impact.

APZ management for the gas plant site and the easement should maintain the fuel loads to Inner Protection Area (IPA) standards and be kept at less than 5cm height. This will be managed through frequent mowing/slashing, removing any other potential fuel loads and pruning any overhanging trees.

3.2. Access/Egress

Access to the GSF is 1.4km long. This road should meet the minimum performance requirements of PBP 2006 (Chapter 4.1):

- Main access will be accessible by two-wheel drive vehicles in all weather conditions.
- Main access road width to be 6.5m wide kerb to kerb, with 1m wide shoulders capable of the same load capacity (total minimum road width 8.5m).

- A further 5m setback from access road edges should be managed, which will form a total 18.5m wide road easement.
- The main access road will have a minimum 12m outer radius turning circle at the entry area to the gas plant site.
- The access road will have a minimum load rating of 28 tonne or 9 tonne per axle.
- The utility road and pipeline corridor as an alternate access/egress path will be 4m wide with 1m wide cleared shoulders, for specific use for light vehicles only.
- Vertical clearance for all roads of at least 4m will be maintained.
- Any proposed parking will not block traffic or obstruct fire fighter access.
- Bush fire emergency access for fire fighting units can be provided within the existing tracks on Hunter Water lands to the north of the site. This matter should be confirmed with the land owner and NSW RFS.

3.3. Water Supply for Bush Fire Protection

The water supply for the gas plant site should be modified to ensure a minimum 20,000 litre volume is available for bush fire protection at all times.

3.4. Bush Fire Management Plan

It is recommended that a Bush Fire Management Plan be prepared specifically for the gas plant site. This Plan should address the management and maintenance of bush fire mitigation infrastructure and works and be made in consultation with the NSW RFS.

3.5. Emergency Response Plan

It is recommended that prior to construction, that an Emergency Response Plan should be prepared, having regard to bush fire protection. This Emergency Response Plan should be consistent with the *RFS Guidelines for the Preparation of Emergency/Evacuation Plan*, and be in compliance with AS 3745 – 2002 '*Emergency control organisation and procedures for buildings, structures and workplaces' for residential accommodation*'.

4. Conclusion

The assessment of the GSF project will be considered under Part 3A of the EP&A Act, and will take into account bush fire risk. This report informs AGL that the GSF project can satisfy the aim and objectives of PBP 2006.

Industrial infrastructure is considered as other development in PBP 2006. The gas plant site bush fire mitigation measures have been recommended to provide protection to human life and minimises impacts on built and environmental assets from the threat of bush fire.

The objectives of PBP 2006 have been achieved through:

- Providing a recommended 25m APZ to the gas plant site, which would provide a defendable space around the structures, and avoid flame contact and radiant heat exceeding 40kW/m2.
- Providing safe operational access and egress for emergency services and evacuating staff through the provisions of suitable access road constructions;
- Utility services for fire-fighters will be provided through the provisions of water supplies, connections and access;
- Providing safe operational and emergency procedures in the event of a local bushfire through the recommendation of an Emergency Response Plan; and
- Ongoing management and maintenance for bush fire protection measures can be achieved through the recommendation of a Bush Fire Management Plan.

Further to the minimum requirements of the Planning for Bush Fire Protection document, the bushfire threat assessment indicates the GSF can comply with the reduced radiant heat requirements as directed by the NSW Department of Planning and the European LNG Code, EN 1473:2007, and as requested by AGL. The following zones have therefore been detailed:

- An APZ of 31m has been calculated to achieve a radiant heat less than 23kW/m^2 to satisfy NSW Department of Planning requirement;
- An APZ of 43m has been calculated to achieve a radiant heat less than 15kW/m^2 to satisfy the European LNG Code, EN 1473:2007 requirement;
- To inform AGL, at 74m setback from bushland interface, the radiant heat expected at the outer storage tank has been calculated to achieve 6.21kW/m^2.

5. References

Australian Standard 3959–2009: *Construction of Buildings in Bush Fire-Prone Areas.*

Keith, D. (2004). *Ocean Shores to Desert Dunes: The native vegetation of New South Wales and the ACT*. Department of Environment and Conservation, NSW.

NSW Depratment of Planning (2002). Hazardous Industry Planning Advisory Paper: No. 4 Risk Criteria for Land Use Safety Planning.

NSW Rural Fire Service (2006). *Planning for Bush Fire Protection, 2006.* A guide for Councils, Planners, Fire Authorities and Developers. Prepared in cooperation with Department of Planning NSW.

Coffey Natural Systems (2010). Preliminary Environmental Assessment, Newcastle Gas Storage Facility.

AGL (2010). AGL Gas Storage Facility Preconstruction Environmental Management Plan. July 2010.

Ecobiological (2010). Flora and Fauna Baseline Report, Old Punt Road, Tomago, NSW. Prepared for Coffey Natural Systems Pty Ltd on behalf of AGL Energy Limited.

The European Standard EN 1473:2007. BRITISH STANDARD BS EN: 1473:2007: Installation and equipment for liquefied natural gas — Design of onshore installations The European Standard EN 1473:2007 has the status of a British Standard ICS 75.200

Attachment 1

Bush Fire Attack Assessment Reports

Bushfire Attack Assessment Report

AS3959 (2009) Version 1.4.2

Print Date: 28/01/2011 **Assessment Date:** 28/01/2011

Site Street Address:	Newcastle Gas Storage Facility, Tomago
Assessor:	admin; admin
Fire Danger Index:	100 (Fire Weather Area: Greater Hunter)
Local Government Area:	Port Stephens
Alpine Area:	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: 1) 29kW/m2 zone

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	25

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5		

Program Outputs

Category of Attack:	VERY HIGH	**Peak Elevation of Receiver(m):**	10.26
Level of Construction:	BAL 40	**Fire Intensity(kW/m):**	54250
Radiant Heat(kW/m2):	29.36	**Flame Angle (degrees):**	60
Flame Length(m):	23.7	**Maximum View Factor:**	0.463
Rate Of Spread (km/h):	3	**Inner Protection Area(m):**	16
Transmissivity:	0.834	**Outer Protection Area(m):**	9

Run Description: 2) 23kW/m2 zone

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	31

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5		

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	10.74
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	54250
Radiant Heat(kW/m2):	22.53	**Flame Angle (degrees):**	65
Flame Length(m):	23.7	**Maximum View Factor:**	0.364
Rate Of Spread (km/h):	3	**Inner Protection Area(m):**	20
Transmissivity:	0.815	**Outer Protection Area(m):**	11

Run Description: 3) 15kW/m2 zone

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	43

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5		

Program Outputs

Category of Attack:	MODERATE	**Peak Elevation of Receiver(m):**	11.14
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	54250
Radiant Heat(kW/m2):	14.53	**Flame Angle (degrees):**	70
Flame Length(m):	23.7	**Maximum View Factor:**	0.243
Rate Of Spread (km/h):	3	**Inner Protection Area(m):**	30
Transmissivity:	0.786	**Outer Protection Area(m):**	13

Run Description: 4) Outer Storage Tank

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	74

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5		

Program Outputs

Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	11.5
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	54250
Radiant Heat(kW/m2):	6.21	**Flame Angle (degrees):**	76
Flame Length(m):	23.7	**Maximum View Factor:**	0.11
Rate Of Spread (km/h):	3	**Inner Protection Area(m):**	55
Transmissivity:	0.744	**Outer Protection Area(m):**	19