Appendix H

Bushfire Assessment Report

peterson bushfire.

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Bushfire Assessment

Broken Hill Battery Energy Storage System

74-84 Pinnacles Place, Broken Hill

AECOM

20 May 2021

(Ref: 20169)

report by

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FPA AUSTRALIA (NO.BPAD18882)
BPAD LEVEL 3 ACCREDITED PRACTITIONER

ABN 28 607 444 833

Contents

1 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by AGL Energy Limited (AGL) to prepare an Environmental Impact Statement (EIS) to assist with obtaining development consent to construct, operate and maintain a battery energy storage system (BESS) facility with a capacity of approximately 50 megawatts (MW) and up to 100 megawatt-hour (MWh) at Broken Hill (hereafter referred to as 'the Project'), NSW.

AECOM commissioned Peterson Bushfire to prepare a Bushfire Assessment Report for the Project.

1.1 Project context and overview

The Project comprises a BESS with a capacity of approximately 50 MW and up to 100 MWh. Key features of the Project include:

- Construction and operation of a BESS; and
- Connection of the BESS facility to the nearby TransGrid substation via a 22 kV powerline connecting through a 22 kV busbar at the substation.

The proposed location of the battery facility (the Site) is on two lots at 74 to 80 Pinnacles Place, Broken Hill 2880 (Lots 57 and 58 of DP 258288). The Site is located approximately 120 metres (m) east of the TransGrid Broken Hill substation located at 76 Pinnacles Road, Broken Hill 2880 (Lot 2 of DP 1102040) (refer to Figure 1). The Project would also involve the installation of a transmission connection between the Site and the TransGrid Broken Hill substation, which would traverse Lot 7302 DP1181129, being Commons. The Site and the transmission line easement constitute the 'Project Area' (refer to Figure 2).

The Project would be generally comprised of the following components:

- Battery enclosures
- Inverters
- Medium voltage transformers up to 22 kV
- Cabling and collector units
- Control and office building, workshop and equipment storage area
- 22 kV electrical switchyard
- Security fencing and lighting
- Access, internal roads and car parking
- Drainage and stormwater management

- Overhead or underground transmission connection infrastructure
- Minor works to connect the BESS to transformer compound or TransGrid switchyard
- Temporary site office, laydown and construction compound
- Other ancillary infrastructure.

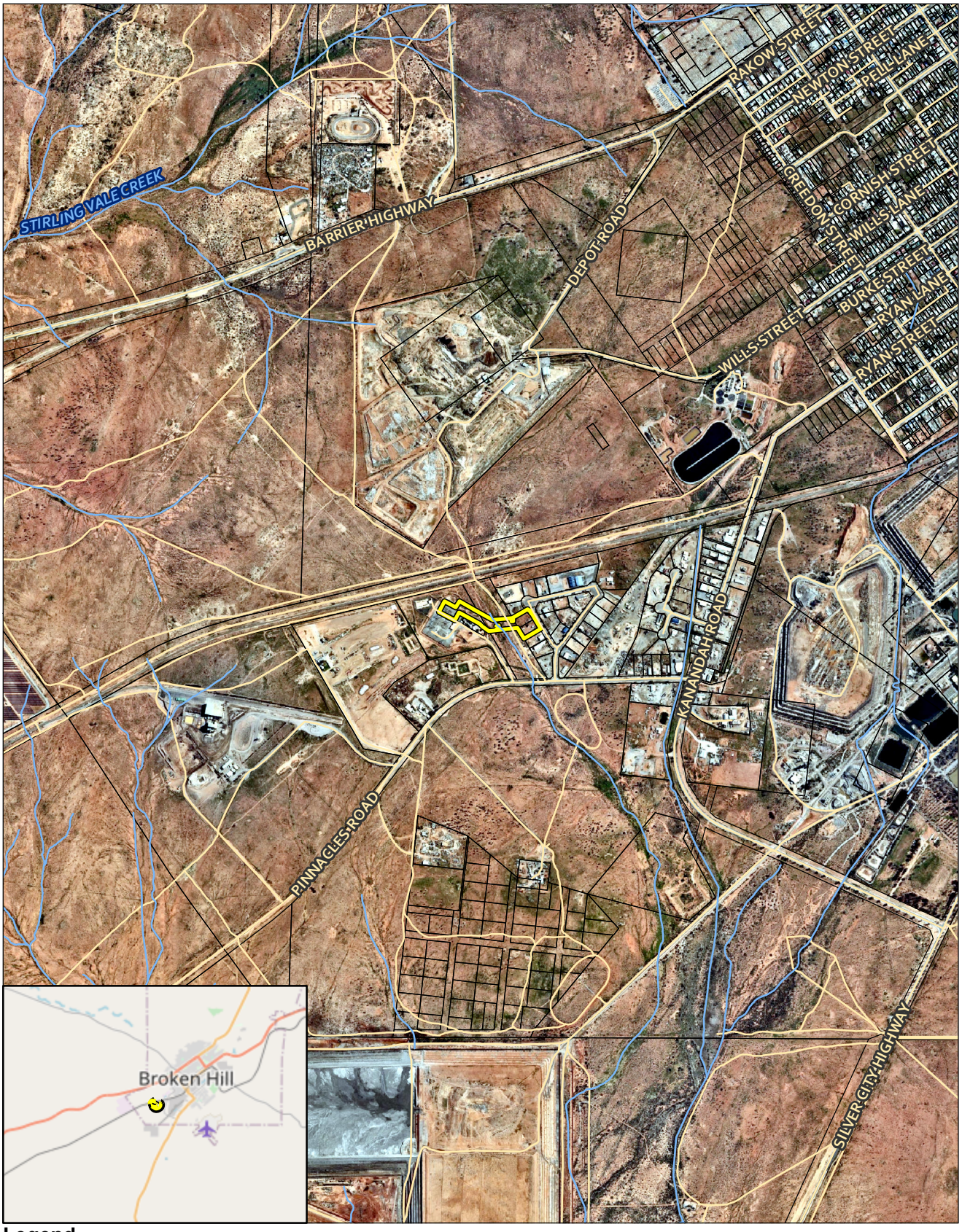
It is currently anticipated that construction of the Project would take up to 12 months, starting in 2021 and being completed in 2022.

Construction works would be likely to comprise:

- Site preparation activities including:
    - Enabling works and prefabrication
    - Site clearance activities
    - Installation of erosion and sediment controls and site fencing
    - Provision of construction power
    - Minor earthworks to form a level BESS pad, switchyard area and construction laydown areas, including potential import or export of fill as required
    - Development of site access
- Structural, civil, mechanical and electrical works:
    - Connections to surrounding utilities, as required
    - Structural works to support BESS facilities
    - Construction of supporting structures, e.g. office building, workshop, and transmission line landing gantry
    - Delivery, installation and electrical fit-out of BESS
    - Construction of transmission connection between the Site and the TransGrid Broken Hill substation including installation of supporting structures, stringing the transmission line, and works at the transmission line landing gantry on site and the 22 kV busbar at the substation
    - Transportation of plant, equipment, materials and workforce to and from the Site as required
- Commissioning:
    - Testing and commissioning activities
    - Finishes and demobilisation

- Provision of landscaping, as required
- Removal of construction equipment and rehabilitation of construction areas.

A construction laydown area would also be provided on the Site. Minor earthworks would be required across this Site, including levelling the Site to ensure a suitable development footprint and establishment of site access. Excavations within the Site are expected to be 1.5 m deep and up to 3 m footing for the transmission line poles.



Legend

- Watercourse
- Road
- Project Area
- Cadastre

N

DKGIS

Date: 11/03/2021

0 125 250 500

Metres

Coordinate System: GDA 1994 MGA Zone 54

Imagery: © Nearmap

Figure 1: The Location of the Project Area

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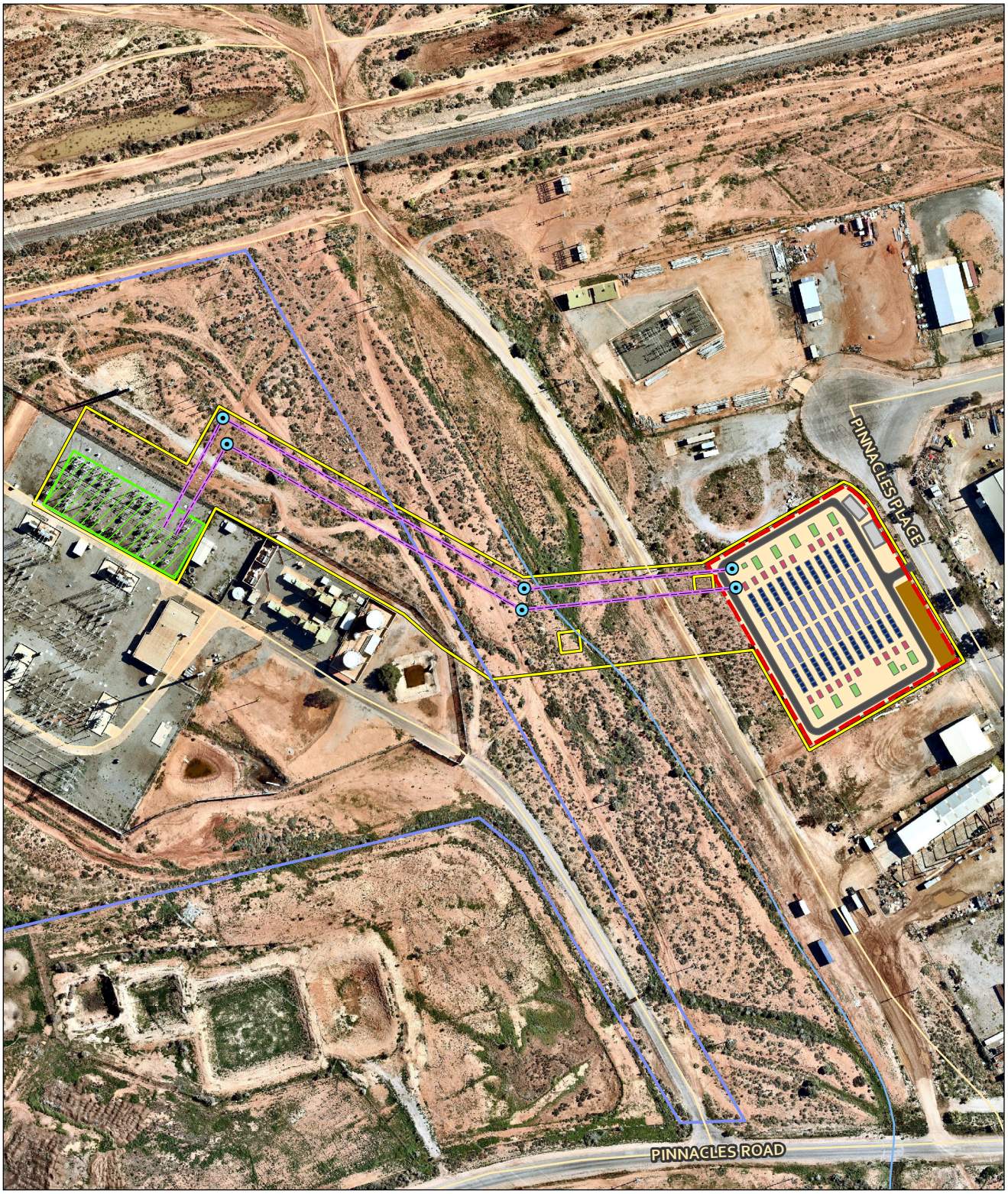

Legend

- Transmission Line Pole
- Proposed Power Line
- Road
- Watercourse
- Project Area
- Site
- Access Road
- Battery (Stage 1)
- Battery (Stage 2)
- Inverter
- Transformer
- Building
- Laydown
- 22kV Bus
- Permeable Surface
- TransGrid Broken Hill Substation

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Date: 29/04/2021

0 25 50 100

Metres

Figure 2: The Project

Coordinate System: GDA 1994 MGA Zone 54

Imagery: © Nearmap

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1.2 Purpose of this report

1.2.1 Assessment objectives

The Project Area is identified as 'bushfire prone land' as shown by the bushfire prone land mapping presented in Figure 3. Development proposals on land identified as bushfire prone require assessment in accordance with the Rural Fire Service (RFS) document *Planning for Bush Fire Protection 2019* (referred to as 'PBP' throughout this report).

The overarching objectives of this report are as follows:

- to form part of the Environmental Impact Statement for the Project
- to identify potential bushfire impacts of the Project based on the Project Area being identified as 'bushfire prone land'
- to outline mitigation measures relating to bushfire during the construction and operation stages of the Project
- to addresses the relevant Secretary's Environmental Assessment Requirements (SEARs) as outlined in Section 1.2.2.

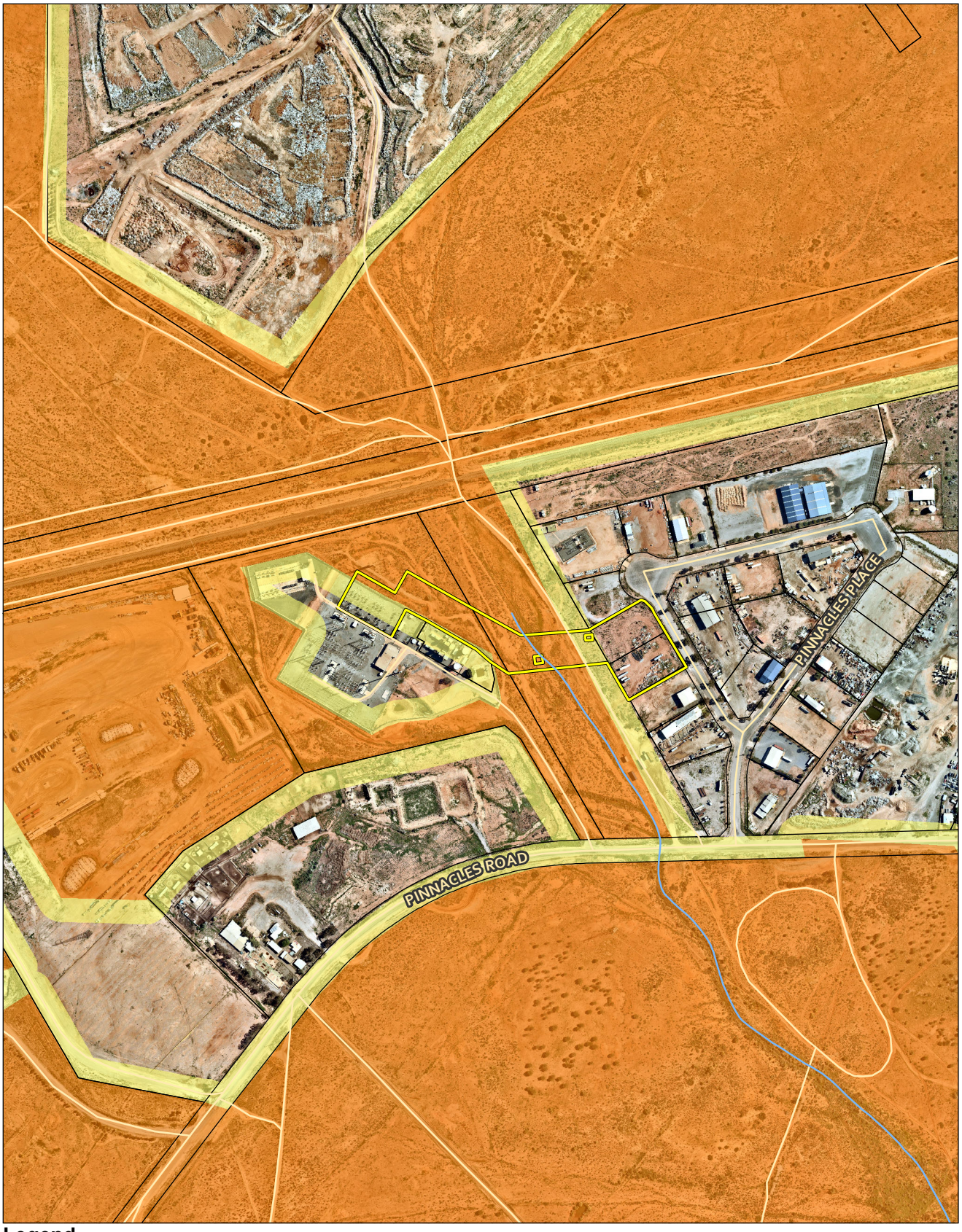
1.2.2 Secretary's environmental assessment requirements

The SEARs issued by the Department of Planning, Industry and Environment (DPIE) relating to bushfire and where these requirements are addressed in this technical report, are outlined in Table 1-1.

Table 1-1: Secretary's Environmental Assessment Requirements

SEARs requirement	Where addressed in this document
Hazard and risks – including: • An assessment of potential hazards and risks including but not limited to bushfires, land contamination, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields	Assessment of potential hazards and risks from bushfires is addressed in this technical report.

Further, the RFS have also requested a bushfire report that addresses the requirements of PBP, specifically Section 8.3.9 'Hazardous industry'.



Legend

Watercourse
Road
Project Area
Cadastre

Bushfire Prone Land

Vegetion Buffer
Vegetation Category 3

N

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0 75 150 300

Metres

Figure 3: Bushfire Prone Land

Coordinate System: GDA 1994 MGA Zone 54

Imagery: © Nearmap

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1.3 Scope of assessment

The scope of this technical report is to:

- Assess the hazards and risks regarding susceptibility of the Project to the impacts of bushfire
- Assess the hazard and risk of fire initiating at the Project area and spreading to impact adjoining developments.
- Recommend bushfire protection measures to address the hazard and risk.

It is important to note that PBP does not prescribe Acceptable Solutions or Performance Criteria for the application of protection measures for industrial developments, as done for other types of developments such as residential subdivisions or schools. Section 8.3.9 of PBP calls for a performance-based assessment resulting in recommended protection measures appropriate for the hazard and vulnerability of the assets involved.

2 Methodology

This study relies on the bushfire risk assessment process used by NSW RFS (BFCC 2008) in developing bushfire risk management plans across NSW. The method follows the procedures and considerations of Australian Standard *AS/NZS ISO 31000:2018 Risk management – Guidelines*.

PBP does not prescribe a risk assessment process. Rather, it requires an assessment of hazard and specifies bushfire protection measures for the type of hazard and proposed class of development. Section 8.3.9 of PBP recognises the need for a project-specific hazard and risk assessment process for 'hazardous industry' and therefore calls for a risk assessment appropriate for the hazard and vulnerability of the assets involved. Notwithstanding, the suite of bushfire protection measures outlined in PBP have been considered as treatments to address the risk.

2.1 Risk assessment

The risk assessment methodology described below has been used to assess risk of:

- impact of bushfire risk on the Project; and
- impact of the Project on bushfire risk.

The risk assessment applies to both the construction and operational phases of the Project.

BFCC (2008) defines bushfire risk as the chance of a bushfire igniting, spreading and causing damage to assets of value. The NSW bushfire risk management planning process used in this study uses a risk classification scheme through qualitative scales to assess the likelihood and consequence of fire impact.

There are four possible likelihood ratings: unlikely, possible, likely and almost certain. An understanding of the bushfire environment (refer to Section 3) is used to determine the likelihood of a bushfire occurring. Where data are not available, subjective estimates may be used which reflect the degree of belief that a bushfire will occur. Table 2-1 outlines the process for determining likelihood.

Consequence is the outcome or impact of a bushfire event. The assessment process for consequence is subjective and includes consideration of threat, vulnerability and other issues such as level of impact and recovery costs. There are four possible consequence ratings: minor, moderate, major and catastrophic. A description of each is provided in Table 2-2.

The bushfire risk level is assessed by combining the likelihood and consequence to provide low, medium, high, very high or extreme levels of bushfire risk. This matrix is provided in Table 2-3.

Table 1-1: Likelihood ratings for assessing bushfire risk (NSW RFS 2008)

	Fires are expected to spread and reach assets	**Fires are not expected to spread and reach assets**
Fires occur frequently	Almost certain	Possible
Fires occur infrequently	Likely	Unlikely

Source: *Bush Fire Risk Management Planning Guidelines for Bush Fire Management Committees* (NSW RFS 2008).

Table 2-2: Consequence ratings for assessing bushfire risk (NSW RFS 2008)

Consequence	**Description**
Minor	• No fatalities • Some minor injuries with first aid treatment possibly required • No persons are displaced • Little or no personal support (physical, mental, emotional) required • Inconsequential or no damage to an asset • Little or no disruption to community and little to no financial loss
Moderate	• Medical treatment required but no fatalities. Some hospitalisation • Localised displacement of persons who return within 24 hours • Personal support satisfied through local arrangements • Localised damage to assets that is rectified by routine arrangements • Community functioning as normal with some inconvenience • Local economy impacted with additional financial support required to recover • Small impact on environment / cultural asset with no long term effects
Major	• Possible fatalities • Extensive injuries, significant hospitalisation • Large number of persons displaced (more than 24 hours duration) • Significant damage to assets that requires external resources • Community only partially functioning, some services unavailable • Local or regional economy impacted for a significant period of time with significant financial assistance required • Significant damage to the environment/cultural asset which requires major rehabilitation or recovery works • Localised extinction of native species
Catastrophic	• Significant fatalities • Large number of severe injuries • Extended and large number requiring hospitalisation • General and widespread displacement of persons for extended duration

Consequence	Description
	• Extensive resources required for personal support • Extensive damage to assets • Community unable to function without significant support • Regional or state economy impacted for an extended period of time • Permanent damage to the environment • Extinction of a native species in nature

Source: *Bush Fire Risk Management Planning Guidelines for Bush Fire Management Committees* (NSW RFS 2008).

Table 2-3: Matrix to determine level of bushfire risk (NSW RFS 2008)

Consequence / Likelihood	Minor	Moderate	Major	Catastrophic
Almost certain	High	Very High	Extreme	Extreme
Likely	Medium	High	Very High	Extreme
Possible	Low	Medium	High	Very High
Unlikely	Low	Low	Medium	High

Source: *Bush Fire Risk Management Planning Guidelines for Bush Fire Management Committees* (NSW RFS 2008).

2.2 Planning for Bush Fire Protection 2019 (PBP)

All risk assessments should culminate in a list of risk treatments designed to treat or reduce the risk identified. These risk treatments are collectively known in NSW as bushfire protection measures (NSW RFS, 2019). Importantly, there is not one bushfire protection measure that can exclusively mitigate bushfire risk. The choice of measures will depend on the level of risk and the ability to implement measures in consideration of other constraints.

There are many different types of measures ranging from the wholesale clearing of vegetation to reviewing an insurance policy, and all can be grouped into the six broad categories listed below:

- Asset Protection Zones (APZ)
- Building construction and design (related to Bushfire Attack Level – BAL)
- Access arrangements
- Water supply and installation of utilities
- Landscaping and vegetation management

- Emergency management arrangements.

The RFS uses these categories in their bushfire risk management planning process for existing development (BFCC, 2008), and in the assessment of new development in bushfire prone areas (NSW RFS, 2019). Each measure or group of measures is considered important to address particular components of risk; however, in order to address the overall bushfire risk on a site, all six bushfire protection measures must be addressed. This is referred to as measures in combination (NSW RFS, 2019). This approach, using bushfire protection measures in combination, has been considered in addressing the risk identified.

2.3 Desk-top assessment

Assessment of the bushfire environment required to determine the hazard and analyse the risk was undertaken by desk-top techniques. The following resources were used:

- Aerial imagery from Nearmap (dated 1st October 2020)
- Vegetation mapping (Western State Vegetation Mapping used for external to Project Area and mapping by Niche ecologists for inside the Project Area)
- Contours (1 m intervals derived from LiDAR)
- Bushfire prone land mapping (RFS)
- West Darling Bush Fire Risk Management Plan (West Darling Bush Fire Management Committee 2011)

3 Bushfire environment

An analysis of the bushfire environment, or parameters that give rise to the bushfire threat, provides the foundation for the assessment of protection measures. The parameters to be analysed are discussed below and include the bushfire hazard (comprising terrain and vegetative fuels), knowledge of the weather and climatic patterns giving rise to bushfires, and an account of fire history.

3.1 Slope

Steeper slopes can significantly increase the rate of spread of fires, and it has been shown that with each 10 degree increase or decrease in slope a corresponding doubling or halving, respectively, in the rate of spread of bushfire can be expected (McArthur 1967). Slope is a major factor determining the direction and rate of bushfire spread.

Figure 4 shows the pattern of the terrain within and surrounding the Project Area. The land is essentially flat consisting of an arid gibber plain. The land slopes gently to the west into a drainage line within Lot 7302. The gradient is less than 1.5 degrees and, therefore, falls within the PBP slope class of 'downslope 0-5 degrees'.

3.2 Vegetation and fuel

Bushfire fuel is the vegetative material in the landscape that burns during a bushfire. Bushfire behaviour is influenced by fuel load, and the availability of the fuel which is mostly determined by the arrangement of the fuel and its moisture content. Fuel load and availability affects the intensity of a bushfire.

Only one vegetation community exists within and surrounding the Project Area. The community is 'Gibber Chenopod shrublands' as indicated on Figure 5. Figure 5 shows the community mapped across and adjoining the Project Area (by Niche Environment & Heritage consultants); however, the community extends throughout the surrounding lands well beyond the Project Area where it is not cleared or developed.

The structural formation according to Keith (2004) is 'Arid Shrubland (chenopd sub-formation)' and the climax fuel load is 3.2 tonnes/hectare (NSW RFS 2019). The shrubland presents a very low hazard due to the low fuel load (almost half the fuel load applied to grassland hazards) largely owing to the separated and clumpy nature of the plants.

Legend

Contour - 1m
Cadastre
Watercourse
Road
Project Area

N

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Date: 11/03/2021

0 25 50 100
Metres

Figure 4: Slope

Coordinate System: GDA 1994 MGA Zone 54

Imagery: © Nearmap

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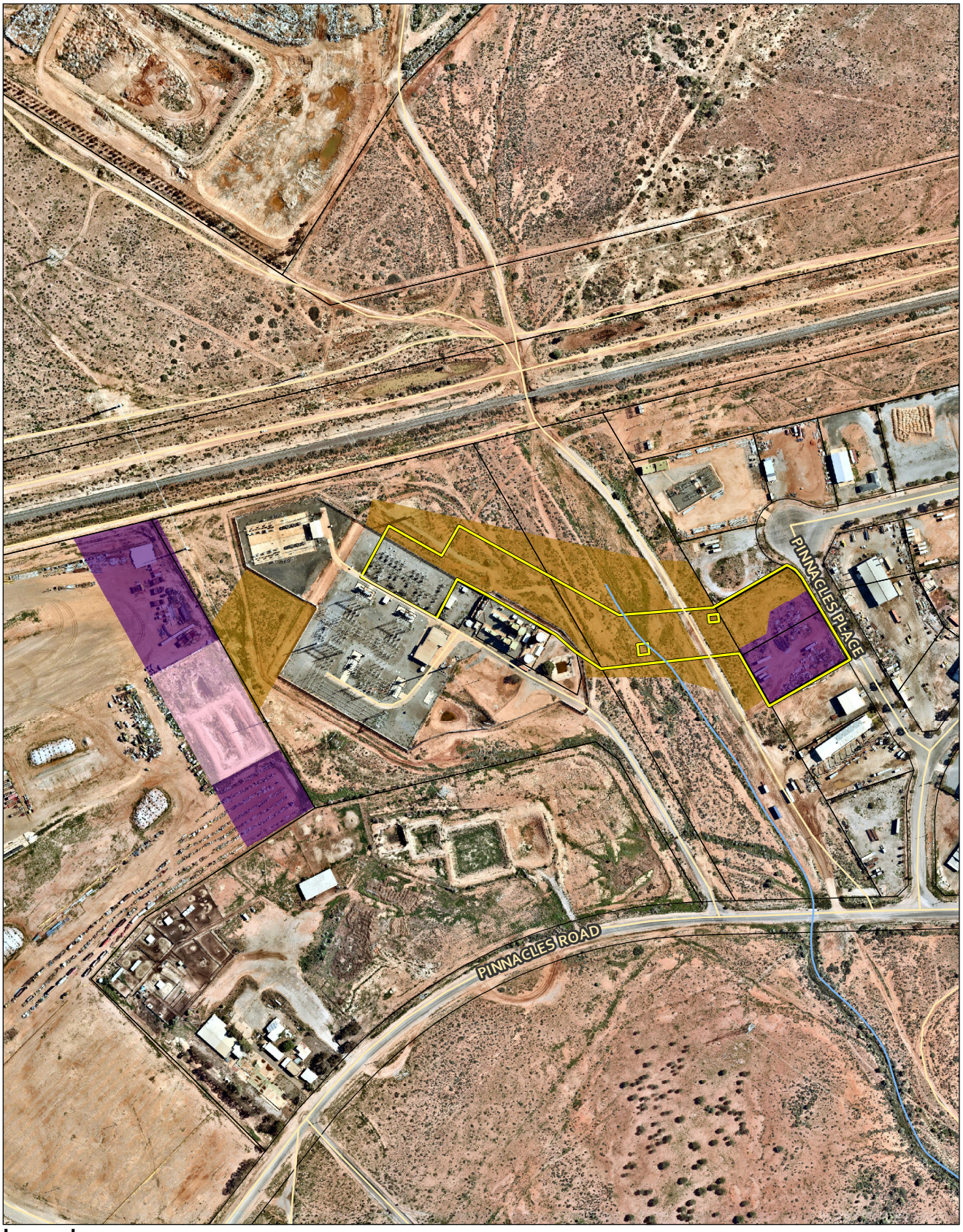

Legend

Watercourse
Road
Project Area
Cadastre

Vegetation

Gibber Chenopod Shrublands
Exotic
Storage depot

N

DKGIS

Date: 11/03/2021

0 25 50 100
Metres

Coordinate System: GDA 1994 MGA Zone 54

Imagery: © Nearmap

Figure 5: Vegetation

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3.3 Fire weather and history

The fire season within the West Darling rural fire district usually runs from October to March when the problematic fire weather is more common, being the combination of very hot days (i.e. 40 degrees and above) with low humidity (i.e. less than 10%) and strong westerly and northwesterly winds (WDBFMC 2011).

Large scale fires are not common in the district and have only occurred during the 1950's, mid 1970's and mid-1980's when grass growth followed a period of rain. Ignition usually occurs from lightning strikes during summer storms. Although drought periods produce problematic fire weather, the fuel is usually not available to create a fire front that would significantly threaten assets (WDBFMC 2011).

3.4 Likely bushfire behaviour and threat

Based on the information provided in Section 3.1 to Section 3.3, likely fire behaviour can be predicted. It is the combination of problematic fire weather (i.e. hot and dry westerly winds during summer) compounded by ignition from within the Project Area or external to the Project Area (e.g. lightning strike) creating the potential for a bushfire to spread and impact the Project Area or adjoining area.

4 Bushfire risk

The risk assessment has been divided into two scenarios of fire spreading to impact the Project Area and fire spreading to impact external assets. Table 4-1 below outlines the risk assessment results following the risk assessment methodology presented in Section 2.1.

Table 4-1: Assessment of level of bushfire risk

Fire scenario	Impact	Level of risk
Impact the Project Area	Likelihood = Unlikely Consequence = Minor	Low
Impact external assets	Likelihood = Unlikely Consequence = Minor	Low

Both risk scenarios resulted in a 'low' risk of bushfire impact out of a possible range of low, medium, high, very high and extreme. The lowest risk rating was attributable primarily to the combination of the following risk factors:

- No significant history of landscape-wide fire
- Fuel and slope parameters will not result in high intensity fires
- Fuel and slope parameters will not result in high residence time
- Non-habitable development
- Opportunities for fire control along local road and trail network
- Response time by fire authorities expected to be adequate due to brigade station 5.5 km to the east

As a comparison, the West Darling Bush Fire Risk Management Plan (WDBFMC 2011) rated the residential interface of Broken Hill also as low risk with the same likelihood and consequence ratings as allocated in this risk assessment.

5 Bushfire protection measures

This section outlines the measures recommended to address the risk and protect the asset. The measures are designed to minimise bushfire impact to the Project Area and prevent fire from spreading from the Project Area.

PBP requires the assessment of a suite of bushfire protection measures that in total provide an adequate level of protection for a project and nearby assets. Section 8.3.9 of PBP requires the measures to be commensurate with the bushfire hazards and associated risks. The measures range from separation of hazard from the asset by way of an APZ through to providing fire-fighters with access and water for suppression operations. A 'measures in combination' approach is desired and is the framework of PBP.

5.1 Asset Protection Zones (APZ)

Overview

An APZ is a buffer area between a bushfire hazard and an asset which minimises the impact of fire on that asset. The foremost significant treatment for reducing bushfire risk is the establishment of an APZ. This involves the removal and continual management of vegetation to create a buffer zone that reduces the effect of flame contact and radiant heat on the asset as well as providing access for fire-fighting operations and other controls on the built environment. An APZ also reduces the chances of fire escaping from a site and entering surrounding bushland by ensuring a fuel-free environment whereby fire cannot propagate and spread.

The dimension of the APZ is determined firstly by the ability for fire-fighters to gain access, that is, a minimum dimension is related to fire-fighter access only and can be designed to allow pedestrian or vehicular access. The second consideration is the vulnerability of the asset such as what dimension is required to prevent exceeding a threshold that may be related to material combustion or threat to life. For example, the APZ dimensions specified by PBP for residential dwellings relate to a construction standard, or Bushfire Attack Level (BAL) of BAL-29. No such standard exists for the development type proposed; therefore, a precautionary approach is proposed.

An analysis of the BAL that could be experienced within the Project Area has been undertaken. The BAL represents an upper limit of a specific level of radiant heat flux (measure of heat energy impacting on a surface measured in kW/m^2) determined in accordance with PBP. There are six BALs; BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ, with each increase in BAL representing a higher degree of radiant heat and bushfire attack, ranging from ember attack (BAL-12.5) to flame contact (BAL-FZ). The BAL system has been designed to determine construction methodology and materials (as per 'AS 3959-2018 Construction of buildings in bushfire-prone areas') for dwellings and is not usually used for industrial uses. However, the BAL can provide a good foundation upon which risk treatments can be designed for developments such as the Project.

APZ for the Project Area

In line with the precautionary principle, all components of the BESS at the Site would be afforded an APZ to prevent exposure to a radiant heat flux greater than BAL-12.5. The APZ dimension to achieve this is 10.5 m to be measured from the western boundary of the Site.

The APZ dimension has been calculated using the NBC Bushfire Attack Assessor which is a performance-based method of determining APZs. The acceptable solution APZ to achieve BAL-12.5 is 16 m as per Table A1.12.5 of PBP. The NBC Bushfire Attack Assessor has allowed the inputs of a specific slope underneath the hazard (1.2 degrees) and specific vegetation type (Gibber Chenopod Shrublands) to achieve BAL-12.5 at 10.5 m (refer to Appendix A for model report). The performance-based method demonstrates how a smaller APZ can achieve the same objective in the confined area of the Site.

The western boundary of the Site is the only location within the Project Area requiring an APZ. The following parts of the Project Area don't require an APZ:

- The northern, eastern and southern sides of the Site due to the presence of managed lands
- The 22kV busbar at the TransGrid substation due to existing APZ provided
- The transmission line as the vegetation clearance requirements of the relevant standards would manage the potential bushfire risk.

5.2 Building construction

Overview

A BAL is typically applied to an enclosed building such as a dwelling, whereby the structure is protected for the sake of a family that may require to shelter in place during fire impact. PBP does not require BALs to be applied to infrastructure buildings or office buildings. Section 8.3 of PBP prescribes the assessment methodology and bushfire protection measures for uses other than a habitable dwelling such as Class 5-8 and 10 buildings. As stated within Section 8.3.1 of PBP, the National Construction Code (NCC) does not provide for any bushfire specific performance requirements for these types of uses. As such BALs do not apply as deemed-to-satisfy provisions for bushfire protection.

BAL for the Project Area

It is not proposed to apply a BAL building construction standard to the proposed infrastructure as part of the Project. The recommended APZ (refer to Section 5.1) has been designed to reduce the effect of flame contact and excess radiant heat on the assets to a radiant heat flux of 12.5 kW/m^2 or less, thus removing the need for construction measures to withstand higher levels of radiant heat.

5.3 Access

5.3.1 Alternate access and egress

Overview

PBP requires an access design that enables safe evacuation whilst facilitating adequate emergency and operational response. All bushfire prone areas should have an alternate access or egress option depending on the bushfire risk, the density of the development, and the chances of the road being cut by fire for a prolonged period.

The Project Area

Pinnacles Place provides the access to the Site and is compliant with the PBP requirements for the design of public roads in bushfire prone areas. Pinnacles Place is a 12 m wide loop road that leads back to Pinnacle Road which services the immediate industrial area. The road is situated in a built-up environment on the edge of town where evacuation away from bushfire prone areas can be achieved almost immediately. The chances of the local roads being severed by the impacts of bushfire and trapping people in place is highly unlikely due to the nature of the bushfire hazard and uneventful fire history (refer to Section 3).

The existing public road access is considered acceptable and satisfies the intent of PBP access objectives for industrial development.

5.3.2 Design of internal roads

Overview

PBP requires safe operational access to structures and water supply for emergency services while occupants are seeking to evacuate the area.

The Project Area

An internal loop road is proposed around the extremity of the Site as shown on Figure 2. The total length of the road would be approximately 300 m and provides a clear egress option away from the bushfire threat to the west.

It is recommended that the proposed road comply with the PBP design and construction standards for ‘property access’ roads as listed in Table 5.3b of PBP. The standards are repeated in Table 5-1 below.

Table 5-1: PBP standards for property access roads

Standard	Comment
Minimum 4 m carriageway. Some short constrictions in the access may be accepted where they are not less than 3.5 m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed.	Recommended for the Project
In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay.	Not required due to overall length of road and hazard type
A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.	Not relevant (no trees or overhanging obstructions present)
Property access must provide a suitable turning area.	Not required due to loop road formation
Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.	Recommended for the Project
The minimum distance between inner and outer curves is 6m.	Recommended for the Project
The crossfall is not more than 10°.	Recommended for the Project
Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads.	Recommended for the Project
A development comprising more than three dwellings has access by dedication of a road and not by right of way.	Not required

5.3.3 Perimeter access

Overview

PBP requires fire-fighter access to the perimeter of a development between the asset and the hazard (refer to Section 5.1 for discussion on 'defendable space').

The Project Area

The proposed loop road acts as a perimeter road, hence achieving compliance with PBP. The perimeter loop road would also assist in the containment of fire within the Site and control fire spread off-site to adjoining properties.

Another perimeter road exists 20 m to the west of the Site within Lot 7302. This informal, unsealed road could be relied upon to control a fire before reaching the Site.

5.4 Water supply, electricity and gas

Overview

An adequate supply of water is essential for fire-fighting purposes. In addition, gas and electricity should be located and installed so as not to contribute to the risk of fire or impede the fire-fighting effort.

5.4.1 Water supply

The Site has a hydrant located immediately in front of the Site on Pinnacles Place beside the existing gate, approximately in the centre of the front boundary. The distance from the hydrant to the rear (western) boundary of the Site is approximately 80 m and would, therefore, be adequate for the supply of water for the suppression of bushfires at the Site, should one occur. An additional water supply is, therefore, not required.

5.4.2 Electrical supply

The vegetation clearance distance to the overhead powerlines within the Project Area would comply with the document *ISSC 3 Guideline for Managing Vegetation Near Power Lines* (Industry Safety Steering Committee 2005).

5.4.3 Gas supply

A gas supply is not proposed.

5.5 Emergency management planning

It is recommended that a 'Bushfire Emergency Management and Evacuation Plan' be prepared in accordance with the RFS document 'A Guide to Developing a Bushfire Emergency Management and Evacuation Plan' for the construction and operation phases of the Project.

5.6 Vegetation management

Overview

Using appropriate bushfire sensitive landscape treatments and maintenance regimes across a site is vital to protecting assets in the event of a bushfire. Research has shown that inappropriate landscaping allows for embers to ignite secondary fires nearby vulnerable building components (Blanchi et al., 2010; Gibbons et al., 2012). Gibbons et al. (2012) also suggested that clearing vegetation around an asset is twice as effective when compared to hazard reduction burning.

The Project Area

The Project Area would be maintained to achieve the performance requirement of an Inner Protection Area (IPA) as described by Appendix 4 of PBP. The following landscaping recommendations would be adopted to achieve the IPA for the Project:

Trees

- Trees at maturity should not touch or overhang assets;
- Tree canopies should not be connected when at maturity. Gaps between crowns or groups of crowns are to be maintained at distances of 2 to 5 m; and
- Preference should be given to smooth barked and evergreen trees.

Shrubs

- Shrubs should not be planted within the Project Area. Screen and buffer planting along the eastern boundary of the Site (adjacent Pinnacles Place) is permitted.

Groundcovers

- Grass should be kept mown (no more than 100 mm in height);
- Leaves and vegetation debris should be regularly removed;
- Organic mulch is not to be used within 2 m of a structure or asset within the Project Area.

6 Conclusion and recommendations

6.1 Summary

The risk of bushfire impact to the Project Area and fire initiating and spreading from the Project Area is assessed to be low. This risk rating was also applied for the adjacent built-up areas of Broken Hill by the West Darling Bush Fire Risk Management Plan.

Notwithstanding, bushfire protection measures have been recommended within this report to address any residual risk, minimise bushfire impact on the proposed assets, and ensure a 'measures in combination' approach as required by *Planning for Bush Fire Protection 2019*. The proposed measures are commensurate with the bushfire hazard and risk identified and the susceptibility of the Project and adjoining properties.

6.2 Conclusion

This assessment satisfies the SEARs (SSD-11437498) requests to include an assessment of bushfire as a potential hazard and risk. Adopting the following recommendations into the design will achieve the objectives of Section 8.3.9 'Hazardous industry' of *Planning for Bush Fire Protection 2019*.

6.3 Recommendations

The following is a list of recommendations arising from the assessment:

1. A 10.5 m APZ is to be achieved between the western boundary of the Site and the proposed BESS.
2. The proposed road should comply with the PBP design and construction standards for 'property access' roads including:
    a. Minimum 4 m carriageway. Some short constrictions in the access may be accepted where they are not less than 3.5 m wide, extend for no more than 30 m and where the obstruction cannot be reasonably avoided or removed.
    b. Curves have a minimum inner radius of 6 m and are minimal in number to allow for rapid access and egress.
    c. The minimum distance between inner and outer curves is 6 m.
    d. The crossfall is not more than 10°.
    e. Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads.
3. The vegetation clearance distance to any overhead powerlines within the Project Area is to comply with the document *ISSC 3 Guideline for Managing Vegetation Near Power Lines* (Industry Safety Steering Committee 2005).

4. A ‘Bushfire Emergency Management and Evacuation Plan’ should be prepared in accordance with the RFS document ‘A Guide to Developing a Bushfire Emergency Management and Evacuation Plan’ for the construction and operation phases of the Project.

5. The Project Area is to be maintained to achieve the performance requirement of an IPA as described by Appendix 4 of PBP. The following landscaping recommendations are to be adopted to achieve the IPA for the Project:

    a. Trees:

        i. Trees at maturity should not touch or overhang assets;

        ii. Tree canopies should not be connected when at maturity. Gaps between crowns or groups of crowns are to be maintained at distances of 2 to 5m; and

        iii. Preference should be given to smooth barked and evergreen trees.

    b. Shrubs:

        i. Shrubs should not be planted within the Project Area. Screen and buffer planting along the eastern boundary of the Site (adjacent Pinnacles Place) is permitted.

    c. Groundcovers:

        i. Grass should be kept mown (no more than 100 mm in height);

        ii. Leaves and vegetation debris should be regularly removed;

        iii. Organic mulch is not to be used within 2 m of a structure or assets within the Project Area.

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Appendix A – Model report

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NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 20/05/2021 **Assessment Date:** 16/02/2021

Site Street Address: 74-84 Pinnacles Place, Broken Hill

Assessor: David Peterson; Peterson Bushfire

Local Government Area: Broken Hill **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: West

Vegetation Information

Vegetation Type: Gibber Chenopod Shrublands

Vegetation Group: Arid Shrublands (Chenopod)

Vegetation Slope: 1.2 Degrees **Vegetation Slope Type:** Downslope

Surface Fuel Load(t/ha): 3.2 **Overall Fuel Load(t/ha):** 3.2

Vegetation Height(m): 1.5 Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 0 Degrees **Site Slope Type:** Level

Elevation of Receiver(m): Default **APZ/Separation(m):** 10.5

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:** 80

Program Outputs

Level of Construction: BAL 12.5 **Peak Elevation of Receiver(m):** 1.94

Radiant Heat(kW/m2): 12.31 **Flame Angle (degrees):** 79

Flame Length(m): 3.95 **Maximum View Factor:** 0.187

Rate Of Spread (km/h): 3.11 **Inner Protection Area(m):** 10

Transmissivity: 0.864 **Outer Protection Area(m):** 0

Fire Intensity(kW/m): 5147

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