Appendix R Bushfire Threat Assessment

Fire Safety Study (Bushfire)

Newcastle Power Station 1940 Pacific Highway Tomago NSW 2322

Ref: 89271-20200296

Document Log: NCA19R94597

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8 May 2019

Prepared for:

Aurecon Pty Ltd on behalf of AGL Energy Limited

Fire Safety Study (Bushfire)

Newcastle Power Station 1940 Pacific Highway Tomago NSW 2322

Kleinfelder Job No. 89271-20200296

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Please note:

This report is prepared in accordance with current accepted practice as described in the NSW Rural Fire Service Guide Planning for Bushfire Protection, 2018 ï a Guide for Councils, Planners, Fire Authorities, Developers and Home Owners, AS 3959ï 2018 Construction of buildings in bushfire-prone areas, and the National Construction Code (NCC).

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

Document Control:

Version	Date	Author	Technical Review	Peer Review
1.0 NCA19R94597	8 May 2019	Tony Hawkins	Dan Pedersen BPAD Bushfire Planning & Design Accredited Practitioner Level 3	Dan Pedersen

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EXECUTIVE SUMMARY

Report Type	Bushfire Threat Assessment
Applicant's Name	Aurecon Pty Ltd on behalf of AGL Energy Limited
Applicant Contact Details	
Site Address	Newcastle Power Station 1940 Pacific Highway Tomago NSW 2322
Local Government Area	Port Stephens Council
Zoning under Lake Macquarie City Council LEP	IN1 ï General Industrial
Fire Danger Index Area Name	Greater Hunter Region, FDI 100
Bushfire Prone Land	Yes
Source methodology/s	NSW Rural Fire Service (2006), Planning for Bushfire Protection guidelines. NSW Rural Fire Service (2018), Planning for Bushfire Protection guidelines. Australian Standard 3959ï 2018: Construction of Buildings in Bushfire-Prone Areas.
Site visit date	24 April 2019
Document date	8 May 2019
Document number	NCA19R94597
Site plan/s attached	Yes
Conclusion	*This bushfire safety study provides the proponent with information regarding the assessment of the classified bushfire prone vegetation within and surrounding the subject site and the minimum performance provisions that must be addressed to comply with Chapter 8 of PBP (2018) for 'other development'.* *The study follows the guidelines provided by the Department of Planning NSW for hazardous industry.* *This bushfire study confirms that the proposed development can achieve required bushfire mitigation actions: minimum defendable space; access and water provisions; and emergency management arrangements.*

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1. SCOPE OF ASSESSMENT

AGL Energy Limited (AGL) propose to construct the Newcastle Power Station at 1940 Pacific Highway Tomago NSW 2322. The proposal is classed as critical State Significant Infrastructure (critical SSI), and Secretaryôs Environmental Assessment Requirements (SEARs, application reference SSI 9837) for this proposal have been issued under section 5.16 of the Environmental Planning and Assessment Act 1979. In its comments on the SEARs, the Rural Fire Service stipulated that AGL address the following bush fire criteria:

- Department of Planning and Environment - Hazardous Industry Planning Advisory Papers;
- The aim and objectives of *Planning for Bushfire Protection 2006;*
- Identification of potential ignition sources during construction and operation of the development; and
- Storage of fuels and other hazardous materials.

This bushfire threat report assesses the performance of the proposed Newcastle Power Station 1940 Pacific Highway Tomago NSW 2322, against the required criteria as detailed in the following:

- NSW RFS *Planning for Bushfire Protection* (PBP 2006);
- NSW RFS *Planning for Bushfire Protection* (PBP 2018);
- The Rural Fires Act 1997;
- The Environmental Planning and Assessment Act 1979;
- NSW Department of Planning *Hazardous Industry Planning Advisory Paper no. 6 Guidelines of Hazard analysis;* and

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- *Hazardous Industry Planning Advisory Paper no. 2 Fire Safety Study Guidelines.*

PBP 2006 (Section 3.1) specifically states that power generating works should not be permitted on bushfire prone land due to the potential to create a bushfire hazard. However, Planning for Bushfire Protection 2018 (PBP 2018), released in draft form at the time of writing but not yet enacted, allows for power generating works to be constructed on bushfire prone land following the preparation of a Fire Safety Study. (PBP 2018 Section 8).

On this basis, the recommendations of PBP 2018 and the aims and objectives of PBP 2006 are adopted for this report which is presented as a Fire Safety Study for the identification of bushfire related hazards and controls(PBP 2018 Section 8.3.9).

A general Fire Safety Study related to the overall operation of the NPS including ignition management from non bushfire sources, suppression of non bushfire fires and emergency management will be prepared and this bushfire report may be used to inform that overarching Fire Safety Study.

This report cannot be used for any other design unless authorised and amended by the author of this report. A full statement of limitations can be found in **Appendix 1.**

1.1 PROJECT DESCRIPTION

The subject site location is shown in **Figure 1**. The NPS consists of a dual-fuel power station, gas supply pipelines, electricity transmission easements, and associated infrastructure such as access and utilities and car parking areas. Access will be off Old Punt Road Tomago in the south eastern corner of the site.
The proposed development will require clearing of vegetation within the power station subject site, with mitigation actions in place to prevent indirect impacts to off-site vegetation.

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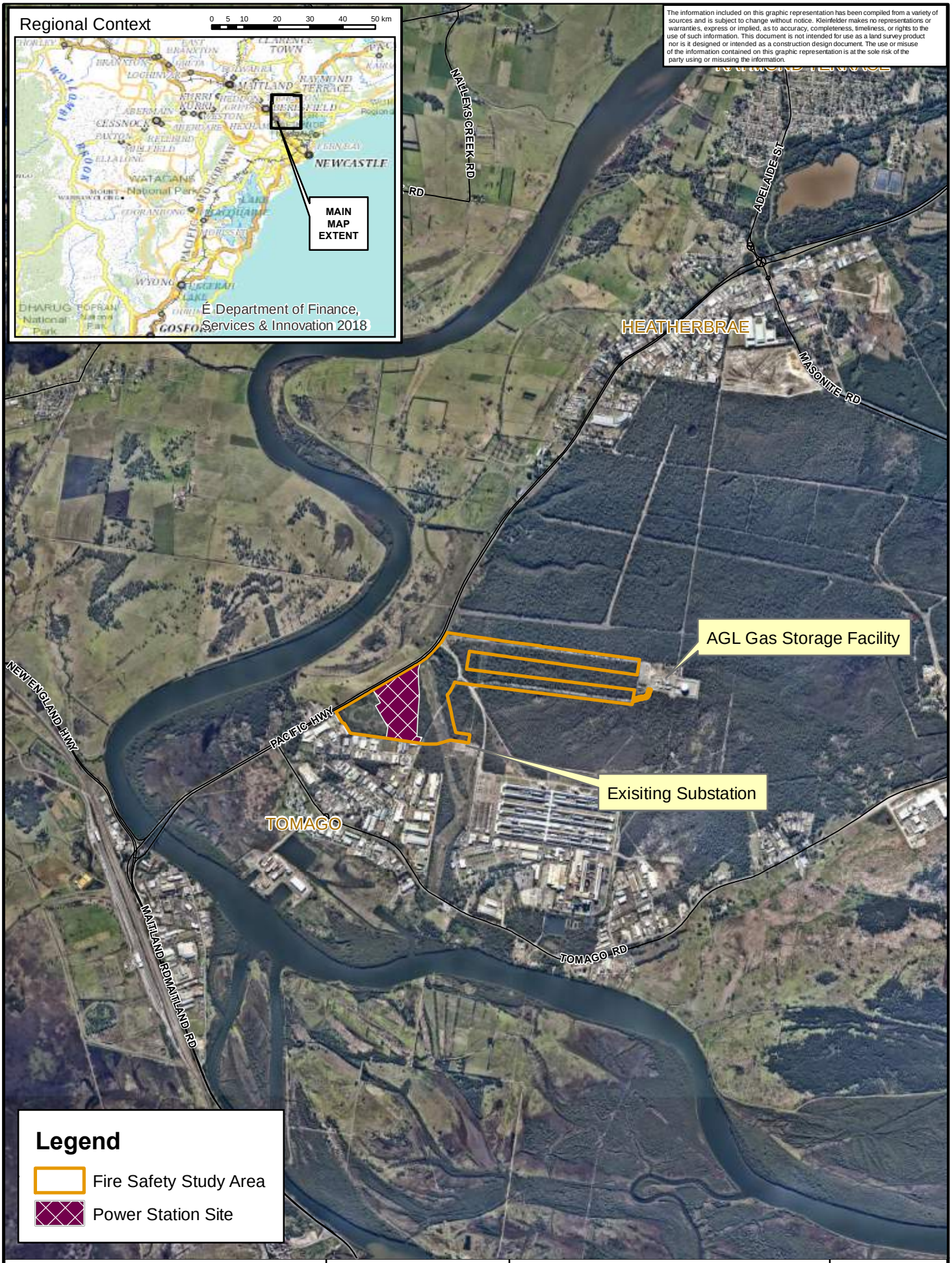

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PROJECT REFERENCE: 20200296
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DRAWN BY: THawkins
DATA SOURCE: LPI - 2018

Locality

Aurecon
AGL Newcastle Power Station
Tomago

FIGURE:
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1.2 SITE DESCRIPTION

The legal description of the proposal site is Lots 2, 3 and 4 DP 1043561, Lot 1203 DP 1229590, Lot 1202 DP 1229590 and Lot 202 DP 1173564.

The site is relatively flat with minor undulations. Surrounding areas feature a slight downslope to the east.

Vegetation on the site has been assessed (Kleinfelder 2019) and consists of cleared land, Alluvial Tall Moist Forest, Seaham Spotted Gum - Ironbark Forest, Swamp Mahogany - Paperbark Swamp Forest, Woodland rehabilitation, Coastal Sand Apple - Blackbutt Forest, Freshwater Wetland Complex, Redgum - Apple - Banksia Forest, Coastal Foothills Spotted Gum Ironbark Forest, Lower Hunter Spotted Gum - Ironbark Forest and Swamp Oak Forest.

Current land use on the Power Station Site (Lot 3) consists of a residence which will be removed, and evidence of past grazing use. Native bushland and areas cleared for linear infrastructure exist in the remainder of the study area.

The site is located in close proximity to other industrial land uses, including high voltage power and bulk gas supplies.

Access is possible to the south (Old Punt Road) and to the north (Pacific Highway) via the existing road frontages of Lot 3.

The site and immediate surrounds have no significant recorded fire history (Pers. Comms. NSW RFS).

The proposed Power Station and associated infrastructure site is mapped as Bushfire Prone Land Category 1 and buffer zone (NSW Planning Portal 2019) as shown in **Figure 2**.

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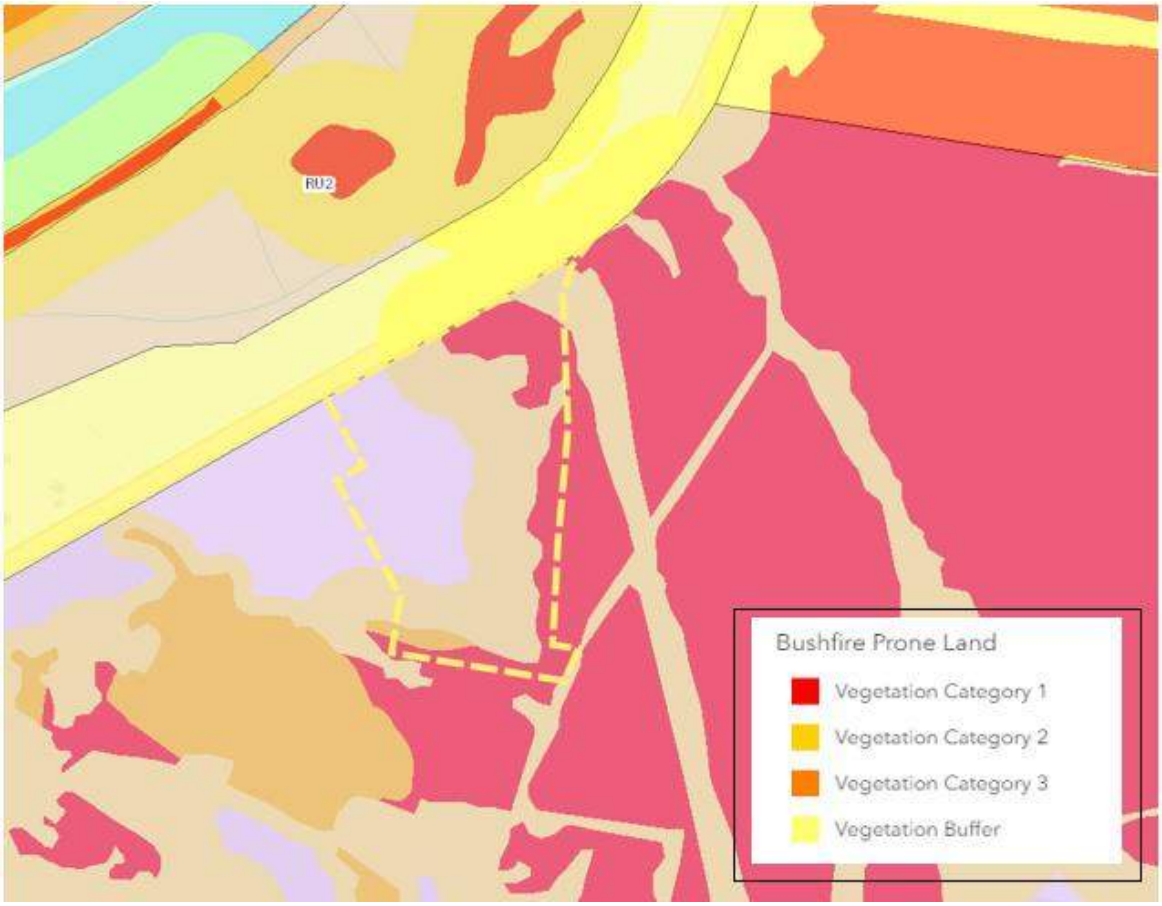

Figure 2. Bushfire prone Land map (NSW Planning Portal 2019)

1.3 SITE ASSESSMENT METHODOLOGY

Assessment of the Bushfire hazards and recommendations for prevention and mitigation strategies have been carried out with consideration of the following documents;

- NSW Department of Planning *Hazardous Industry Planning Advisory Paper no. 6 Guidelines of Hazard analysis,*
- NSW Department of Planning *Hazardous Industry Planning Advisory Paper no. 2 Fire Safety Study Guidelines,*
- Australian Standard AS3959:2018 *Construction of buildings in bushfire prone areas;* and

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- *'Guide for the Management of Vegetation in the Vicinity of Electricity Assets'* (ISSC 3, 2016).

Radiant heat exposures have been calculated using PBP 2006 Appendix 3 (site assessment methodology) and method 2 of AS3959:2018.

This Bushfire Threat Assessment has been conducted using the suggested format contained in the *Hazardous Industry Planning Advisory Paper no. 2 Fire Safety Study Guidelines* as stipulated in PBP 2018 *section 8.3.9 Hazardous Industry*. A flow chart displaying the recommended steps in the study process is shown in **Figure 3**. For the purposes of this assessment, this report will focus on hazard identification, consequence analysis and development of fire protection strategies (the first 3 stages of the HIPAP 2 fire study flow chart). Specifically, the hazard is identified as the bushfire prone vegetation (i.e. fuel), weather and ignition causing a bushfire event and affecting the NPS development and surrounds.

This report should satisfy the aim and objectives of PBP.

The aim of PBP is to provide for the protection of human life (including fire fighters) and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.

The objectives are to:

i. afford buildings and their occupants protection from exposure to a bush fire,

ii. provide for a defendable space to be located around buildings;

iii. provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition;

iv. ensure that appropriate operational access and egress for emergency service personnel and residents is available;

v. provide for ongoing management and maintenance of Bushfire Protection Measures (BPMs); and,

vi. ensure that utility services are adequate to meet the needs of firefighters.

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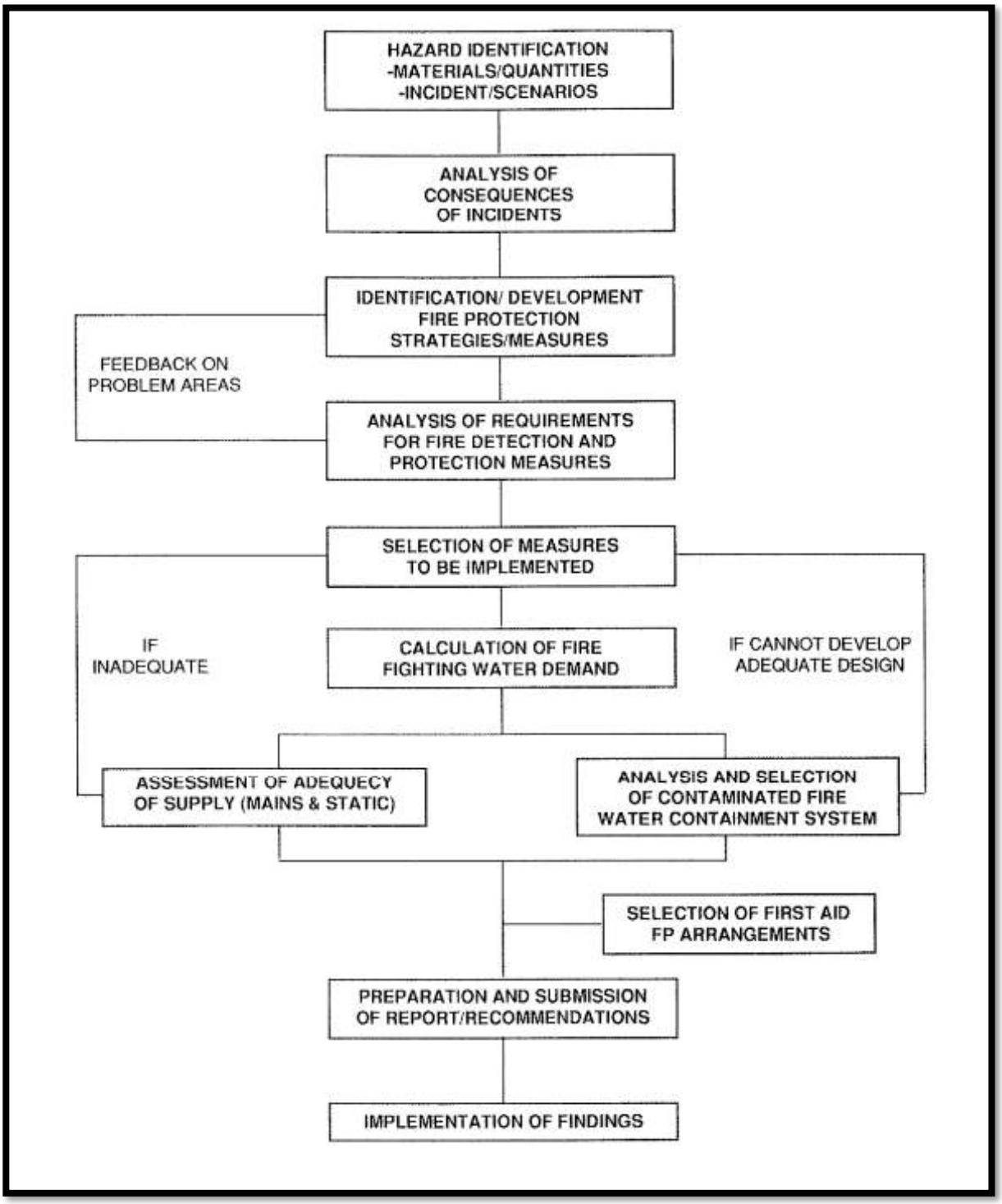
Figure 3. Fire Safety Study process



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2. HAZARD IDENTIFICATION

2.1 BUSHFIRE PRONE VEGETATION AND TOPOGRAPHY

The primary bushfire hazard (vegetation and fuel loading) currently exists to the east of Lot 3 DP1043561 on Lot 4 DP 1043561 and on Lot 202 DP 1173564. The forest vegetation and the vegetation linking across the power line easement extend for large distances and have potential to realise maximum rate of spread and fire intensity. This vegetation is on a slight downslope incline assessed at 4% (2 degrees downslope).

2.2 WEATHER

The subject site is within the Hunter Valley (Greater Hunter) Fire Region and has a Fire Danger Index (FDI) set at 100. The Fire Danger Index is identified for the bushfire prone areas of NSW and varies between 50 and 100, where 100 is considered to be a high potential for Fire Danger.

The Fire Danger Season nominally starts the first week of September and continues through to March, lasting approximately seven months. Historically, the fire season dates have varied dependent on weather and drought conditions. The region generally has a summer peak rainfall (January) followed by a vegetation growth period extending into autumn (April). Climate variations can cause the drying of grasslands in the period leading into and throughout the bushfire season.

The peak fire danger period in the Lower Hunter Valley varies according to seasonal conditions and is dependent upon weather, dryness of the landscape and fuel availability.

2.3 IGNITION SOURCE

In identifying the bushfire hazards which may potentially impact the site, consideration must be given to the source of ignition (**Table 1**). Bushfires may emanate from land external to the site and, consequently, external bushfire likelihood is outside of AGLôs management and control. Any potential bushfire originating on site would be mitigated via procedural and engineered controls.

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2.3.1 Potential Ignition Sources

Identified potential ignition sources are listed in **Table 1.**

Table 1 Potential Ignition sources

Ignition source	On site	Off site	Comment
Powerlines	X	X	Arcing during high winds, line failure, insulator failure.
Gas Pipelines (underground)	X	X	Inherently protected but susceptible to maintenance and construction activities.
Gas Pipelines (Above ground)	X	X	Inherently protected but susceptible to maintenance and construction activities.
Substations	X		Insulator failure, shorting of conductors due to intrusion by foreign objects.
Fuel Storage (Diesel)	X		Inherently protected but susceptible to maintenance and construction activities.
Operations activities	X	X	Maintenance activities, welding, land management, vehicle use.
Generator exhaust (carbon particle emission)	X		Poor maintenance or failure of exhaust spark arrestors, generator failure.
Bushfire	X	X	Lightning, Arson, Uncontrolled (by AGL) = risk of bushfire from adjoining land.

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2.3.2 Potential Ignition Scenarios

Identified scenarios associated with events that could cause or influence bushfire risk and ignition sources are listed in **Table 2.**

Table 2 Potential Ignition scenarios that are considered

Event	Cause/comments	Possible consequence
Powerline arcing	High winds, lack of insulator separators	Ignition of vegetation under and surrounding powerlines and potential bushfire. Impact on site and adjoining landowners.
Gas pipeline leak	Physical damage, pipeline failure	Jet fire igniting surrounding vegetation and potential bushfire. Impact on site and adjoining landowners.
Substation fire/arcing	Equipment failure Foreign object intrusion	Ignition of surrounding vegetation and potential bushfire. Impact on site and adjoining landowners.
Bulk Fuel Storage leak/fire	Tank failure Physical damage Radiant heat impact	Ignition of surrounding vegetation and potential bushfire. Impact on site and adjoining landowners.
Operations activities providing ignition source (welding, land management, vehicle use)	Ignition of vegetation from hot works, land management activities (slashing/mowing), vehicle use in vegetated areas.	Ignition of surrounding vegetation and potential bushfire. Impact on site and adjoining landowners.
Generator exhaust providing ignition source	Ignition of surrounding vegetation from hot exhaust carbon particles	Ignition of surrounding vegetation and potential bushfire. Impact on site and adjoining landowners.
External Bushfire	Bushfire emanating from offsite location.	Bushfire impact (embers, radiant heat and direct flame) to site assets.

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3. CONSEQUENCE ANALYSIS AND MITIGATION ACTIONS

Consequences of an uncontrolled bushfire are determined using bushfire modelling based on the Method 2 analysis (AS3959:2018), Table A1.12.5 of PBP 2018 and the potential to impact the following categories (derived from draft Aurecon power station layout, drawing ref 503269:0010):

- People (life and safety)
- Generators, Gas storage, Fuel storage
- Buildings (industrial workshop and stores, administration)
- Continuity of operations.

3.1 PEOPLE (LIFE AND SAFETY)

The minimum acceptable exposure to heat radiation (radiant heat) for personnel is considered to be 2.1 kW/m^2 or less, so as to avoid potential for injury as shown in **Table 3** (DPE 2011). To achieve this radiant heat exposure (and less) a person would need to be greater than 138m from the primary bushfire hazard (east) during a fire event.

Figure 4 identifies the 2.1 kW/m^2 at 138m from the bushfire hazard. This demonstrates that any persons (staff, contractors, visitors) operating across a majority of the NPS would potentially be exposed to unacceptable radiant heat. The most practical form of protection for life and safety is early evacuation and/or to seek shelter in a designated building or a designated safe place.

The Emergency Management and Evacuation plan will identify a designated building or safe place that has been assessed as being capable of providing refuge from the impact of bushfire. Performance criteria for the determination of a designated building will be assessed by the construction requirements of AS3959:2018 and the NSW RFS ñ*Guidelines for the identification and inspection of Neighbourhood Safer Places in NSW".*

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To control risk to life and safety, an Emergency Management and Evacuation Plan would be developed to consider any specific risks posed by bushfire impact.

Table 3: Consequences of heat radiation (Appendix 8 of Hazardous Industry Planning Advisory Paper No 2 Fire Safety Study Guidelines)

Heat Radiation (kW/m2)	Effect
1 .2	Received from the sun at noon in summer
2.1	Minimum to cause pain after 1 minute
4.7	Will cause pain in 1 5-20 seconds and injury after 30 secondsôexposure (at least second degree burns will occur)
12.6	Significant chance of fatality for extended exposure. High chance of injury. Causes the temperature of wood to rise to a point where it can be ignited by a naked flame after long exposure. Thin steel with insulation on the side away from the fire may reach a thermal stress level high enough to cause structural failure.
23	Likely fatality for extended exposure and chance of fatality for instantaneous exposure. Spontaneous ignition of wood after long exposure. Unprotected steel will reach thermal stress temperatures which can cause failure. Pressure vessel needs to be relieved or failure would occur.
35	Cellulosic material will pilot ignite within one minuteõs exposure. Significant chance of fatality for people exposed instantaneously.

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3.2 GENERATORS AND FUEL STORAGE INFRASTRUCTURE (GAS AND DIESEL)

Generator plant, equipment and fuel storage is generally designed and constructed to have a level of inherent fire resistance. However, controlled levels of radiant heat exposure and prevention of direct flame contact are recommended to maintain infrastructure integrity and provide a safe operating environment.

The thermal failure (the heat radiation levels which infrastructure has potential to fail) for the generators and fuel storage infrastructure is 23 kW/m^2. This standard has been adopted from the Hazardous Industry Planning Advisory Paper No 4 (DPE 2011). To achieve a radiant heat impact of 23 kW/m^2 or less, a separation of 32m is required between infrastructure and the bushfire hazard on the eastern side of the proposed infrastructure. This may be achieved by:

- The implementation of an Asset Protection Zone (APZ) between the infrastructure and the site boundary,
- Installing radiant heat barriers such as metal clad fencing or construct within a shed, in which case the APZ distance may be reassessed and possibly reduced, or,
- Suitable siting of infrastructure within the construction compound.

All APZ areas would provide unobstructed access to firefighting personnel (i.e. allow for a defendable space, such as a perimeter road or trail). **Figure 4** identifies the 23 kW/m^2 at 32m from the bushfire hazard.

The plant and equipment area is understood to contain bulk fuel (diesel) storage of approximately 1.5 ML capacity (Design Concept Report, Aurecon - reference 503269-002). The storage of such a quantity would require additional fire protection measures over and beyond that required for bushfire protection:

- Fire protection measures implemented in compliance with the Australian Standards AS1692:2006 *Steel tanks for flammable and combustible liquid* and AS 1940:2017 *The storage and handling of flammable and combustible liquids* will result in a suite of controls that inherently enhance bushfire protection. In addition to these general fire protection measures, consideration should be given to locating bulk fuel storage as far as practicable from the hazard vegetation on the eastern side of the site.

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- If not implemented for compliance with AS1692:2006 and AS 1940:2017, fire protection on the vegetation hazard side (east) of the plant and equipment area would include as a minimum, compliance with AS 2419.1:2005 for the installation of fire hydrants.

3.2.1 Electrical Switchyard

The electrical switchyard is incorporated into the generators classification for the purpose of this report, but its risk is assessed and mitigated using the ôGuide for the Management of Vegetation in the Vicinity of Electricity Assetsô(ISSC 3, 2016). The ISSC 3 guide states ô*Major substations in Bush Fire Prone areas shall have a total 10 m asset protection zone established surrounding the boundary fence, where only maintained lawn or grasses are permitted*ô

3.3 INDUSTRIAL BUILDINGS (ADMINISTRATION, WORKSHOPS AND STORES)

In general, the National Construction Code (NCC) fire safety construction provisions for these class of buildings are taken as acceptable solutions. However, the buildings may require protection against direct flame and radiant heat. This can be provided through APZ setbacks and considered design of the NPS site. Section 8.4 of PBP 2018 recommends that bushfire protection measures be considered for commercial and industrial development and Class 5-8 buildings. In particular, the objectives of PBP Section 8.3.1. should be applied;

- to provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation;
- to provide adequate services of water for the protection of buildings during and after the passage of bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building;
- to provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development; and
- consideration of storage of hazardous materials away from the hazard wherever possible.

The general fire safety construction provisions (of the NCC) are taken as acceptable solutions however construction requirements for bush fire protection will need to be considered on a case-by-case basis.

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The current proposed design has location of the administration, workshops and stores buildings setback 23 metres from the eastern bushfire hazard vegetation. From Table A1.12.5 of PBP 2018, a distance of 23m would expose the proposed buildings to a Bushfire Attack Level (BAL) of BAL 40. The recommended APZ areas are shown in **Figure 4.** Therefore, these buildings on the eastern side of the proposed area should be constructed to a minimum construction standard of BAL 40.

The setback area should be considered as an APZ, and should provide unobstructed access to firefighting personnel, such as a perimeter road or track.

3.4 GAS PIPELINES AND ELECTRICAL TRANSMISSION LINES.

3.4.1 Gas Pipelines

Underground gas pipelines are existing on Lot 1203 DP 1229590 and Lot 202 DP 1173564. It is proposed to install additional pipelines and infrastructure from the existing AGL Gas Storage Facility to the NPS along the existing routes and extending to the NPS.

Bushfire mitigation measures in the form of vegetation setbacks (30m wide easement) from the existing pipeline are approved (Planning and Assessment Commission, Application MP 10-0133) and have been implemented.

Proposed pipelines would take advantage of the existing bushfire protection measures. Where the final design layout demonstrates that any existing measures are insufficient, compliance with the requirements of the applicable pipeline standard; European LNG Code, EN 1473:2007 would be necessary.

3.4.2 Electrical transmission lines

Electrical transmission lines are proposed to be extended from the existing substation on Lot 202 DP 1173564 to the NPS.

The proposed route of the transmission lines would traverse existing cleared easements and uncleared sections of native bushland.

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Where clearing is required, easement widths would be determined in accordance with the bushfire protection requirements of the Guide for the Management of Vegetation in the Vicinity of Electricity Assets (ISSC 3 ï 2016). Actual requirements would be dependent on final design and determined by conductor voltage capacity and insulation type.

3.5 CONTINUITY OF OPERATIONS

There are no specific requirements to protect continuity of operations. However, the nature of the proposed infrastructure, being state significant, would require that the impact of bushfire be minimised and subsequently avoid or minimise any potential operational recovery period.

The application of the bushfire protection measures recommended in this study and the implementation of an Emergency Management and Evacuation Plan is critical to achieving rapid recovery following a bushfire event.

3.6 EMERGENCY MANAGEMENT PLANNING

Emergency management and personnel evacuation are bushfire protection measures that are required to mitigate bushfire risk, protect assets and minimize impacts to operations. An Emergency Management and Evacuation Plan for the subject site would be developed consistent with the following:

- NSW RFS. A guide to developing a Bush Fire Emergency Management and Evacuation Plan; and

- Australian Standard AS 3745:2010 Planning for Emergencies in Facilities.

The requirement for bush fire maintenance plans or emergency planning would be considered prior to construction and operation, and would be conducted in liaison with the proponent, local NSW RFS, NSW Fire and Rescue, 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).

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3.5.1 Fire Emergency Services Response

The Fire Safety Study Guidelines (HIPAP 2, DPE 2011) identifies Fire and Rescue response times and access would be taken into account. This would be provided through the Emergency Management and Evacuation Plan and would also consider the NSW RFS response for bushfire event. The following information provides the basis for response times.

Fire Rescue NSW

- Tarro Fire Station response time approximately 9 minutes
- Raymond Terrace Fire Station response time approximately 11 minutes

Tarro and Raymond Terrace Fire Stations are retained staff fire stations. A turnout time of approximately 5 minutes should be added to the estimated response times.

NSW Rural Fire Service

- Raymond Terrace Rural fire Brigade response time approximately 11 minutes
- Thornton Rural fire Brigade response time approximately 13 minutes

Raymond Terrace and Thornton Rural Fire Brigades are volunteer staff fire stations. A turnout time of approximately 5 ï 10 minutes should be added to the estimated response times.

3.7 ACCESS

Main access to the site would be off Old Punt Road Tomago, which has a 7m wide sealed carriageway and is a through road. Old Punt Road is compliant with the requirements of PBP 2018 (Table 7.4a).

To achieve compliance with PBP 2018, the internal road system would consist of a perimeter road and a network of service roads. The perimeter road would need to be 8 metres wide and form a part of the APZ setbacks, and would provide suitable access and emergency egress, and defendable space for a bushfire event.

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Service roads would be sealed roads and a minimum of 4 metres width, sign posted and direct access toward the main entry.

Currently, no alternate access/egress has been identified or planned. An alternate access point is a critical emergency response factor, and is recommended for bushfire response situations, in the event the main access to Old Punt Road or Old Punt Road itself is cut off or closed. A potential alternative vehicular egress point is shown in **Figure 4.**

3.8 WATER SUPPLIES

Water for fire fighting would be provided through the installation of a ring main water supply and hydrants throughout the infrastructure section of the site.

It is assumed that the design and layout of a fire fighting water system, including capacities and provision for containing contaminated water would be incorporated into the general fire safety study and resultant design for the site.

As a minimum, the water supply for the site would be capable of complying with the Australian Standard AS2419.1:2017 Fire hydrant installations. System design, installation and commissioning

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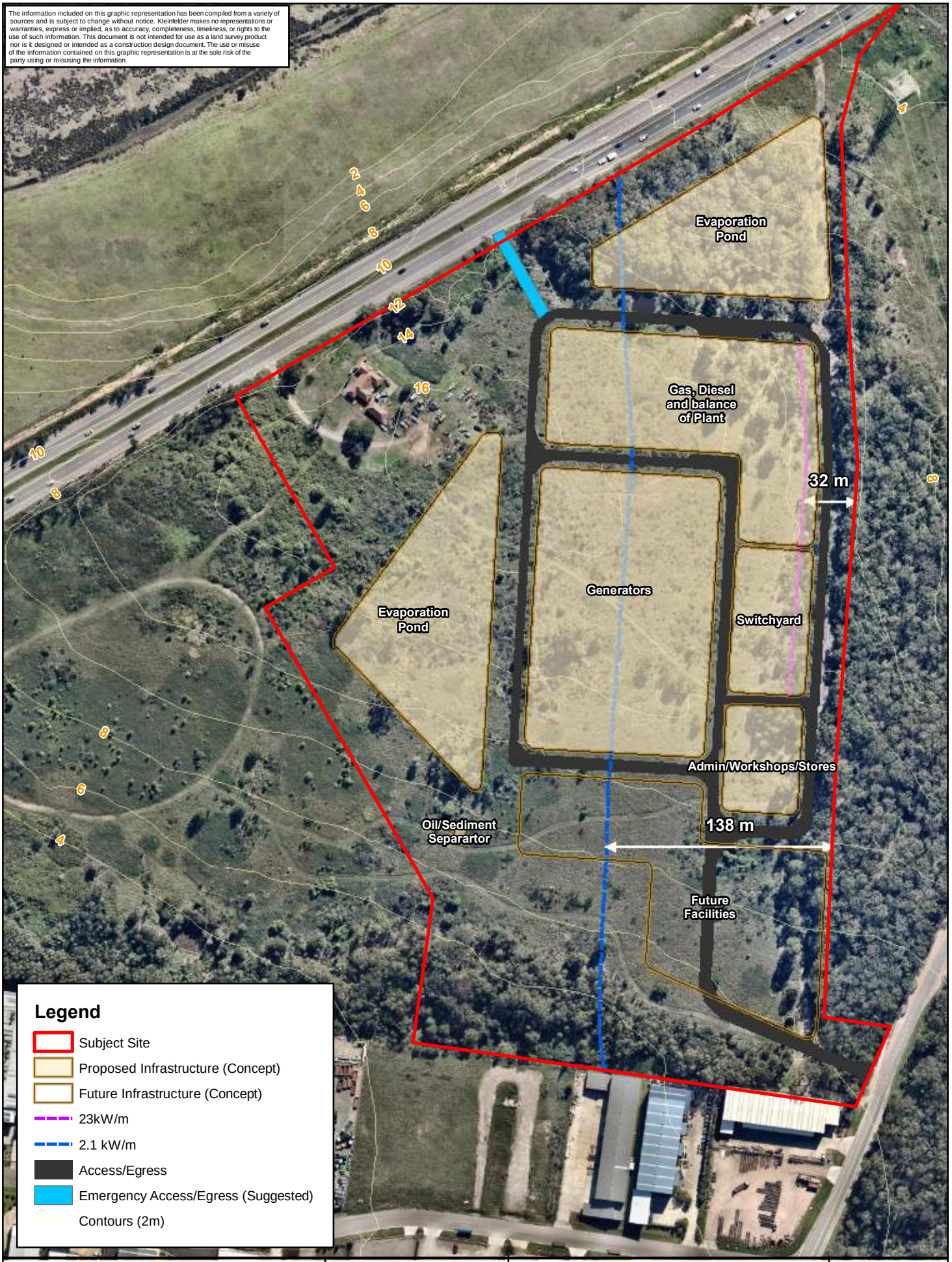

Legend

- Subject Site
- Proposed Infrastructure (Concept)
- Future Infrastructure (Concept)
- 23kW/m
- 2.1 kW/m
- Access/Egress
- Emergency Access/Egress (Suggested)
- Contours (2m)

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DATA SOURCE:
LPI - 2018
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Aurecon - 2019

Fire Safety Study

Aurecon
AGL Newcastle Power Station
Tomago

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Table 4: Summary of Consequences and Mitigation Actions

Asset	Consequence and Acceptable Risk/Performance	Fire Modelling (Method 2 AS3959/PBP 2018)	Mitigation action
People (life and safety)	Exposure to radiant heat exceeding 2.1kW/m2 will result in injury-fatality (Appendix 8 of Hazardous Industry Planning Advisory Paper No 2 Fire Safety Study Guidelines).	To achieve 2.1 kW/m2 exposure, any person would need to be minimum 138m from bushfire hazard (eastern forested area).	- Emergency management planning would provide the procedures required to ensure persons are not exposed to bushfire impacts. - A safe place to shelter would be identified in the Emergency Management and Evacuation Plan. - Safe access and egress would be provided.
Generators and Fuel (Gas and diesel) storage infrastructure	Gas Storage infrastructure has potential to display thermal stress when exposed to radiant heat exceeding 23kW/m2. (DPE 2011 Hazardous Industry Planning Advisory Paper No 4).	To achieve 23kW/m2 exposure, gas storage and generators would need to be minimum 32m from bushfire hazard (eastern forested area).	Mitigation options: - Siting the infrastructure and/or applying suitable APZ (NSW RFS Standards for APZ 2005), to achieve a 32m separation from hazard vegetation, or, - Radiant heat barrier options where final design precludes a compliant APZ. - Emergency management would be supported by access and water supplies. - Defendable space in the form of unobstructed access for firefighting is to be provided around all assets.
Substation	10m clearance to vegetation required (ISSC3).	N/A	Would be achieved through construction of 32m APZ for infrastructure.
Industrial Buildings (administration, workshops and stores)	Industrial buildings can have capacity to withstand bushfire impacts (flame contact, radiant heat and ember). Construction requirements for industrial buildings assumed to be adequate (NCC), consequence is based on the building vulnerability and number of people likely to be occupying the building.	PBP 2018 (Table A1.12.5) determined BAL40 at 22-29m. To achieve BAL40 to industrial buildings, a minimum 22m separation required.	Mitigation options; - Siting the infrastructure and/or applying suitable APZ (NSW RFS Standards for APZ) - Radiant heat barrier options where final design precludes a compliant APZ.

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Asset	Consequence and Acceptable Risk/Performance	Fire Modelling (Method 2 AS3959/PBP 2018)	Mitigation action
	40kW/m2 (BAL40) is considered maximum acceptable exposure (PBP section 7 and 8.4)		- Emergency management would be supported by access and water supplies. - Defendable space in the form of unobstructed access for firefighting is to be provided around all assets.
Continuity of Operations	No specific performance requirements, but to minimize bushfire impacts and assist rapid recovery period post burn.	As detailed above	Apply all BPM as detailed above.
Emergency Management Planning	A Emergency Management and Evacuation Plan prepared consistent with the NSW RFS publication A Guide to Developing a Bushfire Emergency Management and Evacuation Plan. Fire Brigade Response (DPE 2011).	N/A	Prepare an Emergency Management and Evacuation Plan.
Access Requirements	An alternative egress should be provided to control the risk of the main evacuation route being impacted by bushfire.	N/A	An alternative egress to be identified and constructed.
Water Supply	The main fire fighting water supply system for the site should incorporate bushfire fire fighting capability. Bushfire capability should be designed as a minimum to AS2419.1:2017 (PBP 2018).	N/A	Provide fire hydrant system consistent with Australian Standards

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4. COMPLIANCE WITH PBP 2006 AND 2018.

All development in NSW on Bushfire Prone Land (BPL) is required to satisfy the stated aims and objectives contained within PBP.

PBP 2006 provides acceptable solutions for residential and special fire protection purpose (Schools, hospitals, assembly areas etc.) developments. However, due primarily to the varied nature of Industrial and commercial developments, PBP does not provide specific Bushfire Protection Measures (BPMs). As such, each development of this type is assessed on a case by case basis and BPMs is designed on an individual basis.

For power stations in particular, PBP 2006 recommends that hazardous industry not be constructed on bushfire prone land. However, this recommendation is not present in PBP 2018 and hazardous industry is deemed permissible with an appropriate level of bushfire protection measures determined by a Fire Safety Study.

Due to the impending enactment of PBP 2018, it is considered appropriate to adopt the methodology described in PBP 2018 section 8.3.9 and prepare a Fire Safety Study to determine appropriate bushfire protection measures for the NPS.

The NPS proposal is unique in nature and is captured in PBP 2018 as ñOther Developmentò, specifically, sections 8.3.9. Hazardous industry and 8.4 Commercial and Industrial Development.

The implementation of the bushfire protection measures recommended in this Fire Safety Study would result in compliance with the aims and objectives of PBP.

Compliance with the aims and objectives of PBP 2018 is summarised in **Table 5**.

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Table 5. PBP Aims and Objectives compliance

PBP 2018 1.1 Aims and Objectives	
Intent:	**Complies with PBP (2018): YES**
i. Afford buildings and their occupants protection from exposure to a bush fire	The provision of APZ setbacks as detailed in **section 3.1 and 3.2** of this report and relevant construction standards would provide adequate protection from bush fire exposure.
ii. Provide for a defendable space to be located around buildings	**Complies with PBP (2018): YES**
	The provision of APZ setbacks as detailed in **section 3.3** of this report would provide adequate protection from bush fire exposure and an operational space for fire fighting.
iii. Provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition	**Complies with PBP (2018): YES**
	The provision of APZ setbacks as detailed in Sections **3.1, 3.2, 3.3 and 3.4** of this report would provide adequate protection from bush fire exposure.
iv. Ensure that appropriate operational access and egress for emergency service personnel and residents is available	**Complies with PBP (2018): YES**
	Access provisions as detailed in **Section 3.6** of this report would achieve compliance with the requirements of PBP.
v. Provide for ongoing management and maintenance of BPMs	**Complies with PBP (2018): YES**
	Maintenance of APZ areas should be in accordance with PBP 2018 Appendix 4 and in perpetuity.
vi .Ensure that utility services are adequate to meet the needs of firefighters.	**Complies with PBP (2018): YES**
	The provision of services as per **Section 3.7** of this report would achieve compliance with PBP 2018.

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5. REFERENCES

NSW Rural Fire Service. ñPlanning for Bushfire Protection 2018ò State of New South Wales 2018.

NSW Department of Planning 2019. Planning Secretaryôs Environmental Assessment

Requirements SSI 9837

NSW Department of Planning 2011. Hazardous Industry Planning Advisory Paper no. 6 Guidelines of Hazard analysis. Retrieved from; https://www.planning.nsw.gov.au/-/media/Files/DPE/Other/hazardous-industry-planning-advisory-paper-no-3-risk-assessment--2011-01.pdf?la=en

NSW Department of Planning. Hazardous Industry Planning Advisory Paper no. 2 Fire Safety Study Guidelines. Retrieved from; https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/fire-safety-study-guidelines-2011-01.pdf?la=en

NSW Department of Planning. Hazardous Industry Planning Advisory Paper no. 4. Risk Criteria for Land Use Safety Planning. Retrieved from: https://www.planning.nsw.gov.au/-/media/Files/DPE/Other/hazardous-industry-planning-advisory-paper-no-4-risk-criteria-for-land-use-safety-planning-2011-01.pdf?la=en

Kleinfelder Australia 2019. Flora and Fauna Study (Draft).

Australian Standard AS3959:2018 Construction of buildings in bushfire prone areas. SAI Global.

NSW Rural Fire Service. 2005. Standards for Asset Protection Zones.

ISSC3 2016- Guide for the Management of Vegetation in the Vicinity of Electricity Assets

Australian Standard AS1692:2006 Steel tanks for flammable and combustible liquids

Australian Standard AS 1940:2017 The storage and handling of flammable and combustible liquids.

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Australian Standard AS2419.1:2017 Fire hydrant installations System design, installation and commissioning

Aurecon, 27 December 2018. Newcastle Power Station Design Concept Report - reference 503269-002, Rev B

NSW RFS. Guidelines for the identification and inspection of neighbourhood safer places in NSW. Retrieved from; https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0019/55252/NSP-Places-of-Last-Resort-Guidelines.pdf

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

(Industry Safety Steering Committee 3 ï 2016) Guide for the Management of Vegetation in the Vicinity of Electricity Assets. Retrieved from; https://energy.nsw.gov.au/sites/default/files/2018-09/ISSC3-guideline-for-managing-vegetation-near-power-lines.pdf

NSW Planning and Assessment Commission 2012. Newcastle Gas Storage Project Approval File No 1/08788. Retrieved from; https://majorprojects.accelo.com/public/537ae28c8102a8a38dc0bfe1183bc7df/Instrument%20of%20Approval.pdf

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APPENDIX 1: STATEMENT OF LIMITATIONS

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This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelderôs profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

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The findings and conclusions contained within this report are relevant to the conditions of the site and the state of legislation currently enacted in the relevant jurisdiction in which the site is located as at the date of this report.

Additionally, the findings and conclusions contained within this report are made following a review of certain information, reports, correspondence and data noted by methods described in this report including information supplied by the client or its assigns. Kleinfelder has designed and managed the program for this report in good faith and in a manner that seeks to confirm the information provided and test its accuracy and completeness. However, Kleinfelder does not provide guarantees or assurances regarding the accuracy, completeness and validity of information and data obtained from these sources and accepts no responsibility for errors or omissions arising from relying on data or conclusions obtained from these sources.

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APPENDIX 2: RADIANT HEAT MODELLING RESULTS

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NBC Bushfire Attack Assessment Report V3.0

AS3959 (2009) Appendix B - Detailed Method 2

Print Date: 7/05/2019 **Assessment Date:** 7/05/2019

Site Street Address: NGPS - Old Punt Road, Tomago

Assessor: Dan Pedersen; Kleinfelder Australia

Local Government Area: Port Stephens **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
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: 10kW fuel storage (Diesel) exposure

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	2 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	25
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	58

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	**FDI:**	100

Program Outputs

Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	12.07
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	44484
Radiant Heat(kW/m2):	10	**Flame Angle (degrees):**	72
Flame Length(m):	25.39	**Maximum View Factor:**	0.172
Rate Of Spread (km/h):	3.44	**Inner Protection Area(m):**	58
Transmissivity:	0.762	**Outer Protection Area(m):**	0

Run Description: 2.1kW life safety exposure consequence

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	2 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	25
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	138

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	**FDI:**	100

Program Outputs

Category of Attack:	VERY LOW	**Peak Elevation of Receiver(m):**	12.5
Level of Construction:	BAL LOW	**Fire Intensity(kW/m):**	44484
Radiant Heat(kW/m2):	2.1	**Flame Angle (degrees):**	80
Flame Length(m):	25.39	**Maximum View Factor:**	0.039
Rate Of Spread (km/h):	3.44	**Inner Protection Area(m):**	138
Transmissivity:	0.7	**Outer Protection Area(m):**	0

Run Description: 23kW gas infrastructure exposure

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	2 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	25
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	32

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	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	11.41
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	44484
Radiant Heat(kW/m2):	23	**Flame Angle (degrees):**	64
Flame Length(m):	25.39	**Maximum View Factor:**	0.372
Rate Of Spread (km/h):	3.44	**Inner Protection Area(m):**	32
Transmissivity:	0.813	**Outer Protection Area(m):**	0

APPENDIX 3: CONCEPT DESIGN PLAN

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Plot Date: 2019-04-15 11:12:00 Office: Filename: pw:\\designshare.au.aurecon.info:PW_AUDC1_01\Documents\Projects\503xxx\503269 - Newcastle Gas Peaker Development\5 Deliver design\503 Drawing\MM\503269-0000-DRG-MM-0010.dwg

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REV	DATE	REVISION DETAILS	APPROVED
C	2019-04-15	STORMWATER SEDIMENTATION POND ADDED	PB
B	2019-04-01	REVIEW	PB
A		REVIEW	PB

SCALE	SIZE
	A1

DRAWN: P McFARLANE
DESIGNED: P BENYON
REVIEWED:

PRELIMINARY
NOT FOR CONSTRUCTION
APPROVED
DATE

PROJECT: NEWCASTLE POWER STATION
TITLE: POWER STATION LAYOUT

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	503269	0000	DRG	MM	0010	C