



FOGO Facility Keralup

# Bushfire Risk Report

Assessments of Risk Levels and Risk Management

- ◇ *identify the elements at risk*
- ◇ *evaluate the bushfire hazard and its threats*
- ◇ *assess the exposure and vulnerability of elements at risk*
- ◇ *identify applicable bushfire protection measures*
- ◇ *derive inherent and residual risk levels*
- ◇ *inform decision making and implementation of risk management*

320 Gull Road, Keralup

Shire of Murray

19 December 2023

Job Reference No: 220666

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| PREPARATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                     |         |            |                          |                                     |
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| <p><b>Limitations:</b> The protection measures contained in this Bushfire Risk – Assessment and Management Report, are considered to be minimum requirements and they do not guarantee that buildings or infrastructure will not be damaged in a bushfire, persons injured, or fatalities occur either on the subject site or off the site while evacuating. This is substantially due to the unpredictable nature and behaviour of fire and fire weather conditions. Additionally, the correct implementation of the recommended protection measures will depend upon, among other things, the ongoing actions of the landowners and/or operators over which Bushfire Prone Planning has no control.</p> <p>All surveys, forecasts, projections and recommendations made in this report associated with the proposed development are made in good faith based on information available to Bushfire Prone Planning at the time. All maps included herein are indicative in nature and are not to be used for accurate calculations.</p> <p>Notwithstanding anything contained therein, Bushfire Prone Planning will not, except as the law may require, be liable for any loss or other consequences whether or not due to the negligence of their consultants, their servants or agents, arising out of the services provided by their consultants.</p> <p><b>Copyright © 2023 BPP Group Pty Ltd:</b> All intellectual property rights, including copyright, in format and proprietary content contained in documents created by Bushfire Prone Planning, remain the property of BPP Group Pty Ltd. Any use made of such format or content without the prior written approval of Bushfire Prone Planning, will constitute an infringement on the rights of the Company which reserves all legal rights and remedies in respect of any such infringement.</p> |                                     |         |            |                          |                                     |

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# 1 REPORT USE GUIDANCE - FOR MANAGERS & DECISION MAKERS

| LOCATION OF KEY INFORMATION                                                                                                                           |                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| The applied <u>risk assessment process</u> as pre-requisite reading to assist with understanding the assessments and the presentation of the results. | Section 2 and Appendices 1 & 2 |
| The assessed <u>bushfire risk levels</u> and the relative contribution of each primary factor contributing to that risk.                              | Section 3                      |
| The BAL contour map illustrating the <u>Bushfire Attack Levels</u> (BAL's) impacting the site.                                                        | Section 5.2.3                  |
| The <u>mandatory bushfire risk management actions to be addressed</u> (current and future).                                                           | Sections 4.2                   |
| The <u>recommended additional bushfire protection measures</u> and their implementation priority rating.                                              | Section 4.2.1.                 |
| Identified <u>additional issues and advice</u> provided for consideration by management.                                                              | Section 4.2.2                  |

## SECTION 5 - THE ASSESSMENT OF BUSHFIRE RISK

For the Food Organic Garden Organic Facility (FOGO), the risk assessment derives defined levels of risk associated with a bushfire event within the immediate and broader surrounding landscape, to the identified elements at risk (i.e., relevant classes of persons and property).

The adopted assessment approach applies a methodology that considers bushfire risk to be determined as a consequence of the interaction of three factors:

1. The bushfire hazard (which presents varying threats and threat levels);
2. The levels of exposure of each element at risk to those threats; and
3. The levels of vulnerability of each element at risk to those threats.

The assessment considers both the current level of risk (inherent), and the potential level of risk (residual) should proactive management be able to implement the recommended additional bushfire protection measures.

The assessment is largely qualitative in nature but incorporates quantitative processes and information when relevant and available. This results in the derivation of 'indicative' bushfire risk levels.

The assessment is conducted by a bushfire planning consultant with practical bushfire event management experience and relevant accreditation. An important objective is to present understandable and practical protection measures that are able to be justifiably applied by management.

## SECTION 6 - THE ASSESSMENT OF BUSHFIRE RISK MANAGEMENT

Assessments are conducted that consider how well two defined pathways for implementing both the required and any additionally recommended bushfire protection measures, are being applied. Guidance for best practice application of these measures is provided. The two pathways are:

1. The application of 'informative' risk management mechanisms which include:
  - a. The organised application and maintenance of all applicable bushfire protection measures through a range of operational documents, as relevant to a site and its use; and
  - b. The development and application of advice to inform management's planning of future modifications and/or development of a site and its use. This is necessary where bushfire risk mitigation measures are necessary inputs to design and construction.
2. The application of 'regulatory' risk management mechanisms that are to be complied with. These include operating and construction regulations and standards, and relevant planning authority guidelines/standards.

\*\*\*\*\*

## 2 INTRODUCTION

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### 2.1 THE ASSESSED ASSET AND ITS USE

The proposed Food Organics and Garden Organics (FOGO) facility will be developed to maximise material recovery. The facility will include a combination of covered and open-air construction including concrete bunkers. Some components of the proposed development are;

- Receival Hall.
- Shedding and screening.
- Mixing and preparation.
- Composting.
- Final product storing and dispatch area.
- Workshop.
- Office.

### CONDUCTING THE ASSESSMENT

In July of 2022 Bushfire Prone Planning were commissioned by Talis Consulting (on behalf of C-Wise) to undertake a Bushfire Risk Report for the proposed FOGO Facility located at Lot 9500 320 Gull Road Keralup. A site visit was conducted in September 2022 to assess the vegetation and slope to determine BAL requirements and the surrounding landscape up to 2 kilometres.

### 2.2 ESTABLISHING THE REPORT OBJECTIVES

The applied risk assessment process (refer to s2.3 and Appendix 1), and the methodology used to inform the management of risk (refer to s2.4), provide a flexible platform for producing the required evaluations and reporting.

It can account for all types of development and use and be constructed to deliver the required management and decision making information.

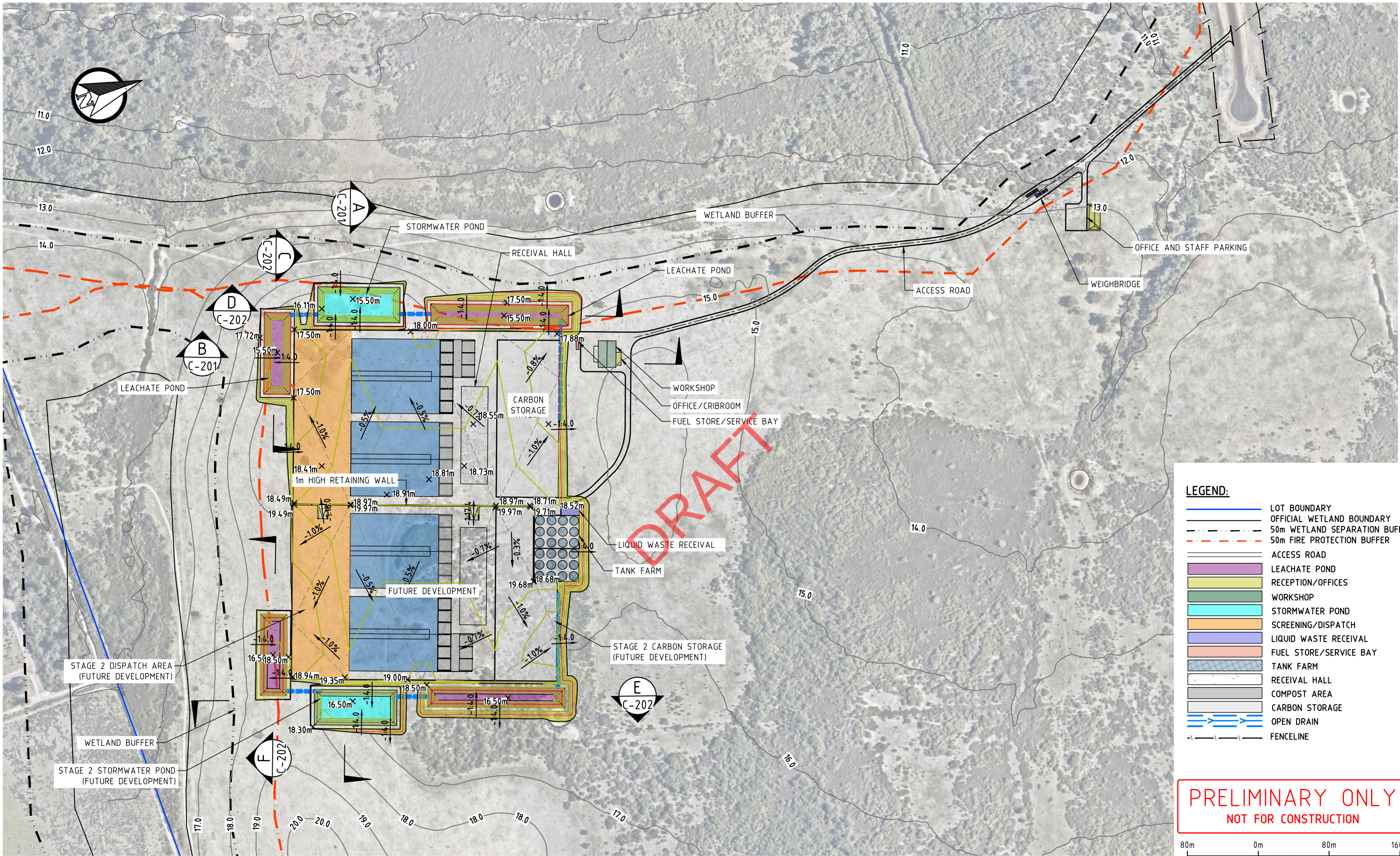
Consequently, to ensure the required information outcomes are met, the specific objectives for the subject site need to be identified to guide the report development.

These objectives are established in the checklist on the following page.

## CHECKLIST ESTABLISHING THE REPORT OBJECTIVES TO BE MET FOR THE SUBJECT SITE

| AVAILABLE OBJECTIVES                                                                                |                                                                                                                                                                                                                                                                                                            |  | THE OBJECTIVES TO BE MET | THE OBJECTIVES TO BE MET ARE ESTABLISHED BY                                          |                                                                     |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------|
|                                                                                                     |                                                                                                                                                                                                                                                                                                            |  |                          | The Owner and/or Operator of Subject Site in Discussion with the Bushfire Consultant | The 'Planning' Bushfire Management Plan Being Concurrently Produced |
| RISK ASSESSMENT                                                                                     |                                                                                                                                                                                                                                                                                                            |  |                          |                                                                                      |                                                                     |
| Hazard                                                                                              | Identify all bushfire hazards with potential to impact the subject site.                                                                                                                                                                                                                                   |  | ✓                        |                                                                                      | ✓                                                                   |
| Risk Levels                                                                                         | Assess inherent bushfire risk levels, for each identified element at risk, by accounting for existing and/or planned implementation of bushfire protection measures, along with all other interacting factors.                                                                                             |  | ✓                        |                                                                                      | ✓                                                                   |
|                                                                                                     | Assess residual bushfire risk levels, for each identified element at risk, by additionally accounting for implementation of recommended bushfire protection measures, along with all other interacting factors.                                                                                            |  | ✓                        |                                                                                      | ✓                                                                   |
| RISK MANAGEMENT                                                                                     |                                                                                                                                                                                                                                                                                                            |  |                          |                                                                                      |                                                                     |
| Compliance                                                                                          | Assess current compliance and/or future compliance capability against the 'mandatory' bushfire risk management mechanisms.                                                                                                                                                                                 |  | ✓                        |                                                                                      | ✓                                                                   |
|                                                                                                     | Note for operating standards, assessment is restricted to the requirements that have direct relevance to a bushfire event. These can include:                                                                                                                                                              |  |                          |                                                                                      |                                                                     |
|                                                                                                     | <ul style="list-style-type: none"><li>Separation from bushfire prone vegetation (APZ/firebreaks);</li><li>Access/egress for firefighting services/site occupants, including firebreaks; and</li><li>Firefighting water supply &amp; delivery for structure and surrounds fire, not the bushfire.</li></ul> |  |                          |                                                                                      |                                                                     |
|                                                                                                     | Planning Guidelines/Standards - for development & uses on bushfire prone land                                                                                                                                                                                                                              |  |                          |                                                                                      |                                                                     |
|                                                                                                     | Operating Standards / Regulations                                                                                                                                                                                                                                                                          |  |                          |                                                                                      |                                                                     |
|                                                                                                     | Construction Standards - for buildings in bushfire areas                                                                                                                                                                                                                                                   |  |                          |                                                                                      |                                                                     |
| Recommendations                                                                                     | Recommend additional bushfire protection measures to be implemented and their priority.                                                                                                                                                                                                                    |  |                          |                                                                                      | ✓                                                                   |
|                                                                                                     | Identify the relevant planning and/or site operations documents in which the recommended bushfire protection measures should be included.                                                                                                                                                                  |  |                          |                                                                                      | ✓                                                                   |
| Advice                                                                                              | Provide specific advice to inform planning for design and construction.                                                                                                                                                                                                                                    |  |                          |                                                                                      |                                                                     |
|                                                                                                     | Provide general advice that identifies issues for management to consider.                                                                                                                                                                                                                                  |  |                          |                                                                                      |                                                                     |
| OBJECTIVE VARIATIONS TO BE APPLIED:                                                                 |                                                                                                                                                                                                                                                                                                            |  |                          |                                                                                      |                                                                     |
| An onsite shelter will be provided. For further details refer to the Bushfire Management Plan (BMP) |                                                                                                                                                                                                                                                                                                            |  |                          |                                                                                      |                                                                     |
| State any specific objectives/outcomes required by the client – N/A                                 |                                                                                                                                                                                                                                                                                                            |  |                          |                                                                                      |                                                                     |





VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM  
HORIZONTAL DATUM: MGA 94 ZONE 50



ASSET  
ENGINEERING  
ENVIRONMENT  
NOISE  
SPATIAL  
WASTE

Client:



NOTES

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| No. | Date       | Drawn | Check | Amendment / Issue                    | App. |
|-----|------------|-------|-------|--------------------------------------|------|
| D   | 16.01.2023 | MH    | AB    | SITE LAYOUT UPDATED                  | MH   |
| C   | 15.11.2022 | AB    | MH    | BOUNDARIES UPDATED                   | MH   |
| B   | 02.03.2022 | YJ    | AB    | SECTIONS AND ISOPACHYTE LAYOUT ADDED | MH   |
| A   | 15.11.2021 | YJ    | AB    | PRELIMINARY ISSUE                    | MH   |

Project:

C-WISE DUE DILIGENCE AND APPROVALS

Title:

SITE PLAN LAYOUT

|                          |                |                  |
|--------------------------|----------------|------------------|
| Scale: 1:4000            | ⊙ A3           | Date: 02.03.2022 |
| Drawn: YJ                | Checked: AB    | Approved: MH     |
| Job No: TW2124           | Drg. No: C-101 | Rev: D           |
| Filename: TW2124-SET.DWG |                |                  |



## 2.3 BUSHFIRE RISK AND THE APPLIED ASSESSMENT PROCESS

### THE RELEVANT RISKS

For this Bushfire Risk Report, the relevant risks are the potential for loss of life, injury, or destroyed or damaged assets which results in personal loss and economic loss due to disruption of services and/or repair or replacement of buildings and infrastructure. The source of the risks is a potential bushfire event as a natural hazard.

### THE APPLIED RISK ASSESSMENT PROCESS

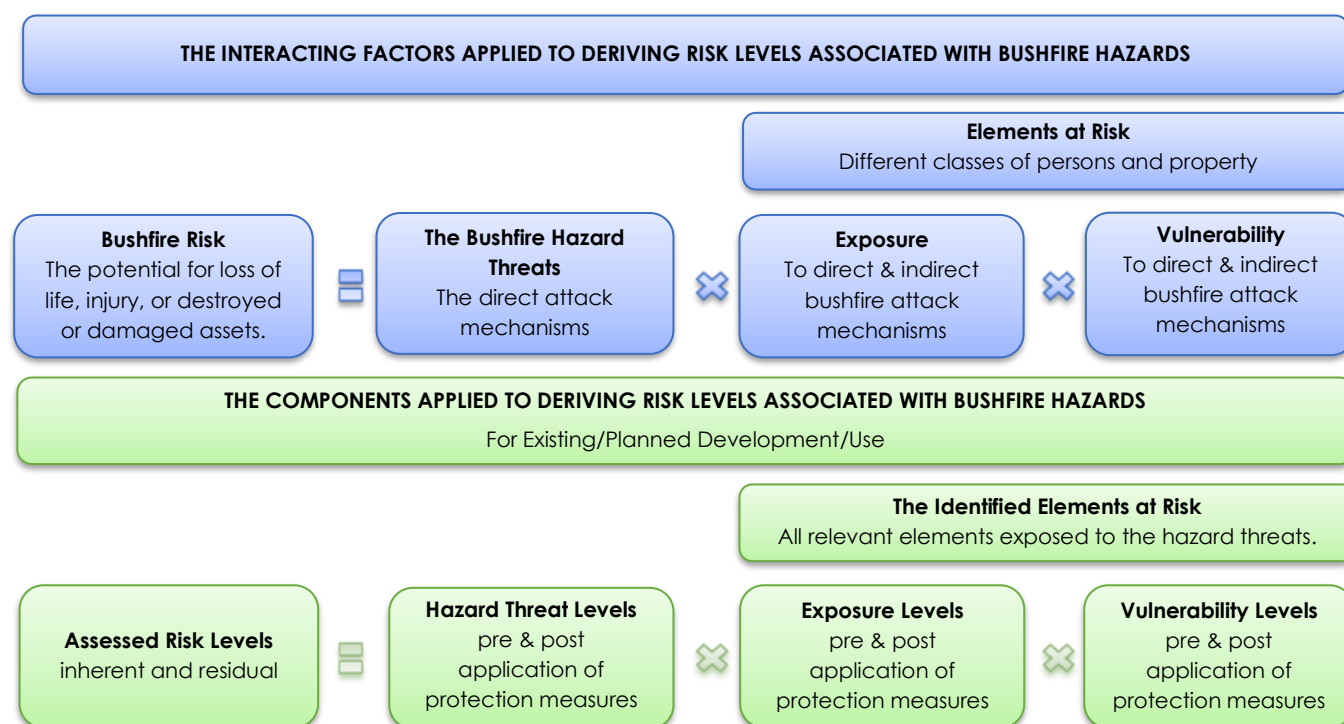
Bushfire Prone Planning (BPP) has adapted the concept for 'Understanding Disaster Risk' as recognised by the United Nations Office for Disaster Risk Reduction [46].

In applying this concept, bushfire risk can be considered a consequence of the interaction of bushfire hazard threats and the exposure and vulnerability of the elements at risk from those threats (i.e., the 'exposed elements' which can include various classes of persons and/or property).

The level of risk associated with bushfire will be reduced by applying bushfire protection measures that:

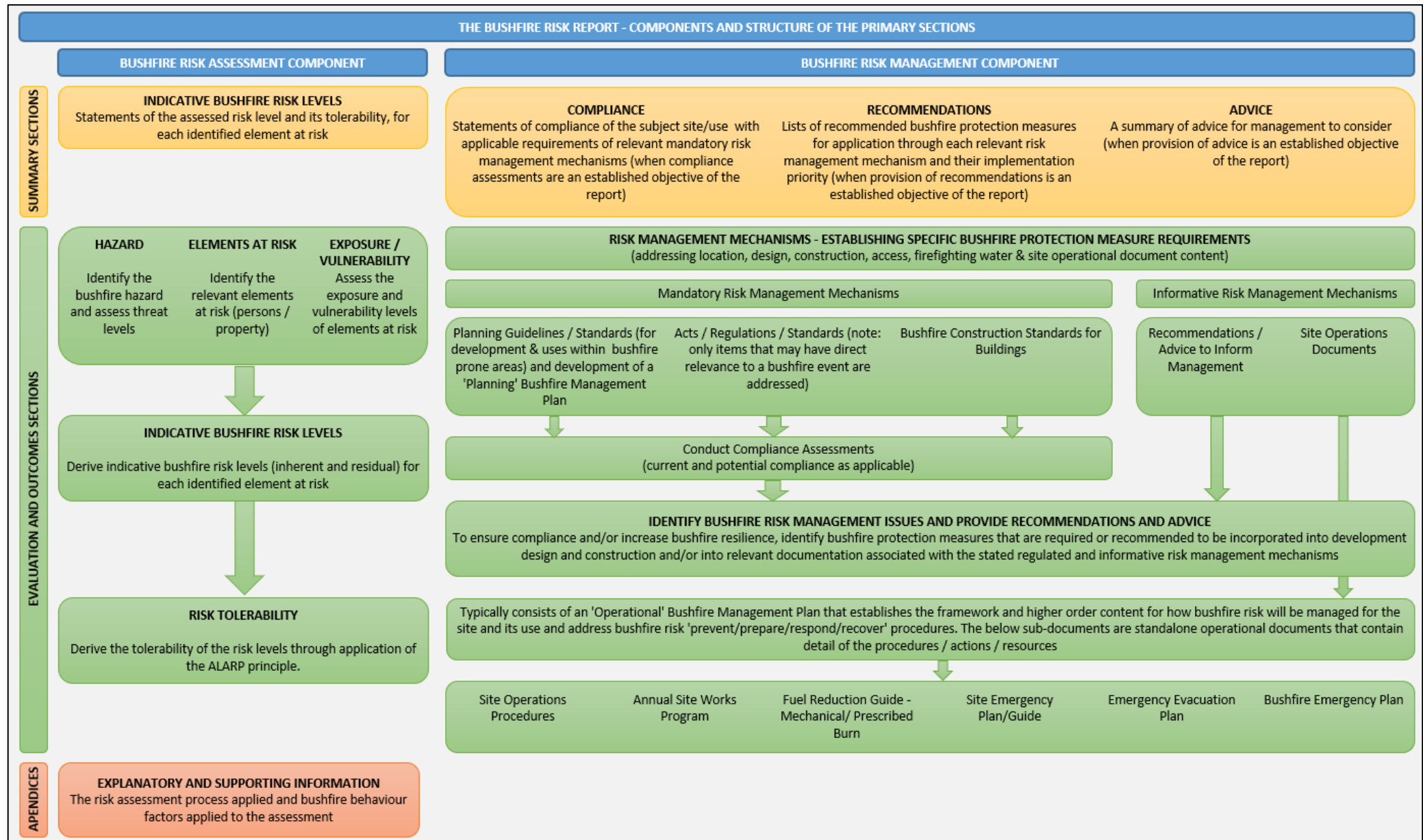
- Reduce the number and/or level of hazard threats; and/or
- Reduce the level of exposure and/or vulnerability of the elements at risk.

The risk assessment process framework is shown in Figure 2.2 and additional detail is presented in Appendix 1.



**Figure 2.2:** The framework of the applied bushfire risk assessment process.

## 2.4 REPORT STRUCTURE OVERVIEW



### 3 SUMMARY: BUSHFIRE INDICATIVE RISK LEVELS

The summary outcomes of the risk assessment process are presented on the next two pages. When the assessed bushfire risk levels are stated as 'indicative', they have been derived through the application of a largely qualitative assessment process that applies quantitative components where they exist.

*[Appendix 1 explains the risk level analysis and tolerance methodologies applied, along with the terminology used. Details of the bushfire risk assessment for the subject site and use are presented in Section 5.]*

#### 3.1 ASSESSED BUSHFIRE INDICATIVE RISK LEVELS AND THEIR TOLERABILITY

For each identified element at risk, the worst assessed risk level is stated, along with its tolerability. This will correspond to the worst combination of bushfire hazard threats, and the element's exposure and vulnerability to those threats. Refer to Section 3.2. for the relative contributions of each of these factors, as the primary drivers of the level of risk associated with bushfire events.

| THE ASSESSED INDICATIVE BUSHFIRE RISK LEVEL AND ITS TOLERABILITY <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                      |                       |                                                              |                        |                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------|------------------------|----------------------------------------|
| ELEMENTS AT RISK<br><br>[Section 5.2]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | INDICATIVE LEVELS OF RISK<br>ASSOCIATED WITH A BUSHFIRE<br>EVENT<br><br>[Appendix 1] |                       | RISK LEVEL TOLERABILITY (ALARP)<br><br>[Appendix 1 – A1.2.6] |                        |                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Inherent <sup>2</sup>                                                                | Residual <sup>2</sup> | Inherent <sup>2</sup>                                        | Residual <sup>2</sup>  | Adjusted<br>Residual Risk <sup>3</sup> |
| Persons onsite and temporarily offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Moderate M8                                                                          | Low L4                | Tolerable but NOT ALARP                                      | Acceptable             | N/A                                    |
| Persons on access/egress routes in vehicles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | High H9                                                                              | Moderate M8           | Intolerable as NOT ALARP                                     | Acceptable as IS ALARP | N/A                                    |
| Buildings/Structures - NCC classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderate M8                                                                          | Low L6                | Tolerable but NOT ALARP                                      | Acceptable             | N/A                                    |
| Built infrastructure assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Moderate M7                                                                          | Low L4                | Tolerable but NOT ALARP                                      | Acceptable             | N/A                                    |
| Materials stored outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Moderate M7                                                                          | Low L4                | Tolerable but NOT ALARP                                      | Acceptable             | N/A                                    |
| <p>Supporting Comments:</p> <p>The factors that influencing the reduction in risk level and subsequent tolerability adjustments is the ability to reduce exposure by increasing the low threat areas (Asset Protection Zone) to achieve a maximum of 10kWm2 heat flux exposure on built assets, constructing the shelter in place building to NASH Standard, reducing consequential fires by implementing controls for managing combustible material around the site, and improving building resilience to ember attack. Other controls include staff training and documented guidance and procedures.</p> |                                                                                      |                       |                                                              |                        |                                        |
| <p><b>Note 1</b> Refer to Appendix 1 for explanatory and supporting information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                      |                       |                                                              |                        |                                        |

**Note 2** Refer to Appendix 1 and the Glossary for explanatory information. Inherent risk accounts for the risk reducing impact of bushfire protection measures already implemented (i.e., the existing and planned measures) while residual risk additionally accounts for any protection measures recommended for implementation by the bushfire consultant.

**Note 3** Refer to Section 3.3 for adjustment justification when applicable.

### 3.2 ASSESSED THREAT, EXPOSURE AND VULNERABILITY LEVELS (APPLIED TO DERIVING RISK LEVELS)

| THE ASSESSED INDICATIVE BUSHFIRE HAZARD THREAT LEVEL AND THE EXPOSURE AND VULNERABILITY LEVELS OF THE IDENTIFIED ELEMENTS AT RISK <sup>1</sup>                                                                                                                           |                                             |                                                  |                                                       |                                             |                                                  |                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------|-------------------------------------------------------|
| ELEMENT AT RISK<br><br>[Section 5.2]                                                                                                                                                                                                                                     | INHERENT LEVELS<br>[Appendix 1 – A1.2.3]    |                                                  |                                                       | RESIDUAL LEVELS<br>[Appendix 1 – A1.2.3]    |                                                  |                                                       |
|                                                                                                                                                                                                                                                                          | Bushfire Hazard Threat<br><br>[Section 5.1] | Exposure of Element at Risk<br><br>[Section 5.3] | Vulnerability of Element at Risk<br><br>[Section 5.4] | Bushfire Hazard Threat<br><br>[Section 5.1] | Exposure of Element at Risk<br><br>[Section 5.3] | Vulnerability of Element at Risk<br><br>[Section 5.4] |
| Persons onsite and temporarily offsite                                                                                                                                                                                                                                   | Moderate                                    | Moderate                                         | High                                                  | Low                                         | Low                                              | Low                                                   |
| Persons on access/egress routes in vehicles                                                                                                                                                                                                                              |                                             | High                                             | High                                                  |                                             | High                                             | High                                                  |
| Buildings/Structures - NCC classes 1-10                                                                                                                                                                                                                                  |                                             | Moderate                                         | High                                                  |                                             | Moderate                                         | Moderate                                              |
| Built infrastructure assets                                                                                                                                                                                                                                              |                                             | Moderate                                         | Moderate                                              |                                             | Low                                              | Low                                                   |
| Materials stored outdoors                                                                                                                                                                                                                                                |                                             | Moderate                                         | Moderate                                              |                                             | Low                                              | Low                                                   |
| <b>Note 1</b> Refer to Appendix 1 and Appendix 2 for explanatory and supporting information.                                                                                                                                                                             |                                             |                                                  |                                                       |                                             |                                                  |                                                       |
| <b>Note 2</b> Inherent levels accounts for the threat/exposure/vulnerability reducing impact of applying existing and planned bushfire protection measures and residual levels additionally accounts for any protection measures recommended by the bushfire consultant. |                                             |                                                  |                                                       |                                             |                                                  |                                                       |

### 3.3 ADJUSTMENT OF RESIDUAL RISK TOLERABILITY

Development/use scenarios can exist where a higher level of residual risk might be considered as tolerable or acceptable. Such a situation may exist when the exposed element is not persons and the economic cost due to the loss or damage of assets and/or disruption of services, is a risk that is retained by the owners as an informed decision. Consideration of the knock-on risk implications to persons who might be associated with these elements, or other nearby elements at risk, will be part of the tolerability adjustment assessment.

There may also be isolated scenarios where the limits for tolerability of risk need to be established at lower residual risk levels i.e. an additional margin of safety is required. The rationale for any residual risk tolerance adjustment is presented below.

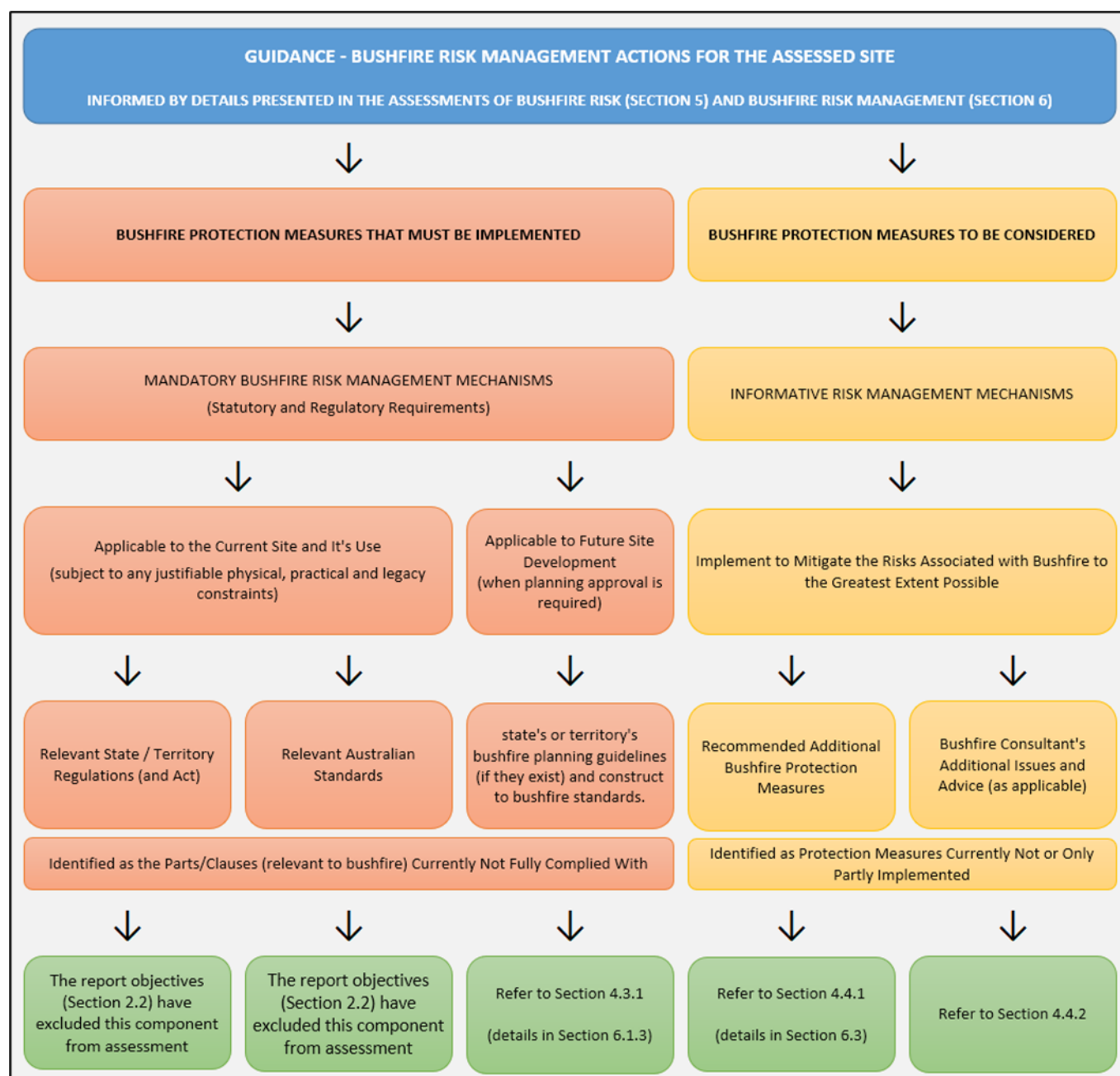
| ELEMENTS AT RISK SUBJECT TO ADJUSTMENT OF RISK TOLERANCE |                      |
|----------------------------------------------------------|----------------------|
| Element At Risk<br>[Section 5.2]                         | Adjustment Rationale |
| N/A                                                      | N/A                  |

## 4 SUMMARY: BUSHFIRE RISK MANAGEMENT

### 4.1 MANAGEMENT ACTIONS TO BE ADDRESSED

The following diagram identifies:

1. The components associated with the mandatory and informative risk management mechanisms; and
2. The location within this summary that presents their corresponding bushfire protection measures as:
  - a) Those currently not fully implemented that must be implemented; and
  - b) Those that are recommended to be implemented.





## 4.2 INFORMATIVE MECHANISMS – ACTION IS RECOMMENDED

### 4.2.1.1 THREAT REDUCING MEASURES - BUSHFIRE HAZARD

| BUSHFIRE HAZARD THREAT REDUCTION<br>RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES |        |                                                                         |                                                                                                                                                               |                                             |
|-----------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| The Protection Mechanism                                                                | Ref No | Brief Description <sup>1</sup>                                          | Recommendation Details                                                                                                                                        | Implementation Priority Rating <sup>2</sup> |
| Prevent Bushfire ignition and/or severity by managing the fuels                         | 1.4    | Remove onsite bushfire fuel                                             | Before clearing, approval must be obtained from the local government before removing or managing native vegetation.                                           | Highest                                     |
|                                                                                         | 1.6    | Reduce onsite bushfire fuel - mechanical                                | Local government approval required before clearing or managing native vegetation.                                                                             | Highest                                     |
|                                                                                         | 1.8    | Enforce compliance with local government property management directives | Include ongoing management requirements in facility guidance and operational documents.                                                                       | High                                        |
| Prevent bushfire ignition by managing heat energy sources                               | 1.9    | Robust and effective site operational procedures                        | Develop guidance documents and operating procedures.                                                                                                          | High                                        |
|                                                                                         | 1.11   | Design and construct equipment to prevent airborne ignition             | Monitor purchase and construction of plant equipment for adequate protection measure against potential ignition sources.                                      | Medium                                      |
|                                                                                         | 1.12   | Actively enforce activity restrictions                                  | Develop Standard Operating Procedures to restrict operation during TFB days. Consider documenting the process for exemptions for certain critical operations. | High                                        |
|                                                                                         | 1.14   | Bushfire awareness and 'good practices' education                       | Basic fire awareness to be included in company induction. Relevant staff training required, site specific Bushfire Awareness and emergency response.          | Medium                                      |
| Prevent bushfire ignition by managing the interactions of heat energy                   | 1.15   | Barriers (shielding) between ignition sources and fuels                 | Include in the facility design stage items and equipment that may be exposed to excessive radiant heat or has the potential to allow the spread of fire.      | High                                        |
|                                                                                         | 1.16   | Equipment design and construction to reduce heat transfer               | Consider in the facility design stage, to reduce the potential of ignition and heat transfer.                                                                 | Medium                                      |

## BUSHFIRE HAZARD THREAT REDUCTION

### RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES

| The Protection Mechanism | Ref No | Brief Description <sup>1</sup>                         | Recommendation Details                              | Implementation Priority Rating <sup>2</sup> |
|--------------------------|--------|--------------------------------------------------------|-----------------------------------------------------|---------------------------------------------|
| sources and fuels        | 1.17   | Separation distance between ignition sources and fuels | Include the critical assets within the 10kWm2 area. | Highest                                     |

<sup>1</sup> The full description of each bushfire protection measure and the detail of the assessment is presented in Section 5.1.5

<sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation.

#### 4.2.1.2 EXPOSURE REDUCING MEASURES - PERSONS

| PERSONS EXPOSURE REDUCTION<br>RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES |        |                                                                |                                                                                                                                                                       |                                             |
|-----------------------------------------------------------------------------------|--------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| The Protection Mechanism                                                          | Ref No | Brief Description <sup>1</sup>                                 | Recommendation Details                                                                                                                                                | Implementation Priority Rating <sup>2</sup> |
| Persons Located Onsite and Temporarily Offsite                                    |        |                                                                |                                                                                                                                                                       |                                             |
| Establish sufficient separation from relevant bushfire hazard threats             | 2.1    | Stay away from the subject site                                | Recommend closing facility to non-essential staff and contractors during heightened fire conditions, being FDI above 75 and catastrophic fire danger days.            | Medium                                      |
|                                                                                   | 2.2    | Remote tourism sites - stay within the subject site            | Apply protection measures. Include safer pathways in the facility design.                                                                                             | Medium                                      |
|                                                                                   | 2.4    | Relocate (evacuate) to designated safer offsite location(s)    | Include Bushfire Emergency Plan into operational documents including the site emergency plan. The cribsroom is the nominated shelter in place building.               | High                                        |
|                                                                                   | 2.6    | Safer pathways for onsite movement                             | Apply protection measures. Include safer pathways in the facility design.                                                                                             | Highest                                     |
|                                                                                   | 2.7    | Pre-emptively relocate to designated safer offsite location(s) | Develop guidelines and procedures to respond to pre-determined FDI and FDR days and other established conditions, eg restricted site access for non-essential people. | High                                        |
| Persons on Access / Egress Routes in Vehicles                                     |        |                                                                |                                                                                                                                                                       |                                             |
|                                                                                   | 3.2    | Egress routes located to ensure driving away from hazard       | Driveway verge to be managed. 3m from the limestone road base driveway will be slashed prior fire season.                                                             | Medium                                      |
|                                                                                   | 3.3    | Greater road width                                             | The driveway will meet public road requirements and additional verge slashing is required. 3m wide verge slashing is required.                                        | Medium                                      |
|                                                                                   | 3.4    | Reduce and maintain road verge fuel to low threat state        | 3m wide verge slashing is required.                                                                                                                                   | Medium                                      |
| Persons Located Onsite and Temporarily Offsite                                    |        |                                                                |                                                                                                                                                                       |                                             |

| PERSONS EXPOSURE REDUCTION                                                                                                                                 |                                               |                                                             |                                                                                                                                   |                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES                                                                                                        |                                               |                                                             |                                                                                                                                   |                                             |
| The Protection Mechanism                                                                                                                                   | Ref No                                        | Brief Description <sup>1</sup>                              | Recommendation Details                                                                                                            | Implementation Priority Rating <sup>2</sup> |
| Establish shielding from relevant bushfire hazard threats                                                                                                  | 2.9                                           | On-site shelter building – not to community refuge standard | Will be constructed to NASH Standard                                                                                              | High                                        |
|                                                                                                                                                            | 2.10                                          | On-site shelter building – not a 'vulnerable' use           | The flame temperature will be calculated at 1200k rather than 1090k and the office/crib room will be constructed to NASH standard | Highest                                     |
|                                                                                                                                                            | Persons on Access / Egress Routes in Vehicles |                                                             |                                                                                                                                   |                                             |
| <sup>1</sup> The full description of each bushfire protection measure and the detail of the assessment is presented in Section 5.3.1.1 and Section 5.3.2.1 |                                               |                                                             |                                                                                                                                   |                                             |
| <sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation.                                                                      |                                               |                                                             |                                                                                                                                   |                                             |



#### 4.2.1.3 EXPOSURE REDUCING MEASURES – ALL STRUCTURES AND MATERIALS STORED OUTDOORS

| ALL STRUCTURES & MATERIALS STORED OUTDOORS EXPOSURE REDUCTION<br>RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES |                          |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                             |
|----------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| The Protection Mechanism                                                                                             | Ref No                   | Brief Description <sup>1</sup>                                     | Recommendation Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Implementation Priority Rating <sup>2</sup> |
| Establish sufficient separation from relevant bushfire hazard threats                                                | 4.2<br>5.2<br>6.2<br>6.1 | Designed location of non-vegetated areas and/or managed open space | Use roads, hardstand areas and footpaths as open managed spaces.<br>Construct and maintain the APZ to ensure maximum heat flux exposure does not exceed 10kWm2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Medium                                      |
|                                                                                                                      | 4.3<br>5.3<br>6.2        | Landscaping - asset protection zone (APZ)                          | <ul style="list-style-type: none"> <li>10kWm2 @ 1200k APZ will be constructed and maintained around the nominated shelter in place building.</li> <li>A Landscape Management Plan will be provided.</li> <li>To minimise exposure from external radiant heat, a &lt;10kWm2 @ 1090k APZ is required to be established. The dimensions for this APZ are provided within the associated BMP. The increased APZ to 10kWm2 will reduce the overall preheating on combustible materials.</li> <li>Develop an emergency Management Plan</li> <li>Install an appropriate fire hydrant system (and water runoff/catchment)</li> <li>Install appropriate fire sprinkler suppression systems (and water runoff/catchment)</li> </ul> <p>External storage management of organic material</p> <ul style="list-style-type: none"> <li>Maximum height of any stockpile loosed piled or baled &lt;4.8m.</li> <li>Maximum width of a stockpile is to be 20m</li> <li>Maximum length of a stockpile to be &lt;50m</li> <li>Arrangement of stockpiles is to minimise the likelihood of fire spread and provide access for fire appliances.</li> </ul> <p>DFES Information Note September 2014 – Spontaneous combustion of green waste windrows and stockpiles due to elevated internal temperatures.</p> | Highest                                     |

## ALL STRUCTURES & MATERIALS STORED OUTDOORS EXPOSURE REDUCTION

### RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES

| The Protection Mechanism | Ref No            | Brief Description <sup>1</sup>                                                                           | Recommendation Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Implementation Priority Rating <sup>2</sup> |
|--------------------------|-------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
|                          |                   |                                                                                                          | <ul style="list-style-type: none"> <li>Moisture content of the composting windrows will be maintained above 45% as part of the composting process, and by virtue will reduce the risk of spontaneous combustion. This will be maintained by watering once a day or as required.</li> <li>Moisture content of the green waste received on site will not exceed 20% to prevent the generation of heat occurring through biological activity occurring and in turn resulting in spontaneous combustion.</li> </ul>                                                                                                                                                                               |                                             |
|                          | 4.4<br>5.4        | Landscaping - tree location                                                                              | Avoid planting trees that allow fire to ascend the trunk and produce embers and firebrands.<br>A Landscape Management Plan will be provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | High                                        |
|                          | 4.6<br>5.6<br>6.3 | Separation from stored flammable products – fuels / other hazardous materials (consequential fire fuels) | <p>Include in facility guidelines to direct the storage of fuel, flammable liquids and workshop gas bottles, used and new oils storage and other flammable items.</p> <p>Where external heat sources have not been considered by the manufacture or Standard, then the separation distance, than item # 7.7 is to be used. If cabling and other flammable items are exposed to direct radiant heat, than &lt;10kWm2 will be the maximum exposure.</p> <p>Include in the facilities emergency plan and operational documents where to store the items, state the separation distances and provide direction on maintaining buildup of fine and heavy fuels.</p> <p>Provide staff training.</p> | High                                        |
|                          | 4.7<br>5.7<br>6.4 | Separation from stored and constructed combustible items (consequential fire fuels)                      | <p>Details: Include in the guidance document separation distances required for flammable and combustible materials.</p> <p>Detail in the facilities guidance document and information in the Emergency Management Plan guidance on storage of heavy fuels and separation distances.</p> <p>It is recommended that this 10m buffer form all hard fix assets is sealed or compacted with concrete, compacted limestone, gravel, blue metal etc.</p>                                                                                                                                                                                                                                             | Highest                                     |

## ALL STRUCTURES & MATERIALS STORED OUTDOORS EXPOSURE REDUCTION

### RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES

| The Protection Mechanism                                  | Ref No                   | Brief Description <sup>1</sup>                          | Recommendation Details                                                                                                                                                                                                                                                                                      | Implementation Priority Rating <sup>2</sup> |
|-----------------------------------------------------------|--------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Establish shielding from relevant bushfire hazard threats | 4.8<br>5.8<br>6.5        | Constructed barrier – shielding from bushfire           | Fencing, external walls and retaining walls to be constructed using non-combustible materials.                                                                                                                                                                                                              | Medium                                      |
|                                                           | 4.9<br>5.9<br>6.9<br>8.6 | Constructed barrier – shielding from consequential fire | Ensure all subfloor spaces are sealed.<br>Shield fuel lines and electrical components extending from the infrastructure.<br>When Separating Masonry walls are used, the walls are to be marked showing the maximum height and width to identify the stockpile limits.                                       | Medium                                      |
|                                                           | 4.11<br>5.11<br>6.8      | Planted vegetation barrier                              | Include in the facility guidance documents and operational documents management of planted vegetation.<br>Vegetation planting to be in accordance with the Landscape Plan.<br>Plantings to be managed to low threat if located in the APZ and Guidelines for Planning in Bushfire Prone Areas - Schedule 1. | Medium                                      |
|                                                           | 4.12<br>5.12             | Shield operation critical non-structural elements       | Position all critical non-structural items in less than 10kWms area and shield electrical cabling, poly tanks and pipes, valves and any other item susceptible to low radiant heat. Include a maintenance regime for debris accumulation management within the guidance document.                           | Highest                                     |

<sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Section 5.3.3.1. and Section 5.3.4.1 & 5.3.5.1

<sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation.

#### 4.2.1.4 VULNERABILITY REDUCING MEASURES - PERSONS

| PERSONS VULNERABILITY REDUCTION<br>RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES |                                                |                                                                                              |                                                                                                                                                                                 |                                             |
|----------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| The Protection Mechanism                                                               | Ref No                                         | Brief Description <sup>1</sup>                                                               | Recommendation Details                                                                                                                                                          | Implementation Priority Rating <sup>2</sup> |
| Transport and multiple evacuation destinations and routes available                    | Persons Located Onsite and Temporarily Offsite |                                                                                              |                                                                                                                                                                                 |                                             |
|                                                                                        | 6.1                                            | Sufficient evacuation transport available                                                    | People on site will have their own transport.                                                                                                                                   | Lowest                                      |
|                                                                                        | 6.2                                            | Multiple safer offsite locations available                                                   | A BEP has been developed for the facility                                                                                                                                       | High                                        |
| Provision of bushfire emergency information and education                              | 6.3                                            | Develop a bushfire emergency plan                                                            | A BEP has been developed and provided.                                                                                                                                          | High                                        |
|                                                                                        | 6.4                                            | Relevant operational documents to contain the bushfire protection measures to be implemented | Update the Fire Response Plan and develop Guidance documents before facility becomes operational                                                                                | High                                        |
|                                                                                        | 6.5                                            | Prominent display of bushfire emergency information                                          | Bushfire information to be displayed at the weigh bridge office and the administration office.                                                                                  | Medium                                      |
|                                                                                        | 6.6                                            | Direct to persons emergency messaging system                                                 | Emergency messaging system to be developed.                                                                                                                                     | High                                        |
|                                                                                        | 6.7                                            | Egress pathway signage                                                                       | Identified safer onsite location.                                                                                                                                               | Medium                                      |
|                                                                                        | 6.8                                            | Personnel are trained to implement the bushfire emergency plan                               | Staff to be trained in emergency response and bushfire awareness.                                                                                                               | Highest                                     |
| Onsite persons capable of managing a bushfire emergency are available                  | 6.12                                           | Onsite persons available to manage bushfire emergency procedures                             | Ensure enough appropriately trained staff are onsite at all times during the bushfire season to assist with emergency procedures. Emergency procedures to be reviewed annually. | Highest                                     |
|                                                                                        | 6.13                                           | Onsite persons can operate firefighting equipment                                            | Provide a mobile response unit. Recommend 2 x slip-on units and basic bushfire awareness and response.                                                                          | Highest                                     |
|                                                                                        | 6.14                                           | External emergency response services available                                               | Safe early evacuation is the preferred response. Local brigade turnout is 20 minutes.                                                                                           | Highest                                     |

**PERSONS VULNERABILITY REDUCTION**  
**RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES**

| The Protection Mechanism                                                                                                                                                                                                                                                 | Ref No                                        | Brief Description <sup>1</sup>               | Recommendation Details                                                                                                                                 | Implementation Priority Rating <sup>2</sup> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Lower risk road construction (design and materials)                                                                                                                                                                                                                      | Persons on Access / Egress Routes in Vehicles |                                              |                                                                                                                                                        |                                             |
|                                                                                                                                                                                                                                                                          | 7.1                                           | Greater road width                           | The driveway will be constructed to public road standards as per Table 6 of the Guidelines for planning in Bushfire Prone Areas.                       | Medium                                      |
|                                                                                                                                                                                                                                                                          | 7.4                                           | Stable road surfaces                         | Road surfaces will meet the technical requirement of the Guidelines. Recommend the driveway is limestone road base.                                    | Medium                                      |
| Evacuees are self-sufficient and have local awareness and own transport                                                                                                                                                                                                  | 7.8                                           | Self-sufficient persons with local awareness | Site induction and contractor information to include information about the sites evacuation process. Include in the Facility guidelines and induction. | High                                        |
|                                                                                                                                                                                                                                                                          | 7.9                                           | Onsite persons have own transport            | Include in facility training and induction program.                                                                                                    | Medium                                      |
| <sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Section 5.4.1.1 and Section 5.3.5.1<br><sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation. |                                               |                                              |                                                                                                                                                        |                                             |



#### 4.2.1.5 VULNERABILITY REDUCING MEASURES – STRUCTURES

| STRUCTURES VULNERABILITY REDUCTION<br>RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES |                     |                                                                           |                                                                                                                                                                                                                                                  |                                             |
|-------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| The Protection Mechanism                                                                  | Ref No              | Brief Description <sup>1</sup>                                            | Recommendation Details                                                                                                                                                                                                                           | Implementation Priority Rating <sup>2</sup> |
| Construction design and materials                                                         | 9.1<br>10.1         | Construct to AS 3959:2018                                                 | Built infrastructure assets - Fit ember screens, gaps to be 2mm or less. The built infrastructure assets where applicable will implement the protection measures.<br>Comment - Nominated shelter in place building to comply with NASH standard. | Medium                                      |
|                                                                                           | 9.2<br>10.2         | Construct to NASH Standard                                                | Nominated shelter in place building to comply with NASH standard.<br>The facilities built infrastructure assets where applicable will implement the protection measures.                                                                         | Highest                                     |
|                                                                                           | 9.3<br>12.3<br>14.3 | Construction materials for external and internal cavity building elements | Where possible use non-combustible material.                                                                                                                                                                                                     | Medium                                      |
|                                                                                           | 9.4<br>10.4         | Construction materials for consequential fire fuels                       | Use of non-combustible materials is preferred/recommended.                                                                                                                                                                                       | Medium                                      |
|                                                                                           | 9.5<br>10.5         | Construction design/materials resistant to high wind damage               | Construct shelter in place building to NASH standard. NASH Standard has been designed for impact of wind.                                                                                                                                        | High                                        |
|                                                                                           | 9.7<br>10.7         | Construction of electricity supply                                        | Cabling to be underground wherever possible.<br>Cabling above ground to be shielded and cradled a minimum 100mm above the ground.                                                                                                                | High                                        |
|                                                                                           | 9.8<br>10.8         | Minimise re-entrant detail to minimise debris and ember accumulation      | The shelter in place building (office) to consider design features to minimise debris and ember accumulation.                                                                                                                                    | Lowest                                      |
|                                                                                           | 9.9<br>10.9         | Minimise debris and ember trapping surfaces                               | The facility is constructed for a specific industry use therefore the trapping surfaces may be flat.                                                                                                                                             | Lowest                                      |
|                                                                                           | 9.10<br>10.10       | Protect roof plumbing to minimise debris and ember accumulation           | Design of facility, workshop plumbing and associated structures and equipment to consider reducing the risk off ignition.                                                                                                                        | Medium                                      |

## STRUCTURES VULNERABILITY REDUCTION

### RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES

| The Protection Mechanism                           | Ref No                 | Brief Description <sup>1</sup>                                                  | Recommendation Details                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Implementation Priority Rating <sup>2</sup> |
|----------------------------------------------------|------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
|                                                    |                        |                                                                                 | The office (shelter in place building) will be constructed using the NASH protection measures.                                                                                                                                                                                                                                                                                                                                                                              |                                             |
|                                                    | 9.11<br>10.11          | Minimise construction cavities to minimise debris and ember accumulation        | The office will be constructed the BAL-29 requirements.<br>Built infrastructure Assets - Seal subfloor space and apply ember screening to opening.                                                                                                                                                                                                                                                                                                                          | Highest                                     |
|                                                    | 9.12<br>10.12          | Minimise external openings to limit flame / radiant heat / ember / debris entry | For the facility, workshop and associated structures, protection measure to be applied where practicable.<br>Office to comply with the NASH Standard protection measures.                                                                                                                                                                                                                                                                                                   | High                                        |
|                                                    | 9.13<br>10.13          | Screen and seal gaps and penetrations                                           | For the facility, workshop and associated structures and built assets, protection measure to be applied where practicable.<br>Office to comply with the NASH Standard protection measures.                                                                                                                                                                                                                                                                                  | High                                        |
|                                                    | 9.14<br>12.14<br>14.14 | Screen external doors and windows                                               | For the facility, workshop and associated structures, protection measure to be applied where practicable.                                                                                                                                                                                                                                                                                                                                                                   | High                                        |
|                                                    | 10.16                  | Construction materials for critical non-structural elements                     | The critical non-structural elements to be located in <10kWm2 area or shielded.                                                                                                                                                                                                                                                                                                                                                                                             | Highest                                     |
| Availability of a firefighting response capability | 9.16<br>10.17          | Firefighting water supply                                                       | Firefighting water tanks are to be non-combustible. Minimum 50,000lt are required and to be fitted with coupling as per BMP requirements. If hydrants are installed, the 50,000lt tank will not be required.                                                                                                                                                                                                                                                                | Highest                                     |
|                                                    | 9.17<br>10.18          | Firefighting equipment actively operated                                        | <ul style="list-style-type: none"> <li>Sprinkler system required for all stockpiles of flammable materials.</li> <li>Training required for system operations.</li> <li>Operational plans required for sprinkler operations.</li> <li>As a minimum, 2 x slip-on firefighting units (not trailer type) are required.</li> <li>Staff training required in unit operations.</li> <li>Training operation manual to be developed in response and equipment operations.</li> </ul> | Highest                                     |

## STRUCTURES VULNERABILITY REDUCTION

### RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES

| The Protection Mechanism                                         | Ref No         | Brief Description <sup>1</sup>                           | Recommendation Details                                                                                                                                                                                                                     | Implementation Priority Rating <sup>2</sup> |
|------------------------------------------------------------------|----------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
|                                                                  |                |                                                          | PPE to be provided to trained staff.                                                                                                                                                                                                       |                                             |
|                                                                  | 9.18<br>10.19  | Firefighting equipment passively operated                | <ul style="list-style-type: none"> <li>Sprinkler system required for all stockpiles of flammable materials.</li> <li>Training required for system operations.</li> <li>Operational plans required for sprinkler operations.</li> </ul>     | Highest                                     |
|                                                                  | 9.19<br>10.20  | Firefighting equipment operability maintained            | Develop operational manual and maintenance schedule.                                                                                                                                                                                       | Highest                                     |
|                                                                  | 12.20<br>10.21 | Access via firebreaks provided                           | The site will comply with the Firebreak Notice.                                                                                                                                                                                            | Medium                                      |
| Manage and maintain effectiveness of applied protection measures | 9.21<br>10.22  | Formal documents created to guide and enforce management | <p>Guidance documents to be developed for site operations and emergency management (maintenance of equipment &amp; training)</p> <p>The different documents will be able to satisfactorily perform this function to differing extents.</p> | High                                        |

<sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Sections 5.4.3.1 & 5.4.3.4

<sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation.

#### 4.2.1.6 VULNERABILITY REDUCING MEASURES – NON-BUILDING ACCOMMODATION AND MATERIALS STORED OUTDOORS

| NON-BUILDING ACCOMMODATION AND MATERIALS STORED OUTDOORS VULNERABILITY REDUCTION                                                                                                                                                                                         |        |                                                          |                                                                                                                                                                                                            |                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| RECOMMENDED ADDITIONAL BUSHFIRE PROTECTION MEASURES                                                                                                                                                                                                                      |        |                                                          |                                                                                                                                                                                                            |                                             |
| The Protection Mechanism                                                                                                                                                                                                                                                 | Ref No | Brief Description <sup>1</sup>                           | Recommendation Details                                                                                                                                                                                     | Implementation Priority Rating <sup>2</sup> |
|                                                                                                                                                                                                                                                                          | 11.1   | Construction materials for consequential fire fuels      | Fences, screen and retaining walls to be non-combustible.                                                                                                                                                  | High                                        |
| Availability of a firefighting response capability                                                                                                                                                                                                                       | 11.2   | Firefighting water supply                                | A 50,000lt water supply for bushfire response is required.<br>Comment: The tank may not be required if hydrants are installed.<br>Comment: A booster, tanks and hydrants may be installed at a later stage | Highest                                     |
|                                                                                                                                                                                                                                                                          | 11.3   | Firefighting equipment actively operated                 | Appropriate training, response equipment and operational documents to be available.                                                                                                                        | High                                        |
|                                                                                                                                                                                                                                                                          | 11.4   | Firefighting equipment passively operated                | Internal systems may be fitted, to be determined by DFES Built Environmental branch, the system may be automatically operated.                                                                             | Highest                                     |
|                                                                                                                                                                                                                                                                          | 11.5   | Firefighting equipment operability maintained            | Guidance manual will include maintenance schedules of all equipment and machinery.                                                                                                                         | Highest                                     |
|                                                                                                                                                                                                                                                                          | 11.6   | Access via firebreaks provided                           | Firebreaks to be compliant with the Shire's Firebreak Notice.                                                                                                                                              | Medium                                      |
| Manage and maintain effectiveness of applied protection measures                                                                                                                                                                                                         | 11.7   | Formal documents created to guide and enforce management | Create documents to guide and enforce management and operations.                                                                                                                                           | Highest                                     |
| <sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Section 5.4.5.1 and Section 5.4.5.2<br><sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation. |        |                                                          |                                                                                                                                                                                                            |                                             |

#### 4.2.2 ADDITIONAL ISSUES AND ADVICE FOR CONSIDERATION

This section presents items the bushfire consultant has identified as being:

- Issues that are additional to or not specifically addressed within the assessment of bushfire risk management conducted in Section 6; and
- Advice for dealing with these issues or other issues that require emphasising, for consideration by management.

No relevant additional issues have been identified for the subject facility/premises.



## 5 BUSHFIRE RISK ASSESSMENT

### 5.1 THE IDENTIFIED BUSHFIRE HAZARDS WITHIN THE SURROUNDING LANDSCAPE

#### INFORMATION TO ASSIST INTERPRETATION

##### AREA OF LAND TO BE ASSESSED AS THE SURROUNDING LANDSCAPE

The assessment for this report considers the surrounding landscape to be comprised of two parts:

1. The subject site and all land surrounding the subject land extending out to 150 metres as the 'Subject Land + 150m Extent'; and
2. The land surrounding the 'Subject Land + 150m Extent' extending out to the maximum distance that will be established by one or more of the following factors:
  - The distance away from the subject land that will result in an area of land that, when supporting bushfire prone vegetation, is of sufficient size such that a large scale bushfire can develop (landscape scale fire);
  - The distance away from the subject land from which the bushfire direct attack mechanism of embers/ burning debris may reasonably be expected impact the subject land. This is highly dependent on the 'category' of vegetation present with regard to its potential ember/burning debris threat (refer to Appendix 2 for explanatory information); and/or
  - The distance away from the subject land that contains the road network that persons in vehicles (including emergency services) would traverse in evacuating or accessing the subject land in the event of a bushfire.

To achieve the required assessment outcomes a maximum distance of 5 km from the subject land is likely to be considered sufficient, with this distance being reduced when the vegetation categories presenting the higher ember/burning debris threat level do not exist.

##### ASSESSMENT PURPOSE

To identify whether the land surrounding the existing or proposed development and its use contains the physical factors necessary for any of the following scenarios to exist:

1. The potential exists for the bushfire hazard threat of embers/burning debris to impact elements at risk on the subject land. It is particularly important this threat is identified when any vegetation planned to be retained and/or established on the subject land and within 100 metres (the 'Subject Land + 150m Extent') may not present this threat - or at least not to the same level. Refer to Appendices A1.3 and A1.6 for additional information.

*Note: Scientific research indicates that at least 80% of building losses from past Australian bushfires can be attributed to ember/firebrand attack (mostly in isolation but also in combination with radiant heat), and the resultant consequential fires. It is a very important threat to be identified; and/or*

2. The potential exists for development of a large scale bushfire event(s) that can impact the subject land because the necessary extent of bushfire prone vegetation exists. Such events may increase the severity of bushfire behaviour within the 'Subject Land + 150m Extent' vegetation, consequently increasing the levels of all bushfire hazard threats impacting elements at risk; and/or
3. The potential exists for development of dynamic fire behaviours and deep flaming that are associated with extreme bushfire events (including pyroconvective events). Dynamic fire propagation arises from complex interactions between the terrain, the atmosphere and the fire (refer to Appendix 3 for additional information).  
  
Extreme bushfire events have the potential to impact subject land through generating fire driven strong winds, increasing erratic fire behaviour and increasing the levels of all bushfire hazard threats impacting elements at risk.; and/or
4. The potential exists for increased levels of bushfire hazard threats, to persons in vehicles who need to move through this area of land (i.e., persons evacuating from the subject land and emergency services), thereby increasing level of risks associated with bushfire.

### 5.1.1 DETERMINATION OF ASSESSMENT EXTENT

| THE APPLIED SURROUNDING LANDSCAPE ASSESSMENT EXTENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Basis for Determination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                  |
| <p>The vegetation categories identified surrounding the subject land include significant extents and continuity of those that contain trees with bark hazards.</p> <p>These present the potential for developing significant ember/burning debris threat levels. These threats are either medium (up to 5km) and/or long distance (greater than 5km) spotting. <sup>1</sup></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                  |
| <p>The vegetation categories identified surrounding the subject land only include those that have the potential for shorter distance spotting (ember/burning debris attack) of up to 500-750m. <sup>1</sup></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                  |
| <p>The distance away from the subject land that contains the road network that persons in vehicles would traverse in evacuating or accessing the subject land in the event of a bushfire, has determined the assessment extent.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  |
| <p><b>Assessment Comments:</b></p> <p>Majority of the area up to 2kms was inaccessible, therefore arial imagery and sample vegetation assessments were used to assess the potential of the threat from the surrounding landscape.</p> <p>The Tree-1 area has more than 10% of trees with fine fibrous bark. See Appendix 5). This complex presents a potential short and medium range threat of ember or burning debris attack.</p> <p>The vegetation complex exists over a small area to the south of the proposed facility.</p> <p>The Tree/Shrub area is the predominant vegetation complex, it consist of regrowth scrub (Kunzea) interspersed with marri and in the wetter areas melaleuca (paperbark). This complex will potentially produce low density embers up to 700 metres.</p> <p>The Tree/Shrub and grassland vegetation categories exists over sufficiently large areas, however due to the potential for low density, and short distance embers, the assessment area was restricted to approximately 2 km.</p> |                                  |
| <p>The extent of land surrounding the subject land that is to be considered as being the surrounding landscape for assessment purposes:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p><b>Approximately 2 km</b></p> |
| <p><b>Note 1:</b> Refer to Appendix 2 and Appendix 3 for additional information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                  |

## 5.1.2 CATEGORIES OF VEGETATION IDENTIFIED AND ASSOCIATED INDICATIVE THREAT LEVEL RANGES

Vegetation categories are established to enable a comprehensive assessment of the type and severity of the bushfire attack mechanisms (i.e., the bushfire threats), potentially generated by bushfire prone vegetation on surrounding land. This enables variations in vegetation composition and structure to be more appropriately accounted for in the determination of the levels of risk associated with a local bushfire event.

The variations in indicative threat level ranges assigned to each vegetation category in the table below are the result of these differences.

The 'Categories' are necessarily different to the vegetation 'Classifications' applied in the BAL determination methodology of AS 3959:2018. The building Standard primarily considers the flame contact and radiant heat attack mechanisms and does not fully address ember/firebrand attack or other threats.

| INDICATIVE THREAT LEVELS OF THE IDENTIFIED BUSHFIRE HAZARD IN THE SURROUNDING LANDSCAPE                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Vegetation Category <sup>1 &amp; 2</sup>                                                                                                                                                                                                                                                                                               | Assessment Comments                                                                                                                                                                                                                                                                                                                                                                                                         | Indicative Threat Level Range <sup>2</sup> |
| Tree-1                                                                                                                                                                                                                                                                                                                                 | This area supports a complex of, marri, paperbark, banksia and various other eucalypt trees with associated shrub understorey (not always present). The species composition varies across locations. Jarrah is evident but not dominant.                                                                                                                                                                                    | Moderate to Very High                      |
| Tree-2                                                                                                                                                                                                                                                                                                                                 | N/A                                                                                                                                                                                                                                                                                                                                                                                                                         | N/A                                        |
| Tree/Shrub                                                                                                                                                                                                                                                                                                                             | These areas support a mixture of taller shrub type vegetation but also contain trees as a taller but less frequent vegetation type within the complex.                                                                                                                                                                                                                                                                      | Moderate to High                           |
| Shrub                                                                                                                                                                                                                                                                                                                                  | N/A                                                                                                                                                                                                                                                                                                                                                                                                                         | N/A                                        |
| Grass                                                                                                                                                                                                                                                                                                                                  | These areas support a range of broadleaf and grass pasture species. Some are managed more intensively and are stocked more regularly, and therefore eaten down. Others have various levels of management but will generally have some form of material reduction during the year or have inherently low fuel loads due to regular disturbance and/or lower quality soils.<br>Rushes are supported in the lower wetter areas | Low to Moderate                            |
| No/Low Threat                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                             | N/A                                        |
| <p><b>Note 1:</b> Refer to Figure 5.1: Surrounding landscape – the identified vegetation categories.</p> <p><b>Note 2:</b> Refer to Appendix 5 for a description of the criteria that establish the vegetation categories, the base bushfire hazard scenario and the indicative threat levels and the application of these levels.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |



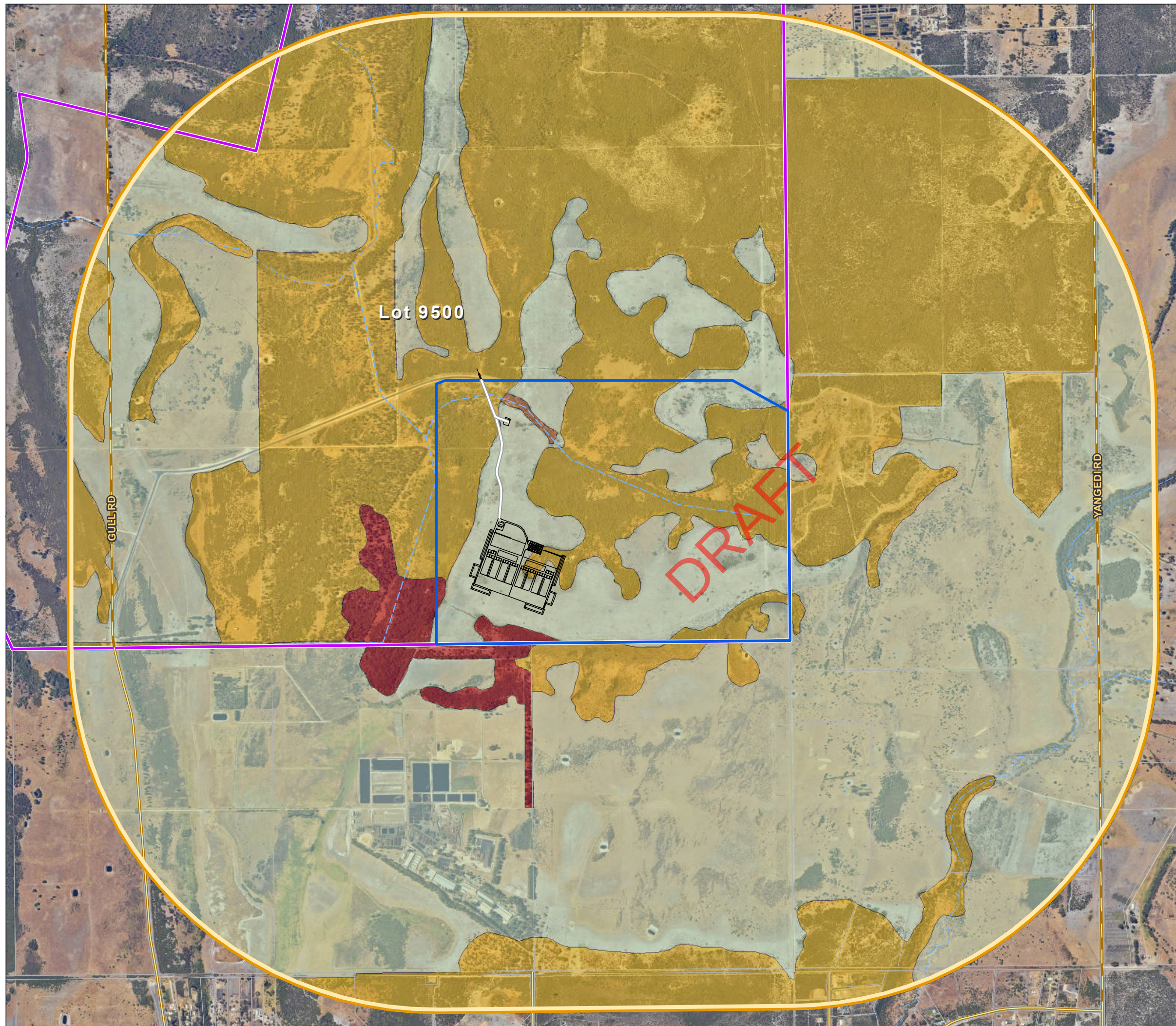
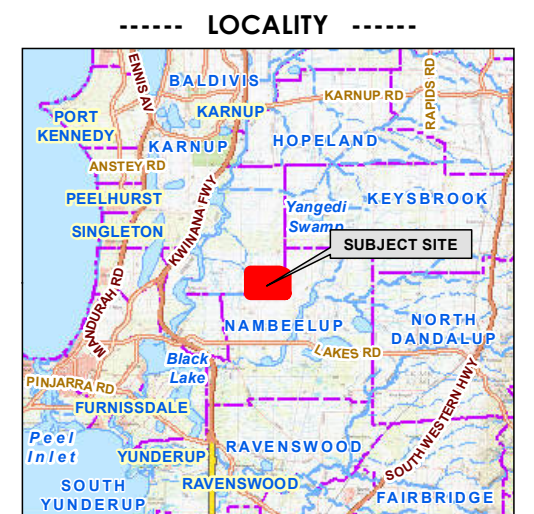
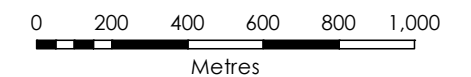


Figure 5-1  
**Broader Landscape Categorical Vegetation**  
 Lot 9500 on Plan 414516, Area : 1,608.9031 ha  
 320 Gull Road,  
 KERALUP 6182  
**SHIRE OF MURRAY**

- **LEGEND** -----
- Development Site
  - Subject Site
  - Other Lots
  - Development
  - Driveway
- Vegetation Assessment Area**
- 2 km from Subject Site
- Broader Landscape Vegetation Categories**
- Tree-1
  - Tree-2
  - Tree/Shrub
  - Grass



Aerial Imagery : Landgate/SLIP  
 Image Date : Feb 2022

Coordinate System: GDA 1994 MGA Zone 50  
 Projection: Universal Transverse Mercator Units: Metre  
 Map compiled by: Ian Ross 4/12/2023  
 Map updated by: Ian Ross 4/12/2023  
 A3 Scale 1:20,000





### 5.1.3 VISUAL REPRESENTATION OF FLAME CONTACT AND RADIANT HEAT THREATS – THE BAL CONTOUR MAP

#### INFORMATION TO ASSIST INTERPRETATION – THE BAL CONTOUR MAP AND BAL RATINGS

1. **The Modelling Methodology (Calculations) Applied:** AS 3959:2018 establishes the Bushfire Attack Level (BAL) determination methodology that will be applied to the relevant vegetation. When applicable, other bushfire behaviour models may be applied, and their application would be identified and justified in this report.
2. **The Relevant Vegetation:** This will be bushfire prone vegetation existing on the 'Subject Land + 150m Extent' that is classified according to the AS 3959:2018 BAL determination methodology. The classified vegetation maps and supporting vegetation photos and calculation data is presented in Appendix 6;
3. **BAL Contour Map:** The levels of potential flame contact and radiant heat transfer are assessed as indicative bushfire attack levels and presented as a 'BAL Contour Map'. The levels to which any element at risk (e.g., a building), whose location on the map is identified, can be derived from this map.

Figure 5.2 illustrates the site specific separation distances from classified vegetation that will correspond to each Bushfire Attack Level (BAL) as coloured contours;

4. **The BAL Contours:** The contours, each of varying widths, extend out from each area of classified vegetation. Each different contour represents a set range of potential radiant heat transfer (in kW/m<sup>2</sup>) to an element at risk located within the contour and is stated as a BAL rating;
5. **The Vegetation Separation Distances:** The horizontal distances from the edge of the classified vegetation to the start and the end of each different BAL contour, represent the separation distances (between the classified vegetation and the element at risk), that will correspond to that BAL rating for that site. The calculated distances have accounted for site specific vegetation types, ground slopes and other relevant input variables. These separation distances can also be presented in a table.

In addition to BAL rating separation distances, a distance that corresponds to singular levels of radiant heat transfer such as 2 kW/m<sup>2</sup> and 10 kW/m<sup>2</sup>, may also be presented for specific purposes including proposed vulnerable land uses; and

6. **The Applicable BAL Rating:** Any element at risk (as the receiver of the radiant heat), that exists wholly or partly within a given contour, will be subject to that BAL rating. The rating establishes the applicable bushfire construction standard requirements. These ratings can also be applied to the derivation of flame contact and radiant heat transfer levels when required as a component of bushfire risk assessment.





Figure 3.1.2  
**Classified Vegetation & Topography (Post Development) Showing 10kw APZ**

Lot 9500 on Plan 414516, Area : 1,608.9031 ha  
320 Gull Road,  
KERALUP 6182  
**SHIRE OF MURRAY**

----- **LEGEND** -----

Development Site  
 Subject Site  
 Other Lots  
 50m Wetland Buffer  
 Development

**Radiant Heat Flux**  
 <10kw Zone (Within Subject Site)

**Description**  
 Office  
 Office / Cribroom  
 Workshop  
 Receiving Hall  
 Weighbridge  
 Liquid Waste Receiving  
 Fuel Store Service Bay  
 Driveway

**150m Vegetation Assessment Area**  
 150m from Subject Site

**Classified Vegetation**  
 Class (A) Forest  
 Class (D) Scrub  
 Class (G) Grassland  
 Exclusion 2.2.3.2  
 APZ Distance

0 100 200 300 400 500  
Metres

----- **LOCALITY** -----

Aerial Imagery : Landgate/SLIP  
Image Date : Feb 2022

Coordinate System: GDA 1994 MGA Zone 50  
Projection: Universal Transverse Mercator Units: Metre  
Map compiled by: Ian Ross 5/12/2023  
Map updated by: Ian 5/12/2023  
A3 Scale 1:7,500

**Disclaimer and Limitation:** This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence arising from relying on any information depicted.  
Map Document Path / Name: K:\Projects\Jobs 2022\220666 - 320 Gull Road Keralup (BMP)\Mapping\MXD\220666\_BRMP\_Fig3-1-2\_VEG\_POST\_320 Gull Road.mxd



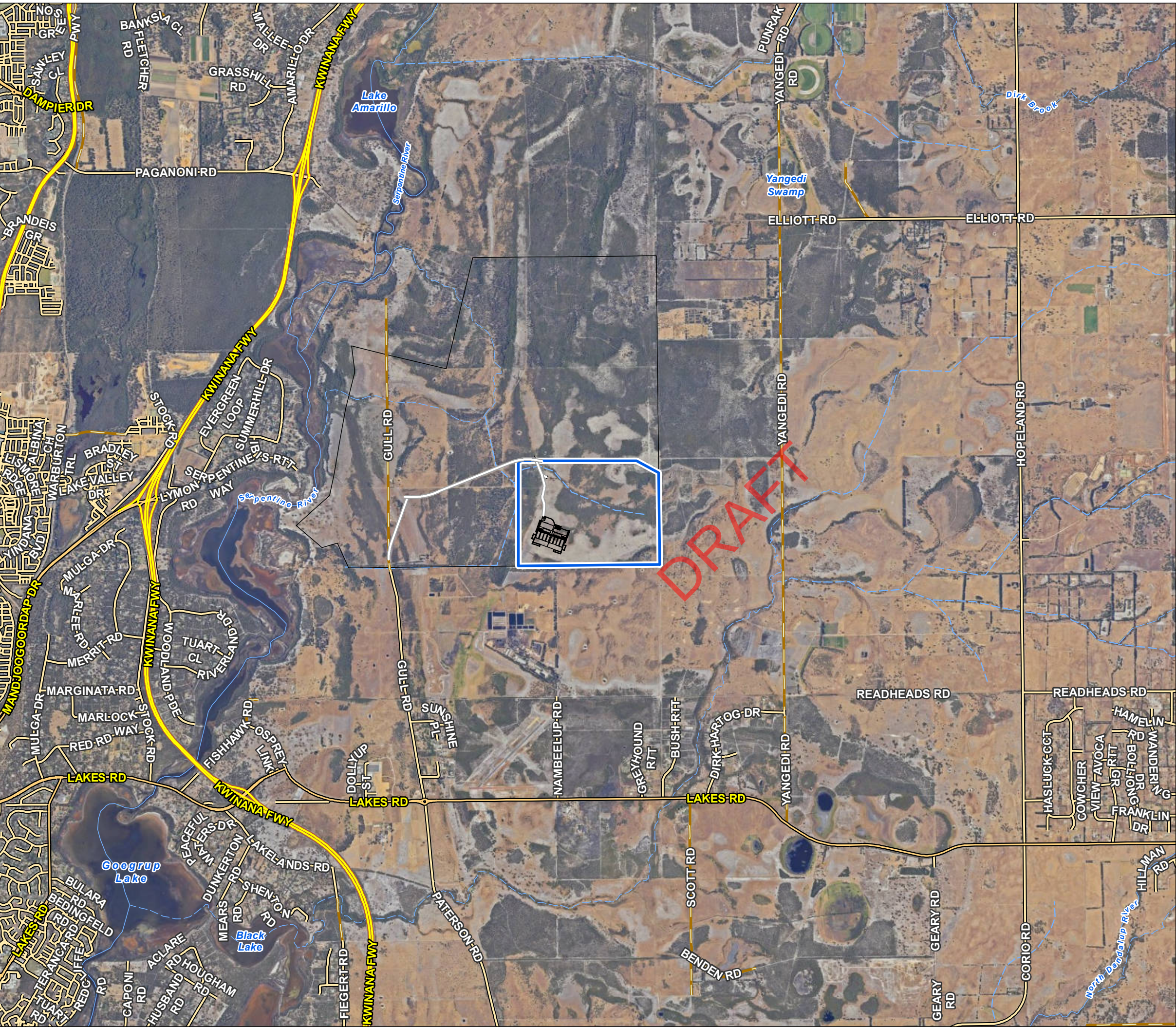
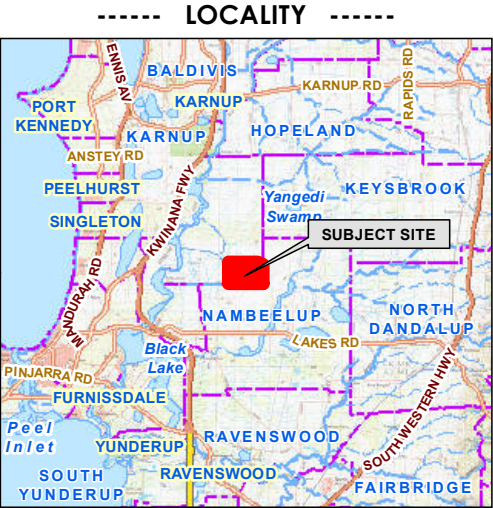
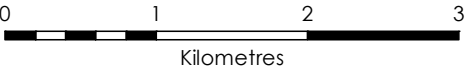


Figure A5.4  
**Broader Landscape  
Road Network Map**  
Lot 9500 on Plan 414516, Area : 1,608.9031 ha  
320 Gull Road,  
KERALUP 6182  
**SHIRE OF MURRAY**

- **LEGEND** -----
- Development Site
  - Development
  - Driveway
- Major Roads**
- State Highway / Freeway
  - Main Road - Sealed
- Minor Roads**
- Minor Road - Sealed
  - Minor Road - Unsealed



Aerial Imagery : Landgate/SLIP  
Image Date : Feb 2022

Coordinate System: GDA 1994 MGA Zone 50  
Projection: Universal Transverse Mercator Units: Metre  
Map compiled by: Ian Ross 4/12/2023  
Map updated by: Ian Ross 4/12/2023  
A3 Scale 1:50,000



## 5.1.4 MODIFYING INDICATIVE THREAT LEVELS - ASSESS EXISTENCE OF RELEVANT PHYSICAL FACTORS

### 5.1.4.1 VEGETATION EXTENT AND CONTINUITY FACTORS

| EXTENT AND CONTINUITY OF IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS                                                                                                                                                                                                                                                                                                                                                                         |                                                                   |                                                     |                                  |                                   |                                                                                                                                                                                  |                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Relevant Physical Factors <sup>1, 4 &amp; 6</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor      | Assessment Comments (As Needed)                                                                                                                                                  | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
| <b>The extent of vegetation is sufficient to support a fully developed bushfire but insufficient to result in an extreme bushfire event. <sup>4</sup></b><br>Note: Vegetation within the 'Subject Land + 150m Extent' is only assessed independently of the surrounding vegetation when it is sufficiently isolated. If the relevant area of vegetation is not isolated or can support an extreme bushfire event (see next physical factor) the assessment response will be N/A. | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                               | The forest area to the south west is greater than 150m from the proposed facility.                                                                                               | N/A                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   | B. WOODLAND                                         | Tree-1                           |                                   |                                                                                                                                                                                  |                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   | D. SCRUB                                            | Tree-2                           | N/A                               |                                                                                                                                                                                  | N/A                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   | D. SCRUB                                            | Tree/Shrub                       | Insignificant / Unlikely to Occur | This area is interspersed with grassland and pasture.                                                                                                                            | Minor Decrease                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                               | -                                                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   | G. GRASSLAND                                        | Grass                            | Partially Exists                  | Portions of partly managed (grazed) grassland vegetation are surrounding the subject site. This type of vegetation does not support extreme fire behaviour.                      | Significant Decrease                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | Does Not Exist                    | The area of forest fuels to the south west of the proposed facility is relatively small and surrounded by grassland. This area will not contribute to an extreme bushfire event. | Significant Decrease                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   |                                                     | Tree-2                           | N/A                               | -                                                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   |                                                     | Tree/Shrub                       | Partially Exists                  | This vegetation complex is interspersed with grassland                                                                                                                           | Minor Decrease                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   |                                                     | Shrub                            | N/A                               | -                                                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   |                                                     | Grass                            | Partially Exists                  | Large portions of partly managed grassland vegetation are surrounding the subject site. This type of vegetation does not support embers, spotting or extreme fire behaviour.     | Significant Decrease                                                   |

| EXTENT AND CONTINUITY OF IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS                                                                                                                                                    |                                                                   |                                                     |                                  |                              |                                                                                                                                                                   |                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Relevant Physical Factors <sup>1, 4 &amp; 6</sup>                                                                                                                                                                                                           | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor | Assessment Comments (As Needed)                                                                                                                                   | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
| <b>The extent of vegetation is sufficient to support large active flaming zones (landscape scale fire).</b><br>This presents one of the physical factors required for the development of an extreme bushfire event. <sup>6</sup>                            | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                          | -                                                                                                                                                                 | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   | B. WOODLAND                                         | Tree-1                           |                              |                                                                                                                                                                   | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   | D. SCRUB                                            | Tree-2                           | N/A                          |                                                                                                                                                                   | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   | Select.                                             | Tree/Shrub                       | Possible to Occur            | A small areas are within 150m from the proposed facility                                                                                                          | Significant Decrease                                                   |
|                                                                                                                                                                                                                                                             |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                          | -                                                                                                                                                                 | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   | G. GRASSLAND                                        | Grass                            | Partially Exists             | -                                                                                                                                                                 | Neutral                                                                |
|                                                                                                                                                                                                                                                             | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | Partially Exists             | The area is small and greater than 200m form the proposed facility.                                                                                               | Significant Decrease                                                   |
|                                                                                                                                                                                                                                                             |                                                                   |                                                     | Tree-2                           | N/A                          | -                                                                                                                                                                 | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   |                                                     | Tree/Shrub                       | Possible to Occur            |                                                                                                                                                                   | Neutral                                                                |
|                                                                                                                                                                                                                                                             |                                                                   |                                                     | Shrub                            | N/A                          | -                                                                                                                                                                 | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   |                                                     | Grass                            | Partially Exists             |                                                                                                                                                                   | Neutral                                                                |
| <b>The bushfire fuels are continuous. Fire is able to spread uninterrupted and not be slowed by the intermittent absence of fuels.</b><br>This presents one of the physical factors required for the development of an extreme bushfire event. <sup>6</sup> | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                          | The Tree 1 area is greater than 200m extent                                                                                                                       | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   | B. WOODLAND                                         | Tree-1                           |                              |                                                                                                                                                                   | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   | D. SCRUB                                            | Tree-2                           |                              |                                                                                                                                                                   | N/A                                                                    |
|                                                                                                                                                                                                                                                             |                                                                   | D. SCRUB                                            | Tree/Shrub                       | Substantially Exists         | Regrowth will likely occur, particularly the Kunzea                                                                                                               | Neutral                                                                |
|                                                                                                                                                                                                                                                             |                                                                   | C. SHRUBLAND                                        | Shrub                            | Select.                      | -                                                                                                                                                                 | Select.                                                                |
|                                                                                                                                                                                                                                                             |                                                                   | G. GRASSLAND                                        | Grass                            | Predominantly Exists         |                                                                                                                                                                   | Neutral                                                                |
|                                                                                                                                                                                                                                                             | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | Partially Exists             | Small areas within 200m from the proposed facilities southern boundary exist and a small line of forest to the north is unlikely to impact the proposed facility. | Significant Decrease                                                   |

| EXTENT AND CONTINUITY OF IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS |                                                                   |                                                     |                                  |                              |                                                                                                                                    |                                                                        |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Relevant Physical Factors <sup>1, 4 &amp; 6</sup>                                                        | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor | Assessment Comments (As Needed)                                                                                                    | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
|                                                                                                          |                                                                   |                                                     | Tree-2                           | N/A                          | -                                                                                                                                  | N/A                                                                    |
|                                                                                                          |                                                                   |                                                     | Tree/Shrub                       | Predominantly Exists         | To the north and west this vegetation is dominant and there is regrowth throughout the grassland extending greater than 2km radius | Neutral                                                                |
|                                                                                                          |                                                                   |                                                     | Shrub                            | N/A                          | -                                                                                                                                  | N/A                                                                    |
|                                                                                                          |                                                                   |                                                     | Grass                            | Substantially Exists         | Substantially exist within and greater than the 2km radius, specifically to the south and east.                                    | Neutral                                                                |

**Note 1:** Refer to Appendix 2 for additional information.

**Note 2:** Refer to Figure 5.1 Surrounding landscape – the identified vegetation categories.

**Note 3:** Refer to Appendix A6.4.2 for the map of classified (AS 3959:2018) bushfire prone vegetation and topography within the 'Subject Land + 150m Extent'. The identified classified vegetation that best corresponds to the categorised vegetation will be specific to the subject land and its surrounds and is identified in this column.

**Note 4:** Refer to Appendix 5 for a description of the criteria that establish the vegetation category and the base bushfire hazard scenario and its indicative threat level range.

**Note 5:** The modification rating is derived for the identified area of vegetation/land after conducting a qualitative assessment of the existence of the relevant physical factor. It is applied to determining a 'Modified Indicative Threat Level' from the ranges of 'Indicative Threat Level' ranges that correspond to each vegetation category (refer to Appendix 5).

Note there is a base bushfire fuels, terrain and fire weather assumption that has been applied in establishing the initial 'Indicative Threat Level' ranges. It is a scenario of a sufficiently large area of bushfire prone vegetation, with continuous fuels, on flat to undulating terrain with no slopes greater than ten degrees, that can support a fully developed bushfire. It is assumed to be possible for the most adverse (catastrophic) fire weather to occur.

**Note 6:** A physical factor with identified links (from bushfire research) to dynamic bushfire propagation and subsequent development of extreme bushfire events, including the development of pyroconvective, coupled atmosphere events. Refer to Appendix 3 for additional information.



### 5.1.4.2 VEGETATION FUEL LOAD/ARRANGEMENT/BARK HAZARD FACTORS

| FUEL LOAD/ARRANGEMENT/BARK HAZARD OF IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS                                       |                                                                   |                                                     |                                  |                                   |                                                                                                                                                                                         |                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Relevant Physical Factors <sup>1 &amp; 6</sup>                                                                                                             | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor      | Assessment Comments (As Needed)                                                                                                                                                         | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
| <b>Managed Fuel Loads</b><br>Evidence that management of fuel loads is planned, conducted regularly and enforced.<br>Includes prescribed burning programs. | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                               | -                                                                                                                                                                                       | N/A                                                                    |
|                                                                                                                                                            |                                                                   | B. WOODLAND                                         | Tree-1                           | N/A                               |                                                                                                                                                                                         | N/A                                                                    |
|                                                                                                                                                            |                                                                   | D. SCRUB                                            | Tree-2                           | N/A                               |                                                                                                                                                                                         | N/A                                                                    |
|                                                                                                                                                            |                                                                   | D. SCRUB                                            | Tree/Shrub                       | Partially Exists                  | Onsite vegetation will be managed in accord with the BMP                                                                                                                                | Neutral                                                                |
|                                                                                                                                                            |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                               | -                                                                                                                                                                                       | N/A                                                                    |
|                                                                                                                                                            |                                                                   | G. GRASSLAND                                        | Grass                            | Does Not Exist                    | Onsite vegetation will be managed in accord with the BMP. Majority of the grassland is grazed; however this may discontinue in the future. The grassland has been considered unmanaged. | Neutral                                                                |
|                                                                                                                                                            | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | Does Not Exist                    | Will not be managed                                                                                                                                                                     | Neutral                                                                |
|                                                                                                                                                            |                                                                   |                                                     | Tree-2                           | N/A                               | -                                                                                                                                                                                       | N/A                                                                    |
|                                                                                                                                                            |                                                                   |                                                     | Tree/Shrub                       | Does Not Exist                    | Will not be managed.                                                                                                                                                                    | Neutral                                                                |
|                                                                                                                                                            |                                                                   |                                                     | Shrub                            | N/A                               | -                                                                                                                                                                                       | N/A                                                                    |
|                                                                                                                                                            |                                                                   |                                                     | Grass                            | Does Not Exist                    | May be grazed, however have considered the grassland unmanaged.                                                                                                                         | Neutral                                                                |
| <b>Adverse Fuel Loads and Arrangement <sup>6</sup></b><br>Fuel loads heavier than a normal range for the category or are uncharacteristic                  | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                               | -                                                                                                                                                                                       | N/A                                                                    |
|                                                                                                                                                            |                                                                   | B. WOODLAND                                         | Tree-1                           | N/A                               |                                                                                                                                                                                         | N/A                                                                    |
|                                                                                                                                                            |                                                                   | D. SCRUB                                            | Tree-2                           | N/A                               |                                                                                                                                                                                         | N/A                                                                    |
|                                                                                                                                                            |                                                                   | D. SCRUB                                            | Tree/Shrub                       | Insignificant / Unlikely to Occur |                                                                                                                                                                                         | Neutral                                                                |
|                                                                                                                                                            |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                               | -                                                                                                                                                                                       | N/A                                                                    |

| FUEL LOAD/ARRANGEMENT/BARK HAZARD OF IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS                                                                                                                                                                     |                                                                   |                                                     |                                  |                                   |                                                                                                                                                  |                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Relevant Physical Factors <sup>1 &amp; 6</sup>                                                                                                                                                                                                                                           | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor      | Assessment Comments (As Needed)                                                                                                                  | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
| for the category; and/or<br>Worst case fuel arrangement exists.<br>[Where heavy forest fuel types with loads in excess of 15-20 t/ha exist, the potential for vorticity-driven lateral spread exists (as a dynamic fire behaviour) if the required terrain characteristics are present]. |                                                                   | G. GRASSLAND                                        | Grass                            | Insignificant / Unlikely to Occur | -                                                                                                                                                | Neutral                                                                |
|                                                                                                                                                                                                                                                                                          | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | Insignificant / Unlikely to Occur | Excessive fuel loads will not occur due to the poor soils.                                                                                       | Neutral                                                                |
|                                                                                                                                                                                                                                                                                          |                                                                   |                                                     | Tree-2                           | N/A                               | -                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                          |                                                                   |                                                     | Tree/Shrub                       | Insignificant / Unlikely to Occur | Excessive fuel loads will not occur due to the poor soils.                                                                                       | Neutral                                                                |
|                                                                                                                                                                                                                                                                                          |                                                                   |                                                     | Shrub                            | N/A                               | -                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                          |                                                                   |                                                     | Grass                            | N/A                               | Grass fuels will not exceed 15-20t/ha                                                                                                            | N/A                                                                    |
| <b>Bark Hazard</b><br>The presence of high threat level bark hazards with potential for high levels of ember/burning debris production (spotting density) and long burnout times (travel distance).                                                                                      | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                               | -                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                          |                                                                   | B. WOODLAND                                         | Tree-1                           |                                   |                                                                                                                                                  | N/A                                                                    |
|                                                                                                                                                                                                                                                                                          |                                                                   | D. SCRUB                                            | Tree-2                           |                                   |                                                                                                                                                  | N/A                                                                    |
|                                                                                                                                                                                                                                                                                          |                                                                   | D. SCRUB                                            | Tree/Shrub                       | Substantially Exists              | Marri trees exist within the scrub and will be the prominent producer of embers (loose coarse fibrous bark). The scrub bark is tight and coarse. | Minor Decrease                                                         |
|                                                                                                                                                                                                                                                                                          |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                               | -                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                          |                                                                   | G. GRASSLAND                                        | Grass                            | N/A                               | -                                                                                                                                                | N/A                                                                    |
|                                                                                                                                                                                                                                                                                          | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | Possible to Occur                 | Marri and paperbark are present in the scrub vegetation. Marri will produce the dominant ember attack.. The scrub bark is tight and coarse.      | Minor Decrease                                                         |

### FUEL LOAD/ARRANGEMENT/BARK HAZARD OF IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS

| Relevant Physical Factors <sup>1 &amp; 6</sup> | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor | Assessment Comments (As Needed)                                                                                                                                                 | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
|------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Refer to photo evidence in Appendix A6.3.      |                                                                   |                                                     |                                  |                              | There is a low percentage of trees within the scrub fuels.                                                                                                                      |                                                                        |
|                                                |                                                                   |                                                     | Tree-2                           | N/A                          | -                                                                                                                                                                               | N/A                                                                    |
|                                                |                                                                   |                                                     | Tree/Shrub                       | Substantially Exists         | Marri trees exist within the scrub and will be the prominent producer of embers (loose coarse fibrous bark). The scrub bark is tight and coarse, thus producing limited embers. | Neutral                                                                |
|                                                |                                                                   |                                                     | Shrub                            | N/A                          | -                                                                                                                                                                               | N/A                                                                    |
|                                                |                                                                   |                                                     | Grass                            | N/A                          | -                                                                                                                                                                               | N/A                                                                    |

**Note 1:** Refer to Appendix 2 for additional information.

**Note 2:** Refer to Figure 5.1 Surrounding landscape – the identified vegetation categories.

**Note 3:** Refer to Appendix A6.4.2 for the map of classified (AS 3959:2018) bushfire prone vegetation and topography within the 'Subject Land + 150m Extent'. The identified classified vegetation that best corresponds to the categorised vegetation will be specific to the subject land and its surrounds and is identified in this column.

**Note 4:** Refer to Appendix 5 for a description of the criteria that establish the vegetation category and its indicative threat level.

**Note 5:** The modification rating is derived for the identified area of vegetation/land after conducting a qualitative assessment of the existence of the relevant physical factor. It is applied to determining a 'Modified Indicative Threat Level' from the ranges of 'Indicative Threat Level' ranges that correspond to each vegetation category (refer to Appendix 5).

Note there is a base bushfire fuels, terrain and fire weather assumption that has been applied in establishing the initial 'Indicative Threat Level' ranges. It is a scenario of a sufficiently large area of bushfire prone vegetation, with continuous fuels, on flat to undulating terrain with no slopes greater than ten degrees, that can support a fully developed bushfire. It is assumed to be possible for the most adverse (catastrophic) fire weather to occur.

**Note 6:** A physical factor with identified links (from bushfire research) to dynamic bushfire propagation and subsequent development of extreme bushfire events, including the development of pyroconvective, coupled atmosphere events. Refer to Appendix 3 for additional information.



### 5.1.4.3 TERRAIN FACTORS

| GROUND SLOPE AND SLOPE LENGTH UNDER IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS                                                                                                                                        |                                                                   |                                                     |                                  |                              |                                       |                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------------------------------------------------|
| Relevant Physical Factors <sup>1 &amp; 6</sup>                                                                                                                                                                                                             | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor | Assessment Comments (As Needed)       | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
| <b>Effective Slopes ≥ 10 Degrees</b><br>Vegetation exists, at least partially, on terrain of 10 degrees or greater ground slope and of sufficient length (see slope length factor), that will increase fire rates of spread and consequent fire intensity. | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                          | 10 degrees or greater does not exist. | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | B. WOODLAND                                         | Tree-1                           |                              |                                       | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | D. SCRUB                                            | Tree-2                           |                              |                                       | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | D. SCRUB                                            | Tree/Shrub                       | N/A                          |                                       | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | G. GRASSLAND                                        | Grass                            | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | N/A                          | 10 degrees or greater does not exist. | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   |                                                     | Tree-2                           | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   |                                                     | Tree/Shrub                       | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   |                                                     | Shrub                            | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   |                                                     | Grass                            | N/A                          | -                                     | N/A                                                                    |
| <b>Effective Slopes ≥ 20 Degrees <sup>6</sup></b><br>Vegetation exists, at least partially, on steep terrain of 20 degrees or greater ground slope and of sufficient length (see slope length factor).<br>The presence of ridges able to present steep     | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                          | 20 degrees or greater does not exist  | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | B. WOODLAND                                         | Tree-1                           |                              |                                       | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | D. SCRUB                                            | Tree-2                           |                              |                                       | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | Select.                                             | Tree/Shrub                       | N/A                          |                                       | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   | G. GRASSLAND                                        | Grass                            | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   |                                                     | Tree-2                           | N/A                          | -                                     | N/A                                                                    |
|                                                                                                                                                                                                                                                            |                                                                   |                                                     | Tree/Shrub                       | N/A                          | -                                     | N/A                                                                    |

| GROUND SLOPE AND SLOPE LENGTH UNDER IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS                                   |                                                                   |                                                     |                                  |                              |                                 |                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|------------------------------|---------------------------------|------------------------------------------------------------------------|
| Relevant Physical Factors <sup>1 &amp; 6</sup>                                                                                                        | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor | Assessment Comments (As Needed) | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
| leeward slopes to exposed elements is an additional component of this factor.                                                                         |                                                                   |                                                     | Shrub                            | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       |                                                                   |                                                     | Grass                            | N/A                          | -                               | N/A                                                                    |
| <b>Sufficient Length of Steep Slopes</b><br>The identified 20 degree and greater slopes can support the entire flame depth of a fully developed fire. | The 'Subject Land + 150m Extent'.                                 | A. FOREST                                           | Tree-1                           | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       |                                                                   | B. WOODLAND                                         | Tree-1                           |                              |                                 | N/A                                                                    |
|                                                                                                                                                       |                                                                   | D. SCRUB                                            | Tree-2                           |                              |                                 | N/A                                                                    |
|                                                                                                                                                       |                                                                   | Select.                                             | Tree/Shrub                       | N/A                          |                                 | N/A                                                                    |
|                                                                                                                                                       |                                                                   | C. SHRUBLAND                                        | Shrub                            | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       |                                                                   | G. GRASSLAND                                        | Grass                            | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       | The Land Surrounding the 'Subject Land + 150m Extent'             |                                                     | Tree-1                           | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       |                                                                   |                                                     | Tree-2                           | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       |                                                                   |                                                     | Tree/Shrub                       | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       |                                                                   |                                                     | Shrub                            | N/A                          | -                               | N/A                                                                    |
|                                                                                                                                                       |                                                                   |                                                     | Grass                            | N/A                          | -                               | N/A                                                                    |

**Note 1:** Refer to Appendix 2 for additional information.

**Note 2:** Refer to Figure 5.1 Surrounding landscape – the identified vegetation categories.

**Note 3:** Refer to Appendix A6.4.2 for the map of classified (AS 3959:2018) bushfire prone vegetation and topography within the 'Subject Land + 150m Extent'. The identified classified vegetation that best corresponds to the categorised vegetation will be specific to the subject land and its surrounds and is identified in this column.

**Note 4:** Refer to Appendix 5 for a description of the criteria that establish the vegetation category and its indicative threat level.

**Note 5:** The modification rating is derived for the identified area of vegetation/land after conducting a qualitative assessment of the existence of the relevant physical factor. It is applied to determining a 'Modified Indicative Threat Level' from the ranges of 'Indicative Threat Level' ranges that correspond to each vegetation category (refer to Appendix 5).

# GROUND SLOPE AND SLOPE LENGTH UNDER IDENTIFIED VEGETATION CATEGORIES – POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS

| Relevant Physical Factors <sup>1 &amp; 6</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vegetation Location Within the Surrounding landscape <sup>2</sup> | Vegetation Classification AS 3959:2018 <sup>3</sup> | Vegetation Category <sup>4</sup> | Existence of Physical Factor | Assessment Comments (As Needed) | Resultant Modification of Indicative Threat Level <sup>4 &amp; 5</sup> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------------------------------|------------------------------|---------------------------------|------------------------------------------------------------------------|
| <p>Note there is a base bushfire fuels, terrain and fire weather assumption that has been applied in establishing the initial 'Indicative Threat Level' ranges. It is a scenario of a sufficiently large area of bushfire prone vegetation, with continuous fuels, on flat to undulating terrain with no slopes greater than ten degrees, that can support a fully developed bushfire. It is assumed to be possible for the most adverse (catastrophic) fire weather to occur.</p> <p><b>Note 6:</b> A physical factor with identified links (from bushfire research) to dynamic bushfire propagation and subsequent development of extreme bushfire events, including the development of pyroconvective, coupled atmosphere events. Refer to Appendix 3 for additional information.</p> <p><b>Note 7:</b> Refer to Figure 5.3: Surrounding landscape - terrain slope map.</p> |                                                                   |                                                     |                                  |                              |                                 |                                                                        |



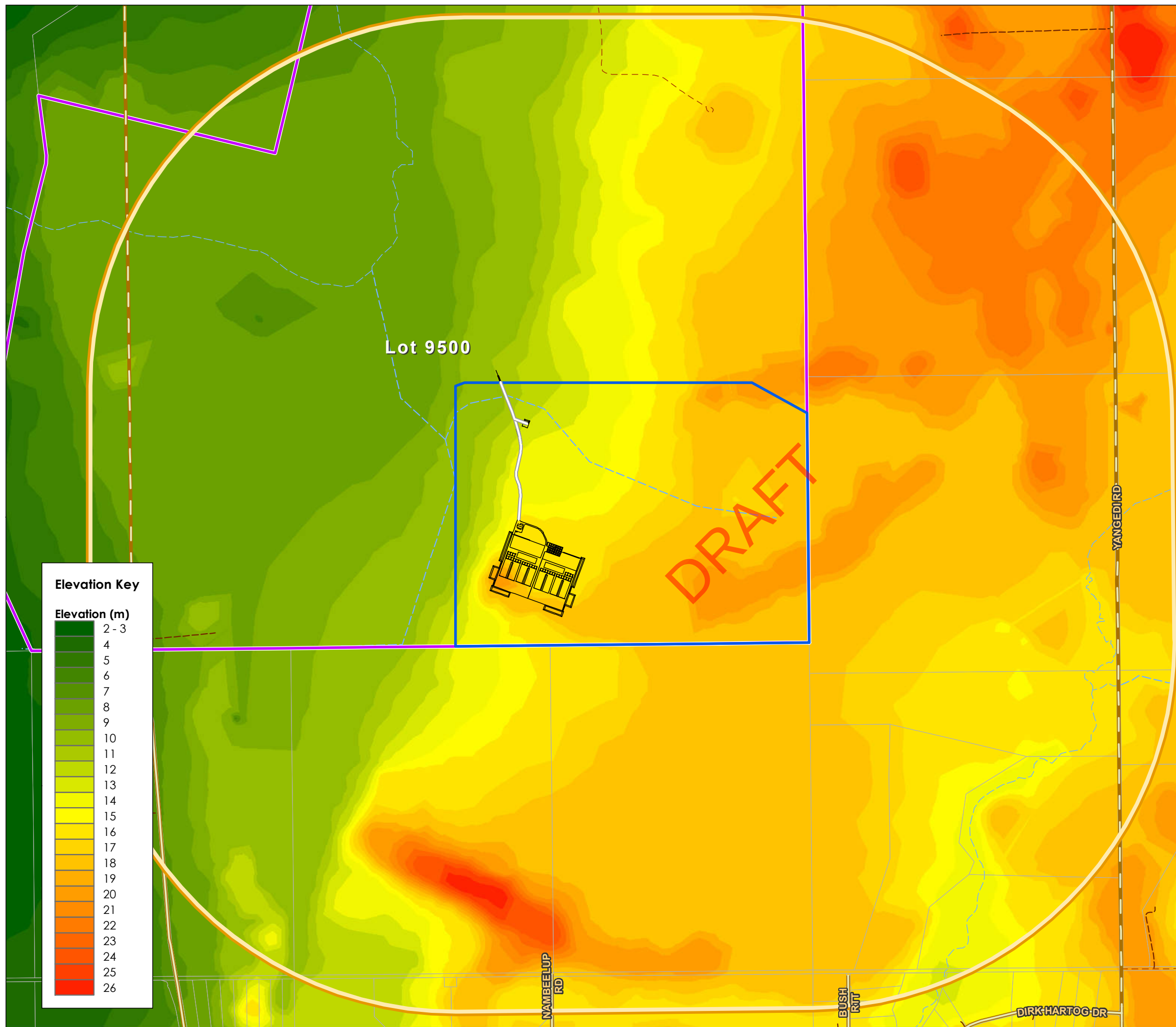
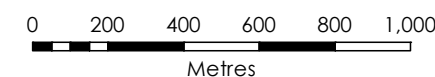
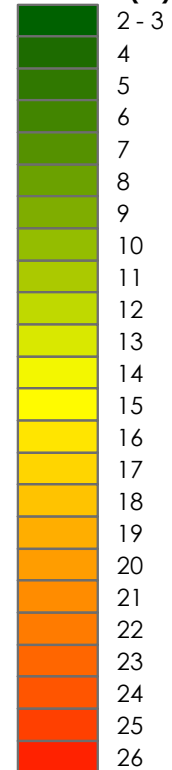


Figure 5-1  
**Broader Landscape  
 Terrain Elevation Map**  
 Lot 9500 on Plan 414516, Area : 1,608.9031 ha  
 320 Gull Road,  
 KERALUP 6182  
**SHIRE OF MURRAY**

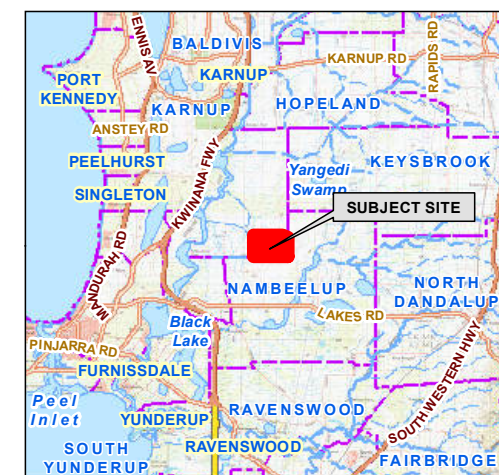
- **LEGEND** -----
- Development Site
  - Subject Site
  - Other Lots
  - Development
  - Driveway
- Vegetation Assessment Area**
- 2 km from Subject Site

**Elevation Key**

**Elevation (m)**



----- **LOCALITY** -----



Aerial Imagery : Landgate/SLIP  
 Image Date : Feb 2022

Coordinate System: GDA 1994 MGA Zone 50  
 Projection: Universal Transverse Mercator Units: Metre  
 Map compiled by: Ian Ross 4/12/2023  
 Map updated by: Ian Ross 4/12/2023  
 A3 Scale 1:20,000

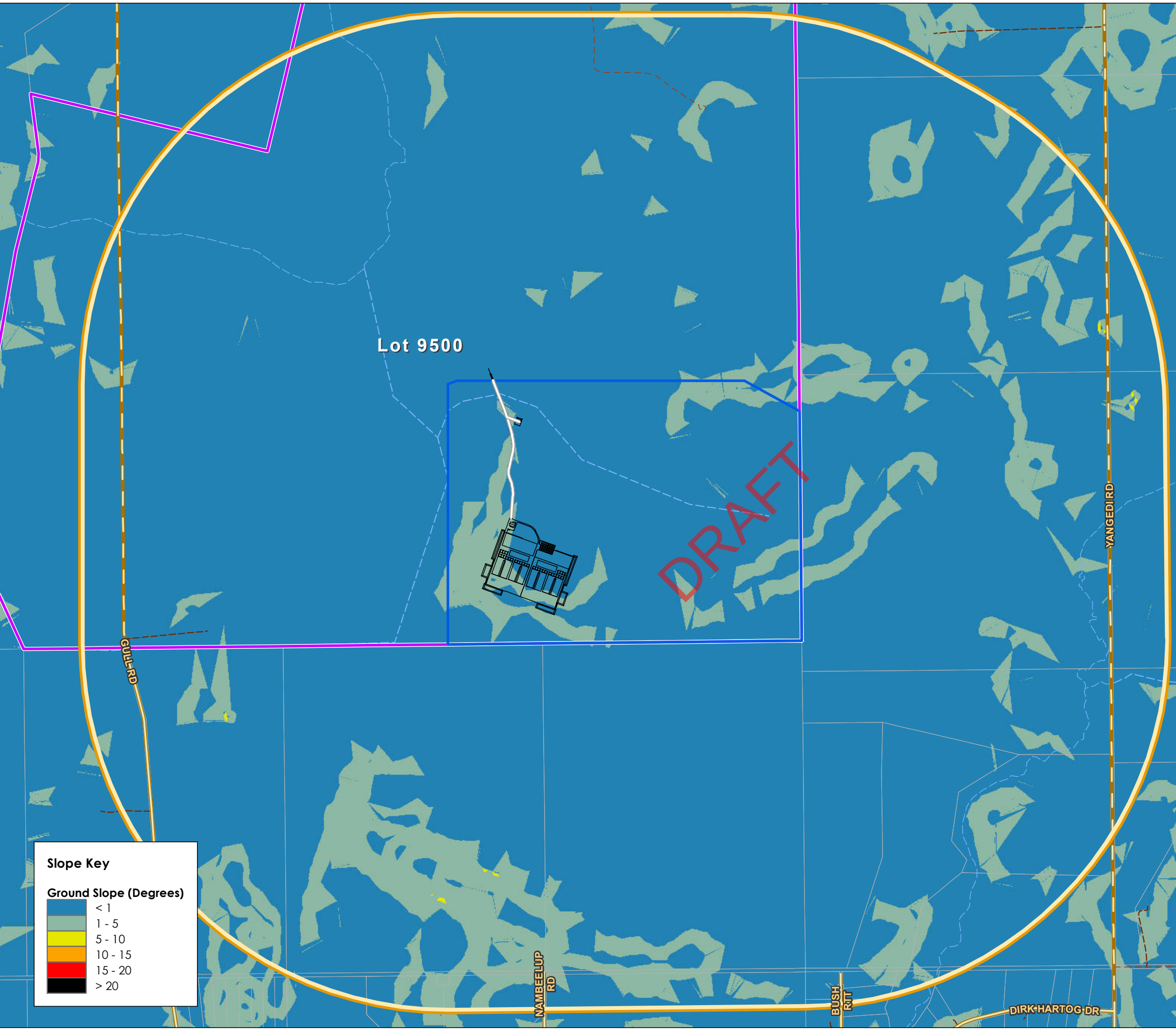
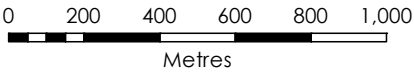
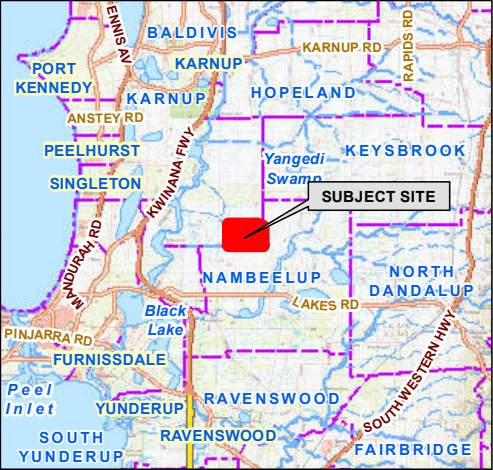


Figure 5-3  
**Broader Landscape  
Terrain Slope Map**  
Lot 9500 on Plan 414516, Area : 1,608.9031 ha  
320 Gull Road,  
KERALUP 6182  
**SHIRE OF MURRAY**

- **LEGEND** -----
- Development Site
  - Subject Site
  - Other Lots
  - Development
  - Driveway
- Vegetation Assessment Area**
- 2 km from Subject Site



----- **LOCALITY** -----



Aerial Imagery : Landgate/SLIP  
Image Date : Feb 2022

Coordinate System: GDA 1994 MGA Zone 50  
Projection: Universal Transverse Mercator Units: Metre  
Map compiled by: Ian Ross 4/12/2023  
Map updated by: Ian Ross 4/12/2023  
A3 Scale 1:20,000



#### 5.1.4.4 FIRE WEATHER FACTORS

The purpose of including consideration of fire weather factors in the surrounding landscape assessment is to be able to account for those scenarios in which the most adverse (catastrophic) fire weather conditions are either (a) cannot occur; or (b) highly unlikely to occur and this can be fully justified. Otherwise, such conditions are accounted for in the 'Indicative Threat Levels' stated for each category of vegetation in Appendix 5.

| FIRE WEATHER CONSIDERATIONS - POTENTIAL TO MODIFY INDICATIVE THREAT LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                                                                                                                                          |                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Relevant Physical Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Existence of Physical Factor | Assessment Comments (As Needed)                                                                                                          | Resultant Modification of Indicative Threat Level <sup>1</sup> |
| Associated with intensification of fire behaviour                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                              |                                                                                                                                          |                                                                |
| Location has persistent strong synoptic winds (i.e., not fire driven)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Possible to Occur            | Westerly winds are dominant                                                                                                              | Neutral                                                        |
| Very low relative humidity and very high ambient air temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Possible to Occur            | It is possible during the summer months to sustain low humidity and high temperatures, usually does not exceed consecutively 4 days in a | Neutral                                                        |
| Associated with development of dynamic fire propagation behaviours, intensification of fire behaviour, and development of extreme bushfire events. <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                              |                                                                                                                                          |                                                                |
| Wind speeds in excess of approximately 20 km/hr and wind direction within 30-40 degrees of ridge/scarp features – increasing the potential for vorticity-driven lateral spread.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | N/A                          | -                                                                                                                                        | N/A                                                            |
| Due to weather factors, fuel moisture contents can dry to around 5% or less.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Possible to Occur            |                                                                                                                                          | Neutral                                                        |
| Atmospheric instability creating opportunity for atmospheric coupling and violent pyroconvection. <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Possible to Occur            |                                                                                                                                          | Neutral                                                        |
| <p><b>Note 1:</b> The modification rating is derived for the identified area of vegetation/land after conducting a qualitative assessment of the existence of the relevant physical factor. It is applied to determining a 'Modified Indicative Threat Level' from the ranges of 'Indicative Threat Level' ranges that correspond to each vegetation category (refer to Appendix 5). Note there is a base bushfire fuels, terrain and fire weather assumption that has been applied in establishing the 'Indicative Threat Level' ranges. It is a scenario of a sufficiently large area of bushfire prone vegetation, with continuous fuels, on flat to undulating terrain with no slopes greater than ten degrees, that can support a fully developed bushfire. It is assumed to be possible for the most adverse (catastrophic) fire weather to occur.</p> <p><b>Note 2:</b> Refer to Appendix 3 for additional information.</p> <p><b>Note 3:</b> Regarding the potential for a pyroconvective fire event to occur, the default assumption is that most locations will have the potential for vertical movement of air without any resistance to that movement (e.g. temperature inversion), as one of the typical requirements for such an event to occur.</p> |                              |                                                                                                                                          |                                                                |



It is not sufficiently risk averse to assume that atmospheric instability is unlikely to exist. Different temperature air masses can always interact as a consequence of the passage of different weather systems at any location. Justifying a variation to this is outside the scope of this assessment.

#### 5.1.4.5 THE BUSHFIRE HAZARD MODIFIED INDICATIVE THREAT LEVELS

| THE CATEGORISED SURROUNDING LANDSCAPE VEGETATION AND ITS ASSESSED BUSHFIRE HAZARD THREAT LEVEL                                                                                                                                                                      |                                  |                         |                                                                                         |                                         |                                         |                                              |                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------|
| Vegetation Location Within the Surrounding Landscape                                                                                                                                                                                                                | Identified Vegetation Categories | Indicative Threat Level | Assessed Potential for the Stated Physical Factor to Modify the Indicative Threat Level |                                         |                                         |                                              | Modified Indicative Threat Level                                                                  |
|                                                                                                                                                                                                                                                                     |                                  |                         | Vegetation Extent and Continuity                                                        | Fuel Load / Arrangement and Bark Hazard | Terrain - Ground Slope and Slope Length | Fire Weather                                 |                                                                                                   |
| (Section 5.1)                                                                                                                                                                                                                                                       | (Figure 5.1 & Appendix 5)        | (Appendix 5)            | (Section 5.2.1)                                                                         | (Section 5.2.2)                         | (Section 5.2.3)                         | (Section 5.2.4)                              |                                                                                                   |
| The 'Subject Land + 150m Extent'                                                                                                                                                                                                                                    | Tree-1                           | N/A                     | N/A                                                                                     | N/A                                     | N/A                                     | N/A                                          | N/A                                                                                               |
|                                                                                                                                                                                                                                                                     | Tree-2                           | N/A                     | N/A                                                                                     | N/A                                     | N/A                                     | N/A                                          | N/A                                                                                               |
|                                                                                                                                                                                                                                                                     | Tree/Shrub                       | Moderate to High        | Minor Decrease                                                                          | Minor Decrease                          | Major Decrease                          | Neutral                                      | Moderate                                                                                          |
|                                                                                                                                                                                                                                                                     | Shrub                            | N/A                     | N/A                                                                                     | N/A                                     | N/A                                     | N/A                                          | N/A                                                                                               |
|                                                                                                                                                                                                                                                                     | Grass                            | Low to Moderate         | Neutral                                                                                 | N/A                                     | Major Decrease                          | Neutral                                      | Moderate                                                                                          |
|                                                                                                                                                                                                                                                                     | No/Low Threat                    | None to Low             |                                                                                         |                                         |                                         |                                              | Moderate                                                                                          |
| The Land Surrounding the 'Subject Land + 150m Extent'                                                                                                                                                                                                               | Tree-1                           | Moderate to Extreme     | Significant Decrease                                                                    | Significant Decrease                    | Major Decrease                          | Neutral                                      | Low                                                                                               |
|                                                                                                                                                                                                                                                                     | Tree-2                           | Moderate to Extreme     | N/A                                                                                     | N/A                                     | N/A                                     | N/A                                          | N/A                                                                                               |
|                                                                                                                                                                                                                                                                     | Tree/Shrub                       | Moderate to High        | Neutral                                                                                 | Minor Decrease                          | Major Decrease                          | Neutral                                      | Moderate                                                                                          |
|                                                                                                                                                                                                                                                                     | Shrub                            | Low to Moderate         | N/A                                                                                     | N/A                                     | N/A                                     | N/A                                          | N/A                                                                                               |
|                                                                                                                                                                                                                                                                     | Grass                            | Low to Moderate         | Neutral                                                                                 | N/A                                     | Major Decrease                          | Neutral                                      | Moderate                                                                                          |
|                                                                                                                                                                                                                                                                     | No/Low Threat                    | None to Low             |                                                                                         |                                         |                                         |                                              | Moderate                                                                                          |
| SURROUNDING LANDSCAPE BUSHFIRE HAZARD - MODIFIED INDICATIVE THREAT LEVEL <sup>1</sup>                                                                                                                                                                               |                                  |                         |                                                                                         | No Threat <input type="checkbox"/>      | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> Very High <input type="checkbox"/> Extreme <input type="checkbox"/> |
| <b>Note 1:</b> Derived qualitatively by considering the modified indicative threat level for each identified category of vegetation and the relative extents of each category. The highest level will apply unless it is associated with a less significant extent. |                                  |                         |                                                                                         |                                         |                                         |                                              |                                                                                                   |

#### ASSESSMENT SUMMARY COMMENTS

## 5.1.5 THREAT LEVEL ASSESSMENT – BUSHFIRE PROTECTION MEASURE ANALYSIS

For each identified bushfire hazard, an assessment is conducted that considers the effectiveness and application status of all available threat reducing bushfire protection measures that are listed under their applicable bushfire protection mechanism. This information is subsequently applied to deriving threat levels.

### 5.1.5.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE THREAT LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                   | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                   |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| <b>THE PROTECTION MECHANISM – PREVENT BUSHFIRE IGNITION AND/OR SEVERITY BY MANAGING THE FUELS:</b> Eliminate or reduce vegetation fuel loads, modify their properties (vegetation types and fuel arrangement). Maintain the measures over time to eliminate bushfire or lower the severity of fire behaviours and the consequent threat levels. Desired and mandatory environmental conservation will likely always be the most significant limitation to applying the mechanism. |                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                        |
| 1.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Remove Offsite Bushfire Fuel:</b> Remove fuel permanently by clearing bushfire prone vegetation - only when permission and relevant agreements for removal have been established with the landowner and relevant authorities.                                                                                                                                                                  | Very High                         | N/A                             | N/A    | N/A     | N/A                    |
| <i>Assessment Comments:</i> The facility will be located on a large portion of land that can meet all clearing and management requirements on site.. There is no requirement to manage vegetation off site.<br><br><i>Recommendation Details:</i> Not Applicable                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                        |
| 1.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Reduce Offsite Bushfire Fuel - Prescribed Burning:</b> Planned hazard reduction when permission and relevant agreements to conduct and maintain have been established with the landowner and relevant authorities.                                                                                                                                                                             | High                              | N/A                             | N/A    | N/A     | N/A                    |
| <i>Assessment Comments:</i> Not Required<br><br><i>Recommendation Details:</i> Not Applicable                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                        |
| 1.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Reduce Offsite Bushfire Fuel - Mechanical:</b> Modify composition of vegetation types and/or the arrangement of fuels and maintain the modification over time e.g. reduce canopy, limit higher threat bark types (e.g. stringy, ribbon), minimise 'ladder' fuels'. Will likely require permission and relevant agreements to conduct and maintain from the landowner and relevant authorities. | High                              | N/A                             | N/A    | N/A     | N/A                    |
| <i>Assessment Comments:</i> Not Required<br><br><i>Recommendation Details:</i> Not Applicable                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                        |



| PROTECTION MEASURES AVAILABLE TO REDUCE THREAT LEVELS                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| 1.4                                                                                                                                                                                                                                                                                                                                                                                  | <b>Remove Onsite Bushfire Fuel:</b> Remove fuel permanently by clearing bushfire prone vegetation – only after the necessary approvals from relevant authorities have been obtained.                                                                                                                                                                             | Very High                         | Yes                             | Yes    | Yes     | Yes                    |
| <p><i>Assessment Comments:</i> Clearing can be achieved. Environmental assessment has been completed for the site.</p> <p><i>Recommendation Details:</i> Before clearing, approval must be obtained from the local government before removing or managing native vegetation.</p>                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.5                                                                                                                                                                                                                                                                                                                                                                                  | <b>Reduce Onsite Bushfire Fuel - Prescribed Burning:</b> Planned hazard reduction only after the necessary approvals from relevant authorities have been obtained.                                                                                                                                                                                               | High                              | N/A                             | N/A    | N/A     | N/A                    |
| <p><i>Assessment Comments:</i> Not Required</p> <p><i>Recommendation Details:</i> Not Applicable</p>                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.6                                                                                                                                                                                                                                                                                                                                                                                  | <b>Reduce Onsite Bushfire Fuel - Mechanical:</b> Modify composition of vegetation types and/or the arrangement of fuels and maintain the modification over time e.g. reduce canopy, limit higher threat bark types (e.g. stringy, ribbon), minimise 'ladder' fuels'. Approvals from relevant authorities regarding environmental considerations may be required. | High                              | Yes                             | Yes    | Yes     | Yes                    |
| <p><i>Assessment Comments:</i> Mechanical fuel reduction or grazing can be considered.</p> <p><i>Recommendation Details:</i> Local government approval required before clearing or managing native vegetation.</p>                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.7                                                                                                                                                                                                                                                                                                                                                                                  | <b>Reduce Road Verge Fuel:</b> Road verges of designated evacuation routes are subject to fuel load reduction, tree management and ongoing maintenance when an authority exists to conduct and maintain.                                                                                                                                                         | Medium                            | No                              | No     | No      | No                     |
| <p><i>Assessment Comments:</i> Road verges are not in the control of the facility management. The road verges outside the facilities management control will not be managed.</p> <p><i>Recommendation Details:</i> Not Applicable</p>                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.8                                                                                                                                                                                                                                                                                                                                                                                  | <b>Enforce Compliance with Local Government Property Management Directives:</b> Inform landowners of the high level of enforcement that will be applied by the relevant authority.                                                                                                                                                                               | High                              | Yes                             | No     | No      | Yes                    |
| <p><i>Assessment Comments:</i> The local government Firebreak Notice must be complied with. The associated Bushfire Management Plan (BMP), Environment Plan and any local government and State government schemes and plans must be complied with.</p> <p><i>Recommendation Details:</i> Include ongoing management requirements in facility guidance and operational documents.</p> |                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE THREAT LEVELS                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| THE PROTECTION MECHANISM – PREVENT BUSHFIRE IGNITION BY MANAGING HEAT ENERGY SOURCES: The use of measures that control the existence of potential ignition sources. This includes human actions and/or faulty or poorly designed equipment. Natural causes of ignition (lightning) cannot be controlled and will remain an unmanageable limitation.                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.9                                                                                                                                                                                                                                                                                                                                                                                      | <b>Robust and Effective Site Operational Procedures:</b> Apply fire safe principles to site operation procedures including: <ul style="list-style-type: none"><li>Eliminating or reducing the potential for open air creation of fire, embers or sparks; and</li><li>Closing identified high risk operations when a bushfire event exists.</li><li>Ensure safe practices are carried out via appropriate guidelines, protocols, signage and education.</li></ul> | Medium                            | Yes                             | Partly | No      | Yes                    |
| Assessment Comments: Guidelines and operating procedures for facility operations and during a fire event to be developed. The guidelines and procedures to include but not limited to hot works, TFB and VMB days, extreme and catastrophic fire danger days, and triggers in the event of a fire event.<br>Recommendation Details: Develop guidance documents and operating procedures. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.10                                                                                                                                                                                                                                                                                                                                                                                     | <b>Develop Planning and Management Procedures for Prescribed Burning:</b> Ensure proper management of hazard reduction burning to prevent ignition of unintended fuels.                                                                                                                                                                                                                                                                                          | Medium                            | N/A                             | N/A    | N/A     | N/A                    |
| Assessment Comments: Not Required<br>Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.11                                                                                                                                                                                                                                                                                                                                                                                     | <b>Design and Construct Equipment to Prevent Airborne Ignition:</b> Apply fire safe design principles to equipment, vehicles, and energy transmission etc. Design to control rate of energy release and eliminate/reduce potential for open air creation of fire, embers or sparks.                                                                                                                                                                              | Medium                            | Yes                             | Partly | Unknown | Yes                    |
| Assessment Comments: To be included in equipment design at purchase stage. All equipment must meet minimum national standards and standards associated with industry requirements, and this is considered adequate.<br>Recommendation Details: Monitor purchase and construction of plant equipment for adequate protection measure against potential ignition sources.                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 1.12                                                                                                                                                                                                                                                                                                                                                                                     | <b>Actively Enforce Activity Restrictions:</b> Impose restrictions on source of ignition operations by enforcing total fire bans.                                                                                                                                                                                                                                                                                                                                | Medium                            | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Onsite activity capable of igniting a fire will be controlled by the Standard Operating Procedures.                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE THREAT LEVELS                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                       | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                       |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Recommendation Details: Develop Standard Operating Procedures to restrict operation during TFB days. Consider documenting the process for exemptions for certain critical operations.                                                                                        |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| 1.13                                                                                                                                                                                                                                                                         | <b>Monitor and Penalise Illegal Activity:</b> Reduce arson events as sources of ignition by monitoring and publicising enforcement of penalties.                                                                                                                                                                                                                      | Medium                            | N/A                             | N/A    | N/A     | N/A                    |
| Assessment Comments: Not Required                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| 1.14                                                                                                                                                                                                                                                                         | <b>Bushfire Awareness and ‘Good Practices’ Education:</b> Educate persons to reduce the occurrence of accidental ignitions in vegetation by persons and/or vehicles, including in road reserves.                                                                                                                                                                      | Medium                            | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Staff and contractors to be inducted.                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| Recommendation Details: Basic fire awareness to be included in company induction. Relevant staff training required, site specific Bushfire Awareness and emergency response.                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| THE PROTECTION MECHANISM - PREVENT BUSHFIRE IGNITION BY MANAGING INTERACTIONS OF HEAT ENERGY SOURCES AND FUELS: The use of measures that control the interaction of heat sources and fuels.                                                                                  |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| 1.15                                                                                                                                                                                                                                                                         | <b>Barriers (Shielding) between Ignition Sources and Fuels:</b> Utilise physical barriers (shielding) between bushfire fuels and heat energy sources such as electricity generation / transmission, fuel supplies, stored flammable products etc.<br>Examples include appropriate walls, enclosures, and underground transmission of electricity or liquid/gas fuels. | Medium                            | Yes                             | Partly | Unknown | Yes                    |
| Assessment Comments: Protection measures to be implemented during the design stage, this includes being aware of the critical point for heat exposure on equipment such as cabling, poly pipe, valves, conveyor belts etc. and potential ember/firebrand accumulation areas. |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| Recommendation Details: Include in the facility design stage items and equipment that may be exposed to excessive radiant heat or has the potential to allow the spread of fire.                                                                                             |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| 1.16                                                                                                                                                                                                                                                                         | <b>Equipment Design and Construction to Reduce Heat Transfer:</b> Through design (e.g., insulation) and materials, control heat energy transfer via conduction, convection and radiation.                                                                                                                                                                             | Medium                            | Yes                             | Partly | Unknown | Yes                    |
| Assessment Comments: Common electrical cabling should not be exposed to greater than 10kWm2 heat flux and poly pipe critical point in 120 degrees Celsius. Equipment to be designed to minimise the potential of heat transfer.                                              |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| Recommendation Details: Consider in the facility design stage, to reduce the potential of ignition and heat transfer.                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE THREAT LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                     | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                     |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| 1.17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Separation Distance Between Ignition Sources and Fuels:</b> Establish sufficient separation distance between bushfire fuels and heat energy sources such as electricity generation / transmission, fuel supplies, stored flammable products etc. | Medium                            | Yes                             | No     | Unknown | Yes                    |
| <p><i>Assessment Comments:</i> The Asset Protection Zone (APZ) to be constructed to achieve 10kWm2 or less to reduce the potential of the critical assets being rendered inoperable.</p> <p><i>Recommendation Details:</i> Include the critical assets within the 10kWm2 area.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| <p><sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.</p> <p><sup>2</sup> <b>Protection Measure Application Status:</b></p> <ul style="list-style-type: none"> <li>• <b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li> <li>• <b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li> <li>• <b>Currently Planned:</b> Protection measures that: <ul style="list-style-type: none"> <li>• Are incorporated into the site plans;</li> <li>• Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li> <li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li> </ul> <p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p> </li> <li>• <b>Additionally Recommend:</b> Protection measures that: <ul style="list-style-type: none"> <li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li> <li>• Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li> </ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> </li> </ul> |                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |



### 5.1.5.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the identified bushfire hazard, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing threat levels is stated. This information is subsequently applied to assess the ability of applied protection measures to reduce threat levels. Refer to Appendix 1 for explanatory and supporting information.

|                                                                                     |              |    |    |   |   |   |   |
|-------------------------------------------------------------------------------------|--------------|----|----|---|---|---|---|
|                                                                                     | Not Relevant | 2  |    |   |   |   |   |
| Prevent Bushfire Ignition by Managing Interactions of Heat Energy Sources and Fuels | Very High    |    |    |   |   |   |   |
|                                                                                     | High         |    |    |   |   |   |   |
|                                                                                     | Medium       | 3  | 3  | 2 |   |   | 3 |
|                                                                                     | Not Relevant |    |    |   |   |   |   |
| Number Analysis                                                                     | Very High    | 1  | 1  |   | 1 | 1 | 1 |
|                                                                                     | High         | 2  | 2  | 1 | 1 | 1 | 1 |
|                                                                                     | Medium       | 8  | 7  | 2 | 2 |   | 7 |
|                                                                                     | Not Relevant | 6  |    |   |   |   |   |
|                                                                                     | Totals       | 17 | 10 | 3 | 4 | 2 | 9 |

<sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.

<sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section.

### 5.1.5.3 PROTECTION MEASURES - THREAT REDUCING POTENTIAL

For the identified bushfire hazard, the potential for applied bushfire protection measures to reduce indicative threat levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing hazard threat levels.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE BUSHFIRE HAZARD THREAT LEVELS <sup>1</sup>                                                                                                                                                                                                                                                                                                  |              |                         |                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------|---------------------------------|
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> THREAT LEVEL <sup>3</sup>                                                                                                                                                                                                                                                                                             |              |                         |                                 |
| Bushfire Direct Attack Mechanisms <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                          |              |                         |                                 |
| Flame Contact                                                                                                                                                                                                                                                                                                                                                                                           | Radiant Heat | Embers / Burning Debris | High / Erratic Fire Driven Wind |
| Minimal                                                                                                                                                                                                                                                                                                                                                                                                 | Minimal      | Moderate                | Moderate                        |
| Moderate                                                                                                                                                                                                                                                                                                                                                                                                |              |                         |                                 |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> THREAT LEVEL <sup>4</sup>                                                                                                                                                                                                                                                                                              |              |                         |                                 |
| Bushfire Direct Attack Mechanisms <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                          |              |                         |                                 |
| Flame Contact                                                                                                                                                                                                                                                                                                                                                                                           | Radiant Heat | Embers / Burning Debris | High / Erratic Fire Driven Wind |
| Very Significant                                                                                                                                                                                                                                                                                                                                                                                        | Significant  | Significant             | Moderate                        |
| Significant                                                                                                                                                                                                                                                                                                                                                                                             |              |                         |                                 |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.<br><sup>2</sup> Refer to Appendix 2 for explanatory information.<br><sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.<br><sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |              |                         |                                 |

#### Assessment Comments:

The above table has assumed all planning requirements are compliant including the Planning for bushfire guidelines. This Bushfire Risk Report has applied additional protection measures, and these are the applied to the derivation of the Residual Threat Level.

#### 5.1.5.4 ASSESSED THREAT LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire hazard assessments have facilitated the derivation of the indicative inherent and residual threat levels. The considered assessments are:

1. The assessed indicative threat levels for the different categories of bushfire prone vegetation identified in the surrounding landscape, as modified by the presence or not of relevant physical factors associated with vegetation, terrain and fire weather; and
2. The assessed threat reducing ability of applied bushfire protection measures.

The resultant inherent and residual threat levels (each applying to a different stage of bushfire protection measure application), are indicative as they are derived through a qualitative assessment process.

These threat levels, in combination with the corresponding assessed exposure and vulnerability levels, are later applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE THREAT LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup>                                                                                                                                                                                                                       |                                         |                                              |                               |                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------------|-------------------------------|----------------------------------|
| INHERENT THREAT LEVEL <sup>2</sup>                                                                                                                                                                                                                                                                                      |                                         |                                              |                               |                                  |
| Very Low <input type="checkbox"/>                                                                                                                                                                                                                                                                                       | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |
| RESIDUAL THREAT LEVEL <sup>3</sup>                                                                                                                                                                                                                                                                                      |                                         |                                              |                               |                                  |
| Very Low <input type="checkbox"/>                                                                                                                                                                                                                                                                                       | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |
| <sup>1</sup> Refer to Appendix 1 for explanatory information.<br><sup>2</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.<br><sup>3</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |                                         |                                              |                               |                                  |

**Assessment Comments:** The recommendation is to increase the separation distances, introduce shielding and improved equipment and structural design, including locating critical assets within the 10kWm2 area.

## 5.2 THE IDENTIFIED ELEMENTS AT RISK

| THE IDENTIFIED ELEMENTS AT RISK AND SUBJECT TO ASSESSMENT                                                                                                              |                                                                  |                                                                 |                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------|
| Possible Types                                                                                                                                                         | Exists on Subject Site and is Exposed to Bushfire Hazard Threats | Bushfire Risk Report Objectives Establish Requirement to Assess | Description                                           |
| <b>Persons located onsite and temporarily offsite as part of site operations</b> - includes occupants, staff, visitors and persons on day trips offsite (e.g. tourism) | ✓                                                                | ✓                                                               | Student educational day trips<br>Contractors<br>Staff |
| <b>Persons on access/egress routes (roads, driveways, access ways) in vehicles:</b>                                                                                    | ✓                                                                | ✓                                                               | Student educational day trips<br>Contractors<br>Staff |
| <b>Buildings - NCC Classes 1 to 9</b> - residential, offices, shops (retail/services), warehouses, carparks, factories, workshops, laboratories, public buildings.     | ✓                                                                | ✓                                                               | Recycling factory<br>Workshop and storage             |
| <b>Buildings or Structures – NCC Class 10</b> - non-habitable – shed, carport, garage, fence, retaining wall etc.                                                      | ✓                                                                | ✓                                                               | Sheds                                                 |
| <b>Park Vans – Long Term Installations</b> – park vans with or without associated additions.                                                                           |                                                                  |                                                                 |                                                       |
| <b>Non-Building Accommodation</b> - caravan / camper trailer / tent.                                                                                                   |                                                                  |                                                                 |                                                       |
| <b>Built Infrastructure Assets</b> – structures associated with telecommunications / power generation / transport / water supply etc.                                  | ✓                                                                | ✓                                                               | Generator, water recycling, communications tower      |
| <b>Materials Stored Outdoors</b> – as part of recycling and/or waste management operations.                                                                            | ✓                                                                | ✓                                                               | Recycling products and by-products (FOGO)             |
| <b>Livestock/Animals</b> - as part of commercial or private operations (saleyards / events / wildlife sanctuaries).                                                    |                                                                  |                                                                 |                                                       |



### 5.3 EXPOSURE LEVEL ASSESSMENT – BUSHFIRE PROTECTION MEASURE ANALYSIS

For each stated element at risk and each relevant bushfire hazard, an assessment is conducted that considers the effectiveness and application status of all available exposure reducing bushfire protection measures that are listed under their applicable bushfire protection mechanism. This information is subsequently applied to deriving exposure levels.

#### 5.3.1 PERSONS ONSITE AND TEMPORARILY OFFSITE

##### 5.3.1.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                                                                                         | Persons Onsite And Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – ESTABLISH SUFFICIENT SEPARATION FROM RELEVANT BUSHFIRE HAZARD THREATS: To ensure that the persons are located or re-located at a sufficient distance from the bushfire hazard to ensure the level of exposure to the threats, and the associated risk of persons death or injury, is contained within acceptable parameters. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| 2.1                                                                                                                                                                                                                                                                                                                                                     | <b>Stay Away from the Subject Site:</b> Prevent access to, occupancy or operation of the subject site (i.e. closure of use) in response to a pre-determined fire danger rating (FDR) or fire behaviour index (FBI) and/or activity restriction (e.g., total fire ban) or a defined period of the year (highest risk).<br><br>The relevant conditions and the requirement to stay away will be established through relevant site operational documents such as a Bushfire Emergency Plan or Site Emergency Plan/Guide.                                                                                                                                                                                    | Very High                         | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Closing of facility would be impractical based on facility use.                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| Recommendation Details: Recommend closing facility to non-essential staff and contractors during heightened fire conditions, being FDI above 75 and catastrophic fire danger days.                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| 2.2                                                                                                                                                                                                                                                                                                                                                     | <b>Remote Tourism Sites - Stay Within the Subject Site:</b> Relevant when tourism operations are moving persons offsite as part of operations e.g., tourism day trips.<br><br>All associated persons (staff, guests, visitors), in response to a pre-determined fire danger rating (FDR) or fire behaviour index (FBI) and/or activity restriction (e.g., total fire ban), will remain on-site as better communication and sheltering options exist on-site compared to travelling in a remote area – if possible.<br><br>The relevant conditions and the requirement to stay will be established through relevant site operational documents such as a Bushfire Emergency Plan or Site Emergency Guide. | High                              | N/A                             | N/A    | N/A     | N/A                      |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                        | Persons Onsite And Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| 2.3                                                                                                                                                                                                                                    | <b>Remote Tourism Sites - Relocate to Designated Safer Offsite Location:</b> Relevant when tourism operations are moving persons offsite as part of operations e.g., tourism day trips.<br>A suitable offsite alternative safer location(s) is identified as a destination should the subject site and/or the route back to the subject site, be impacted by a bushfire event during the time away from the site.                                                                                                        | High                              | N/A                             | N/A    | N/A     | N/A                      |
| Assessment Comments: Not Required                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| 2.4                                                                                                                                                                                                                                    | <b>Relocate (Evacuate) to Designated Safer Offsite Location(s):</b> A building, area or general location is identified and accessible from the subject site as an evacuation destination. The offsite location exists at a sufficient distance away ensuring that the destination and the subject site are not likely to be simultaneously impacted by a bushfire event.                                                                                                                                                 | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: The site office/cribroom is the nominated shelter in place, and staff will either go home or the contractors will return to their place of employment. A Bushfire Emergency Plan has been developed for the site. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| Recommendation Details: Include Bushfire Emergency Plan into operational documents including the site emergency plan. The cribroom is the nominated shelter in place building.                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| 2.5                                                                                                                                                                                                                                    | <b>Relocate to Safer Onsite Open Area:</b> Provide an accessible area located in the open (i.e. not in an enclosed building), within the subject site and on which persons can assemble and that will not be subject to radiant heat flux in excess of 2 kW/m <sup>2</sup> (determined using a flame temperature of 1200 K).<br>Consideration must also be given to potential exposure to embers, adverse weather, availability of water / facilities and the relative importance of these to the specific use proposal. | High                              | N/A                             | N/A    | N/A     | N/A                      |
| Assessment Comments: Onsite open area has not been nominated.                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| 2.6                                                                                                                                                                                                                                    | <b>Safer Pathways for Onsite Movement:</b> To ensure lower risk movement (walking) of persons and firefighters on the site, heavy fuels are excluded from areas adjacent to pathways used to access designated safer locations onsite. The required minimum separation distances are [13] [31]: <ul style="list-style-type: none"><li>At least 4m from stored heavy fuels (refer to Appendix 2).</li></ul>                                                                                                               | Medium                            | Yes                             | No     | Partly  | Yes                      |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                        | Persons Onsite And Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
|                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"><li>At least 6m from stored and constructed large heavy fuels (refer to Appendix 2).</li><li>At least 12m from constructed large heavy fuels that are buildings/structures.</li></ul> Additionally: <ul style="list-style-type: none"><li>The pathway/route is constructed of non-combustible materials;</li><li>No gas bottles are venting towards the pathway/route; and</li><li>Shrubs are separated from the pathway/route corresponding to a distance to minimise the threats to persons on foot with consideration of their flammability and height.</li></ul> |                                   |                                 |        |         |                          |
| Assessment Comments: At the facility design stage, safer pathways are to be included.                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| Recommendation Details: Apply protection measures. Include safer pathways in the facility design.                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| 2.7                                                                                                                                                                                                                                                    | <p><b>Pre-Emptively Relocate to Designated Safer Offsite Location(s):</b> In response to a pre-determined fire danger rating (FDR) or fire behaviour index (FBI) and/or activity restriction (e.g., total fire ban) or other established condition, all persons onsite will pre-emptively relocate offsite for the duration of the existence of the conditions.</p> <p>The relevant conditions and the requirement to pre-emptively relocate will be established through relevant site operational documents such as a Bushfire Emergency Plan or Site Emergency Guide.</p>                            | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: It is not practicable to close the facility, however all no essential contractors and visitors should not enter site for the duration of the conditions.                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| Recommendation Details: Develop guidelines and procedures to respond to pre-determined FDI and FDR days and other established conditions, eg restricted site access for non-essential people.                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – ESTABLISH SHIELDING FROM RELEVANT BUSHFIRE HAZARD THREATS: To utilise constructed or natural shielding to reduce the exposure of persons to the flame, radiant heat, and ember attack from bushfire and consequential fire. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| 2.8                                                                                                                                                                                                                                                    | <p><b>On-site Shelter Building – Community Refuge:</b> For ‘vulnerable’ persons (refer to Glossary), provide a building which is constructed in accordance with the NCC and the ABCB Design and Construction of Community Bushfire Refuges – Information Handbook [20].</p> <p>Note: The minimum requirement for floor area per person of 0.75 m<sup>2</sup> may be increased by relevant authorities in specific jurisdictions (e.g., to 1.0 m<sup>2</sup> in WA, Guidelines v1.4 [22]).</p>                                                                                                          | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: The building will be constructed to BAL-29 and the APZ will ensure 10kWm2 or less heat flux exposure.                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                        | Persons Onsite And Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                          |
| Recommendation Details: Construct nominated shelter in place building to BAL-29 requirements and manage the APZ to ensure less than 10kWm2 heat flux exposure during a bushfire event. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 2.9                                                                                                                                                                                    | <b>On-site Shelter Building – Not to Community Refuge [20] Standard:</b> For 'vulnerable' persons (refer to Glossary) where accommodation is not part of the site use, provide a building that will not be subject to radiant heat flux in excess of 10 kW/m <sup>2</sup> (determined using AS 3959 BAL determination methodology [4] and applying a flame temperature of 1200 K) and constructed to the bushfire standard corresponding to the BAL-29 rating (to provide greater resistance to consequential fire).                                                                                                                                                                                                                                                                                                                                              | High                              | N/A                             | N/A    | N/A     | N/A                      |
| Assessment Comments: The facility is not a vulnerable land use.                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 2.10                                                                                                                                                                                   | <b>On-site Shelter Building – Not a 'Vulnerable' Use:</b> For sites and uses other than those involving 'vulnerable' persons (refer to Glossary), provide a building that incorporates sufficient design and construction protection measures to reduce the building vulnerability to bushfire and consequential fire threats to an appropriate level (refer to the section of this report that identifies bushfire protection measures to reduce the vulnerability of buildings/structures).<br><br>Alternatively, provide a building that will not be subject to radiant heat flux in excess of 10 kW/m <sup>2</sup> (determined using AS 3959 BAL determination methodology [4] and applying a flame temperature of 1200 K) and constructed to the bushfire standard corresponding to the BAL-29 rating (to provide greater resistance to consequential fire). | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: The office/crib room building will be constructed to BAL-29 and the APZ will ensure less than 10kWm2 heat flux exposure.                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: The flame temperature will be calculated at 1200k rather than 1090k and the office/crib room will be constructed to NASH standard                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 2.11                                                                                                                                                                                   | <b>On-site Shelter Structure – Class 10c:</b> Provide a private bushfire shelter (Class 10c building) constructed in accordance with the NCC and the <i>Performance Standard – The design and construction of private bushfire shelter (ABCB 2014)</i> .<br><br>This is not a standalone measure but an additional measure as a last resort.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | High                              | N/A                             | N/A    | N/A     | N/A                      |
| Assessment Comments: Not Required                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 2.12                                                                                                                                                                                   | <b>Constructed Barrier – Shield Persons in the Open:</b> Construct walls / fences / landforms as shielding structures that are not buildings, applying appropriate fire resistant / non-combustible construction materials (e.g. masonry, steel, earthworks).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Medium                            | N/A                             | N/A    | N/A     | N/A                      |



| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                             | Persons Onsite And Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
|                                                                                                                                                                                                                                                                                                                                             | These are to withstand the impact of direct bushfire attack mechanisms for the required period of time and provide the required reduction in threat levels to persons in the open.<br><br>Construction requirements will correspond, as a minimum, to the BAL-FZ requirements for walls as established by AS 3959:2018 [4] and/or the NASH Standard [33] and additionally informed by the research report 'Research and Investigation into the Performance of Residential Boundary Fencing Systems in Bushfires' [29].                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| Assessment Comments: Not Required<br>Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| 2.13                                                                                                                                                                                                                                                                                                                                        | <b>Natural Barrier – Shield Persons in the Open:</b> Utilise natural landforms that have the potential to shield persons from the bushfire and consequential fire threats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Medium                            | N/A                             | N/A    | N/A     |                        |
| Assessment Comments: Not Required<br>Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| 2.14                                                                                                                                                                                                                                                                                                                                        | <b>Constructed/Natural Barrier – Shielding for Persons on Pathways to Safer Onsite Area/Building:</b> Where possible, alongside pathways to an on-site shelter building/area, utilise walls / fences / landforms as shielding structures constructed using fire resistant / non-combustible construction materials (e.g. masonry, steel, earthworks).<br><br>These are to withstand the impact of direct bushfire attack mechanisms for the required period of time and provide the required reduction in threat levels to persons (including firefighters) traversing the pathway.<br><br>Construction can be informed by the BAL-FZ requirements for walls as established by AS 3959:2018 [4] and/or the NASH Standard [33] and additionally informed by the research report 'Research and Investigation into the Performance of Residential Boundary Fencing Systems in Bushfires' [29]. | Medium                            | N/A                             | N/A    | N/A     |                        |
| Assessment Comments: Not Required<br>Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| <sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.<br><br><sup>2</sup> <b>Protection Measure Application Status:</b> <ul style="list-style-type: none"><li><b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                        | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Persons Onsite And Temporarily Offsite |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"><li>• <b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li>• <b>Currently Planned:</b> Protection measures that:<ul style="list-style-type: none"><li>• Are incorporated into the site plans;</li><li>• Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul><p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p></li><li>• <b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>• Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul><p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p></li></ul> |                                        |                                   |                                 |        |         |                        |

### 5.3.1.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing exposure levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the exposure of the relevant element at risk to bushfire hazard threats.

| EXPOSURE REDUCING PROTECTION MEASURE ANALYSIS                                                                                                                                                                          |                                        |                                |                                 |              |               |                   |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                                                                                                                                                                        | Persons Onsite and Temporarily Offsite |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup>      | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                        | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                        |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Establish Sufficient Separation from Relevant Bushfire Hazard Threats                                                                                                                                                  | Very High                              | 1                              | 1                               |              |               |                   | 1                        |
|                                                                                                                                                                                                                        | High                                   | 2                              | 2                               |              |               |                   | 2                        |
|                                                                                                                                                                                                                        | Medium                                 | 1                              | 1                               |              |               | 1                 | 1                        |
|                                                                                                                                                                                                                        | Not Relevant                           | 3                              |                                 |              |               |                   |                          |
| Establish Shielding from Relevant Bushfire Hazard Threats                                                                                                                                                              | Very High                              |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                                   | 2                              | 2                               |              |               |                   | 2                        |
|                                                                                                                                                                                                                        | Medium                                 |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                           | 3                              |                                 |              |               |                   |                          |
| <b>Number Analysis</b>                                                                                                                                                                                                 | <b>Very High</b>                       | <b>1</b>                       | <b>1</b>                        |              |               |                   | <b>1</b>                 |
|                                                                                                                                                                                                                        | <b>High</b>                            | <b>4</b>                       | <b>4</b>                        |              |               |                   | <b>4</b>                 |
|                                                                                                                                                                                                                        | <b>Medium</b>                          | <b>1</b>                       | <b>1</b>                        |              |               | <b>1</b>          | <b>1</b>                 |
|                                                                                                                                                                                                                        | <b>Not Relevant</b>                    | <b>6</b>                       |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | <b>Totals</b>                          | <b>12</b>                      | <b>6</b>                        |              |               | <b>1</b>          | <b>6</b>                 |
| <sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.<br><sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section. |                                        |                                |                                 |              |               |                   |                          |

### 5.3.1.3 PROTECTION MEASURES - EXPOSURE REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce indicative exposure levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the exposure of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE EXPOSURE TO BUSHFIRE HAZARD THREATS <sup>1</sup>                  |              |                                        |                                 |                                         |              |                           |                            |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                               |              | Persons Onsite and Temporarily Offsite |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> EXPOSURE LEVEL <sup>3</sup>                 |              |                                        |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                                        |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris                | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Moderate     | Moderate                               | Minimal                         | Moderate                                | Minimal      | None                      | Significant                |
| Moderate                                                                                                                      |              |                                        |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> EXPOSURE LEVEL <sup>4</sup>                  |              |                                        |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                                        |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris                | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| None                                                                                                                          | Minimal      | Moderate                               | Minimal                         | Minimal                                 | Minimal      | None                      | Minimal                    |
| Minimal                                                                                                                       |              |                                        |                                 | Minimal                                 |              |                           |                            |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.                                                  |              |                                        |                                 |                                         |              |                           |                            |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |              |                                        |                                 |                                         |              |                           |                            |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |              |                                        |                                 |                                         |              |                           |                            |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |              |                                        |                                 |                                         |              |                           |                            |

**Assessment Comments:** No additional comment.



### 5.3.1.4 ASSESSED EXPOSURE LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual exposure levels. These exposure levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and vulnerability levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE EXPOSURE LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup> |                                  |                                              |                                         |                                              |                                          |                                  |          |
|-----------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|------------------------------------------|----------------------------------|----------|
| ELEMENT AT RISK                                                                                     |                                  | Persons Onsite and Temporarily Offsite       |                                         |                                              |                                          |                                  |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | INHERENT EXPOSURE LEVEL <sup>3</sup>         |                                         |                                              |                                          |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | RESIDUAL EXPOSURE LEVEL <sup>4</sup>         |                                         |                                              |                                          |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> | Low      |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |

<sup>1</sup> Refer to Appendix 1 for explanatory information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

<sup>5</sup> The level of exposure to flames and radiant heat is derived from the assessed indicative BAL ratings (refer to the BAL contour map). The exposure levels applied are BAL-LOW/Very Low Exposure, BAL-12.5/Low Exposure, BAL-19/Moderate Exposure, BAL-29/High Exposure, BAL-40 and BAL-FZ/Extreme Exposure.

**Assessment Comments:** There will potentially be a significant reduction in exposure for persons on site during a bushfire event. The site exposure level will be a maximum 10kWm<sup>2</sup> heat flux on built assets.

## 5.3.2 PERSONS ON ACCESS/EGRESS ROUTES IN VEHICLES

### 5.3.2.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

#### ACCESS/EGRESS ROUTE: Gull, Road

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|--|
|                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              |                                   | Possible                        | Exists | Planned | Additionally Recommend |  |
| Element at Risk                                                                                                                                                                                                                                                                                                                                         | Persons On Access / Egress Routes In Vehicles                                                                                                                                                                                                                                                                      | Access Route Description | Gull Road is approximately 4kms from the nearest two-way access route at the lakes Road. Gull Rd is sealed with approximately 4m surface and is bordered by pastured paddocks and forest fuels within the road drainage area. Gull Rd has good line of site. |                                   |                                 |        |         |                        |  |
| THE PROTECTION MECHANISM - ESTABLISH SUFFICIENT SEPARATION FROM RELEVANT BUSHFIRE HAZARD THREATS: To utilise distance away from relevant bushfire hazard threats (primarily flames, radiant heat and tree strike/obstruction) while traversing an access/egress route in a vehicle to lower the exposure of persons for the expected time on the route. |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |
| 3.1                                                                                                                                                                                                                                                                                                                                                     | Locate Access/Egress Routes Away from Adjacent Hazards: Existing or to be installed vehicular access/egress route components (roads, access ways, and driveways) are positioned to maximise the distance away from any adjacent bushfire prone vegetation where possible.                                          |                          |                                                                                                                                                                                                                                                              | High                              | No                              | No     | No      | Yes                    |  |
| Assessment Comments: Gull Road is a public road and cannot be moved or managed. The internal driveway verge can be managed                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |
| 3.2                                                                                                                                                                                                                                                                                                                                                     | Egress Routes Located to Ensure Driving Away from Hazard: Existing or to be installed vehicular access/egress route components (roads, access ways, and driveways) are positioned so that the direction of egress is away from the hazard into lower threat areas.                                                 |                          |                                                                                                                                                                                                                                                              | Very High                         | Yes                             | No     | No      | Yes                    |  |
| Assessment Comments: The driveway extending to Gull Road can be managed. The driveway verge will be managed.                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |
| Recommendation Details: Driveway verge to be managed. 3m from the limestone road base driveway will be slashed prior fire season.                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |
| 3.3                                                                                                                                                                                                                                                                                                                                                     | Greater Road Width: Wider roads will allow for a greater separation distance between traversing vehicles and the bushfire hazard.<br><br>The incorporation of non-vegetated and trafficable road verges/shoulders and adjacent footpaths can also safely increase effective separation for slower moving vehicles. |                          |                                                                                                                                                                                                                                                              | High                              | Yes                             | No     | No      | Yes                    |  |
| Assessment Comments: The driveway will meet public road requirements and additional verge slashing is required.                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                    |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|--|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   | Possible                        | Exists | Planned | Additionally Recommend |  |  |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                         | Persons On Access / Egress Routes In Vehicles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Access Route Description | Gull Road is approximately 4kms from the nearest two-way access route at the lakes Road. Gull Rd is sealed with approximately 4m surface and is bordered by pastured paddocks and forest fuels within the road drainage area. Gull Rd has good line of site. |                                   |                                 |        |         |                        |  |  |
| Recommendation Details: 3m wide verge slashing is required.                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |
| 3.4                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Reduce and Maintain Road Verge Fuel to a Low Threat State:</b> Road verges, or part off, support low threat vegetation or vegetation is removed or reduced and maintained to a minimal fuel condition to increase the separation distance from the bushfire hazard. This is practical when an authority exists to conduct the management and will have greater threat reducing impact as a protection measure, if there is certainty it will be carried out.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              | Medium                            | Yes                             | No     | No      | Yes                    |  |  |
| Assessment Comments: The driveway will meet public road requirements and additional verge slashing is required.                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |
| Recommendation Details: 3m wide verge slashing is required.                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |
| <b>THE PROTECTION MECHANISM – ESTABLISH SHIELDING FROM RELEVANT BUSHFIRE HAZARD THREATS:</b> To utilise constructed or natural shielding to reduce the exposure of persons, traversing the access/egress routes, to relevant bushfire threats (primarily flames, radiant heat and embers). To assist with ensuring the level of exposure to the threats is survivable for the expected time on the route while travelling in a vehicle. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |
| 3.5                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Ensure Evacuation Vehicle Types Provide a Degree of Protection:</b> People can only tolerate low levels of radiant heat without some protection. Vehicles provide some protection from low intensity fires (if they stay on cleared area and remain in the vehicle) but they will not protect people in moderate to intense grass fires or in any location where scrub or forest adjoin the road.<br><br>Protection provided by vehicles with predominantly metal bodies (including roof) and able to be enclosed (glass window), while limited is also still significant. It is particularly significant when compared to other potentially available modes of transport on roads (e.g. open top/backed vehicles, motorbikes, bicycles and being on foot).<br><br>The availability such vehicles of required capacity can contribute to reduced exposure to the bushfire threats for persons on access/egress routes. |                          |                                                                                                                                                                                                                                                              | Medium                            | N/A                             | N/A    | N/A     | N/A                    |  |  |
| Assessment Comments: Shelter in place building is provided on site. Late evacuation will not occur.                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |
| <sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |
| <sup>2</sup> <b>Protection Measure Application Status:</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |  |  |



| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                               |                          |                                                                                                                                                                                                                                                              | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                               |                          |                                                                                                                                                                                                                                                              |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Persons On Access / Egress Routes In Vehicles | Access Route Description | Gull Road is approximately 4kms from the nearest two-way access route at the lakes Road. Gull Rd is sealed with approximately 4m surface and is bordered by pastured paddocks and forest fuels within the road drainage area. Gull Rd has good line of site. |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"><li>• <b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li><li>• <b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li>• <b>Currently Planned:</b> Protection measures that:<ul style="list-style-type: none"><li>• Are incorporated into the site plans;</li><li>• Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> <p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p> <ul style="list-style-type: none"><li>• <b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>• Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> |                                               |                          |                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |

### 5.3.2.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing exposure levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the exposure of the relevant element at risk to bushfire hazard threats.

| EXPOSURE REDUCING PROTECTION MEASURE ANALYSIS                         |                                               |                                |                                 |              |               |                   |                          |
|-----------------------------------------------------------------------|-----------------------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                       | Persons on Access / Egress Routes in Vehicles |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                              | Effectiveness Rating <sup>1</sup>             | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                       |                                               | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                       |                                               |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Establish Sufficient Separation from Relevant Bushfire Hazard Threats | Very High                                     | 1                              | 1                               |              |               |                   | 1                        |
|                                                                       | High                                          | 2                              | 1                               |              |               |                   | 2                        |
|                                                                       | Medium                                        | 1                              | 1                               |              |               |                   | 1                        |
|                                                                       | Not Relevant                                  |                                |                                 |              |               |                   |                          |
| Establish Shielding from Relevant Bushfire Hazard Threats             | Very High                                     |                                |                                 |              |               |                   |                          |
|                                                                       | High                                          |                                |                                 |              |               |                   |                          |
|                                                                       | Moderate                                      |                                |                                 |              |               |                   |                          |
|                                                                       | Not Relevant                                  | 1                              |                                 |              |               |                   |                          |
| Number Analysis                                                       | Very High                                     | 1                              | 1                               |              |               |                   | 1                        |
|                                                                       | High                                          | 2                              | 1                               |              |               |                   | 2                        |
|                                                                       | Medium                                        | 1                              | 1                               |              |               |                   | 1                        |
|                                                                       | Not Relevant                                  | 1                              |                                 |              |               |                   |                          |
|                                                                       | Totals                                        | 5                              | 3                               |              |               |                   | 4                        |

<sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.

<sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section.

### 5.3.2.3 PROTECTION MEASURES - EXPOSURE REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce indicative exposure levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the exposure of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE EXPOSURE TO BUSHFIRE HAZARD THREATS <sup>1</sup>                  |              |                                             |                                 |                                         |              |                           |                            |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                               |              | Persons On Access/Egress Routes In Vehicles |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> EXPOSURE LEVEL <sup>3</sup>                 |              |                                             |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                                             |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris                     | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Moderate                                                                                                                      | Significant  | Moderate                                    | Minimal                         | Moderate                                | Minimal      | Moderate                  | None                       |
| Moderate                                                                                                                      |              |                                             |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> EXPOSURE LEVEL <sup>4</sup>                  |              |                                             |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                                             |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris                     | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Moderate                                                                                                                      | Significant  | Moderate                                    | Minimal                         | Moderate                                | Minimal      | Moderate                  | None                       |
| Moderate                                                                                                                      |              |                                             |                                 | Moderate                                |              |                           |                            |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.                                                  |              |                                             |                                 |                                         |              |                           |                            |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |              |                                             |                                 |                                         |              |                           |                            |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |              |                                             |                                 |                                         |              |                           |                            |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |              |                                             |                                 |                                         |              |                           |                            |

**Assessment Comments:** No comment

### 5.3.2.4 ASSESSED EXPOSURE LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual exposure levels. These exposure levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and vulnerability levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE EXPOSURE LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup> |                                  |                                              |                                         |                                              |                                          |                                             |          |
|-----------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|------------------------------------------|---------------------------------------------|----------|
| ELEMENT AT RISK                                                                                     |                                  | Persons On Access/Egress Routes in Vehicles  |                                         |                                              |                                          |                                             |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | INHERENT EXPOSURE LEVEL <sup>3</sup>         |                                         |                                              |                                          |                                             | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input checked="" type="checkbox"/> | Moderate |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | RESIDUAL EXPOSURE LEVEL <sup>4</sup>         |                                         |                                              |                                          |                                             | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            | Moderate |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/>            |          |

<sup>1</sup> Refer to Appendix 1 for explanatory information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

<sup>5</sup> The level of exposure to flames and radiant heat is derived from the assessed indicative BAL ratings (refer to the BAL contour map). The exposure levels applied are BAL-LOW/Very Low Exposure, BAL-12.5/Low Exposure, BAL-19/Moderate Exposure, BAL-29/High Exposure, BAL-40 and BAL-FZ/Extreme Exposure.

**Assessment Comments:** No comment



### 5.3.3 BUILDINGS AND STRUCTURES - NCC CLASSES 1-10

#### 5.3.3.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| THE PROTECTION MECHANISM – ESTABLISH SUFFICIENT SEPARATION FROM RELEVANT BUSHFIRE HAZARD THREATS: To reduce exposure to the relevant direct and indirect attack mechanisms of bushfire by locating buildings and attached/adjacent structures at sufficient distances away from the bushfire hazard and consequential fire fuels. The required distances will be dependent on the indicative threat levels and the degree of bushfire resilience that exists or is planned to be incorporated into the exposed elements through design and construction. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 4.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Siting of Buildings/Structures Considering Potential High Wind Exposure:</b> Site buildings and attached/adjacent structures in locations that have less exposure to terrain influenced prevailing synoptic winds, and in particular, those locations with potential for significant terrain/bushfire threat intensification interactions (refer to Appendix 3).<br><br>Avoid the top and sides of ridges. Strong winds can directly or indirectly (airborne materials/debris) cause damage to the external building envelope, potentially allowing flame, radiant heat and ember entry.                                                                                      | High                              | N/A                             | N/A    | N/A     | N/A                    |
| Assessment Comments: The site is located on flat ground and will be exposed to little fire driven wind.<br><br>Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 4.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Designed Location of Non-Vegetated Areas and/or Managed Open Space:</b> Non-vegetated land uses include footpaths, paved areas, roads, parking, open drainage channels, and major services delivery (power, water, gas) installed in common corridors.<br><br>Managed open space is land for public or private use on which the vegetation is either low threat due to type or situation or is continually managed in a minimal fuel condition. This can include public open space providing recreation facilities.<br><br>Use these design elements to create or increase separation from any bushfire prone vegetation by positioning them adjacent to the bushfire hazard. | Very High                         | Yes                             | Partly | Partly  | No                     |
| Assessment Comments: Operational areas including trafficable area frequented by trunks will be included as part of the APZ (Low Threat area).<br><br>Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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| Element at Risk: Buildings/Structures - NCC Classes 1-10                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| 4.3                                                                                                                           | <p><b>Landscaping - Asset Protection Zone (APZ):</b> Ensure an APZ is established surrounding the relevant element(s) at risk to create the required separation distance from the bushfire hazard to protect against the direct attack mechanisms of flame contact and radiant heat and reduce exposure to embers.</p> <p><b><i>In addition to providing separation from the direct bushfire attack mechanisms, the nature of the APZ design and management requirements is intended to minimise the potential impact of the indirect bushfire attack mechanisms of surface fire attack, debris production and accumulation, tree strike and consequential fire (refer to Appendix 2).</i></b></p> <p>This is achieved by ensuring the APZ contains low threat vegetation; and/or has potential fire fuels managed in a minimal fuel condition; and/or contains non-vegetated areas (e.g. footpaths, paved areas, driveways, parking, swimming pools etc) and/or limits the presence/location of constructed/stored combustible items.</p> <p>For different States and local government areas, APZ establishment and maintenance guides ideally need to be local environment specific. Some authorities establish general requirements while specific requirements may also be established through site specific management documents (e.g. bushfire management plan).</p> <p>The required dimensions of the APZ will correspond to the maximum level of radiant heat the exposed element is to be exposed to – or a greater distance if it is stipulated by a relevant authority.</p> <p>As a minimum avoid dimensions (separation distances) that correspond to BAL-FZ and BAL-40 ratings for any given site/vegetation combination of relevant parameters. This will also apply to BAL-29 separation distances if flame length modelling indicates potential contact due to specific site and effective slope configurations.</p> <p>The location of an APZ should be entirely within the boundaries of each lot so that landowners can have control and responsibility for its implementation and maintenance. Exceptions exist for instances where adjoining land is not vegetated or it can be justified that the fire fuels will be managed in a minimal fuel, low threat state on an ongoing basis, in perpetuity.</p> | Very High                         | Yes                             | No     | Partly  | Yes                      |
| Assessment Comments: The planning APZ (BAL-29) will be established and maintained as per the BMP.                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| Recommendation Details: 10kWm2 @ 1200k APZ will be constructed and maintained around the nominated shelter in place building. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| 4.4                                                                                                                           | <p><b>Landscaping - Tree Location:</b> Use separation to minimise the potential for debris accumulation and tree strike damage to the building/structures that will allow flame, radiant heat and ember entry to internal spaces. Principles to apply are:</p> <ul style="list-style-type: none"><li>The buildings/structures are separated from trees (or trees from buildings) by a distance of at least 1.5 times the height of the tallest tree; and</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Medium                            | Yes                             | No     | Yes     | Partly                   |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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| Element at Risk:                                                                                                                                               | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
|                                                                                                                                                                | <ul style="list-style-type: none"><li>Trees that produce significant quantities of debris (fine fuels) during the bushfire season should be located a sufficient distance away from vulnerable exposed elements to ensure debris cannot drop and accumulate within at least 4m of buildings/structures or be likely to be relocated by wind to closer than 4m to buildings / structures. Avoid planting trees with ribbon or stringy bark (ember/firebrand production).</li><li>If the minimum distance cannot be achieved with an existing tree either remove the tree or at least ensure tree branches are sufficiently separated from buildings and attached/adjacent structures (at a minimum to not overhang) to ensure branches cannot fall onto or be blown onto the buildings/structures.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| Assessment Comments: Not Required                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| Recommendation Details: Avoid planting trees that allow fire to ascend the trunk and produce embers and firebrands.                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| 4.5                                                                                                                                                            | <p><b>Separation from Stored Flammable Products - Gas in Cylinders:</b> To reduce the potential for gas flaring or explosion (consequential fire), installation of LPG cylinders is to apply as a minimum, the principles and requirements established in AS 1596 'The Storage and Handling of LP Gas'. Readily available guidance is provided by CSIRO Best Practice Bushfire Guide (<a href="https://research.csiro.au/bushfire/new-builds/water-electricity-gas/">https://research.csiro.au/bushfire/new-builds/water-electricity-gas/</a>) and WA Dept. Mines, Industry, Regulation and Safety 'LP Gas cylinder safety in bushfire prone areas' (<a href="https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas">https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas</a>).</p> <p>Otherwise, the required separation distance is 6m from any combustible materials.</p> <p>Heat from bushfire or consequential fire can be sufficient to cause cylinder pressure to reach critical levels and the pressure relief valve release large quantities of gas (flare). If the cylinder falls over the pressure relief valve may not function correctly, and the cylinder may rupture (explosion).</p> | Medium                            | N/A                             | N/A    | N/A     |                          |
| Assessment Comments: No gas cylinders on site.                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| 4.6                                                                                                                                                            | <p><b>Separation from Stored Flammable Products – Fuels / Other Hazardous Materials (Consequential Fire Fuels):</b> Establish sufficient separation distance between these consequential fire fuels and buildings/structures. The required separation distance will be dependent on the fuel and storage type.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | High                              | Yes                             | No     | Yes     |                          |
| Assessment Comments: Include in facility guidance document appropriate storage of flammable liquids and stored items to reduce the risk of consequential fire. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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| Element at Risk:                                                                                                                                                                       | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                        |
| Recommendation Details: Include in facility guidelines to direct the storage of fuel, flammable liquids and workshop gas bottles, used and new oils storage and other flammable items. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                        |
| 4.7                                                                                                                                                                                    | <p><b>Separation from Stored and Constructed Combustible Items (Consequential Fire Fuels):</b> These consequential fire fuels include:</p> <ul style="list-style-type: none"><li>• Stored Combustible Items - Heavy Fuels (&gt;6mm diameter) e.g. building materials, packaging materials, firewood, branches, sporting/playground equipment, outdoor furniture, rubbish bins etc;</li><li>• Stored Combustible Items – Large Heavy Fuels e.g. vehicles, caravans, boats and large quantities of dead vegetation materials stored as part of site use;</li><li>• Constructed Combustible Items – Heavy Fuels e.g. landscaping structures including fences, screens, walls, plastic water tanks; and</li><li>• Constructed Combustible Items – Large Heavy Fuels e.g. adjacent buildings/structures including houses, sheds, garages, carports. (Note: If the adjacent structure is constructed to BAL-29 requirements or greater and can implement a significant number of additional bushfire protection measures associated with reducing exposure and vulnerability, these minimum separation distances could be reduced by 30%) [31].</li></ul> <p>Apply the rule of thumb [13] “assume flames produced from a consequential fire source will be twice as high as the object itself ... where the consequential fire source is a structure, then the maximum eave height is a reasonable measure of maximum height”.</p> <p>Apply the following separation distances from the subject building/structure as a multiple of the height of the consequential fire source and dependent on the bushfire construction standard applied to the building/structure [13 and 31]:</p> <ul style="list-style-type: none"><li>• At least six times the height when the building/structure construction incorporates design and materials that is only intended to resist low levels of radiant heat up to 12.5 kW/m²) and no flame contact;</li><li>• Between 4 and 6 six times the height when the building/structure construction incorporates design and materials intended to resist radiant heat up to 29 kW/m² and no flame contact.</li><li>• Between 2 and 4 times the height when the building/structure construction incorporates design and materials intended to resist up to 40kW/m² and potential flame contact.</li></ul> | High                              | Yes                             | No     | No      | Yes                    |



| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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| Element at Risk:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"><li>Less than 2 times the height when the building/structure construction incorporates design and materials intended to resist extreme levels of radiant heat and flame contact.</li><li>Zero separation distance is required if the building/structure is separated by a non-combustible FRL 60/60/60 rated wall, or the potential consequential fire source is fully enclosed by the building/structure.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| Assessment Comments: When storage of flammable items or materials are stored on site temporarily (for maintenance etc), separation distances must be complied with.                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| Recommendation Details: Include in the guidance document separation distances required for flammable and combustible materials.                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| THE PROTECTION MECHANISM – ESTABLISH SHIELDING FROM RELEVANT BUSHFIRE HAZARD THREATS: Reduce exposure the direct bushfire attack mechanisms of flame, radiant heat, surface migration of embers and to a potentially limited extent, fire driven wind - by shielding buildings and attached/adjacent structures or other consequential fire fuels. To also reduce exposure to the indirect attack mechanism of debris accumulation against buildings/structures and other consequential fire fuels. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| 4.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Constructed Barrier – Shielding from Bushfire:</b> Walls, fences and/or landforms to shield the subject building/structure from direct and indirect bushfire attack mechanisms and reduce the potential impact.<br><br>Must be constructed using appropriate fire resistant / non-combustible construction materials (e.g. masonry, steel, earthworks). These are to withstand the impact of direct bushfire attack mechanisms for the required period of time.<br><br>Apply the bushfire construction standards for external walls subject to the assessed level of radiant heat or flame contact to which the barrier will be exposed (or otherwise to BAL-FZ requirements). These are established by AS 3959:2018 [4] and/or the NASH Standard [33] and additionally informed by the research report 'Research and Investigation into the Performance of Residential Boundary Fencing Systems in Bushfires.' [29] | High                              | Yes                             | No     | No      |                        |
| Assessment Comments: The measure is not cost-effective or necessary where greater separation distance can be achieved.                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| Recommendation Details: Not Applicable. The buildings are not located in BAL-FZ.                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| 4.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Constructed Barrier - Shielding from Consequential Fire:</b> Applicable to all consequential fire fuel sources. Install a non-combustible barrier (including complete enclosure when appropriate), of required robustness, that can perform the following as relevant: <ul style="list-style-type: none"><li>Reduce the exposure of the subject building/structure to the threats of consequential fire; and/or</li><li>Reduce the exposure of the consequential fire fuels to the bushfire hazard.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                        | High                              | Yes                             | No     | No      |                        |
| Assessment Comments: Nil                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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| Element at Risk:                                                                                                                                                                                                                                                                                          | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                        |
| Recommendation Details: Ensure all subfloor spaces are sealed.                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| 4.10                                                                                                                                                                                                                                                                                                      | <b>Natural Landforms Barrier:</b> Use existing natural landforms to reduce buildings/structures exposure to radiant heat, and lower wind speeds (prevailing synoptic and/or fire driven).                                                                                                                                                                                                                                                                                                                                                                                                                                     | High                              | N/A                             | N/A    | N/A     | N/A                    |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| 4.11                                                                                                                                                                                                                                                                                                      | <b>Planted Vegetation Barrier:</b> Use appropriate species (lower flammability) of hedges and trees strategically to reduce (to varying extents) buildings/structures exposure to radiant heat, to filter/trap embers and firebrands, and to lower wind speeds (prevailing synoptic and/or fire driven).                                                                                                                                                                                                                                                                                                                      | Medium                            | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Plantings must be in compliance with the Landscape Management Plan and be complaint with Schedule 1 of the Guidelines for Planning in Bushfire Prone Areas.                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| Recommendation Details: Include in the facility guidance documents and operational documents management of planted vegetation.                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| 4.12                                                                                                                                                                                                                                                                                                      | <b>Shield Operation Critical Non-Structural Elements:</b> These are vulnerable elements essential to the continued operation of the building/structure which are potentially exposed to the attack mechanisms of both bushfire and consequential fire. These elements include cabling and plumbing associated with power delivery, data transmission, fuel and water transport.<br><br>When the use of fire rated materials to the degree necessary is not possible or practical, the application of non-combustible shielding can be applied to reduce exposure to the threats. Shielding includes underground installation. | Medium                            | Yes                             | No     | Partly  | Yes                    |
| Assessment Comments: Generators, weighbridge, tank farm, liquid waste receival and any other critical non-structural items to be assessed for heat exposure vulnerabilities.                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| Recommendation Details: Position all critical non-structural items in less than 10kWms area and shield electrical cabling, poly tanks and pipes, valves and any other item susceptible to low radiant heat. Include a maintenance regime for debris accumulation management within the guidance document. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| <sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |
| <sup>2</sup> <b>Protection Measure Application Status:</b> <ul style="list-style-type: none"><li><b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li></ul>                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                         | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |  |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                         |                                   | Possible                        | Exists | Planned | Additionally Recommend |  |
| Element at Risk:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Buildings/Structures - NCC Classes 1-10 |                                   |                                 |        |         |                        |  |
| <ul style="list-style-type: none"><li>• <b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li>• <b>Currently Planned:</b> Protection measures that:<ul style="list-style-type: none"><li>• Are incorporated into the site plans;</li><li>• Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul><p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p></li><li>• <b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>• Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul><p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p></li></ul> |                                         |                                   |                                 |        |         |                        |  |

### 5.3.3.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing exposure levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the exposure of the relevant element at risk to bushfire hazard threats.

| EXPOSURE REDUCING PROTECTION MEASURE ANALYSIS                                                                                                                                                                          |                                           |                                |                                 |              |               |                   |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                                                                                                                                                                        | Buildings / Structures - NCC Classes 1-10 |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup>         | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                           | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                           |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Establish Sufficient Separation from Relevant Bushfire Hazard Threats                                                                                                                                                  | Very High                                 | 2                              | 2                               |              |               | 2                 | 1                        |
|                                                                                                                                                                                                                        | High                                      | 2                              | 2                               |              |               |                   | 2                        |
|                                                                                                                                                                                                                        | Medium                                    | 1                              |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                              | 1                              | 1                               |              |               | 1                 | 1                        |
| Establish Shielding from Relevant Bushfire Hazard Threats                                                                                                                                                              | Very High                                 |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                                      | 3                              |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Medium                                    | 2                              |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                              |                                |                                 |              |               |                   |                          |
| Number Analysis                                                                                                                                                                                                        | Very High                                 | 2                              | 2                               |              |               | 2                 | 1                        |
|                                                                                                                                                                                                                        | High                                      | 5                              | 2                               |              |               |                   | 2                        |
|                                                                                                                                                                                                                        | Moderate                                  | 3                              |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                              | 1                              | 1                               |              |               | 1                 | 1                        |
|                                                                                                                                                                                                                        | Totals                                    | 11                             | 5                               |              |               | 3                 | 4                        |
| <sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.<br><sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section. |                                           |                                |                                 |              |               |                   |                          |

### 5.3.3.3 PROTECTION MEASURES - EXPOSURE REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce indicative exposure levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the exposure of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE EXPOSURE TO BUSHFIRE HAZARD THREATS <sup>1</sup>                  |              |                                         |                                 |                                         |              |                           |                            |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                               |              | Buildings/Structures - NCC Classes 1-10 |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> EXPOSURE LEVEL <sup>3</sup>                 |              |                                         |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                                         |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris                 | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Moderate     | Moderate                                | Minimal                         | Moderate                                | Minimal      | None                      | Significant                |
| Moderate                                                                                                                      |              |                                         |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> EXPOSURE LEVEL <sup>4</sup>                  |              |                                         |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                                         |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris                 | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Moderate     | Moderate                                | Minimal                         | Minimal                                 | Minimal      | None                      | Minimal                    |
| Moderate                                                                                                                      |              |                                         |                                 | Minimal                                 |              |                           |                            |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.                                                  |              |                                         |                                 |                                         |              |                           |                            |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |              |                                         |                                 |                                         |              |                           |                            |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |              |                                         |                                 |                                         |              |                           |                            |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |              |                                         |                                 |                                         |              |                           |                            |

**Assessment Comments:** It is recommended to reduce consequential fire by sealing subfloors, shielding or reducing the radiant heat exposure to electrical cabling, poly tanks and pipes and also consider the vulnerability of valves etc.



### 5.3.3.4 ASSESSED EXPOSURE LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual exposure levels. These exposure levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and vulnerability levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE EXPOSURE LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup> |                                  |                                              |                                         |                                              |                                          |                                  |          |
|-----------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|------------------------------------------|----------------------------------|----------|
| ELEMENT AT RISK                                                                                     |                                  | Buildings and Structures – NCC Classes 1-10  |                                         |                                              |                                          |                                  |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | INHERENT EXPOSURE LEVEL <sup>3</sup>         |                                         |                                              |                                          |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | RESIDUAL EXPOSURE LEVEL <sup>4</sup>         |                                         |                                              |                                          |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |

<sup>1</sup> Refer to Appendix 1 for explanatory information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

<sup>5</sup> The level of exposure to flames and radiant heat is derived from the assessed indicative BAL ratings (refer to the BAL contour map). The exposure levels applied are BAL-LOW/Very Low Exposure, BAL-12.5/Low Exposure, BAL-19/Moderate Exposure, BAL-29/High Exposure, BAL-40 and BAL-FZ/Extreme Exposure.

### 5.3.4 BUILT INFRASTRUCTURE ASSETS

#### 5.3.4.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Built (Hard) Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – ESTABLISH SUFFICIENT SEPARATION FROM RELEVANT BUSHFIRE HAZARD THREATS: To reduce exposure to the relevant direct and indirect attack mechanisms of bushfire by locating buildings and attached/adjacent structures at sufficient distances away from the bushfire hazard and consequential fire fuels. The required distances will be dependent on the indicative threat levels and the degree of bushfire resilience that exists or is planned to be incorporated into the exposed elements through design and construction. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |
| 5.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Siting of Buildings/Structures Considering Potential High Wind Exposure:</b> Site buildings and attached/adjacent structures in locations that have less exposure to terrain influenced prevailing synoptic winds, and in particular, those locations with potential for significant terrain/bushfire threat intensification interactions (refer to Appendix 3).<br><br>Avoid the top and sides of ridges. Strong winds can directly or indirectly (airborne materials/debris) cause damage to the external building envelope, potentially allowing flame, radiant heat and ember entry.                                                                                      | High                              | N/A                             | N/A    | N/A     | N/A                      |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |
| 5.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Designed Location of Non-Vegetated Areas and/or Managed Open Space:</b> Non-vegetated land uses include footpaths, paved areas, roads, parking, open drainage channels, and major services delivery (power, water, gas) installed in common corridors.<br><br>Managed open space is land for public or private use on which the vegetation is either low threat due to type or situation or is continually managed in a minimal fuel condition. This can include public open space providing recreation facilities.<br><br>Use these design elements to create or increase separation from any bushfire prone vegetation by positioning them adjacent to the bushfire hazard. | Very High                         | Yes                             | No     | Partly  | Yes                      |
| Assessment Comments: Generator, tank farm and other critical infrastructure to be located, if possible, in 10kWm2 or less heat flux exposure.                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |
| Recommendation Details: Use roads, hardstand areas and footpaths as open managed spaces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Built (Hard) Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| 5.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p><b>Landscaping - Asset Protection Zone (APZ):</b> Ensure an APZ is established surrounding the relevant element(s) at risk to create the required separation distance from the bushfire hazard to protect against the direct attack mechanisms of flame contact and radiant heat and reduce exposure to embers.</p> <p><b><i>In addition to providing separation from the direct bushfire attack mechanisms, the nature of the APZ design and management requirements is intended to minimise the potential impact of the indirect bushfire attack mechanisms of surface fire attack, debris production and accumulation, tree strike and consequential fire (refer to Appendix 2).</i></b></p> <p>This is achieved by ensuring the APZ contains low threat vegetation; and/or has potential fire fuels managed in a minimal fuel condition; and/or contains non-vegetated areas (e.g. footpaths, paved areas, driveways, parking, swimming pools etc) and/or limits the presence/location of constructed/stored combustible items.</p> <p>For different States and local government areas, APZ establishment and maintenance guides ideally need to be local environment specific. Some authorities establish general requirements while specific requirements may also be established through site specific management documents (e.g. bushfire management plan).</p> <p>The required dimensions of the APZ will correspond to the maximum level of radiant heat the exposed element is to be exposed to – or a greater distance if it is stipulated by a relevant authority.</p> <p>As a minimum avoid dimensions (separation distances) that correspond to BAL-FZ and BAL-40 ratings for any given site/vegetation combination of relevant parameters. This will also apply to BAL-29 separation distances if flame length modelling indicates potential contact due to specific site and effective slope configurations.</p> <p>The location of an APZ should be entirely within the boundaries of each lot so that landowners can have control and responsibility for its implementation and maintenance. Exceptions exist for instances where adjoining land is not vegetated or it can be justified that the fire fuels will be managed in a minimal fuel, low threat state on an ongoing basis, in perpetuity.</p> | Very High                         | Yes                             | No     | No      | Yes                    |
| <p><i>Assessment Comments:</i> The required separation distance is a function of the relevant levels of the bushfire threats (attack mechanisms) presented by the vegetation and the relevant vulnerabilities of the identified elements at risk (the generator, communication arial, tank farm and associated infrastructure).</p> <p>The relevant threats are the flame lengths and the potential for radiant heat transfer as determined from the design fire modelling for the grassland and woodland vegetation types that have been identified.</p> <p>The relevant vulnerability that has been adopted for the calculations is the identified critical heat exposure for the FOGO Facility (Generator, tank farm and associated infrastructure).</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                   | Built (Hard) Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                        |
| Recommendation Details: To minimise exposure from external radiant heat, a <10kWm2 @ 1090k APZ is required to be established. The dimensions for this APZ are provided within the associated BMP. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                        |
| It is recommended the APZ be increased to 10kWm2 to reduce the overall preheating on combustible materials.                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                        |
| 5.4                                                                                                                                                                                               | <p><b>Landscaping - Tree Location:</b> Use separation to minimise the potential for debris accumulation and tree strike damage to the building envelop potentially allowing flame, radiant heat and ember entry to internal spaces.</p> <ul style="list-style-type: none"><li>The buildings/structures are separated from trees (or trees from buildings) by a distance of at least 1.5 times the height of the tallest tree.</li><li>Trees that produce significant quantities of debris (fine fuels) during the bushfire season should be located a sufficient distance away from vulnerable exposed elements to ensure debris cannot drop and accumulate within at least 4m of buildings/structures or be likely to be relocated by wind to closer than 4m to buildings / structures.</li><li>If the minimum distances cannot be achieved with an existing tree either remove the tree or at least ensure tree branches are sufficiently separated from buildings and attached/adjacent structures (at a minimum to not overhang) to ensure branches cannot fall onto or be blown onto the buildings/structures.</li></ul>                                                                                                                                             | Medium                            | Yes                             | No     | No      |                        |
| Assessment Comments: there are not trees on the site. Planting any trees must comply with the landscape plan and BMP_ requirements.                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                        |
| Recommendation Details: Not Applicable                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                        |
| 5.5                                                                                                                                                                                               | <p><b>Separation from Stored Flammable Products - Gas in Cylinders:</b> To reduce the potential for gas flaring or explosion (consequential fire), installation of LPG cylinders is to apply as a minimum, the principles and requirements established in AS 1596 'The Storage and Handling of LP Gas'. Readily available guidance is provided by CSIRO Best Practice Bushfire Guide (<a href="https://research.csiro.au/bushfire/new-builds/water-electricity-gas/">https://research.csiro.au/bushfire/new-builds/water-electricity-gas/</a>) and WA Dept. Mines, Industry, Regulation and Safety 'LP Gas cylinder safety in bushfire prone areas' (<a href="https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas">https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas</a>).</p> <p>Otherwise, the required separation distance is 6m from any combustible materials.</p> <p>Heat from bushfire or consequential fire can be sufficient to cause cylinder pressure to reach critical levels and the pressure relief valve release large quantities of gas (flare). If the cylinder falls over the pressure relief valve may not function correctly, and the cylinder may rupture (explosion).</p> | Medium                            | N/A                             | N/A    | N/A     |                        |
| Assessment Comments: There are no LPG gas bottles on site. The workshop may have other gas bottles for workshop use.                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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|                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                              | Built (Hard) Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                          |
| 5.6                                                                                                                                                                                                                                                                                          | <b>Separation from Stored Flammable Products – Fuels / Other Hazardous Materials (Consequential Fire Fuels):</b> Establish sufficient separation distance between these consequential fire fuels and buildings/structures. The required separation distance will be dependent on the fuel and storage type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Hazards fuels and material will be stored in accord with manufacturers and Australian Standards requirements.                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                          |
| Recommendation Details: Where external heat sources have not been considered by the manufacture or Standard, then the separation distance (below item # 7.7) to be used. If cabling and other flammable items are exposed to direct radiant heat, than <10kWm2 will be the maximum exposure. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                          |
| 5.7                                                                                                                                                                                                                                                                                          | <b>Separation from Stored and Constructed Combustible Items (Consequential Fire Fuels):</b> These consequential fire fuels include: <ul style="list-style-type: none"><li>• Stored Combustible Items - Heavy Fuels e.g. building materials, packaging materials, rubbish bins etc;</li><li>• Stored Combustible Items – Large Heavy Fuels e.g. vehicles, caravans and large quantities of dead vegetation materials stored as part of site use;</li><li>• Constructed Combustible Items – Heavy Fuels e.g. landscaping structures including fences, screens, walls, plastic water tanks; and</li><li>• Constructed Combustible Items – Large Heavy Fuels e.g. adjacent buildings/structures including houses, sheds, garages, carports. (Note: If the adjacent structure is constructed to BAL-29 requirements or greater and can implement a significant number of additional bushfire protection measures associated with reducing exposure and vulnerability, these minimum separation distances could be reduced by 30%) [31].</li></ul> <p>Apply the rule of thumb [13] “assume flames produced from a consequential fire source will be twice as high as the object itself ... where the consequential fire source is a structure, then the maximum eave height is a reasonable measure of maximum height”.</p> <p>Apply the following separation distances from the subject building/structure as a multiple of the height of the consequential fire source and dependent on the construction standard applied to the building/structure [13 and 31]:</p> <ul style="list-style-type: none"><li>• At least six times the height when the building/structure construction incorporates design and materials that is only intended to resist low levels of radiant heat up to 12.5 kW/m<sup>2</sup>) and no flame contact;</li><li>• Between 4 and 6 six times the height when the building/structure construction incorporates design and materials intended to resist radiant heat up to 29 kW/m<sup>2</sup> and no flame contact.</li></ul> | High                              | Yes                             | No     | No      | Yes                      |



| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Built (Hard) Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"><li>Between 2 and 4 times the height when the building/structure construction incorporates design and materials intended to resist up to 40kW/m² and potential flame contact.</li><li>Less than 2 times the height when the building/structure construction incorporates design and materials intended to resist extreme levels of radiant heat and flame contact.</li><li>Zero separation distance is required if the building/structure is separated by a non-combustible FRL 60/60/60 rated wall, or the potential consequential fire source is fully enclosed by the building/structure.</li></ul>                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                        |
| <p><i>Assessment Comments:</i></p> <p>When storage of flammable items or materials are stored on site temporarily (for maintenance etc), separation distances must be complied with. All combustible are to be removed within 10m of structures onsite.</p> <p>All vegetation, flammable and combustible material is to be removed within 10 metres of the genertor. This includes but is not limited to; waste, leaf litter, machinery, grasses, vehicles, fuel, furniture, and timber.</p> <p><i>Recommendation Details:</i> It is recommended that this 10 metre buffer is sealed or compacted with concrete, compacted limestone, gravel, blue metal etc.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| <b>THE PROTECTION MECHANISM – ESTABLISH SHIELDING FROM RELEVANT BUSHFIRE HAZARD THREATS:</b> To shield buildings and attached/adjacent structures (or other consequential fire fuels) from the direct bushfire attack mechanisms of flame, radiant heat, surface fire and surface migration of embers. To also reduce exposure to the indirect attack mechanism of debris accumulation against buildings/structures and other consequential fire fuels and wind attack.                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| 5.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><b>Constructed Barrier – Shielding from Bushfire:</b> Walls, fences and/or landforms to shield the subject building/structure from direct and indirect bushfire attack mechanisms and reduce the potential impact of these.</p> <p>Must be constructed using appropriate fire resistant / non-combustible construction materials (e.g. masonry, steel, earthworks). These are to withstand the impact of direct bushfire attack mechanisms for the required period of time.</p> <p>Apply the bushfire construction standards for external walls subject to the assessed level of radiant heat or flame contact to which the barrier will be exposed (or otherwise to BAL-FZ requirements). These are established by AS 3959:2018 [4] and/or the NASH Standard [33] and additionally informed by the research report ‘Research and Investigation into the Performance of Residential Boundary Fencing Systems in Bushfires.’ [29]</p> | High                              | Yes                             | No     | No      | No                     |
| <p><i>Assessment Comments:</i> Not Required</p> <p><i>Recommendation Details:</i> Not Applicable</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup>  | Application Status <sup>2</sup> |        |         |                        |  |
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|                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    | Possible                        | Exists | Planned | Additionally Recommend |  |
| Element at Risk                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Built (Hard) Infrastructure Assets |                                 |        |         |                        |  |
| 5.9                                                                                                                                                                                                                                                                                                                                               | <b>Constructed Barrier - Shielding from Consequential Fire:</b> Applicable to all consequential fire fuel sources. Install a non-combustible barrier (including complete enclosure when appropriate), of required robustness, that can perform the following as relevant: <ul style="list-style-type: none"><li>Reduce the exposure of the subject building/structure to the threats of consequential fire; and/or</li><li>Reduce the exposure of the consequential fire fuels to the bushfire hazard.</li></ul>                                                                                                              | High                               | Yes                             | Partly | Partly  | Yes                    |  |
| Assessment Comments: Ensure all subfloor spaces are sealed to reduce ember and firebrand penetration.<br>Recommendation Details: All subfloors to be enclosed.<br>Shield fuel lines and electrical components extending form the infrastructure                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |                                 |        |         |                        |  |
| 5.10                                                                                                                                                                                                                                                                                                                                              | <b>Natural Landforms Barrier:</b> Use existing natural landforms to reduce buildings/structures exposure to radiant heat, and lower wind speeds (prevailing synoptic and/or fire driven).                                                                                                                                                                                                                                                                                                                                                                                                                                     | High                               | N/A                             | N/A    | N/A     | N/A                    |  |
| Assessment Comments: There are no natural landforms.<br>Recommendation Details: Not Applicable                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |                                 |        |         |                        |  |
| 5.11                                                                                                                                                                                                                                                                                                                                              | <b>Planted Vegetation Barrier:</b> Use appropriate hedges and trees strategically to reduce (to varying extents) buildings/structures exposure to radiant heat, to filter/trap embers and firebrands, and to lower wind speeds (prevailing synoptic and/or fire driven).                                                                                                                                                                                                                                                                                                                                                      | Medium                             | Yes                             | No     | No      | Yes                    |  |
| Assessment Comments: Planting can be applied to the site, however, must be in accordance with the Landscape Plan and Guidelines for Planning lin Bushfire Prone Areas - Schedule 1.<br>Recommendation Details: Vegetation planting to be in accordance with the Landscape Plan and Guidelines for Planning lin Bushfire Prone Areas - Schedule 1. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |                                 |        |         |                        |  |
| 5.12                                                                                                                                                                                                                                                                                                                                              | <b>Shield Operation Critical Non-Structural Elements:</b> These are vulnerable elements essential to the continued operation of the building/structure which are potentially exposed to the attack mechanisms of both bushfire and consequential fire. These elements include cabling and plumbing associated with power delivery, data transmission, fuel and water transport.<br><br>When the use of fire rated materials to the degree necessary is not possible or practical, the application of non-combustible shielding can be applied to reduce exposure to the threats. Shielding includes underground installation. | Medium                             | Yes                             | No     | Partly  | Yes                    |  |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                    | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                    |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Built (Hard) Infrastructure Assets |                                   |                                 |        |         |                        |
| <p><i>Assessment Comments:</i> Use non-combustible or products with high heat ratings to assist with maintaining their operability.</p> <p><i>Recommendation Details:</i> Shielding to include cabling and plumbing associated with power / data transmission, tank farm and associated piping and valves.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |                                   |                                 |        |         |                        |
| <p><sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.</p> <p><sup>2</sup> <b>Protection Measure Application Status:</b></p> <ul style="list-style-type: none"> <li>• <b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li> <li>• <b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li> <li>• <b>Currently Planned:</b> Protection measures that: <ul style="list-style-type: none"> <li>• Are incorporated into the site plans;</li> <li>• Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li> <li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li> </ul> <p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p> </li> <li>• <b>Additionally Recommend:</b> Protection measures that: <ul style="list-style-type: none"> <li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li> <li>• Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li> </ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> </li> </ul> |                                    |                                   |                                 |        |         |                        |

### 5.3.4.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing exposure levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the exposure of the relevant element at risk to bushfire hazard threats.

| The Protection Mechanism                                              | Effectiveness Rating <sup>1</sup> | Total Available | Application Status <sup>2</sup> |              |               |                   |                          |
|-----------------------------------------------------------------------|-----------------------------------|-----------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
|                                                                       |                                   |                 | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Establish Sufficient Separation from Relevant Bushfire Hazard Threats | Very High                         | 2               | 2                               |              |               | 1                 | 2                        |
|                                                                       | High                              | 2               | 2                               |              |               |                   | 2                        |
|                                                                       | Medium                            | 2               | 1                               |              |               |                   |                          |
|                                                                       | Not Relevant                      | 2               |                                 |              |               |                   |                          |
| Establish Shielding from Relevant Bushfire Hazard Threats             | Very High                         |                 |                                 |              |               |                   |                          |
|                                                                       | High                              | 2               | 2                               |              |               | 1                 | 1                        |
|                                                                       | Medium                            | 2               | 2                               |              |               | 1                 | 1                        |
|                                                                       | Not Relevant                      |                 |                                 |              |               |                   |                          |
| <b>Number Analysis</b>                                                | <b>Very High</b>                  | <b>2</b>        | <b>2</b>                        |              |               | <b>1</b>          | <b>2</b>                 |
|                                                                       | <b>High</b>                       | <b>4</b>        | <b>4</b>                        |              |               | <b>1</b>          | <b>3</b>                 |
|                                                                       | <b>Medium</b>                     | <b>4</b>        | <b>3</b>                        |              |               | <b>1</b>          | <b>1</b>                 |
|                                                                       | <b>Not Relevant</b>               | <b>2</b>        |                                 |              |               |                   |                          |
|                                                                       | <b>Totals</b>                     | <b>12</b>       | <b>9</b>                        |              |               | <b>3</b>          | <b>6</b>                 |

<sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.

<sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section.

### 5.3.4.3 PROTECTION MEASURES - EXPOSURE REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce indicative exposure levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the exposure of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE EXPOSURE TO BUSHFIRE HAZARD THREATS <sup>1</sup>                  |              |                             |                                 |                                         |              |                           |                            |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                               |              | Built Infrastructure Assets |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> EXPOSURE LEVEL <sup>3</sup>                 |              |                             |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                             |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris     | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Moderate     | Moderate                    | Minimal                         | Moderate                                | Minimal      | None                      | Moderate                   |
| Moderate                                                                                                                      |              |                             |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> EXPOSURE LEVEL <sup>4</sup>                  |              |                             |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                             |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris     | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Minimal      | Minimal                     | Minimal                         | Significant                             | Significant  | None                      | Minimal                    |
| Significant                                                                                                                   |              |                             |                                 | Significant                             |              |                           |                            |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.                                                  |              |                             |                                 |                                         |              |                           |                            |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |              |                             |                                 |                                         |              |                           |                            |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |              |                             |                                 |                                         |              |                           |                            |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |              |                             |                                 |                                         |              |                           |                            |

**Assessment Comments:** There will be minimal embers and debris and accumulation with the increase in exposure distances and shielding.



### 5.3.4.4 ASSESSED EXPOSURE LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual exposure levels. These exposure levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and vulnerability levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE EXPOSURE LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup> |                                  |                                              |                                         |                                              |                               |                                  |          |
|-----------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|-------------------------------|----------------------------------|----------|
| ELEMENT AT RISK                                                                                     |                                  | Built Infrastructure Assets                  |                                         |                                              |                               |                                  |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | INHERENT EXPOSURE LEVEL <sup>3</sup>         |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | RESIDUAL EXPOSURE LEVEL <sup>4</sup>         |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Low      |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |

<sup>1</sup> Refer to Appendix 1 for explanatory information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

<sup>5</sup> The level of exposure to flames and radiant heat is derived from the assessed indicative BAL ratings (refer to the BAL contour map). The exposure levels applied are BAL-LOW/Very Low Exposure, BAL-12.5/Low Exposure, BAL-19/Moderate Exposure, BAL-29/High Exposure, BAL-40 and BAL-FZ/Extreme Exposure.

**Assessment Comments:** Cabling, fuel lines and piping and other flammable materials/structures, where possible to be shielded and raised from the ground by approximately 100mm.

### 5.3.5 MATERIALS STORED OUTDOORS

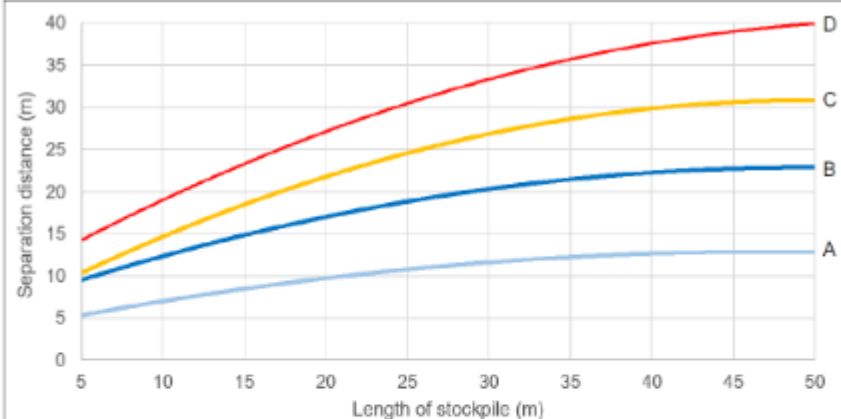
#### 5.3.5.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Materials Stored Outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – ESTABLISH SUFFICIENT SEPARATION FROM RELEVANT BUSHFIRE HAZARD THREATS: To reduce exposure to the relevant direct and indirect attack mechanisms of bushfire by locating buildings and attached/adjacent structures at sufficient distances away from the bushfire hazard and consequential fire fuels. The required distances will be dependent on the indicative threat levels and the degree of bushfire resilience that exists or is planned to be incorporated into the exposed elements through design and construction. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| 6.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><b>Designed Location of Non-Vegetated Areas and/or Managed Open Space:</b> Non-vegetated land uses include footpaths, paved areas, roads, parking, open drainage channels, and major services delivery (power, water, gas) installed in common corridors.</p> <p>Managed open space is land for public or private use on which the vegetation is either low threat due to type or situation or is continually managed in a minimal fuel condition. This can include public open space providing recreation facilities.</p> <p>Use these design elements to create or increase separation from any bushfire prone vegetation by positioning them adjacent to the bushfire hazard.</p>     | Very High                         | Yes                             | No     | No      | Yes                      |
| Assessment Comments: The materials stored outdoors should have reduced exposure to ember and firebrand attack, and minimal level of radiant heat exposure. This can be reduced by increasing the separation distances to ensure heat flux exposure does not exceed 10kWm2 on recycled materials.                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| Recommendation Details: Construct and maintain the APZ to ensure maximum heat flux exposure does not exceed 10kWm2                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| 6.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><b>Landscaping - Asset Protection Zone (APZ):</b> Ensure an APZ is established surrounding the relevant element(s) at risk to create the required separation distance from the bushfire hazard to protect against the direct attack mechanisms of flame contact and radiant heat and reduce exposure to embers.</p> <p><b>In addition to providing separation from the direct bushfire attack mechanisms, the nature of the APZ design and management requirements is intended to minimise the potential impact of the indirect bushfire attack mechanisms of surface fire attack, debris production and accumulation, tree strike and consequential fire (refer to Appendix 2).</b></p> | Very High                         | Yes                             | Yes    | Partly  | Yes                      |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Materials Stored Outdoors |                                   |                                 |        |         |                        |
| <p>This is achieved by ensuring the APZ contains low threat vegetation; and/or has potential fire fuels managed in a minimal fuel condition; and/or contains non-vegetated areas (e.g. footpaths, paved areas, driveways, parking, swimming pools etc) and/or limits the presence/location of constructed/stored combustible items.</p> <p>For different States and local government areas, APZ establishment and maintenance guides ideally need to be local environment specific. Some authorities establish general requirements while specific requirements may also be established through site specific management documents (e.g. bushfire management plan).</p> <p>The required dimensions of the APZ will correspond to the maximum level of radiant heat the exposed element is to be exposed to – or a greater distance if it is stipulated by a relevant authority.</p> <p>As a minimum avoid dimensions (separation distances) that correspond to BAL-FZ and BAL-40 ratings for any given site/vegetation combination of relevant parameters. This will also apply to BAL-29 separation distances if flame length modelling indicates potential contact due to specific site and effective slope configurations.</p> <p>The location of an APZ should be entirely within the boundaries of each lot so that landowners can have control and responsibility for its implementation and maintenance. Exceptions exist for instances where adjoining land is not vegetated or it can be justified that the fire fuels will be managed in a minimal fuel, low threat state on an ongoing basis, in perpetuity.</p> |                           |                                   |                                 |        |         |                        |
| <p><i>Assessment Comments:</i> The required separation distance is a function of the relevant levels of the bushfire threats (attack mechanisms) presented by the vegetation and the relevant vulnerabilities of the identified elements at risk (the stored organic materials).</p> <p>The relevant threats are the flame lengths and the potential for radiant heat transfer as determined from the design fire modelling for the grassland and Scrub/woodland vegetation types that have been identified.</p> <p>DFES Guidance Note: GN04 must be complied with.</p> <p>The relevant vulnerability that has been adopted for the calculations is the identified critical heat exposure for the FOGO facility (structures and stored outdoor materials).</p> <p><i>Recommendation Details:</i></p> <ul style="list-style-type: none"> <li>To minimise exposure from external radiant heat, a &lt;10kWm<sup>2</sup> APZ is required to be established. The dimensions for this APZ are provided within the associated BMP.</li> <li>Develop an emergency Management Plan</li> <li>Install an appropriate fire hydrant system (and water runoff/catchment)</li> <li>Install appropriate fire sprinkler suppression systems (and water runoff/catchment)</li> </ul> <p>Storage management of organic material</p>                                                                                                                                                                                                                                                                                                            |                           |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Materials Stored Outdoors |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"> <li>Maximum height of any stockpile loosed piled or baled <math>\leq 4.8\text{m}</math>.</li> <li>Maximum width of a stockpile is to be 20m</li> <li>Maximum length of a stockpile to be <math>\leq 50\text{m}</math></li> <li>Arrangement of stockpiles is to minimise the likelihood of fire spread and provide access for fire appliances.</li> </ul> <p>DFES Information Note September 2014 – Spontaneous combustion of green waste windrows and stockpiles due to elevated internal temperatures.</p> <ul style="list-style-type: none"> <li>Moisture content of the composting windrows will be maintained above 45% as part of the composting process, and by virtue will reduce the risk of spontaneous combustion. This will be maintained by watering once a day or as required.</li> <li>Moisture content of the green waste received on site will not exceed 20% to prevent the generation of heat occurring through biological activity occurring and in turn resulting in spontaneous combustion.</li> </ul> |                           |                                   |                                 |        |         |                        |

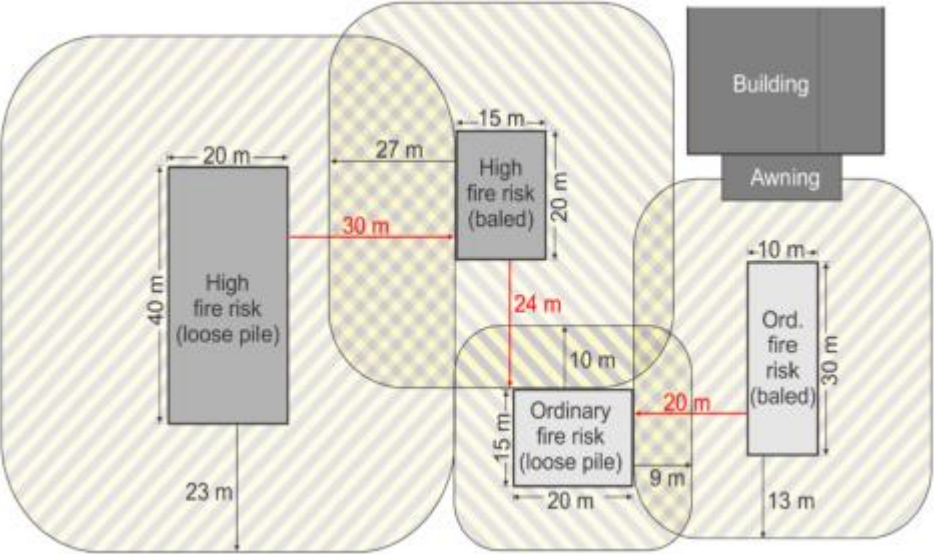


| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |           |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |                                   | Possible                        | Exists    | Planned | Additionally Recommend |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Materials Stored Outdoors          |                                   |                                 |           |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| Minimum separation distances between external stockpiles (DFES GN04) (NSW Fire Safety Guidelines Fire Safety in Waste Facilities)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                   |                                 |           |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| <div><div></div><table><tr><th rowspan="2">Length of stockpile (m)</th><th colspan="2">Ordinary fire risk (i.e. ≤ 1000°C)</th><th colspan="2">High fire risk (i.e. &gt;1000°C)</th></tr><tr><th>Loose pile (A)</th><th>Baled (B)</th><th>Loose pile (C)</th><th>Baled (D)</th></tr><tr><td>5</td><td>5 m</td><td>9 m</td><td>10 m</td><td>14 m</td></tr><tr><td>10</td><td>7 m</td><td>13 m</td><td>15 m</td><td>19 m</td></tr><tr><td>15</td><td>9 m</td><td>15 m</td><td>18 m</td><td>24 m</td></tr><tr><td>20</td><td>10 m</td><td>17 m</td><td>23 m</td><td>27 m</td></tr><tr><td>30</td><td>11 m</td><td>20 m</td><td>26 m</td><td>34 m</td></tr><tr><td>50</td><td>13 m</td><td>23 m</td><td>31 m</td><td>40 m</td></tr></table></div> |                                    |                                   |                                 |           |         |                        | Length of stockpile (m) | Ordinary fire risk (i.e. ≤ 1000°C) |  | High fire risk (i.e. >1000°C) |  | Loose pile (A) | Baled (B) | Loose pile (C) | Baled (D) | 5 | 5 m | 9 m | 10 m | 14 m | 10 | 7 m | 13 m | 15 m | 19 m | 15 | 9 m | 15 m | 18 m | 24 m | 20 | 10 m | 17 m | 23 m | 27 m | 30 | 11 m | 20 m | 26 m | 34 m | 50 | 13 m | 23 m | 31 m | 40 m |
| Length of stockpile (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Ordinary fire risk (i.e. ≤ 1000°C) |                                   | High fire risk (i.e. >1000°C)   |           |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Loose pile (A)                     | Baled (B)                         | Loose pile (C)                  | Baled (D) |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5 m                                | 9 m                               | 10 m                            | 14 m      |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 7 m                                | 13 m                              | 15 m                            | 19 m      |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 9 m                                | 15 m                              | 18 m                            | 24 m      |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10 m                               | 17 m                              | 23 m                            | 27 m      |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11 m                               | 20 m                              | 26 m                            | 34 m      |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |
| 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 13 m                               | 23 m                              | 31 m                            | 40 m      |         |                        |                         |                                    |  |                               |  |                |           |                |           |   |     |     |      |      |    |     |      |      |      |    |     |      |      |      |    |      |      |      |      |    |      |      |      |      |    |      |      |      |      |

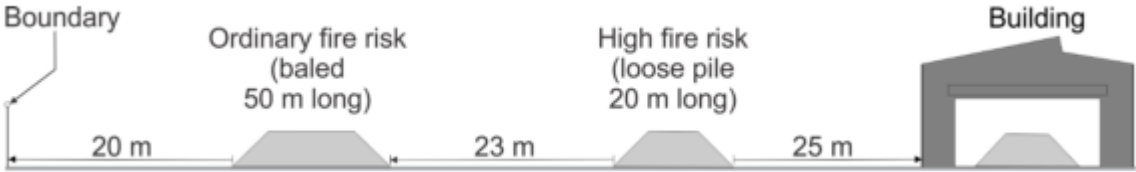
| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS |  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                         |  |                                   | Possible                        | Exists | Planned | Additionally Recommend |

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|-----------------|---------------------------|
| Element at Risk | Materials Stored Outdoors |
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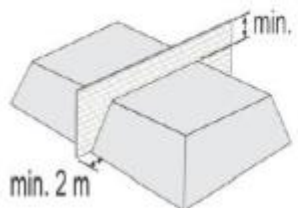
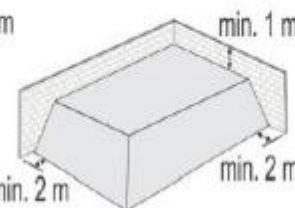
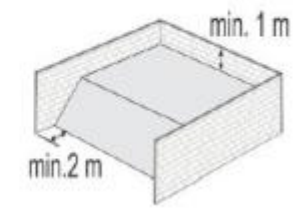
Examples minimum separation between external stockpiles (DFES GN04, NSW Gov)

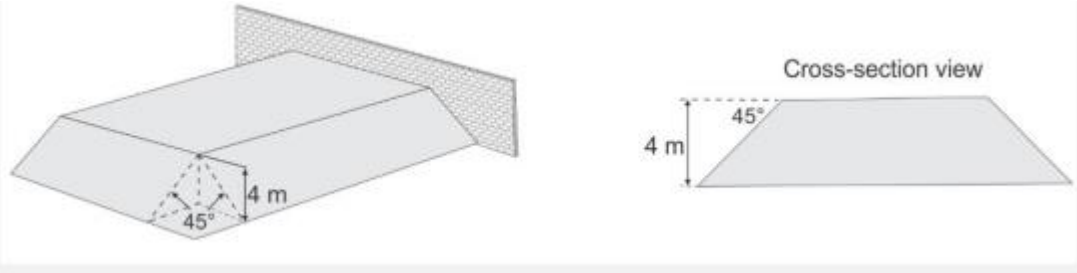


Examples of separation between stockpiles and fire-source features (DFES GN04)



| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |         |         |                        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   | Possible                        | Exists  | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Materials Stored Outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                 |         |         |                        |
| 6.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Separation from Stored Flammable Products – Fuels / Other Hazardous Materials (Consequential Fire Fuels):</b> Establish sufficient separation distance between these consequential fire fuels and the stored materials. The required separation distance will be dependent on the fuel and storage type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | High                              | Yes                             | No      | No      | Yes                    |
| <i>Assessment Comments:</i> Other flammable products/materials are to be stored appropriately, to available guidance documents and standards.                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |         |         |                        |
| <i>Recommendation Details:</i> Include in the facilities emergency plan and operational documents where to store the items, state the separation distances and provide direction on maintaining buildup of fine and heavy fuels.                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |         |         |                        |
| Provide staff training.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |         |         |                        |
| 6.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Separation from Stored and Constructed Combustible Items (Consequential Fire Fuels):</b> Apply a separation distance of at least six times the height of the stored and constructed combustible items. These consequential fire fuels include: <ul style="list-style-type: none"><li>• Stored Combustible Items - Heavy Fuels e.g. building materials, packaging materials, rubbish bins etc;</li><li>• Stored Combustible Items – Large Heavy Fuels e.g. vehicles, caravans etc;</li><li>• Constructed Combustible Items – Heavy Fuels e.g. landscaping structures including fences, screens, walls, plastic water tanks; and</li><li>• Constructed Combustible Items – Large Heavy Fuels e.g. adjacent buildings/structures such as sheds and offices.</li></ul> <i>Apply the rule of thumb [13] “assume flames produced from a consequential fire source will be twice as high as the object itself ... where the consequential fire source is a structure, then the maximum eave height is a reasonable measure of maximum height”.</i> | High                              | Yes                             | No      | Partly  | Yes                    |
| <i>Assessment Comments:</i> Detail guidance, compliance and maintenance requirements for heavy fuels                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |         |         |                        |
| <i>Recommendation Details:</i> Detail in the facilities guidance document and information in the Emergency Management Plan guidance on storage of heavy fuels and separation distances.                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |         |         |                        |
| <b>THE PROTECTION MECHANISM – ESTABLISH SHIELDING FROM RELEVANT BUSHFIRE HAZARD THREATS:</b> To shield buildings and attached/adjacent structures (or other consequential fire fuels) from the direct bushfire attack mechanisms of flame, radiant heat, surface fire and surface migration of embers. To also reduce exposure to the indirect attack mechanism of debris accumulation against buildings/structures and other consequential fire fuels and wind attack. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |         |         |                        |
| 6.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Constructed Barrier – Shielding from Bushfire:</b> Walls, fences and/or landforms to shield the stored materials from direct and indirect bushfire attack mechanisms and reduce the potential impact of these threats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | High                              | Yes                             | Unknown | Partly  | Yes                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |         |         |                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|---------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   | Possible                        | Exists  | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                             | Materials Stored Outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |         |         |                        |
|                                                                                                                                                                                                                                                                                                                                                                             | Must be constructed using appropriate fire resistant / non-combustible construction materials (e.g. masonry, steel, earthworks). These are to withstand the impact of direct bushfire attack mechanisms for the required period of time.<br><br>Apply the bushfire construction standards for external walls subject to the assessed level of radiant heat or flame contact to which the barrier will be exposed (or otherwise to BAL-FZ requirements). These are established by AS 3959:2018 [4] and/or the NASH Standard [33] and additionally informed by the research report 'Research and Investigation into the Performance of Residential Boundary Fencing Systems in Bushfires.' [29] |                                   |                                 |         |         |                        |
| Assessment Comments: non-combustible walls, fencing and retaining walls are effective in reducing radiant heat exposure onto flammable organic material. The use of combustible materials for walls, fencing and retaining walls are heavy fuels and will carry fire, thus increasing the risk of ignition in the organic material.                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |         |         |                        |
| Recommendation Details: Fencing, external walls and retaining walls to be constructed using non-combustible materials.                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |         |         |                        |
| 6.6                                                                                                                                                                                                                                                                                                                                                                         | <b>Constructed Barrier - Shielding from Consequential Fire:</b> Applicable to all consequential fire fuel sources. Install a non-combustible barrier (including complete enclosure when appropriate), of required robustness, that can perform the following as relevant: <ul style="list-style-type: none"><li>Reduce the exposure of the stored materials to the threats of consequential fire; and/or</li><li>Reduce the exposure of the consequential fire fuels to the bushfire hazard.</li></ul>                                                                                                                                                                                        | High                              | Yes                             | Unknown | Partly  | Yes                    |
| Assessment Comments: Separating masonry or non-combustible walls will reduce the risk of fire spreading in other stockpiles of organic materials.                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |         |         |                        |
| Recommendation Details: When Separating Masonry walls are used, the walls are to be marked showing the maximum height and width to identify the stockpile limits.                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |         |         |                        |
| Examples separating walls (DFES GN04, NSW Gov)                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |         |         |                        |
| <div><div><p>Separating wall</p></div><div><p>Two-sided revetment</p></div><div><p>Three-sided pen</p></div></div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |         |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                      | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                      |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Materials Stored Outdoors                                                                                                                                                                                                                                            |                                   |                                 |        |         |                        |
| <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| 6.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Natural Landforms Barrier:</b> Use existing natural landforms to reduce stored materials exposure to radiant heat, and lower wind speeds (prevailing synoptic and/or fire driven).                                                                                |                                   | High                            | N/A    | N/A     | N/A                    |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| 6.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Planted Vegetation Barrier:</b> Use appropriate hedges and trees strategically to reduce (to varying extents) stored materials exposure to radiant heat, to filter/trap embers and firebrands, and to lower wind speeds (prevailing synoptic and/or fire driven). |                                   | Medium                          | Yes    | No      | Yes                    |
| Assessment Comments: Plantings to be managed if located in the APZ to ensure the vegetation does not contribute to increased fire intensity or consequential fire. Managed vegetation within the APZ will offer a degree of shielding.                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| Recommendation Details: Plantings to be managed to low threat if located in the APZ                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| <sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| <sup>2</sup> <b>Protection Measure Application Status:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"><li><b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li><li><b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li><b>Currently Planned:</b> Protection measures that:</li></ul> |                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                        |



| PROTECTION MEASURES AVAILABLE TO REDUCE EXPOSURE LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Materials Stored Outdoors |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"><li>Are incorporated into the site plans;</li><li>Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li><li>Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul> <p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p> <ul style="list-style-type: none"><li><b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> |                           |                                   |                                 |        |         |                        |

### 5.3.5.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing exposure levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the exposure of the relevant element at risk to bushfire hazard threats.

| EXPOSURE REDUCING PROTECTION MEASURE ANALYSIS                         |                                   |                                |                                 |              |               |                   |                          |
|-----------------------------------------------------------------------|-----------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                       | Materials Stored Outdoors         |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                              | Effectiveness Rating <sup>1</sup> | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                       |                                   | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                       |                                   |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Establish Sufficient Separation from Relevant Bushfire Hazard Threats | Very High                         | 2                              | 2                               | 1            | 1             | 1                 | 2                        |
|                                                                       | High                              | 2                              | 2                               |              |               | 1                 | 2                        |
|                                                                       | Medium                            |                                |                                 |              |               |                   |                          |
|                                                                       | Not Relevant                      |                                |                                 |              |               |                   |                          |
| Establish Shielding from Relevant Bushfire Hazard Threats             | Very High                         |                                |                                 |              |               |                   |                          |
|                                                                       | High                              | 3                              | 3                               | 3            | 2             | 3                 | 3                        |
|                                                                       | Medium                            | 1                              | 1                               |              |               |                   | 1                        |
|                                                                       | Not Relevant                      |                                |                                 |              |               |                   |                          |
| Number Analysis                                                       | Very High                         | 2                              | 2                               | 1            | 1             | 1                 | 2                        |
|                                                                       | High                              | 5                              | 5                               | 3            | 2             | 4                 | 5                        |
|                                                                       | Medium                            | 1                              | 1                               |              |               |                   | 1                        |
|                                                                       | Not Relevant                      |                                |                                 |              |               |                   |                          |
|                                                                       | Totals                            | 8                              | 8                               | 4            | 3             | 5                 | 8                        |

<sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.

<sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section.

### 5.3.5.3 PROTECTION MEASURES - EXPOSURE REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce indicative exposure levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the exposure of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE EXPOSURE TO BUSHFIRE HAZARD THREATS <sup>1</sup>                  |              |                           |                                 |                                         |              |                           |                            |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                               |              | Materials Stored Outdoors |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> EXPOSURE LEVEL <sup>3</sup>                 |              |                           |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                           |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris   | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Moderate     | Moderate                  | Minimal                         | Minimal                                 | Minimal      | None                      | Moderate                   |
| Moderate                                                                                                                      |              |                           |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> EXPOSURE LEVEL <sup>4</sup>                  |              |                           |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                           |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris   | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Minimal      | Moderate                  | Minimal                         | Minimal                                 | Minimal      | None                      | Minimal                    |
| Minimal                                                                                                                       |              |                           |                                 | Minimal                                 |              |                           |                            |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.                                                  |              |                           |                                 |                                         |              |                           |                            |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |              |                           |                                 |                                         |              |                           |                            |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |              |                           |                                 |                                         |              |                           |                            |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |              |                           |                                 |                                         |              |                           |                            |

**Assessment Comments:** Materials stored outdoors are exposed to ember attack and increasing the APZ to ensure a maximum 10kWm<sup>2</sup> heat flux exposure will reduce the likelihood of the detached flame from a bushfire event impacting the stored organic material, and reduce the preheating of material from the fire front.

### 5.3.5.4 ASSESSED EXPOSURE LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual exposure levels. These exposure levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and vulnerability levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE EXPOSURE LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup> |                                  |                                              |                                         |                                              |                               |                                  |          |
|-----------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|-------------------------------|----------------------------------|----------|
| ELEMENT AT RISK                                                                                     |                                  | Materials Stored Outdoors                    |                                         |                                              |                               |                                  |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | INHERENT EXPOSURE LEVEL <sup>3</sup>         |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                             |                                  | RESIDUAL EXPOSURE LEVEL <sup>4</sup>         |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                              | Flame Contact <sup>5</sup>       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Low      |
|                                                                                                     | Radiant Heat <sup>5</sup>        | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                            | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                     | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |

<sup>1</sup> Refer to Appendix 1 for explanatory information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

<sup>5</sup> The level of exposure to flames and radiant heat is derived from the assessed indicative BAL ratings (refer to the BAL contour map). The exposure levels applied are BAL-LOW/Very Low Exposure, BAL-12.5/Low Exposure, BAL-19/Moderate Exposure, BAL-29/High Exposure, BAL-40 and BAL-FZ/Extreme Exposure.

**Assessment Comments:** Nil

## 5.4 VULNERABILITY LEVEL ASSESSMENT – BUSHFIRE PROTECTION MEASURE ANALYSIS

For each stated element at risk an assessment is conducted that considers the effectiveness and application status of all available vulnerability reducing bushfire protection measures that are listed under their applicable bushfire protection mechanism. This information is subsequently applied to deriving vulnerability levels.

### 5.4.1 PERSONS ONSITE AND TEMPORARILY OFFSITE

#### 5.4.1.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk:                                                                                                                                                                                            | Persons Located Onsite and Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – TRANSPORT AND MULTIPLE EVACUATION DESTINATIONS AND ROUTES AVAILABLE                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| 7.1                                                                                                                                                                                                         | <b>Sufficient Evacuation Transport Available:</b> Ensure that all persons likely to be on site have access to transport. This can be through own vehicles, facility vehicles, a formal arrangement with an external provider or a combination of these.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Very High                         | Yes                             | Yes    | Yes     | No                       |
| Assessment Comments: People on site will have their own transport.                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| Recommendation Details: Nil                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| 7.2                                                                                                                                                                                                         | <b>Multiple Safer Offsite Locations Available:</b> Increasing the route and destination options decreases vulnerability of persons as the exposed element.<br><br>Multiple buildings/areas are accessible from the subject site as evacuation destinations. The offsite locations exist at a sufficient distance from the subject site ensuring that the destination and the subject site are very unlikely to be simultaneously impacted by a bushfire event.<br><br>For the most robust scenario: <ul style="list-style-type: none"><li>Multiple access/egress route are available to the safer locations from the subject site;</li><li>The entirety of at least two routes is unlikely to be simultaneously impacted by a bushfire event; and</li><li>The availability of water and amenities corresponding to person numbers increases the effectiveness of the measure.</li></ul> | Very High                         | Yes                             | No     | Yes     | No                       |
| Assessment Comments: Early evacuation will be the primary bushfire response procedure. Staff or contractors will be directed to either go to their home address or go to their primary place of employment. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |



| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk:                                                                                                                      | Persons Located Onsite and Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |
| Recommendation Details: A BEP has been developed for the facility                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – PROVISION OF BUSHFIRE EMERGENCY INFORMATION AND EDUCATION                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
| 7.3                                                                                                                                   | <p><b>Develop a Bushfire Emergency Plan:</b> This will provide operational guidance for the implementation of prevention, preparation, response and recovery procedures and their associated actions.</p> <p>The format and content of the plan documents will be aligned with the specific needs of the site and its use.</p> <p>Development of the Plan considers site specific information that includes:</p> <ul style="list-style-type: none"><li>• The site's use and the numbers and types of persons who will be on the site at any time;</li><li>• The physical characteristics of the site and its structures; and</li><li>• The surrounding topography and bushfire prone vegetation; and</li><li>• The surrounding human settlement and road networks.</li></ul> <p>It is produced for use by the site owners, managers, operators and occupants (as relevant).</p> | High                              | Yes                             | Yes    | Yes     | No                       |
| Assessment Comments: Nil                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
| Recommendation Details: A BEP has been developed and provided.                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
| 7.4                                                                                                                                   | <p><b>Operational Documents are to Contain the Bushfire Protection Measures to be Implemented:</b> The documents include the 'planning' or 'operational' Bushfire Management Plan (BMP), the Bushfire Emergency Plan (BEP), the Site Emergency Plan and any relevant documents associated with a projects design phase.</p> <p>The purpose of this measure is to ensure the application of applicable protection measures identified in this Report, will be acted upon through responsibilities created within the operational documents.</p>                                                                                                                                                                                                                                                                                                                                  | High                              | Yes                             | Partly | Partly  | Yes                      |
| Assessment Comments: The existing BEP and operational document has some information, however requires additional detail and updating. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
| Recommendation Details: Update the Fire Response Plan and develop Guidance documents.                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
| 7.5                                                                                                                                   | <p><b>Prominent Display of Bushfire Emergency Information:</b> The relevant format and content of the site specific bushfire emergency response information, taken from the planning developed for a bushfire emergency, is made readily available to all persons on site.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Medium                            | Yes                             | Yes    | Yes     | Yes                      |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk:                                                                                                                           | Persons Located Onsite and Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |
| Assessment Comments: A display BEP map and information has been provided.                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| Recommendation Details: Bushfire information to be displayed at the weigh bridge office and the administration office.                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| 7.6                                                                                                                                        | <b>Direct to Persons Emergency Messaging System:</b> Have a process and system (e.g. SMS) for site managers to provide persons onsite and temporarily offsite with emergency information as necessary. Consideration will need to be given to availability and reliability of the infrastructure that is to facilitate this system.                                                                                                                                                                                                                                                                                                                                                                         | Medium                            | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Nil                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| Recommendation Details: Emergency messaging system to be developed.                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| 7.7                                                                                                                                        | <b>Egress Pathway Signage:</b> Where pathways exist onsite for occupants to relocate to an identified safer onsite location, appropriate signage to guide unfamiliar persons can reduce their vulnerability.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Medium                            | Yes                             | No     | Partly  | No                     |
| Assessment Comments: Signage will be provided to guide delivery of materials, this will also be relevant for emergencies (exit signs etc). |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| Recommendation Details: Identified safer onsite location.                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| 7.8                                                                                                                                        | <b>Personnel are Trained to Implement the Bushfire Emergency Plan:</b> Operational persons (staff) are provided with appropriate training, aligned with the subject site's prepared Bushfire Emergency Plan (BEP). The process will also identify specific roles and persons to fill those roles.                                                                                                                                                                                                                                                                                                                                                                                                           | High                              | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Not Required                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| Recommendation Details: Staff to be trained in emergency response and bushfire awareness.                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| 7.9                                                                                                                                        | <b>Build Community Resilience Through Education:</b> When relevant to the type and scale of proposed development/use, the delivery of effective community education programs, to ensure information is acted upon and packages of protection measures are put in place, will result in lowering the vulnerability of the community to a bushfire event, once the. Local government develops an ongoing program of innovative and leading edge community and landowner education that builds on the information presented within this Report. Implementation of recommended/required protection measures can be encouraged through legislation, education, audits, enforcement and penalties as appropriate. | High                              | N/A                             | N/A    | N/A     | N/A                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk:                                                                                              | Persons Located Onsite and Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
|                                                                                                               | Examples of such community education programs exist in various jurisdictions. The CSIRO (2020) Climate and Disaster Resilience Overview Report in 'Recommendation No. 5' [18] encourages collaboration with research agencies on the issue of building community resilience.                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                          |
| Assessment Comments: Not Required                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| 7.10                                                                                                          | <b>Encourage 'Property Bushfire Resilience Assessments'</b> : Local government to promote (and potentially incentivise) the conducting of these assessments and the implementation of any recommendations. These assessments address bushfire hazard threat levels and the level of exposure and vulnerability of specific buildings and persons. It identifies appropriate protection measures that can be implemented to increase bushfire resilience.                                                                                                                                                                                      | High                              | Yes                             | N/A    | N/A     |                          |
| Assessment Comments: This DA will include documents (BMP< BEP & BRR) to reduce the risk to a tolerable level. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| 7.11                                                                                                          | <b>Locations of Vulnerable Persons are Registered</b> : Relevant department of local government and their emergency services maintains a register of the location of land uses that are likely to result in a number of 'vulnerable' persons (see Glossary) residing onsite, so that their needs can be addressed as a priority in a bushfire emergency. The subject development/use would exist on that register.                                                                                                                                                                                                                            | Medium                            | N/A                             | N/A    | N/A     |                          |
| Assessment Comments: Not Required                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – ONSITE PERSONS CAPABLE OF MANAGING A BUSHFIRE EMERGENCY ARE AVAILABLE              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| 7.12                                                                                                          | <b>Onsite Persons Available to Manage Bushfire Emergency Procedures</b> : Different categories of persons can perform this role in different scenarios, with potentially varying levels of expertise and effectiveness. These include: <ul style="list-style-type: none"><li>Appropriately trained person(s) will be onsite at all times, or able to be onsite at short notice. They are trained in bushfire emergency procedures in general and have specific knowledge of the site's Bushfire Emergency Plan, and the environment in which the development/use exists. This person(s) may have the official title of fire warden.</li></ul> | High                              | Yes                             | No     | Yes     |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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|                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk:                                                                                                                                                                                        | Persons Located Onsite and Temporarily Offsite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
|                                                                                                                                                                                                         | <ul style="list-style-type: none"><li>An untrained person familiar with the local area will be onsite at all times. They have knowledge and instruction gained from the site's Bushfire Emergency Plan and can implement the required procedures. They can guide and assist persons onsite.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                          |
| Assessment Comments: Onsite personnel will trained in emergency response and persons allocated the role of fire wardens.                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                          |
| Recommendation Details: Ensure enough appropriately trained staff are onsite at all times during the bushfire season to assist with emergency procedures. Emergency procedures to be reviewed annually. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                          |
| 7.13                                                                                                                                                                                                    | <b>Onsite Persons Can Operate Firefighting Equipment:</b> Such person(s) is suitably capable of maintaining and operating any installed firefighting water supply and associated pumps, hoses/nozzles and sprinklers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Medium                            | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Fire hose reels and fire extinguishers will be available onsite.                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                          |
| Recommendation Details: Provide a mobile response unit. Recommend 2 x slip-on units and basic bushfire awareness and response.                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                          |
| 7.14                                                                                                                                                                                                    | <p><b>External Emergency Response Services Available:</b> An emergency service with a bushfire response capability is located within a realistic operational distance of the subject development/use. This includes services provided by government (e.g., career fire and rescue services or other agencies) and volunteer services.</p> <p>Note: The services of these limited resources should not be relied upon, as their availability for a given event can be compromised by other obligations at the crucial time.</p> <p><i>Bushfire Verification Method – Handbook s6.6 [14] states “During significant bushfires, there will be conflicting demands on fire brigade resources and reliance should not be placed on fire brigade intervention to protect a specific property. Prior to the 2009 Black Saturday fires, an early evacuation or stay and defend policy was in place and data from major fires indicated that the presence of occupants significantly increased the probability of house survival (refer Table 7.1). However, in response to the subsequent Royal Commission findings there is now a greater emphasis on early evacuation. Whilst this is expected to reduce fatalities by reducing the numbers of people at risk, a negative consequence will be an increase in property losses for buildings constructed to similar standards. It should therefore be assumed that there will be no fire brigade or occupant intervention with respect to protecting a specific property.”</i></p> | Medium                            | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Karnup Volunteer Fire & Emergency Services is located 20 minutes from the subject site and staff will be trained bushfire awareness and emergency evacuation.                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                          |
| Recommendation Details: Safe early evacuation is the preferred response.                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Persons Located Onsite and Temporarily Offsite |                                   |                                 |        |         |                        |
| <p><sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.</p> <p><sup>2</sup> <b>Protection Measure Application Status:</b></p> <ul style="list-style-type: none"><li>• <b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li><li>• <b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li>• <b>Currently Planned:</b> Protection measures that:<ul style="list-style-type: none"><li>• Are incorporated into the site plans;</li><li>• Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> <p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p> <ul style="list-style-type: none"><li>• <b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>• Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> |                                                |                                   |                                 |        |         |                        |



### 5.4.1.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing vulnerability levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the vulnerability of the relevant element at risk to bushfire hazard threats.

| VULNERABILITY REDUCING PROTECTION MEASURE ANALYSIS                                                                                                                                                                     |                                                |                                |                                 |              |               |                   |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                                                                                                                                                                        | Persons Located Onsite and Temporarily Offsite |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup>              | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                                | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                                |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Transport and multiple evacuation destinations and routes available                                                                                                                                                    | Very High                                      | 2                              | 2                               | 1            |               | 1                 | 2                        |
|                                                                                                                                                                                                                        | High                                           |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Medium                                         |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                                   |                                |                                 |              |               |                   |                          |
| Provision of bushfire emergency information and education                                                                                                                                                              | Very High                                      |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                                           | 5                              | 4                               |              |               | 3                 | 3                        |
|                                                                                                                                                                                                                        | Medium                                         | 4                              | 4                               | 1            |               | 1                 | 2                        |
|                                                                                                                                                                                                                        | Not Relevant                                   | 1                              |                                 |              |               |                   |                          |
| Onsite Persons Capable of Managing a Bushfire Emergency Are Available                                                                                                                                                  | Very High                                      |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                                           | 1                              | 1                               |              |               |                   | 1                        |
|                                                                                                                                                                                                                        | Medium                                         | 2                              | 2                               |              |               |                   | 2                        |
|                                                                                                                                                                                                                        | Not Relevant                                   |                                |                                 |              |               |                   |                          |
| Number Analysis                                                                                                                                                                                                        | Very High                                      | 2                              | 2                               | 1            |               | 1                 | 2                        |
|                                                                                                                                                                                                                        | High                                           | 6                              | 5                               |              |               | 3                 | 4                        |
|                                                                                                                                                                                                                        | Medium                                         | 6                              | 6                               | 1            |               | 1                 | 4                        |
|                                                                                                                                                                                                                        | Not Relevant                                   | 1                              |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Totals                                         | 15                             | 13                              | 2            |               | 5                 | 10                       |
| <sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.<br><sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section. |                                                |                                |                                 |              |               |                   |                          |

### 5.4.1.3 PROTECTION MEASURES - VULNERABILITY REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce inherent vulnerability levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the vulnerability of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE VULNERABILITY TO BUSHFIRE HAZARD THREATS <sup>1</sup>                                                                                                                                                                                                                      |                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Element at Risk                                                                                                                                                                                                                                                                                                                        | Persons Located Onsite And Temporarily Offsite                    |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF VULNERABILITY LEVELS                                                                                                                                                                                                                                                    |                                                                   |
| REDUCTION IN THE <u>INHERENT</u> VULNERABILITY LEVEL <sup>2</sup>                                                                                                                                                                                                                                                                      | REDUCTION IN THE <u>RESIDUAL</u> VULNERABILITY LEVEL <sup>3</sup> |
| Minimal                                                                                                                                                                                                                                                                                                                                | Significant                                                       |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.<br><sup>2</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.<br><sup>3</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |                                                                   |

**Assessment Comments:** A Bushfire Emergency Plan and training will be provided. A shelter in place building will be constructed for people on site.

### 5.4.1.4 ASSESSED VULNERABILITY LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual vulnerability levels. These vulnerability levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and exposure levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE VULNERABILITY LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup>                      |                                         |                                                |                                          |                                  |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------|------------------------------------------|----------------------------------|
| ELEMENT AT RISK                                                                                                               |                                         | Persons Located Onsite And Temporarily Offsite |                                          |                                  |
| THE <u>INHERENT</u> VULNERABILITY LEVEL <sup>2</sup>                                                                          |                                         |                                                |                                          |                                  |
| Very Low <input type="checkbox"/>                                                                                             | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>              | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/> |
| THE <u>RESIDUAL</u> VULNERABILITY LEVEL <sup>3</sup>                                                                          |                                         |                                                |                                          |                                  |
| Very Low <input type="checkbox"/>                                                                                             | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>              | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.                                                  |                                         |                                                |                                          |                                  |
| <sup>2</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |                                         |                                                |                                          |                                  |
| <sup>3</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |                                         |                                                |                                          |                                  |

**Assessment Comments:** Nil

## 5.4.2 PERSONS ON ACCESS/EGRESS ROUTES (IN VEHICLES) OR PATHWAYS

### 5.4.2.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|--|
|                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   | Possible                        | Exists | Planned | Additionally Recommend |  |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                          | Persons On Access/Egress Routes In Vehicles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Access/Egress Route ID | Internal road / driveway |                                   |                                 |        |         |                        |  |
| <b>THE PROTECTION MECHANISM – LOWER RISK ROAD CONSTRUCTION (DESIGN AND MATERIALS):</b> The application of as many of the following protection measures as possible ensures a greater level of safety for users and lowers the associated risk when roads need to be used to evacuate to a safer offsite location in potentially high stress situations within a threatening environment. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   |                                 |        |         |                        |  |
| Safety for persons using the route is increased through reducing the likelihood of vehicle/terrain or vehicle/vehicle accidents and the ability to maintain travelling speed.                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   |                                 |        |         |                        |  |
| 8.1                                                                                                                                                                                                                                                                                                                                                                                      | <b>Greater Road Width:</b> Ensure appropriate width roads are installed. Wider roads allow safer passing of the anticipated traffic that can be travelling in both directions (e.g. emergency services travelling towards the emergency event). The effectiveness of road width to reduce vulnerability is also a function of the required carriage capacity - which may be increased by the proposed development/use when it will increase traffic intensity.<br><br>The incorporation of non-vegetated and trafficable road verges/shoulders and adjacent footpaths can also be considered to increase effective width for slower moving vehicles (providing additional separation from the hazard and passing opportunities). |                        |                          | High                              | Yes                             | No     | Partly  | Yes                    |  |
| Assessment Comments: The driveway will be used by staff and contractors; therefore the road will be considered a public road.                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: The driveway will be constructed to public road standards as per Table 6 of the Guidelines for planning in Bushfire Prone Areas.                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   |                                 |        |         |                        |  |
| 8.2                                                                                                                                                                                                                                                                                                                                                                                      | <b>Lower Road Gradient:</b> Ensure appropriate road gradients are available. Lower gradients help ensure traction and speed can be maintained. Steep gradients can also be associated with driver visibility. Appropriate gradients will depend on the constructed surface materials and the weights and tractive capability of expected vehicle types.                                                                                                                                                                                                                                                                                                                                                                          |                        |                          | Medium                            | Yes                             | No     | N/A     | N/A                    |  |
| Assessment Comments: The land is flat, there are not steep gradients.                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   |                                 |        |         |                        |  |
| 8.3                                                                                                                                                                                                                                                                                                                                                                                      | <b>Greater Road Clearance:</b> Ensure appropriate clearance can exist and is established. Sufficient horizontal and vertical clearances from obstructions ensure unhindered movement of all possible vehicle types;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |                          | Medium                            | Yes                             | No     | Partly  | Yes                    |  |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |                          |                                   |                                 |        |         |                        |  |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|--|
|                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   | Possible                        | Exists | Planned | Additionally Recommend |  |
| Element at Risk                                                                                                                                                                                                                                                                                                                                 | Persons On Access/Egress Routes In Vehicles                                                                                                                                                                                                                                                                                                                                                                                                           | Access/Egress Route ID | Internal road / driveway |                                   |                                 |        |         |                        |  |
| Recommendation Details: Roads are to maintain as a minimum 4.5m vertical and 6m horizontal clearances                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| 8.4                                                                                                                                                                                                                                                                                                                                             | <b>Stable Road Surfaces:</b> Ensure that roads are constructed of materials that will provide the necessary traction (also a function of gradient), can support the weight of all expected vehicle types and remain operational in all weather. The required supportive capacity also applies to associated structures such as bridges.                                                                                                               |                        |                          | Medium                            | Yes                             | No     | Partly  | Yes                    |  |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: Road surfaces will meet the technical requirement of the Guidelines. Recommend the driveway is limestone road base.                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| 8.5                                                                                                                                                                                                                                                                                                                                             | <b>Driver Visibility and Road Ahead Signage:</b> Ensure that road design provides high levels of visibility ahead (in the absence of smoke and embers) and informative signage indicating relevant 'up ahead' route information (includes information stating distance to turnaround area for narrow roads in more remote locations). Good visibility is associated with the avoidance of 'blind' corners and crests to the greatest extent possible. |                        |                          | Medium                            | Yes                             | Partly | Partly  | No                     |  |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| 8.6                                                                                                                                                                                                                                                                                                                                             | <b>Shorter Road Length:</b> Shorter distances to safer locations reduce the length of time persons remain vulnerable to bushfire threats.                                                                                                                                                                                                                                                                                                             |                        |                          | High                              | No                              | No     | No      | No                     |  |
| Assessment Comments: The road cannot be shortened, however the intent in the future is to extend Gull Road to another destination.                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| 8.7                                                                                                                                                                                                                                                                                                                                             | <b>Interconnected Road Network to Provide Route Options:</b> Ensuring that the design of the road network provides through roads and avoids dead-end roads, provides the choice of alternative routes to for minimising close contact with a bushfire event. Otherwise vehicles and persons can be trapped.                                                                                                                                           |                        |                          | Very High                         | No                              | No     | No      | No                     |  |
| Assessment Comments: The road cannot be shortened, however the intent in the future is to extend Gull Road to another destination.                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: Not Applicable                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |
| <b>THE PROTECTION MECHANISM – EVACUEES ARE SELF-SUFFICIENT AND HAVE LOCAL AWARENESS AND OWN TRANSPORT:</b> The 'type' of persons that will be present on the site of the proposed development/use influences their degree of vulnerability to both bushfire threats and to risk associated with vehicular accidents in a stressful environment. |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                          |                                   |                                 |        |         |                        |  |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                      |                        |                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                      |                        |                          |                                   | Possible                        | Exists | Planned | Additionally Recommend |  |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Persons On Access/Egress Routes In Vehicles                                                                                                                          | Access/Egress Route ID | Internal road / driveway |                                   |                                 |        |         |                        |  |
| Persons that have local knowledge, are self-supportive, have their own transport and are physically and mentally capable present the lowest degree of vulnerability for this factor. This contrasts with persons who can be considered 'vulnerable' and are likely to be less capable or effective at making the required decisions and carrying out the required actions in the timeframe required. They are likely to be dependent on others for both information and transport and will not have any local knowledge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| 8.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Self Sufficient Persons with Local Awareness: The sites use and location increases the likelihood these are the type of persons that will be present on the site.    |                        |                          | High                              | Yes                             | No     | Partly  | Yes                    |  |
| Assessment Comments: Staff and most contractors will be familiar with the site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: Site induction and contractor information to include information about the sites evacuation process. Include in the Facility guidelines and induction.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| 8.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Onsite Persons Have Own Transport: There is no need to have arrangements in place for external provision of evacuation vehicles. Transport will always be available. |                        |                          | High                              | Yes                             | No     | Yes     | Yes                    |  |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| Recommendation Details: Include in facility training and induction program.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| <sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| <sup>2</sup> Protection Measure Application Status:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| <ul style="list-style-type: none"><li>• Possible: Protection measures that can potentially be applied to the proposed development/use.</li><li>• Fully or Partly Exists: A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li>• Currently Planned: Protection measures that:<ul style="list-style-type: none"><li>• Are incorporated into the site plans;</li><li>• Exist in an approved Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li><li>• Exist in a yet to be submitted Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |
| These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                      |                        |                          |                                   |                                 |        |         |                        |  |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                             |                        |                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------------|--------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                             |                        |                          |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Persons On Access/Egress Routes In Vehicles | Access/Egress Route ID | Internal road / driveway |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"><li><b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> |                                             |                        |                          |                                   |                                 |        |         |                        |



### 5.4.2.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing vulnerability levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the vulnerability of the relevant element at risk to bushfire hazard threats.

| VULNERABILITY REDUCING PROTECTION MEASURE ANALYSIS                                                                                                                                                                     |                                             |                                |                                 |              |               |                   |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                                                                                                                                                                        | Persons on Access/Egress Routes in Vehicles |                                |                                 |              |               |                   |                          |
| Access/Egress Route ID                                                                                                                                                                                                 |                                             |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup>           | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                             | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                             |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Lower Risk Road Construction (Design and Materials)                                                                                                                                                                    | Very High                                   | 1                              |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                                        | 2                              | 1                               |              |               | 1                 | 1                        |
|                                                                                                                                                                                                                        | Medium                                      | 4                              | 4                               | 1            |               | 3                 | 2                        |
|                                                                                                                                                                                                                        | Not Relevant                                |                                |                                 |              |               |                   |                          |
| Evacuees are Self-Sufficient and Have Local Awareness and Own Transport                                                                                                                                                | Very High                                   |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                                        | 2                              | 2                               |              |               | 2                 | 2                        |
|                                                                                                                                                                                                                        | Medium                                      |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                                |                                |                                 |              |               |                   |                          |
| Number Analysis                                                                                                                                                                                                        | Very High                                   | 1                              |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                                        | 4                              | 3                               |              |               | 3                 | 3                        |
|                                                                                                                                                                                                                        | Medium                                      | 4                              | 4                               | 1            |               | 3                 | 2                        |
|                                                                                                                                                                                                                        | Not Relevant                                |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Totals                                      | 9                              | 7                               | 1            |               | 6                 | 5                        |
| <sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.<br><sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section. |                                             |                                |                                 |              |               |                   |                          |

### 5.4.2.3 PROTECTION MEASURES - VULNERABILITY REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce inherent vulnerability levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the vulnerability of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE VULNERABILITY TO BUSHFIRE HAZARD THREATS <sup>1</sup>                                                                                                                                                                                                                      |                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Element at Risk                                                                                                                                                                                                                                                                                                                        | Persons on Access/Egress Routes in Vehicles                       |
| Access/Egress Route ID                                                                                                                                                                                                                                                                                                                 | Private driveway and Gull Road                                    |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF VULNERABILITY LEVELS                                                                                                                                                                                                                                                    |                                                                   |
| REDUCTION IN THE <u>INHERENT</u> VULNERABILITY LEVEL <sup>2</sup>                                                                                                                                                                                                                                                                      | REDUCTION IN THE <u>RESIDUAL</u> VULNERABILITY LEVEL <sup>3</sup> |
| None                                                                                                                                                                                                                                                                                                                                   | Minimal                                                           |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.<br><sup>2</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.<br><sup>3</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |                                                                   |

**Assessment Comments:** The private driveway will be constructed to public road standards thereby minimally reducing the residual vulnerability level.

#### 5.4.2.4 ASSESSED VULNERABILITY LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual vulnerability levels. These vulnerability levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and exposure levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE VULNERABILITY LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup> |                                                |                                   |                                          |                                  |
|----------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------|------------------------------------------|----------------------------------|
| ELEMENT AT RISK                                                                                          | Persons Located Onsite And Temporarily Offsite |                                   |                                          |                                  |
| Access/Egress Route ID                                                                                   | Private driveway and Gull Road                 |                                   |                                          |                                  |
| THE <u>INHERENT</u> VULNERABILITY LEVEL <sup>2</sup>                                                     |                                                |                                   |                                          |                                  |
| Very Low <input type="checkbox"/>                                                                        | Low <input type="checkbox"/>                   | Moderate <input type="checkbox"/> | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/> |
| THE <u>RESIDUAL</u> VULNERABILITY LEVEL <sup>3</sup>                                                     |                                                |                                   |                                          |                                  |
| Very Low <input type="checkbox"/>                                                                        | Low <input type="checkbox"/>                   | Moderate <input type="checkbox"/> | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/> |

<sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.

<sup>2</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

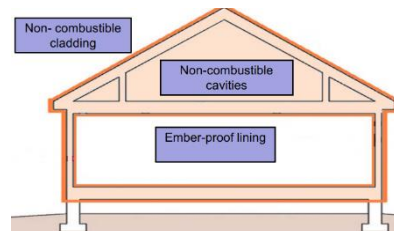
<sup>3</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

**Assessment Comments:** The private driveway will be constructed to public road standards thereby minimally reducing the residual vulnerability level. However, the Residual vulnerability level will remain at high due to the distance, 4km from the site to the nearest two-way access.

### 5.4.3 BUILDINGS AND STRUCTURES (NCC CLASSES 1-10)

#### 5.4.3.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                          |
| <p><b>THE PROTECTION MECHANISM – CONSTRUCTION DESIGN AND MATERIALS:</b> Increase bushfire resilience through the application of beneficial design and construction, including using non-combustible materials and minimising the use of vulnerable materials, to the greatest extent possible. Practicality and cost will be key considerations in determining the viability of applying protection measures in differing scenarios, but this should be determined with due consideration of threat levels and the importance of the elements at risk.</p> <p>The constructed systems should utilise the following properties to the greatest extent possible: <u>reliability</u> (which requires their durability over time, low maintenance and being unlikely to change over time), <u>robustness</u> (which limits damage spread from minor sources, continues to protect when thermally loaded and protects vulnerable elements), <u>resilience</u> (which enables their return to a functional state following an overload) and <u>redundancy</u> (which ensures the fate of the subject building/structure is not reliant on the effective performance of a single element). Refer to the glossary for additional explanation.</p> <p>The mechanism is also applicable to constructed consequential fire fuels.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                          |
| 9.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p><b>Construct to AS 3959:2018 [4]:</b> Apply the specified requirements to construction. These are intended to reduce the risk of building ignition from bushfire direct attack mechanisms. Note that the indirect attack mechanisms and the threats presented by consequential fire fuels are not specifically considered.</p> <p><i>"The standard is primarily concerned with improving the ability of buildings ... to better withstand attack from bushfire thus giving a measure of protection to the building occupants (until the fire front passes), as well as to the building itself".</i></p> <p>The AS 3959 approach adopts a strategy that relies on the integrity of the building's exterior envelope (i.e., the cladding of roof/wall/eaves, floor supporting structures/flooring and all penetrations) to resist all bushfire exposure conditions and environmental actions thereby protecting all structural construction elements behind it, including allowable combustible materials. It provides protection by:</p> <ul style="list-style-type: none"><li>Using specified materials that provide ignition resistance (tolerance of radiant heat and flames). Higher BAL ratings impose increased construction requirements for these exterior envelope materials;</li><li>Specifying precise gap control (applicable to all bushfire attack levels) for the exterior envelope of the building to prevent ember entry); and</li><li>Attached and adjacent structures (within 6m) must also comply with the Standard.</li></ul> | High                              | Yes                             | No     | Yes     | Yes                      |
| <p><i>Assessment Comments:</i> The office/crib room (shelter in place building) building will be either constructed to AS 3959 or NASH standards. It is unlikely and impractical for the facility structure and associated infrastructure to comply with AS 3959 requirements, specifically ember attack requirements.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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| Element at Risk                                                                           | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| Recommendation Details: Nominated shelter in place building to comply with NASH standard. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.2                                                                                       | <p><b>Construct to NASH Standard [33]:</b> Apply the specified requirements to construction. The Standard:</p> <p><i>"Sets out acceptable construction requirements for residential and low-rise buildings in bushfire prone areas to reduce the risk of ignition from bushfire attack involving embers, radiant heat and direct flame impingement using non-combustible materials. Buildings constructed in accordance with this Standard are intended to provide a sheltering envelope during the passage of a bushfire flame front. They do not constitute 'last resort' private bushfire shelters as defined in the NCC. The Standard is based on achieving ignition resistance through non-combustible construction using conventional building materials and a level of redundancy to provide a high level of performance in extreme bushfire events and an increased probability that unattended buildings will survive such events."</i></p> <p>Key attributes of the Standard include:</p> <ul style="list-style-type: none"><li>Materials used anywhere on the building envelope (see shaded part of diagram below), must be non-combustible except for a small amount allowed externally that includes flooring, window frames, doors and external decorative trim. The building envelope is comprised of a framed roof/ceiling system, an external wall system and a floor system;</li></ul> <div></div> <ul style="list-style-type: none"><li>The same construction requirements apply for all BAL ratings up to BAL-40 (except for external doors and windows which apply AS 3959 requirements). An additional benefit of this is the built in resistance to the direct attack mechanisms of consequential fire when lower BAL ratings apply.</li><li>It does not rely on eliminating ember entry to the roof space, wall cavities and floor system as these are non-combustible construction. Embers only need to be kept from entering the internal living/operating spaces.</li><li>It is ember tolerant without unrealistic workmanship, supervision and maintenance requirements;</li><li>The combination of a non-combustible cladding and cavities is a robust solution that enables the building to be configured so that failure or damage to one element does not lead to the inevitable failure of the building or a breach of the habitable envelope; and</li></ul> | Very High                         | Yes                             | No     | Partly  | Yes                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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| Element at Risk                                                                                                                                                                                                                                                                                                     | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
|                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"><li>Attached and adjacent structures (within 6m) must also comply with the Standard.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                          |
| <i>Assessment Comments:</i> The office/crib room (shelter in place building) building will be either constructed to AS 3959 or NASH standards. It is unlikely and impractical for the facility structure and associated infrastructure to comply with AS 3959 requirements, specifically ember attack requirements. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| <i>Recommendation Details:</i> Nominated shelter in place building to comply with NASH standard.                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| 9.3                                                                                                                                                                                                                                                                                                                 | <b>Construction Materials for External and Internal Cavity Building Elements:</b> Except for internal living or operation spaces, to the degree necessary, utilise materials resistant to fire attack mechanisms of flame and radiant heat (preferably non-combustible) for all relevant building elements, including wall, roof, floor, supporting structures and framing systems.                                                                                                                                                                                                                                                                                                                                                       | Very High                         | Yes                             | No     | Unknown | Yes                      |
| <i>Assessment Comments:</i> Not Required                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| <i>Recommendation Details:</i> Where possible use non-combustible material.                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| 9.4                                                                                                                                                                                                                                                                                                                 | <b>Construction Materials for Consequential Fire Fuels:</b> For constructed large consequential fire fuels, use non-combustible materials to the fullest extent possible. Potential fuels include: <ul style="list-style-type: none"><li>Landscaping items – fences, screens, retaining walls, gazebos, plastic water tanks etc;</li><li>Attached structures - decks, verandahs, stairs, carports, garages, pergolas, patios, etc;</li><li>Adjacent structures – other houses, sheds, garages, carports, etc.</li></ul> Post bushfire event assessments identify structure to structure fire as a common cause of overall building loss [9].                                                                                              | High                              | Yes                             | No     | Unknown | Yes                      |
| <i>Assessment Comments:</i> Not Required                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| <i>Recommendation Details:</i> Use of non-combustible materials is preferred/recommended.                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| 9.5                                                                                                                                                                                                                                                                                                                 | <b>Construction Design / Materials Resistant To High Wind Damage:</b> Apply construction measures to prevent the type of building damage from wind that will open or create gaps (from the wind itself or carried projectiles) and allow the entry of embers, radiant heat and flames.<br><br>This type of damage is typically superficial damage. Building codes relating to wind (e.g., cyclones) do not necessarily address this superficial type of impact.<br><br>Additional fixings for building envelope claddings and protection of the most vulnerable elements, such as glazing, from debris impact, are key considerations.<br><br>Consider applying the principles of the NASH Standard [33] design solution to construction. | Medium                            | Yes                             | No     | Unknown | Yes                      |



| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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| Element at Risk                                                                                                                   | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
|                                                                                                                                   | <p>"Potential wind effects directly associated with bushfire events have been considered in this Standard. Wind actions may affect buildings subject to a bushfire attack in various ways including:</p> <ul style="list-style-type: none"><li>• The intensity of flame front activity may produce locally high wind pressures on parts of the building;</li><li>• In the post fire phase, some weakened components on the building envelope may be vulnerable to normal design pressures; and</li><li>• Wind can drive embers into the building envelope."</li></ul> <p>Most applicable when the physical requirements exist for the development of an extreme bushfire event within the surrounding landscape.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                        |
| Assessment Comments: Not Required                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| Recommendation Details: Construct shelter in place building to NASH standard. NASH Standard has been designed for impact of wind. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.6                                                                                                                               | <p><b>Construction of Gas Supply:</b> All gas cylinders are installed and maintained in accordance with AS 1596 (for domestic house supply) as a guide. The requirement of the standard includes:</p> <ul style="list-style-type: none"><li>• Safety release valve shall be directed away from the building and persons access/egress routes;</li><li>• Metal piping and fittings shall be used on all piping inside the building's cavities and enclosable occupied spaces and the high pressure side of any gas regulators; and</li><li>• Tethers securing cylinders are to be non-combustible.</li></ul> <p>The objective is to reduce the risk of local fire against a building and reduce the risk of death or injury, from gas flaring or explosion. The rationale is gas cylinders which have either flared or ruptured are commonly found in post bushfire surveys [9]. The heat from the bushfire or consequential local fire has been sufficient to cause their pressure to reach critical levels beyond which their pressure release valve releases large quantities of LP gas. If these gas cylinders fall over, this pressure release valve may no longer function correctly, meaning that the gas cylinder may continue to increase in pressure with continued heating until the cylinder ruptures. The resulting explosion includes a pressure wave and large ball of flame which can threaten nearby life and buildings.</p> <p>Readily available guidance is provided by CSIRO Best Practice Bushfire Guide (<a href="https://research.csiro.au/bushfire/new-builds/water-electricity-gas/">https://research.csiro.au/bushfire/new-builds/water-electricity-gas/</a>) and WA Dept. Mines, Industry, Regulation and Safety 'LP Gas cylinder safety in bushfire prone areas' (<a href="https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas">https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas</a>).</p> | Medium                            | N/A                             | N/A    | N/A     | N/A                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                       | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| Assessment Comments: There will be no gas cylinders on site.                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| Recommendation Details: Not Applicable                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.7                                                                                                                                   | <p><b>Construction of Electricity Supply:</b> Cabling to be shielded (includes installing underground within subject property boundary) from applicable bushfire attack mechanisms.</p> <p>The objective is to assist with continuity of supply for essential site operations and/or electrically driven firefighting pumps. It also reduces the risk of electrocution to any persons onsite and reduces potentially additional sources of fire ignition.</p> <p>It is common in bushfires for power infrastructure to burn and collapse or be impacted by falling trees or branches while power lines are still live. Removing this risk may be appropriate for some sites.</p> | Medium                            | Yes                             | N/A    | N/A     | Yes                    |
| Assessment Comments:                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| Recommendation Details: Cabling to be underground wherever possible.                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.8                                                                                                                                   | <p><b>Minimise Re-entrant Detail to Minimise Debris and Ember Accumulation:</b> Avoid or limit the accumulation of unburnt debris and embers by minimising re-entrant details and/or adopting aerodynamic forms that will self-shed windblown debris and embers. For example:</p> <ul style="list-style-type: none"><li>Simple building/structure footprints that avoid re-entrant corners in access ways, at wall/floor, wall/ground, roof/wall junctions and around doors, vents, windows; and</li><li>Simple roof layouts that avoid valleys and minimise the number of ridges that need protection details (e.g. skillion roofs).</li></ul>                                  | Medium                            | Yes                             | No     | Partly  | Yes                    |
| Assessment Comments: The facility and workshop is constructed for a specific industry use very likely cannot comply.                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| Recommendation Details: The shelter in place building (office) to consider design features to minimise debris and ember accumulation. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.9                                                                                                                                   | <p><b>Minimise Debris and Ember Trapping Surfaces:</b> Avoid or minimise the use of exposed combustible surfaces that can trap and accumulate debris and embers. These include:</p> <ul style="list-style-type: none"><li>Horizontal, or shallow angle surfaces e.g. exposed wall/roof framework, roofs, decking, verandahs, steps, windowsills; and</li><li>Vertical surfaces with rough textured cladding (e.g. sawn timber).</li></ul>                                                                                                                                                                                                                                        | Medium                            | Yes                             | No     | Partly  | Yes                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                     | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| Assessment and Recommendation Details: The facility is constructed for a specific industry use therefore the trapping surfaces may be flat.                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.10                                                                                                                                                                                                                                                                                | <b>Protect Roof Plumbing to Minimise Debris and Ember Accumulation:</b> All roof plumbing (gutters, valleys) is protected from the accumulation of debris and embers that can result in direct fire attack mechanisms immediately adjacent to any combustible elements within the roof cavity.                                                                                                                   | Medium                            | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Not Required<br>Recommendation Details: Design of facility, workshop plumbing and associated structures and equipment to consider reducing the risk off ignition.<br>The office (shelter in place building) will be constructed using the protection measures. |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.11                                                                                                                                                                                                                                                                                | <b>Minimise Construction Cavities to Minimise Debris and Ember Accumulation:</b> Apply designs that lower the potential for accumulation of embers and debris within cavity spaces of buildings/structures. Examples include concrete floor slab on the ground and solid masonry walls.                                                                                                                          | Medium                            | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Not Required<br>Recommendation Details:                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.12                                                                                                                                                                                                                                                                                | <b>Minimise External Openings to Limit Flame/Radiant Heat/Ember/Debris Entry:</b> Limit potential sites for threat entry to through the external building envelope to internal spaces containing combustible materials (consequential fire fuels). Examples include reducing windows/doors on elevations facing the bushfire hazard and apply design to limit gaps and penetrations that will require screening. | Medium                            | Yes                             | No     | Partly  | Yes                    |
| Assessment Comments: for facility and workshop, Screens to be provided where practicable.<br>Recommendation Details: For the facility, workshop and associated structures, protection measure to be applied where practicable.<br>Office to comply with the protection measures.    |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 9.13                                                                                                                                                                                                                                                                                | <b>Screen and Seal Gaps and Penetrations:</b> Apply fire rated sealants and/or install metal screening (corrosion resistant steel, bronze, aluminium <2mm aperture).<br>All external construction and penetration gaps with apertures greater than 2mm will allow ember entry (and potentially debris) to internal cavities and combustible materials within (as consequential fire fuels).                      | Medium                            | Yes                             | No     | Partly  | Yes                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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|                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                      | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
|                                                                                                                                                                                                                                      | This includes gaps in roofs, walls, doors, windows and their surrounding trims – including those associated with penetrations, vents, weepholes, poor workmanship and material deterioration and movement over time (maintenance). Internal fire is difficult to see and extinguish.                                                                                                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                          |
| Assessment Comments: Not Required                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: For the facility, workshop and associated structures, protection measure to be applied where practicable.                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Office to comply with the protection measures.                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 9.14                                                                                                                                                                                                                                 | <b>Screen External Doors and Windows:</b> Metal screens (corrosion resistant steel, bronze, aluminium <2mm aperture) installed over non-openable and/or openable parts of windows and doors to prevent ember entry to internal spaces containing combustible materials (consequential fire fuels) and reduce radiant heat load on vulnerable surfaces.                                                                                                                                                                                                                                                                            | Medium                            | Yes                             | No     | Partly  | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: For the facility, workshop and associated structures, protection measure to be applied where practicable.                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Office to comply with the protection measures.                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 9.15                                                                                                                                                                                                                                 | <b>Shutter External Doors and Windows:</b> Fire rated shutters are installed to significantly increase bushfire resistance of the vulnerable building elements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Medium                            | N/A                             | N/A    | N/A     | N/A                      |
| Assessment Comments: Not Required                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – AVAILABILITY OF A FIREFIGHTING RESPONSE CAPABILITY: Provide sufficient and reliable dedicated firefighting water supply and delivery capability as necessary for installed active and/or passive systems. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 9.16                                                                                                                                                                                                                                 | <b>Firefighting Water Supply:</b> Have a dedicated static supply of firefighting water for the protection of buildings/structures before and after the passage of a bushfire front. Adequate water supply is critical for any firefighting operation, particularly where property protection is the intent. This is necessary when: <ul style="list-style-type: none"><li>A water supply additional to a reticulated water supply is required to counter the loss of firefighting water as a protection measure, should the reticulated supply be interrupted; and</li><li>It is the only source of firefighting water.</li></ul> | High                              | Yes                             | No     | Partly  | Yes                      |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | All tanks shall be non-combustible. Aside from losing water, failure of combustible tank can provide an additional heat or load to a vulnerable building element. Metal piping and fittings shall be used for any above ground components.<br><br>The limitation to the effectiveness of the measure is the requirement for persons to be present and have the minimum required operational knowledge and/or access to appropriate information.                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| Recommendation Details: Firefighting water tanks are to be non-combustible. Minimum 50,000lt are required and to be fitted with coupling as per BMP requirements.                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| 9.17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Firefighting Equipment Actively Operated:</b> In addition to a dedicated water supply, appropriate mobile firefighting appliances are available quickly and/or fixed firefighting equipment is installed (pumps, hoses, sprinklers etc).<br><br>Where equipment is installed, this will be resilient to bushfire impact, to the extent necessary, through the application of appropriate equipment materials and protection (shielding or separation from the hazard).<br><br>The limitation to the effectiveness of the measure is the requirement for persons to be present and have the minimum required operational knowledge and/or access to appropriate information. | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: The equipment required as a minimum 2 x 500lt slip-on units (not trailer type) and staff trained in their operations. Manual operated sprinkler system for stored stockpiles of flammable material.                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| Recommendation Details: <ul style="list-style-type: none"><li>Sprinkler system required for all stockpiles of flammable materials.</li><li>Training required for system operations.</li><li>Operational plans required for sprinkler operations.</li><li>As a minimum, 2 x slip-on firefighting units (not trailer type) are required.</li><li>Staff training required in unit operations.</li><li>Training operation manual to be developed in response and equipment operations.</li></ul> PPE to be provided to trained staff. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                          |
| 9.18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Fire Fighting Equipment Passively Operated:</b> In addition to a dedicated water supply, appropriate water dispensing apparatus are installed (e.g. pumps, plumbing and sprinklers) that are automatically activated.<br><br>These will be resilient to bushfire impact, to the extent necessary, through the application of appropriate equipment materials and protection (shielding or separation from the hazard).                                                                                                                                                                                                                                                      | High                              | Yes                             | No     | No      | Yes                      |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                 | Buildings/Structures - NCC Classes 1-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| Assessment Comments: DFES built environment will determine an internal automated sprinklers system will be required to be available to apply to stockpiles of combustible material.                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| Recommendation Details:                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"><li>Sprinkler system required for all stockpiles of flammable materials.</li><li>Training required for system operations.</li><li>Operational plans required for sprinkler operations.</li></ul>                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| 9.19                                                                                                                                                                                                                                                                                                            | <b>Fire Fighting Equipment Operability Maintained:</b> Where water pumps, shutters or other active/passive protection measures rely on the continued supply of electricity, establish barriers (shielding) or separation from potential damaging factors (e.g. falling trees/branches, fire, or other impact sources). For example, bury transmission systems to the greatest extent possible.                                                                                                                                                                                                  | High                              | Yes                             | No     | Unknown | Yes                    |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| Recommendation Details: Develop operational manual and maintenance schedule.                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| 9.20                                                                                                                                                                                                                                                                                                            | <b>Access via Firebreaks Provided:</b> Installation and maintenance of firebreaks to facilitate firefighting access / backburning (and also limiting surface fire progression).                                                                                                                                                                                                                                                                                                                                                                                                                 | Medium                            | Yes                             | Yes    | Yes     | No                     |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| Recommendation Details: The site will comply with the Firebreak Notice.                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| THE PROTECTION MECHANISM – MANAGE AND MAINTAIN EFFECTIVENESS OF APPLIED PROTECTION MEASURES: To ensure the retention of the level of bushfire resilience that has been established through the implementation of appropriate bushfire protection measures, formal and enforceable responsibilities are created. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                        |
| 9.21                                                                                                                                                                                                                                                                                                            | <b>Formal Documents Created to Guide and Enforce Management:</b> Through relevant site operations document(s) and/or an enforceable agreement, regulation or standard, a mechanism is put in place to ensure that: <ul style="list-style-type: none"><li>The required management and maintenance of applied bushfire protection measures is conducted on a regular basis – with the interval dependent on the necessary frequency that will maintain full effectiveness;</li><li>The relevant protection measures are known and understood; and</li><li>Responsibilities are created.</li></ul> | High                              | Yes                             | No     | No      | Yes                    |



| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                         | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                         |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Buildings/Structures - NCC Classes 1-10 |                                   |                                 |        |         |                        |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                         |                                   |                                 |        |         |                        |
| Recommendation Details: Guidance documents to be developed for site operations and emergency management (maintenance of equipment & training)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                         |                                   |                                 |        |         |                        |
| <div><div><sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.</div><div><sup>2</sup> <b>Protection Measure Application Status:</b><ul style="list-style-type: none"><li>• <b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li><li>• <b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li>• <b>Currently Planned:</b> Protection measures that:<ul style="list-style-type: none"><li>• Are incorporated into the site plans;</li><li>• Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul><p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p><li>• <b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>• Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>• Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul><p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p></li></div></div> |                                         |                                   |                                 |        |         |                        |

### 5.4.3.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing vulnerability levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the vulnerability of the relevant element at risk to bushfire hazard threats.

| VULNERABILITY REDUCING PROTECTION MEASURE ANALYSIS               |                                           |                                |                                 |              |               |                   |                          |
|------------------------------------------------------------------|-------------------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                  | Buildings / Structures - NCC Classes 1-10 |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                         | Effectiveness Rating <sup>1</sup>         | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                  |                                           | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                  |                                           |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Construction Design and Materials                                | Very High                                 | 2                              | 2                               |              |               | 2                 | 2                        |
|                                                                  | High                                      | 2                              | 2                               | 1            |               | 1                 | 2                        |
|                                                                  | Medium                                    | 9                              | 9                               |              |               | 5                 | 9                        |
|                                                                  | Not Relevant                              | 2                              |                                 |              |               |                   |                          |
| Availability of a Firefighting Response Capability               | Very High                                 |                                |                                 |              |               |                   |                          |
|                                                                  | High                                      | 4                              | 4                               |              |               |                   | 4                        |
|                                                                  | Medium                                    | 1                              | 1                               | 1            |               | 1                 | 0                        |
|                                                                  | Not Relevant                              |                                |                                 |              |               |                   |                          |
| Manage and Maintain Effectiveness of Applied Protection Measures | Very High                                 |                                |                                 |              |               |                   |                          |
|                                                                  | High                                      | 1                              | 1                               | 0            | 0             |                   | 1                        |
|                                                                  | Moderate                                  |                                |                                 |              |               |                   |                          |
|                                                                  | Not Relevant                              |                                |                                 |              |               |                   |                          |
| Number Analysis                                                  | Very High                                 | 2                              | 2                               |              |               | 2                 | 2                        |
|                                                                  | High                                      | 7                              | 7                               | 1            |               | 1                 | 7                        |
|                                                                  | Medium                                    | 10                             | 10                              | 1            |               | 6                 | 9                        |
|                                                                  | Not Relevant                              | 2                              |                                 |              |               |                   |                          |
|                                                                  | Totals                                    | 21                             | 19                              | 2            |               | 9                 | 18                       |

<sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.

<sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section.

### 5.4.3.3 PROTECTION MEASURES - VULNERABILITY REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce inherent vulnerability levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the vulnerability of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE VULNERABILITY TO BUSHFIRE HAZARD THREATS <sup>1</sup>  |                                             |                         |                                 |                                         |              |                           |                            |
|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                    | Buildings and Structures – NCC Classes 1-10 |                         |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> VULNERABILITY LEVEL <sup>3</sup> |                                             |                         |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                              |                                             |                         |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                      | Radiant Heat                                | Embers / Burning Debris | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                            | Significant                                 | Moderate                | Minimal                         | Moderate                                | Minimal      | None                      | Significant                |
| Moderate                                                                                                           |                                             |                         |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> VULNERABILITY LEVEL <sup>4</sup>  |                                             |                         |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                              |                                             |                         |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                      | Radiant Heat                                | Embers / Burning Debris | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                            | Minimal                                     | Moderate                | Minimal                         | Moderate                                | Minimal      | None                      | Minimal                    |
| Significant                                                                                                        |                                             |                         |                                 | Significant                             |              |                           |                            |

<sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

**Assessment Comments:** Inclusion of guidance plans, operational and emergency management plans and training will reduce vulnerability. The application of suppression systems and response equipment will reduce infrastructure vulnerability.

#### 5.4.3.4 ASSESSED VULNERABILITY LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual vulnerability levels. These vulnerability levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and exposure levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

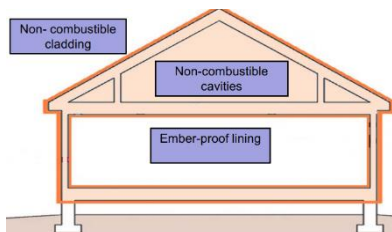
| ASSESSED INDICATIVE VULNERABILITY LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup>                      |                                  |                                              |                                         |                                              |                                          |                                  |          |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|------------------------------------------|----------------------------------|----------|
| ELEMENT AT RISK                                                                                                               |                                  | Buildings/Structures - NCC Classes 1-10      |                                         |                                              |                                          |                                  |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                                                       |                                  | INHERENT VULNERABILITY LEVEL <sup>3</sup>    |                                         |                                              |                                          |                                  | OVERALL  |
| DIRECT                                                                                                                        | Flame Contact                    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> | High     |
|                                                                                                                               | Radiant Heat                     | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                                                      | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input checked="" type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                                                       |                                  | RESIDUAL VULNERABILITY LEVEL <sup>4</sup>    |                                         |                                              |                                          |                                  | OVERALL  |
| DIRECT                                                                                                                        | Flame Contact                    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                                               | Radiant Heat                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                                                      | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/>            | Extreme <input type="checkbox"/> |          |
| <sup>1</sup> Refer to Appendix 1 for explanatory information.                                                                 |                                  |                                              |                                         |                                              |                                          |                                  |          |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |                                  |                                              |                                         |                                              |                                          |                                  |          |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |                                  |                                              |                                         |                                              |                                          |                                  |          |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |                                  |                                              |                                         |                                              |                                          |                                  |          |

**Assessment Comments:** The recommended protection measures are effective in reducing the vulnerability levels. Inclusion of guidance plans, operational and emergency management plans and training will reduce vulnerability. The application of suppression systems and response equipment will reduce infrastructure vulnerability.

## 5.4.4 BUILT INFRASTRUCTURE ASSETS

### 5.4.4.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |
| <p><b>THE PROTECTION MECHANISM – CONSTRUCTION DESIGN AND MATERIALS:</b> Increase bushfire resilience through the application of beneficial design and construction, including using non-combustible materials and minimising the use of vulnerable materials, to the greatest extent possible. Practicality and cost will be key considerations in determining the viability of applying protection measures in differing scenarios, but this should be determined with due consideration of threat levels and the importance of the elements at risk.</p> <p>The constructed systems should utilise the following properties to the greatest extent possible: <b>reliability</b> (which requires their durability over time, low maintenance and being unlikely to change over time), <b>robustness</b> (which limits damage spread from minor sources, continue to protect when thermally loaded and protects vulnerable elements), <b>resilience</b> (which enables their return to a functional state following an overload) and <b>redundancy</b> (which ensures the fate of the subject building/structure is not reliant on the effective performance of a single element). Refer to the glossary for additional explanation.</p> <p>The principle is also applicable to constructed consequential fire fuels.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| 10.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><b>Construct to AS 3959:2018 [4]:</b> Use the principles and requirements established in the Standard, for buildings in general, and apply to the infrastructure assets where they have merit.</p> <p>These are intended to reduce the risk of building ignition from bushfire direct attack mechanisms. Note that the indirect attack mechanisms and the threats presented by consequential fire fuels are not specifically considered. Key attributes of the Standard that may have relevance to other built assets include:</p> <ul style="list-style-type: none"> <li>The AS 3959 strategy that relies on the integrity of the building's exterior envelope (i.e., the cladding of roof/wall/eaves, floor supporting structures/flooring and all penetrations) to resist all bushfire exposure conditions and environmental actions thereby protecting all structural construction elements behind it, including allowable combustible materials.</li> <li>Using specified materials that provide ignition resistance (tolerance of radiant heat and flames). Higher BAL ratings impose increased construction requirements for these exterior envelope materials;</li> <li>Specifying precise gap control (applicable to all bushfire attack levels) for the exterior envelope of the building to prevent ember entry); and</li> <li>Attached and adjacent structures (within 6m) must also comply with the Standard.</li> </ul> | High                              | Yes                             | No     | No      | Yes                    |
| <p><i>Assessment Comments:</i> Not required</p> <p><i>Recommendation Details:</i> Fit ember screens, gaps to be 2mm or less. The built infrastructure assets where applicable will implement the protection measures.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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| Element at Risk                                                                                                                                                                                                                                                                                                                               | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                                 |        |         |                          |
| 10.2                                                                                                                                                                                                                                                                                                                                          | <p><b>Construct to NASH Standard [33]:</b> Use the principles and requirements established in the Standard, for residential and low-rise buildings, and apply to the infrastructure assets where they have merit.</p> <p>Key attributes of the Standard that may have relevance to other built assets include:</p> <ul style="list-style-type: none"><li>Materials used anywhere on the building envelope (see shaded part of diagram below), must be non-combustible (except for a small number of smaller building elements). The building envelope is comprised of a framed roof/ceiling system, an external wall system and a floor system;</li></ul> <div></div> <ul style="list-style-type: none"><li>The same construction requirements apply for all BAL ratings up to BAL-40 (except for external doors and windows which apply AS 3959 requirements). An additional benefit of this is the built in resistance to the direct attack mechanisms of consequential fire when lower BAL ratings apply.</li><li>It does not rely on eliminating ember entry to the roof space, wall cavities and floor system as these are non-combustible construction. Embers only need to be kept from entering the internal living/operating spaces.</li><li>It is ember tolerant without unrealistic workmanship, supervision and maintenance requirements;</li><li>The combination of a non-combustible cladding and cavities is a robust solution that enables the building to be configured so that failure or damage to one element does not lead to the inevitable failure of the building or a breach of the habitable envelope; and</li><li>Attached and adjacent structures (within 6m) must also comply with the Standard.</li></ul> | Very High                         | Yes                             | No     | No      | Yes                      |
| <p><i>Assessment Comments:</i> Constructing or utilising the NASH Standard will increase robustness and reduce vulnerability. NASH Standard materials are the preferred construction materials.</p> <p><i>Recommendation Details:</i> The facilities built infrastructure assets where applicable will implement the protection measures.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                 |        |         |                          |
| 10.3                                                                                                                                                                                                                                                                                                                                          | <p><b>Construction Materials for External and Internal Cavity Building Elements:</b> Except for internal living or operation spaces, to the degree necessary, utilise materials resistant to fire attack mechanisms of flame and radiant heat (preferably non-combustible) for all relevant building elements, including wall, roof, floor, supporting structures and framing systems.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Very High                         | Yes                             | No     | Unknown | Yes                      |



| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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| Element at Risk                                                                                                                                                                                                                                                            | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                 |        |         |                          |
| Assessment Comments: The protection measure may be relevant to some built infrastructure assets.                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: Apply protection measures where applicable.                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 10.4                                                                                                                                                                                                                                                                       | <b>Construction Materials for Consequential Fire Fuels:</b> For constructed large consequential fire fuels, use non-combustible materials to the fullest extent possible. Potential fuels include attached structures, adjacent structures and surrounding landscaping items (fences, screens, retaining walls etc.).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | High                              | Yes                             | No     | Unknown | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| Recommendation Details: Protection measures to be implemented.                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |
| 10.5                                                                                                                                                                                                                                                                       | <b>Construction Design / Materials Resistant To High Wind Damage:</b> Apply construction measures to prevent the type of building damage from wind that will open or create gaps (from the wind itself or carried projectiles) and allow the entry of embers, radiant heat and flames.<br>This type of damage is typically superficial damage. Building codes relating to wind (e.g., cyclones) do not necessarily address this superficial type of impact.<br>Additional fixings for building envelope claddings and protection of the most vulnerable elements, such as glazing, from debris impact, are key considerations.<br>Consider applying the principles of the NASH Standard [33] design solution to construction.<br>"Potential wind effects directly associated with bushfire events have been considered in this Standard. Wind actions may affect buildings subject to a bushfire attack in various ways including: <ul style="list-style-type: none"><li>The intensity of flame front activity may produce locally high wind pressures on parts of the building;</li><li>In the post fire phase, some weakened components on the building envelope may be vulnerable to normal design pressures; and</li><li>Wind can drive embers into the building envelope."</li></ul> Most applicable when the physical requirements exist for the development of an extreme bushfire event within the surrounding landscape. | Medium                            | Yes                             | No     | Partly  | Yes                      |
| Assessment Comments: AS 3959 does not have structural requirements for wind that may be generated during a bushfire event, whereas the NASH Standard does. However, industrial built infrastructure are usually wind rated or constructed to withstand external exposures. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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| Element at Risk                                                                                 | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                 |        |         |                        |
| Recommendation Details: The shelter in pace building is to be constructed to the NASH Standard. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                        |
| 10.6                                                                                            | <p><b>Construction of Gas Supply:</b> All gas cylinders are installed and maintained in accordance with AS 1596 (for domestic house supply) as a guide. The requirement of the standard includes:</p> <ul style="list-style-type: none"><li>Safety release valve shall be directed away from the building and persons access/egress routes;</li><li>Metal piping and fittings shall be used on all piping inside the building's cavities and enclosable occupied spaces and the high pressure side of any gas regulators; and</li><li>Tethers securing cylinders are to be non-combustible.</li></ul> <p>The objective is to reduce the risk of local fire against a building and reduce the risk of death or injury, from gas flaring or explosion. The rationale is gas cylinders which have either flared or ruptured are commonly found in post bushfire surveys [9]. The heat from the bushfire or consequential local fire has been sufficient to cause their pressure to reach critical levels beyond which their pressure release valve releases large quantities of LP gas. If these gas cylinders fall over, this pressure release valve may no longer function correctly, meaning that the gas cylinder may continue to increase in pressure with continued heating until the cylinder ruptures. The resulting explosion includes a pressure wave and large ball of flame which can threaten nearby life and buildings.</p> <p>Readily available guidance is provided by CSIRO Best Practice Bushfire Guide (<a href="https://research.csiro.au/bushfire/new-builds/water-electricity-gas/">https://research.csiro.au/bushfire/new-builds/water-electricity-gas/</a>) and WA Dept. Mines, Industry, Regulation and Safety 'LP Gas cylinder safety in bushfire prone areas' (<a href="https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas">https://www.commerce.wa.gov.au/publications/lp-gas-cylinder-safety-bushfire-prone-areas</a>).</p> | Medium                            | N/A                             | N/A    | N/A     | N/A                    |
| Assessment Comments: No LP gas bottles will be on site.                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                        |
| Recommendation Details: Not Applicable                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |                                 |        |         |                        |
| 10.7                                                                                            | <p><b>Construction of Electricity Supply:</b> Cabling to be shielded (includes installing underground within subject property boundary) from applicable bushfire attack mechanisms.</p> <p>The objective is to assist with continuity of supply for essential site operations and/or electrically driven firefighting pumps. It also reduces the risk of electrocution to any persons onsite and reduces potentially additional sources of fire ignition.</p> <p>It is common in bushfires for power infrastructure to burn and collapse or be impacted by falling trees or branches while power lines are still live. Removing this risk may be appropriate for some sites.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Medium                            | Yes                             | No     | Unknown | Yes                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                      | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                        |
| 10.8                                                                                                                                                                 | <b>Minimise Re-entrant Detail to Minimise Debris and Ember Accumulation:</b> Avoid or limit the accumulation of unburnt debris and embers by minimising re-entrant details and/or adopting aerodynamic forms that will self-shed windblown debris and embers. For example: <ul style="list-style-type: none"><li>Simple building/structure footprints that avoid re-entrant corners in access ways, at wall/floor, wall/ground, roof/wall junctions and around doors, vents, windows; and</li><li>Simple roof layouts that avoid valleys and minimise the number of ridges that need protection details (e.g. skillion roofs).</li></ul> | Medium                            | Yes                             | No     | Unknown | Yes                    |
| Assessment Comments: It is not practicable for all structures to comply with the protection measures.                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| Recommendation Details: Where practicable, apply the protection measures. Generators and pump room to be fitted with ember screening and all gaps to be 2mm or less. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| 10.9                                                                                                                                                                 | <b>Minimise Debris/Ember Trapping Surfaces:</b> Avoid or minimise the use of exposed combustible surfaces that can trap and accumulate debris and embers. These include: <ul style="list-style-type: none"><li>Horizontal, or shallow angle surfaces e.g. exposed wall/roof framework, roofs, decking, verandahs, steps, windowsills; and</li><li>Vertical surfaces with rough textured cladding (e.g. sawn timber).</li></ul>                                                                                                                                                                                                           | Medium                            | Yes                             | No     | No      | Yes                    |
| Assessment Comments: Not Required                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| Recommendation Details: To comply with the protection measures.                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| 10.10                                                                                                                                                                | <b>Protect Roof Plumbing to Minimise Debris and Ember Accumulation:</b> All roof plumbing (gutters, valleys) is protected from the accumulation of debris and embers that can result in direct fire attack mechanisms immediately adjacent to any combustible elements within the roof cavity.                                                                                                                                                                                                                                                                                                                                           | Medium                            | Yes                             | No     | Partly  | Yes                    |
| Assessment Comments: It is not practicable for all structures to comply with the protection measures.                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| Recommendation Details: Where practicable, apply the protection measures.                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |                                 |        |         |                        |
| 10.11                                                                                                                                                                | <b>Minimise Construction Cavities to Minimise Debris and Ember Accumulation:</b> Apply designs that lower the potential for accumulation of embers and debris within cavity spaces of buildings/structures. Examples include concrete floor slab on the ground and solid masonry walls.                                                                                                                                                                                                                                                                                                                                                  | Medium                            | Yes                             | No     | Partly  | Yes                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
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|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                   | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| Assessment Comments: Not Required                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| Recommendation Details: Seal subfloor space and apply ember screening to opening. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| 10.12                                                                             | <b>Minimise External Openings to Limit Flame/Radiant Heat/Ember/Debris Entry:</b> Limit potential sites for threat entry to through the external building envelope to internal spaces containing combustible materials (consequential fire fuels). Examples include reducing windows/doors on elevations facing the bushfire hazard and apply design to limit gaps and penetrations that will require screening.                                                                                                                                                                                                                                                                    | Medium                            | Yes                             | No     | Unknown | Yes                    |
| Assessment Comments: Not Required                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| Recommendation Details: Comply with protection measures.                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| 10.13                                                                             | <b>Screen and Seal Gaps and Penetrations:</b> Apply fire rated sealants and/or install metal screening (corrosion resistant steel, bronze, aluminium <2mm aperture).<br>All external construction and penetration gaps with apertures greater than 2mm will allow ember entry (and potentially debris) to internal cavities and combustible materials within (as consequential fire fuels).<br>This includes gaps in roofs, walls, doors, windows and their surrounding trims – including those associated with penetrations, vents, weepholes, poor workmanship and material deterioration and movement over time (maintenance). Internal fire is difficult to see and extinguish. | Medium                            | Yes                             | No     | Unknown | Yes                    |
| Assessment Comments: Not Required                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| Recommendation Details: Comply with protection measures                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| 10.14                                                                             | <b>Screen External Doors and Windows:</b> Metal screens (corrosion resistant steel, bronze, aluminium <2mm aperture) installed over non-openable and/or openable parts of windows and doors to prevent ember entry to internal spaces containing combustible materials (consequential fire fuels) and reduce radiant heat load on vulnerable surfaces.                                                                                                                                                                                                                                                                                                                              | Medium                            | Yes                             | No     | Unknown | Yes                    |
| Assessment Comments: Not Required                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| Recommendation Details: Windows to be screened.                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| 10.15                                                                             | <b>Shutter External Doors and Windows:</b> Fire rated shutters are installed to significantly increase bushfire resistance of the vulnerable building elements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Medium                            | N/A                             | N/A    | N/A     | N/A                    |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
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| Element at Risk                                                                                                                                                                                                                      | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| Assessment Comments: Not Required                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| Recommendation Details: Not Applicable                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| 10.16                                                                                                                                                                                                                                | <b>Construction Materials for Critical Non-Structural Elements:</b> Utilise fire/radiant heat rated products (rated to the level determined necessary), for the construction of non-structural elements that are essential to the continued operation of the built asset, and which are potentially exposed to the attack mechanisms of both bushfire and consequential fire. These vulnerable elements include cabling and plumbing associated with power (delivery) inputs and outputs, data transmission, liquid/gas transport (fuel/water) etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| Recommendation Details: The critical non-structural elements to be located in <10kWm2 area or shielded.                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – AVAILABILITY OF A FIREFIGHTING RESPONSE CAPABILITY: Provide sufficient and reliable dedicated firefighting water supply and delivery capability as necessary for installed active and/or passive systems. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| 10.17                                                                                                                                                                                                                                | <b>Firefighting Water Supply:</b> Have a dedicated static supply of firefighting water for the protection of buildings/structures before and after the passage of a bushfire front. Adequate water supply is critical for any firefighting operation, particularly where property protection is the intent. This is necessary when: <ul style="list-style-type: none"><li>A water supply additional to a reticulated water supply is required to counter the loss of firefighting water as a protection measure, should the reticulated supply be interrupted; and</li><li>It is the only source of firefighting water.</li></ul> All tanks shall be non-combustible. Aside from losing water, failure of combustible tank can provide an additional heat load to a vulnerable building element. Metal piping and fittings shall be used for any above ground components. The limitation to the effectiveness of the measure is the requirement for persons to be present and have the minimum required operational knowledge and/or access to appropriate information. | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| Recommendation Details: A 50,000 lt water tank to be installed and the protection measures applied.                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                          |
| 10.18                                                                                                                                                                                                                                | <b>Firefighting Equipment Actively Operated:</b> In addition to a dedicated water supply, appropriate mobile firefighting appliances are available quickly and/or fixed firefighting equipment is installed (pumps, hoses, sprinklers etc).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | High                              | Yes                             | No     | No      | Yes                      |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                             | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                      | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                 |        |         |                          |
|                                                                                                                                                                                                                      | Where equipment is installed, this will be resilient to bushfire impact, to the extent necessary, through the application of appropriate equipment materials and protection (shielding or separation from the hazard).<br><br>The limitation to the effectiveness of the measure is the requirement for persons to be present and have the minimum required operational knowledge and/or access to appropriate information. |                                   |                                 |        |         |                          |
| Assessment Comments: Not Required                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| Recommendation Details: Emergency response plans, Bushfire Emergency Plan and basic first response firefighting training, equipment maintenance and operation training and emergency response plans to be developed. |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| 10.19                                                                                                                                                                                                                | <b>Fire Fighting Equipment Passively Operated:</b> In addition to a dedicated water supply, appropriate water dispensing apparatus are installed (e.g. pumps, plumbing and sprinklers) that are automatically activated.<br><br>These will be resilient to bushfire impact, to the extent necessary, through the application of appropriate equipment materials and protection (shielding or separation from the hazard).   | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: First responders to have knowledge of operating systems including sprinklers and layout of power cables.                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| Recommendation Details: Staff training in the operation of the automatic (if fitted) and manual sprinkler systems for response to a fire event. Electrical schematics to be available for first responders.          |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| 10.20                                                                                                                                                                                                                | <b>Fire Fighting Equipment Operability Maintained:</b> Where water pumps, shutters or other active/passive protection measures rely on the continued supply of electricity, establish barriers (shielding) or separation from potential damaging factors (e.g. falling trees/branches, fire, or other impact sources). For example, bury transmission systems to the greatest extent possible.                              | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| Recommendation Details: Guidance documents to include the appropriate maintenance regime.                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| 10.21                                                                                                                                                                                                                | <b>Access via Firebreaks Provided:</b> Installation and maintenance of firebreaks to facilitate firefighting access / backburning (and also limiting surface fire progression).                                                                                                                                                                                                                                             | Medium                            | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |
| Recommendation Details: Guidance documents to include the appropriate maintenance regime and as a minimum comply with the Shire's Firebreak Notice.                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                                 |        |         |                          |



| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Built Infrastructure Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |                                 |        |         |                        |
| <b>THE PROTECTION MECHANISM – MANAGE AND MAINTAIN EFFECTIVENESS OF APPLIED PROTECTION MEASURES:</b> To ensure the retention of the level of bushfire resilience that has been established through the implementation of appropriate bushfire protection measures, formal and enforceable responsibilities are created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| 10.22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Formal Documents Created to Guide and Enforce Management:</b> Through relevant site operations document(s) and/or an enforceable agreement, regulation or standard, a mechanism is put in place to ensure that: <ul style="list-style-type: none"> <li>The required management and maintenance of applied bushfire protection measures is conducted on a regular basis – with the interval dependent on the necessary frequency that will maintain full effectiveness;</li> <li>The relevant protection measures are known and understood; and</li> <li>Responsibilities are created.</li> </ul> | High                              | Yes                             | No     | No      | Yes                    |
| <i>Assessment Comments:</i> Not Required<br><i>Recommendation Details:</i> The different documents will be able to satisfactorily perform this function to differing extents.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |
| <sup>1</sup> <b>Protection Measure Effectiveness Rating:</b> Refer to Appendix A1.2.4 for explanation and defining.<br><sup>2</sup> <b>Protection Measure Application Status:</b> <ul style="list-style-type: none"> <li><b>Possible:</b> Protection measures that can potentially be applied to the proposed development/use.</li> <li><b>Fully or Partly Exists:</b> A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li> <li><b>Currently Planned:</b> Protection measures that:               <ul style="list-style-type: none"> <li>Are incorporated into the site plans;</li> <li>Exist in an <u>approved</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li> <li>Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li> </ul>               These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).             </li> <li><b>Additionally Recommend:</b> Protection measures that:</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                 |        |         |                        |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Built Infrastructure Assets |                                   |                                 |        |         |                        |
| <ul style="list-style-type: none"> <li>Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li> <li>Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li> </ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> |                             |                                   |                                 |        |         |                        |

#### 5.4.4.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing vulnerability levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the vulnerability of the relevant element at risk to bushfire hazard threats.

| Mechanism                                                        | Rating              | Available | Possible  | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
|------------------------------------------------------------------|---------------------|-----------|-----------|--------------|---------------|-------------------|--------------------------|
| Construction Design and Materials                                | Very High           | 2         | 2         |              |               |                   | 2                        |
|                                                                  | High                | 3         | 3         |              |               |                   | 3                        |
|                                                                  | Medium              | 11        | 9         |              |               | 1                 | 9                        |
|                                                                  | Not Relevant        |           | 2         |              |               | 2                 |                          |
| Availability of a Firefighting Response Capability               | Very High           |           |           |              |               |                   |                          |
|                                                                  | High                | 4         | 4         |              |               |                   | 4                        |
|                                                                  | Medium              | 1         | 1         |              |               |                   | 1                        |
|                                                                  | Not Relevant        |           |           |              |               |                   |                          |
| Manage and Maintain Effectiveness of Applied Protection Measures | Very High           |           |           |              |               |                   |                          |
|                                                                  | High                | 1         | 1         |              |               |                   | 1                        |
|                                                                  | Medium              |           |           |              |               |                   |                          |
|                                                                  | Not Relevant        |           |           |              |               |                   |                          |
| <b>Number Analysis</b>                                           | <b>Very High</b>    | <b>2</b>  | <b>2</b>  |              |               |                   | <b>2</b>                 |
|                                                                  | <b>High</b>         | <b>8</b>  | <b>8</b>  |              |               |                   | <b>8</b>                 |
|                                                                  | <b>Moderate</b>     | <b>12</b> | <b>10</b> |              |               | <b>1</b>          | <b>10</b>                |
|                                                                  | <b>Not Relevant</b> |           | <b>2</b>  |              |               | <b>2</b>          |                          |
|                                                                  | <b>Totals</b>       | <b>22</b> | <b>22</b> |              |               | <b>3</b>          | <b>20</b>                |

<sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.

<sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section.

#### 5.4.4.3 PROTECTION MEASURES - VULNERABILITY REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce inherent vulnerability levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the vulnerability of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE VULNERABILITY TO BUSHFIRE HAZARD THREATS <sup>1</sup>  |              |                             |                                 |                                         |              |                           |                            |
|--------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                    |              | Built Infrastructure Assets |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> VULNERABILITY LEVEL <sup>3</sup> |              |                             |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                              |              |                             |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                      | Radiant Heat | Embers / Burning Debris     | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Moderate                                                                                                           | Moderate     | Moderate                    | Minimal                         | Moderate                                | Minimal      | None                      | Moderate                   |
| Moderate                                                                                                           |              |                             |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> VULNERABILITY LEVEL <sup>4</sup>  |              |                             |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                              |              |                             |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                      | Radiant Heat | Embers / Burning Debris     | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                            | Minimal      | Moderate                    | Minimal                         | Minimal                                 | Minimal      | None                      | Minimal                    |
| Significant                                                                                                        |              |                             |                                 | Significant                             |              |                           |                            |

<sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

**Assessment Comments:** Eliminating subfloor space, fitting ember screens, ensuring appropriate maintenance and appropriate first responder training will effectively reduce incidents and increase awareness.

#### 5.4.4.4 ASSESSED VULNERABILITY LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual vulnerability levels. These vulnerability levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and exposure levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE VULNERABILITY LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup> |                                  |                                              |                                         |                                              |                               |                                  |          |
|----------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|-------------------------------|----------------------------------|----------|
| ELEMENT AT RISK                                                                                          |                                  | Built Infrastructure Assets                  |                                         |                                              |                               |                                  |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                                  |                                  | INHERENT VULNERABILITY LEVEL <sup>3</sup>    |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                                   | Flame Contact                    | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                          | Radiant Heat                     | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                                 | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                                  |                                  | RESIDUAL VULNERABILITY LEVEL <sup>4</sup>    |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                                   | Flame Contact                    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Low      |
|                                                                                                          | Radiant Heat                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                                 | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                          | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |

<sup>1</sup> Refer to Appendix 1 for explanatory information.

<sup>2</sup> Refer to Appendix 2 for explanatory information.

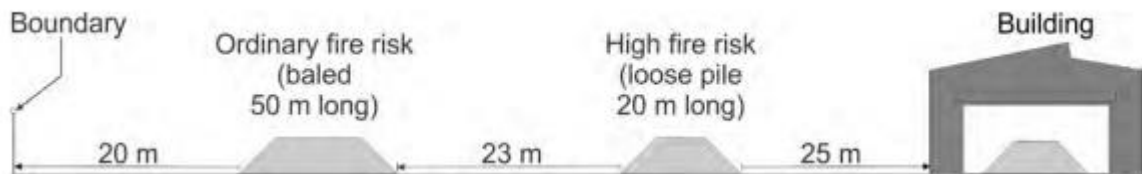
<sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.

<sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant.

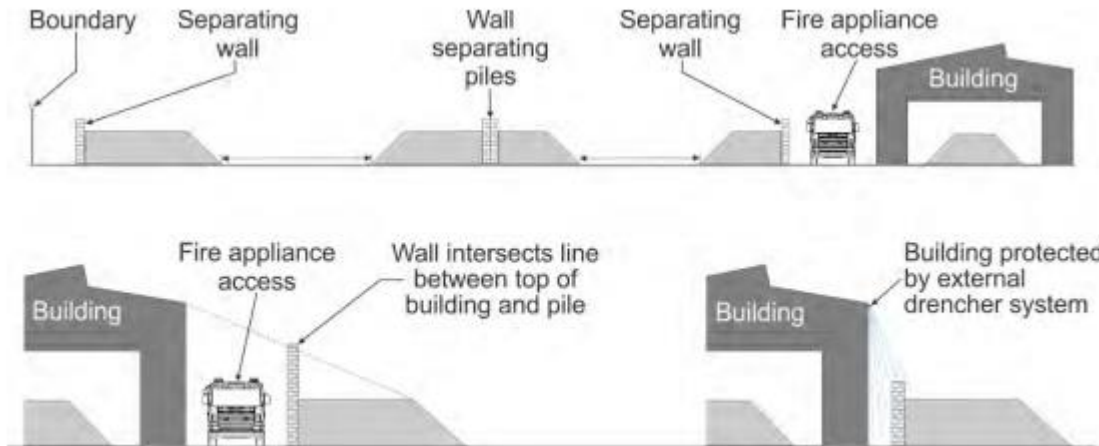
**Assessment Comments:** Eliminating subfloor space, fitting ember screens, ensuring appropriate maintenance and appropriate first responder training will effectively reduce incidents and increase operational and situational awareness.

## 5.4.5 MATERIALS STORED OUTDOORS

### 5.4.5.1 PROTECTION MEASURES - IDENTIFICATION AND APPLICATION STATUS

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommend |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Materials Stored Outdoors                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                        |
| <p><b>THE PROTECTION MECHANISM – CONSTRUCTION DESIGN AND MATERIALS:</b> Increase bushfire resilience through the application of beneficial design and construction, including using non-combustible materials and minimising the use of vulnerable materials, to the greatest extent possible. Practicality and cost will be key considerations in determining the viability of applying protection measures in differing scenarios, but this should be determined with due consideration of threat levels and the importance of the elements at risk.</p> <p>The constructed systems should utilise the following properties to the greatest extent possible: <b>reliability</b> (which requires their durability over time, low maintenance and being unlikely to change over time), <b>robustness</b> (which limits damage spread from minor sources, continue to protect when thermally loaded and protects vulnerable elements), <b>resilience</b> (which enables their return to a functional state following an overload) and <b>redundancy</b> (which ensures the fate of the subject building/stribute is not reliant on the effective performance of a single element). Refer to the glossary for additional explanation.</p> <p>The principle is also applicable to constructed consequential fire fuels.</p> |                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |
| 11.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Construction Materials for Consequential Fire Fuels:</b> For constructed large consequential fire fuels, use non-combustible materials to the fullest extent possible. Potential fuels include adjacent structures and surrounding landscaping items (fences, screens, retaining walls etc.). | High                              | Yes                             | No     | Unknown | Yes                    |
| <p>Assessment Comments: Not Required</p> <p>Recommendation Details: Fences, screen and retaining walls to be non-combustible.</p> <div></div> <p>Examples of separation between stockpiles and fire source features (NSW FB)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |



| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                        |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|------------------------|-----|
|                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   | Possible                        | Exists | Planned | Additionally Recommend |     |
| Element at Risk                                                                                                                                                                                                                        | Materials Stored Outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                        |     |
| <div></div> <p>The masonry wall to be located to provide fire appliance access and examples of reduced separation using wall or sprinkler system.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |     |
| THE PROTECTION MECHANISM – AVAILABILITY OF A FIREFIGHTING RESPONSE CAPABILITY: Provide sufficient and reliable dedicated firefighting water supply and delivery capability as necessary for installed active and/or passive systems.   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |     |
| 11.2                                                                                                                                                                                                                                   | <p><b>Firefighting Water Supply:</b> Have a dedicated static supply of firefighting water for the protection of buildings/structures before and after the passage of a bushfire front. Adequate water supply is critical for any firefighting operation, particularly where property protection is the intent. This is necessary when:</p> <ul style="list-style-type: none"><li>• A water supply additional to a reticulated water supply is required to counter the loss of firefighting water as a protection measure, should the reticulated supply be interrupted; and</li><li>• It is the only source of firefighting water.</li></ul> <p>All tanks shall be non-combustible. Aside from losing water, failure of combustible tank can provide an additional heat load to a vulnerable building element. Metal piping and fittings shall be used for any above ground components.</p> <p>The limitation to the effectiveness of the measure is the requirement for persons to be present and have the minimum required operational knowledge and/or access to appropriate information.</p> |                                   | High                            | Yes    | No      | Partly                 | Yes |
| Assessment Comments: Not Required                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                 |        |         |                        |     |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                             | Materials Stored Outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                                 |        |         |                          |
| Recommendation Details: A 50,000lt water supply for bushfire response is required.<br>Comment: The tank may not be required if hydrants are installed.                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| 11.3                                                                                                                                                                                        | <b>Firefighting Equipment Actively Operated:</b> In addition to a dedicated water supply, appropriate mobile firefighting appliances are available quickly and/or fixed firefighting equipment is installed (pumps, hoses, sprinklers etc).<br>Where equipment is installed, this will be resilient to bushfire impact, to the extent necessary, through the application of appropriate equipment materials and protection (shielding or separation from the hazard).<br>The limitation to the effectiveness of the measure is the requirement for persons to be present and have the minimum required operational knowledge and/or access to appropriate information. | High                              | Yes                             | N/A    | N/A     | Yes                      |
| Assessment Comments: Not Required<br>Recommendation Details: Appropriate training, response equipment and operational documents to be available.                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| 11.4                                                                                                                                                                                        | <b>Fire Fighting Equipment Passively Operated:</b> In addition to a dedicated water supply, appropriate water dispensing apparatus are installed (e.g. pumps, plumbing and sprinklers) that are automatically activated.<br>These will be resilient to bushfire impact, to the extent necessary, through the application of appropriate equipment materials and protection (shielding or separation from the hazard).                                                                                                                                                                                                                                                  | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required<br>Recommendation Details: Internal systems may be fitted, to be determined by DFES Built Environmental branch, the system may be automatically operated. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |
| 11.5                                                                                                                                                                                        | <b>Fire Fighting Equipment Operability Maintained:</b> Where water pumps, shutters or other active/passive protection measures rely on the continued supply of electricity, establish barriers (shielding) or separation from potential damaging factors (e.g. falling trees/branches, fire, or other impact sources). For example, bury transmission systems to the greatest extent possible.                                                                                                                                                                                                                                                                         | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required<br>Recommendation Details: Guidance manual will include maintenance schedules of all equipment and machinery.                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Materials Stored Outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |                                   |                                 |        |         |                          |
| 11.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Access via Firebreaks Provided: Installation and maintenance of firebreaks to facilitate firefighting access / backburning (and also limiting surface fire progression).                                                                                                                                                                                                                                                                                                                                                                                                                 |  | Medium                            | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |
| Recommendation Details: Firebreaks to be compliant with the Shire's Firebreak Notice.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |
| THE PROTECTION MECHANISM – MANAGE AND MAINTAIN EFFECTIVENESS OF APPLIED PROTECTION MEASURES: To ensure the retention of the level of bushfire resilience that has been established through the implementation of appropriate bushfire protection measures, formal and enforceable responsibilities are created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |
| 11.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Formal Documents Created to Guide and Enforce Management: Through relevant site operations document(s) and/or an enforceable agreement, regulation or standard, a mechanism is put in place to ensure that: <ul style="list-style-type: none"><li>The required management and maintenance of applied bushfire protection measures is conducted on a regular basis – with the interval dependent on the necessary frequency that will maintain full effectiveness;</li><li>The relevant protection measures are known and understood; and</li><li>Responsibilities are created.</li></ul> |  | High                              | Yes                             | No     | No      | Yes                      |
| Assessment Comments: Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |
| Recommendation Details: Create documents to guide and enforce management and operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |
| <sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |
| <sup>2</sup> Protection Measure Application Status:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |
| <ul style="list-style-type: none"><li>Possible: Protection measures that can potentially be applied to the proposed development/use.</li><li>Fully or Partly Exists: A current state assessment of protection measures already implemented by existing components of the proposed development/use. The status of current implementation can also be fully or partly. These measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</li><li>Currently Planned: Protection measures that:<ul style="list-style-type: none"><li>Are incorporated into the site plans;</li><li>Exist in an approved Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), alternative solutions and any additional recommended protection measures - for which a responsibility for their implementation has been created and approved; and/or</li></ul></li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |                                 |        |         |                          |

| PROTECTION MEASURES AVAILABLE TO REDUCE VULNERABILITY LEVELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                           | Effectiveness Rating <sup>1</sup> | Application Status <sup>2</sup> |        |         |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------|---------------------------------|--------|---------|--------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                           |                                   | Possible                        | Exists | Planned | Additionally Recommended |
| Element at Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Materials Stored Outdoors |                                   |                                 |        |         |                          |
| <ul style="list-style-type: none"><li>Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and are comprised of the applicable acceptable solutions (established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), that can be met and for which a responsibility for their implementation can be created in the BMP.</li></ul> <p>These planned measures are accounted for in assessing 'inherent' risk levels (refer to Glossary).</p> <ul style="list-style-type: none"><li><b>Additionally Recommend:</b> Protection measures that:<ul style="list-style-type: none"><li>Exist in a <u>yet to be submitted</u> Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and comprise alternative solutions and/or additional recommended protection measures (that can and should be implemented in the opinion of the bushfire consultant), and for which a responsibility for their implementation can be created in the BMP; and/or</li><li>Are developed in the process of producing this risk assessment and management report and for which a responsibility for their implementation can be created in the BMP.</li></ul></li></ul> <p>These additionally recommended measures, along with existing and planned measures, are accounted for in assessing 'residual' risk levels (refer to Glossary).</p> |                           |                                   |                                 |        |         |                          |

#### 5.4.5.2 PROTECTION MEASURES - EFFECTIVENESS AND NUMBER APPLIED

For the stated element at risk, the numbers of both available and potentially applied bushfire protection measures are summarised and the effectiveness of each measure at reducing vulnerability levels is stated (refer to Appendix 1 for explanatory and supporting information).

This information is applied in the following section of this report to the derivation of the potential for applied bushfire protection measures to reduce the vulnerability of the relevant element at risk to bushfire hazard threats.

| VULNERABILITY REDUCING PROTECTION MEASURE ANALYSIS                                                                                                                                                                     |                                   |                                |                                 |              |               |                   |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------|---------------------------------|--------------|---------------|-------------------|--------------------------|
| Element at Risk                                                                                                                                                                                                        | Materials Stored Outdoors         |                                |                                 |              |               |                   |                          |
| The Protection Mechanism                                                                                                                                                                                               | Effectiveness Rating <sup>1</sup> | Numbers of Protection Measures |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                   | Total Available                | Application Status <sup>2</sup> |              |               |                   |                          |
|                                                                                                                                                                                                                        |                                   |                                | Possible                        | Fully Exists | Partly Exists | Currently Planned | Additionally Recommended |
| Construction Design and Materials                                                                                                                                                                                      | Very High                         |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                              | 1                              | 1                               |              |               | 1                 | 1                        |
|                                                                                                                                                                                                                        | Medium                            |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                      |                                |                                 |              |               |                   |                          |
| Availability of a Firefighting Response Capability                                                                                                                                                                     | Very High                         |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                              | 4                              | 3                               |              |               | 1                 | 3                        |
|                                                                                                                                                                                                                        | Medium                            | 1                              | 1                               |              |               |                   | 1                        |
|                                                                                                                                                                                                                        | Not Relevant                      | 1                              |                                 |              |               |                   | 1                        |
| Manage and Maintain Effectiveness of Applied Protection Measures                                                                                                                                                       | Very High                         |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                              | 1                              | 1                               |              |               |                   | 1                        |
|                                                                                                                                                                                                                        | Moderate                          |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | Not Relevant                      |                                |                                 |              |               |                   |                          |
| Number Analysis                                                                                                                                                                                                        | Very High                         |                                |                                 |              |               |                   |                          |
|                                                                                                                                                                                                                        | High                              | 6                              | 5                               |              |               | 2                 | 5                        |
|                                                                                                                                                                                                                        | Medium                            | 1                              | 1                               |              |               |                   | 1                        |
|                                                                                                                                                                                                                        | Not Relevant                      | 1                              |                                 |              |               |                   | 1                        |
|                                                                                                                                                                                                                        | Totals                            | 8                              | 6                               |              |               | 2                 | 7                        |
| <sup>1</sup> Protection Measure Effectiveness Rating: Refer to Appendix A1.2.4 for explanation and defining.<br><sup>2</sup> Protection Measure Application Status: Refer to table footnotes in the preceding Section. |                                   |                                |                                 |              |               |                   |                          |

### 5.4.5.3 PROTECTION MEASURES - VULNERABILITY REDUCING POTENTIAL

For the stated element at risk and identified bushfire hazard, the potential for applied bushfire protection measures to reduce inherent vulnerability levels is assessed as a function of:

- The number of bushfire protection measures that can be applied compared to the number available; and
- The weighting applied to each protection measure that indicates how effective it can be at reducing the vulnerability of elements at risk.

| ASSESSED POTENTIAL OF APPLIED PROTECTION MEASURES TO REDUCE VULNERABILITY TO BUSHFIRE HAZARD THREATS <sup>1</sup>             |              |                           |                                 |                                         |              |                           |                            |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------|---------------------------------|-----------------------------------------|--------------|---------------------------|----------------------------|
| Element at Risk                                                                                                               |              | Materials Stored Outdoors |                                 |                                         |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF AN <u>INHERENT</u> VULNERABILITY LEVEL <sup>3</sup>            |              |                           |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                           |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris   | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Moderate                                                                                                                      | Moderate     | Moderate                  | Minimal                         | Moderate                                | Moderate     | None                      | Moderate                   |
| Moderate                                                                                                                      |              |                           |                                 | Moderate                                |              |                           |                            |
| ASSESSMENT OF PROTECTION MEASURES APPLIED TO THE DERIVATION OF A <u>RESIDUAL</u> VULNERABILITY LEVEL <sup>4</sup>             |              |                           |                                 |                                         |              |                           |                            |
| Direct Attack Mechanisms <sup>2</sup>                                                                                         |              |                           |                                 | Indirect Attack Mechanisms <sup>2</sup> |              |                           |                            |
| Flame Contact                                                                                                                 | Radiant Heat | Embers / Burning Debris   | High / Erratic Fire Driven Wind | Debris Production / Accumulation        | Surface Fire | Tree Strike / Obstruction | Consequential (Local) Fire |
| Minimal                                                                                                                       | Minimal      | Moderate                  | Minimal                         | Moderate                                | Minimal      | None                      | Minimal                    |
| Significant                                                                                                                   |              |                           |                                 | Significant                             |              |                           |                            |
| <sup>1</sup> Refer to Appendix 1 for explanatory and supporting information.                                                  |              |                           |                                 |                                         |              |                           |                            |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |              |                           |                                 |                                         |              |                           |                            |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |              |                           |                                 |                                         |              |                           |                            |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |              |                           |                                 |                                         |              |                           |                            |

**Assessment Comments:** The materials stored outside are combustible and vulnerable to ember attack, however with sprinkler systems, non-combustible retaining walls and pile separation, will reduce the risk of ignition and provide a safer place for responders.



#### 5.4.5.4 ASSESSED VULNERABILITY LEVEL (INHERENT AND RESIDUAL)

The preceding bushfire protection measure analysis has enabled the derivation of the indicative inherent and residual vulnerability levels. These vulnerability levels are indicative as they are derived through a qualitative assessment process. In combination with the corresponding assessed threat and exposure levels, they will be applied to deriving the indicative inherent and residual bushfire risk levels.

| ASSESSED INDICATIVE VULNERABILITY LEVELS – POST APPLICATION OF BUSHFIRE PROTECTION MEASURES <sup>1</sup>                      |                                  |                                              |                                         |                                              |                               |                                  |          |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|-------------------------------|----------------------------------|----------|
| ELEMENT AT RISK                                                                                                               |                                  | Materials Stored Outdoors                    |                                         |                                              |                               |                                  |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                                                       |                                  | INHERENT VULNERABILITY LEVEL <sup>3</sup>    |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                                                        | Flame Contact                    | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Moderate |
|                                                                                                                               | Radiant Heat                     | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                                                      | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| BUSHFIRE ATTACK MECHANISMS <sup>2</sup>                                                                                       |                                  | RESIDUAL VULNERABILITY LEVEL <sup>4</sup>    |                                         |                                              |                               |                                  | OVERALL  |
| DIRECT                                                                                                                        | Flame Contact                    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> | Low      |
|                                                                                                                               | Radiant Heat                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Embers / Burning Debris          | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | High/Erratic Fire Driven Wind    | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| INDIRECT                                                                                                                      | Debris Production / Accumulation | Very Low <input type="checkbox"/>            | Low <input type="checkbox"/>            | Moderate <input checked="" type="checkbox"/> | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Surface Fire                     | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Tree Strike / Obstruction        | Very Low <input checked="" type="checkbox"/> | Low <input type="checkbox"/>            | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
|                                                                                                                               | Consequential (Local) Fire       | Very Low <input type="checkbox"/>            | Low <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/>            | High <input type="checkbox"/> | Extreme <input type="checkbox"/> |          |
| <sup>1</sup> Refer to Appendix 1 for explanatory information.                                                                 |                                  |                                              |                                         |                                              |                               |                                  |          |
| <sup>2</sup> Refer to Appendix 2 for explanatory information.                                                                 |                                  |                                              |                                         |                                              |                               |                                  |          |
| <sup>3</sup> Accounts for all currently implemented bushfire protection measures and those planned to be implemented.         |                                  |                                              |                                         |                                              |                               |                                  |          |
| <sup>4</sup> Additionally accounts for bushfire protection measures recommended to be implemented by the bushfire consultant. |                                  |                                              |                                         |                                              |                               |                                  |          |

**Assessment Comments:** Ember attack and debris accumulation will not change, however sprinkler systems, non-combustible retaining walls and pile separation, will reduce the risk of ignition and provide a safer place for responders.

## 5.5 INFORMATIVE MECHANISMS – APPLICATION GUIDANCE FOR ALL BUSHFIRE PROTECTION MEASURES

### 5.5.1 BUSHFIRE HAZARD THREAT REDUCING MEASURES

| <b>BUSHFIRE HAZARD<br/>THREAT REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br>All Implemented ('Existing' & 'Planned') and<br>'Additionally Recommended' Protection Measures |        |                                                                                        | <b>IDENTIFICATION OF<br/>'ADDITIONALLY<br/>RECOMMENDED'<br/>(EXTRA) MEASURES AND<br/>THEIR IMPLEMENTATION<br/>PRIORITY</b> |                                         | <b>APPLICATION GUIDANCE</b><br><br>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|-------------------------|
|                                                                                                                                                                                   |        |                                                                                        | <b>EXTRA<br/>MEASURE</b>                                                                                                   | <b>PRIORITY<br/>RATING <sup>2</sup></b> | <b>DOCUMENTS<br/>REQUIRED FOR<br/>PLANNING FUTURE<br/>DEVELOPMENT<br/>AND/OR RETROFIT</b>                                      |                           | <b>OPERATIONAL DOCUMENTS RELEVANT TO SITE USE</b><br><br>BPP: remove non-applicable document headings and leave column blank |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                          | Ref No | Brief Description <sup>1</sup>                                                         |                                                                                                                            |                                         | Bushfire Manage. Plan (Planning)                                                                                               | Inform Design & Construct | Bushfire Manage. Plan (Guidance)                                                                                             | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| Prevent bushfire ignition and/or severity by managing the fuels                                                                                                                   | 1.1    | Remove offsite bushfire fuel                                                           |                                                                                                                            | N/A                                     |                                                                                                                                |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                   | 1.2    | Reduce offsite bushfire fuel – prescribed burning                                      |                                                                                                                            | N/A                                     |                                                                                                                                |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                   | 1.3    | Reduce offsite bushfire fuel - mechanical                                              |                                                                                                                            | N/A                                     |                                                                                                                                |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                   | 1.4    | Remove onsite bushfire fuel                                                            | ✓                                                                                                                          | Highest                                 | ✓                                                                                                                              |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                   | 1.5    | Reduce onsite bushfire fuel - prescribed burning                                       |                                                                                                                            | N/A                                     |                                                                                                                                |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                   | 1.6    | Reduce onsite bushfire fuel - mechanical                                               | ✓                                                                                                                          | Highest                                 | ✓                                                                                                                              |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                   | 1.7    | Reduce road verge fuel                                                                 |                                                                                                                            | N/A                                     |                                                                                                                                |                           |                                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                   | 1.8    | Enforce compliance with any applicable local government property management directives | ✓                                                                                                                          | High                                    | ✓                                                                                                                              |                           | ✓                                                                                                                            |                            | ✓                         |                          |                           |                         |

| <b>BUSHFIRE HAZARD</b><br><b>THREAT REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br>All Implemented ('Existing' & 'Planned') and<br>'Additionally Recommended' Protection Measures |        |                                                                   | <b>IDENTIFICATION OF<br/>'ADDITIONALLY<br/>RECOMMENDED'<br/>(EXTRA) MEASURES AND<br/>THEIR IMPLEMENTATION<br/>PRIORITY</b> |                                         | <b>APPLICATION GUIDANCE</b><br><br>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures |                           |                                                                                                                          |                            |                           |                          |                           |                         |
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|                                                                                                                                                                                         |        |                                                                   | <b>EXTRA<br/>MEASURE</b>                                                                                                   | <b>PRIORITY<br/>RATING <sup>2</sup></b> | <b>DOCUMENTS<br/>REQUIRED FOR<br/>PLANNING FUTURE<br/>DEVELOPMENT<br/>AND/OR RETROFIT</b>                                      |                           | <b>OPERATIONAL DOCUMENTS RELEVANT TO SITE USE</b><br>BPP: remove non-applicable document headings and leave column blank |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                                | Ref No | Brief Description <sup>1</sup>                                    |                                                                                                                            |                                         | Bushfire Manage. Plan (Planning)                                                                                               | Inform Design & Construct | Bushfire Manage. Plan (Guidance)                                                                                         | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| Prevent bushfire ignition by managing heat energy sources                                                                                                                               | 1.9    | Robust and effective site operational procedures                  | ✓                                                                                                                          | High                                    |                                                                                                                                |                           | ✓                                                                                                                        | ✓                          | ✓                         |                          | ✓                         | ✓                       |
|                                                                                                                                                                                         | 1.10   | Develop planning and management procedures for prescribed burning |                                                                                                                            | N/A                                     |                                                                                                                                |                           |                                                                                                                          |                            |                           |                          |                           |                         |
|                                                                                                                                                                                         | 1.11   | Design and construct equipment to prevent airborne ignition       | ✓                                                                                                                          | Medium                                  |                                                                                                                                | ✓                         |                                                                                                                          |                            |                           |                          |                           |                         |
|                                                                                                                                                                                         | 1.12   | Actively enforce activity restrictions                            | ✓                                                                                                                          | High                                    |                                                                                                                                |                           | ✓                                                                                                                        | ✓                          |                           |                          | ✓                         | ✓                       |
|                                                                                                                                                                                         | 1.13   | Monitor and penalise illegal activity                             |                                                                                                                            | N/A                                     |                                                                                                                                |                           |                                                                                                                          |                            |                           |                          |                           |                         |
|                                                                                                                                                                                         | 1.14   | Bushfire awareness and 'good practices' education                 |                                                                                                                            | Medium                                  |                                                                                                                                |                           | ✓                                                                                                                        | ✓                          |                           |                          | ✓                         | ✓                       |
| Prevent bushfire ignition by managing the interactions of heat energy                                                                                                                   | 1.15   | Barriers (shielding) between ignition sources and fuels           | ✓                                                                                                                          | High                                    |                                                                                                                                | ✓                         |                                                                                                                          |                            |                           |                          |                           |                         |
|                                                                                                                                                                                         | 1.16   | Equipment design and construction to reduce heat transfer         | ✓                                                                                                                          | Medium                                  |                                                                                                                                | ✓                         |                                                                                                                          |                            |                           |                          |                           |                         |
|                                                                                                                                                                                         | 1.17   | Separation distance between ignition sources and fuels            | ✓                                                                                                                          | Highest                                 |                                                                                                                                | ✓                         |                                                                                                                          |                            |                           |                          |                           |                         |

| <b>BUSHFIRE HAZARD</b><br><b>THREAT REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br>All Implemented ('Existing' & 'Planned') and<br>'Additionally Recommended' Protection Measures |        |                                | <b>IDENTIFICATION OF<br/>'ADDITIONALLY<br/>RECOMMENDED'<br/>(EXTRA) MEASURES AND<br/>THEIR IMPLEMENTATION<br/>PRIORITY</b> |                                         | <b>APPLICATION GUIDANCE</b><br><br>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures |                           |                                                                                                                              |                            |                           |                          |                           |                         |
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|                                                                                                                                                                                         |        |                                | <b>EXTRA<br/>MEASURE</b>                                                                                                   | <b>PRIORITY<br/>RATING <sup>2</sup></b> | <b>DOCUMENTS<br/>REQUIRED FOR<br/>PLANNING FUTURE<br/>DEVELOPMENT<br/>AND/OR RETROFIT</b>                                      |                           | <b>OPERATIONAL DOCUMENTS RELEVANT TO SITE USE</b><br><br>BPP: remove non-applicable document headings and leave column blank |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                                | Ref No | Brief Description <sup>1</sup> |                                                                                                                            |                                         | Bushfire Manage. Plan (Planning)                                                                                               | Inform Design & Construct | Bushfire Manage. Plan (Guidance)                                                                                             | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| sources and fuels                                                                                                                                                                       |        |                                |                                                                                                                            |                                         |                                                                                                                                |                           |                                                                                                                              |                            |                           |                          |                           |                         |

<sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Section 5.1.1.1

<sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation.

## 5.5.2 EXPOSURE REDUCING MEASURES – PERSONS

| <b>PERSONS</b><br><b>EXPOSURE REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br><b>All Implemented ('Existing' &amp; 'Planned') and<br/> 'Additionally Recommended' Protection Measures</b> |                                                |                                                                | <b>IDENTIFICATION OF<br/> 'ADDITIONALLY<br/> RECOMMENDED'<br/> MEASURES AND THEIR<br/> IMPLEMENTATION<br/> PRIORITY</b> |                                          | <b>APPLICATION GUIDANCE</b><br><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                                 |                                              |                                  |                                 |                                |                                 |                               |
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|                                                                                                                                                                                                |                                                |                                                                |                                                                                                                         |                                          | <b>PLANNING FUTURE<br/> DEVELOPMENT</b>                                                                                               |                                 | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b> |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                                |                                                |                                                                | <b>EXTRA<br/> MEASURE</b>                                                                                               | <b>PRIORITY<br/> RATING <sup>2</sup></b> | Bushfire<br>Manage.<br>Plan<br>(Planning)                                                                                             | Inform<br>Design &<br>Construct | Bushfire<br>Manage.<br>Plan<br>(Guidance)    | Site<br>Operations<br>Procedures | Annual Site<br>Works<br>Program | Prescribed<br>Burning<br>Guide | Site<br>Emergency<br>Plan/Guide | Bushfire<br>Emergency<br>Plan |
| The Protection<br>Mechanism                                                                                                                                                                    | Ref<br>No                                      | Brief Description <sup>1</sup>                                 |                                                                                                                         |                                          |                                                                                                                                       |                                 |                                              |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                                | Persons Located Onsite and Temporarily Offsite |                                                                |                                                                                                                         |                                          |                                                                                                                                       |                                 |                                              |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                                | 2.1                                            | Stay away from the subject site                                |                                                                                                                         | Medium                                   | ✓                                                                                                                                     | ✓                               | ✓                                            | ✓                                |                                 |                                | ✓                               |                               |
|                                                                                                                                                                                                | 2.4                                            | Relocate (evacuate) to designated safer offsite location(s)    | ✓                                                                                                                       | High                                     | ✓                                                                                                                                     | ✓                               | ✓                                            | ✓                                |                                 |                                | ✓                               | ✓                             |
|                                                                                                                                                                                                | 2.6                                            | Safer pathways for onsite movement                             | ✓                                                                                                                       | Highest                                  |                                                                                                                                       | ✓                               | ✓                                            |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                                | 2.7                                            | Pre-emptively relocate to designated safer offsite location(s) | ✓                                                                                                                       | High                                     | ✓                                                                                                                                     |                                 | ✓                                            | ✓                                |                                 |                                | ✓                               | ✓                             |
|                                                                                                                                                                                                | Persons on Access / Egress Routes in Vehicles  |                                                                |                                                                                                                         |                                          |                                                                                                                                       |                                 |                                              |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                                | 3.1                                            | Locating route away from adjacent hazards                      | ✓                                                                                                                       | Lowest                                   | ✓                                                                                                                                     |                                 |                                              |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                                | 3.2                                            | Egress routes located to ensure driving away from hazard       | ✓                                                                                                                       | Medium                                   | ✓                                                                                                                                     |                                 |                                              |                                  | ✓                               |                                |                                 |                               |
|                                                                                                                                                                                                | 3.3                                            | Greater road width                                             | ✓                                                                                                                       | Medium                                   | ✓                                                                                                                                     |                                 |                                              |                                  | ✓                               |                                |                                 |                               |
|                                                                                                                                                                                                | 3.4                                            | Reduce and maintain road verge fuel to low threat state        | ✓                                                                                                                       | Medium                                   | ✓                                                                                                                                     |                                 |                                              |                                  | ✓                               |                                |                                 |                               |

| <b>PERSONS</b><br><b>EXPOSURE REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br><b>All Implemented ('Existing' &amp; 'Planned') and 'Additionally Recommended' Protection Measures</b>                                                                                 |        |                                                   | <b>IDENTIFICATION OF 'ADDITIONALLY RECOMMENDED' MEASURES AND THEIR IMPLEMENTATION PRIORITY</b> |                                     | <b>APPLICATION GUIDANCE</b><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                           |                                              |                            |                           |                          |                           |                         |
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|                                                                                                                                                                                                                                                                           |        |                                                   | <b>EXTRA MEASURE</b>                                                                           | <b>PRIORITY RATING <sup>2</sup></b> | <b>PLANNING FUTURE DEVELOPMENT</b>                                                                                                |                           | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b> |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                                                                                                                  | Ref No | Brief Description <sup>1</sup>                    |                                                                                                |                                     | Bushfire Manage. Plan (Planning)                                                                                                  | Inform Design & Construct | Bushfire Manage. Plan (Guidance)             | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| Establish shielding from relevant bushfire hazard threats                                                                                                                                                                                                                 | 2.10   | On-site shelter building – not a 'vulnerable' use | ✓                                                                                              | High                                | ✓                                                                                                                                 | ✓                         |                                              |                            |                           |                          |                           |                         |
| <sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Section 5.3.1.1 and Section 5.3.2.1.<br><sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation. |        |                                                   |                                                                                                |                                     |                                                                                                                                   |                           |                                              |                            |                           |                          |                           |                         |



### 5.5.3 EXPOSURE REDUCING MEASURES – ALL STRUCTURES AND MATERIALS STORED OUTDOORS

| <b>ALL STRUCTURES &amp; MATERIALS STORED OUTDOORS</b><br><b>EXPOSURE REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br><b>All Implemented ('Existing' &amp; 'Planned') and 'Additionally Recommended' Protection Measures</b> |                          |                                                                               | <b>IDENTIFICATION OF 'ADDITIONALLY RECOMMENDED' MEASURES AND THEIR IMPLEMENTATION PRIORITY</b> |                              | <b>APPLICATION GUIDANCE</b><br><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                           |                                       |                            |                           |                          |                           |                         |
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| The Protection Mechanism                                                                                                                                                                                                         | Ref No                   | Brief Description <sup>1</sup>                                                | EXTRA MEASURE                                                                                  | PRIORITY RATING <sup>2</sup> | PLANNING FUTURE DEVELOPMENT                                                                                                           |                           | OPERATIONAL – AS RELEVANT TO SITE USE |                            |                           |                          |                           |                         |
|                                                                                                                                                                                                                                  |                          |                                                                               |                                                                                                |                              | Bushfire Manage. Plan (Planning)                                                                                                      | Inform Design & Construct | Bushfire Manage. Plan (Guidance)      | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| Establish sufficient separation from relevant bushfire hazard threats                                                                                                                                                            | 4.2<br>5.2<br>6.2<br>6.1 | Design - use of non-vegetated areas and/or managed public open space          | ✓                                                                                              | Medium                       |                                                                                                                                       | ✓                         |                                       |                            |                           |                          |                           |                         |
|                                                                                                                                                                                                                                  | 4.3<br>5.3<br>6.3<br>6.2 | Landscaping - asset protection zone (APZ)                                     | ✓                                                                                              | Highest                      | ✓                                                                                                                                     |                           | ✓                                     |                            | ✓                         |                          |                           |                         |
|                                                                                                                                                                                                                                  | 4.4<br>5.4               | Landscaping - tree location                                                   | ✓                                                                                              | High                         | ✓                                                                                                                                     |                           | ✓                                     |                            | ✓                         |                          |                           |                         |
|                                                                                                                                                                                                                                  | 4.6<br>5.6<br>6.3        | Separation from stored flammable products – fuels / other hazardous materials | ✓                                                                                              | Highest                      | ✓                                                                                                                                     |                           | ✓                                     | ✓                          |                           |                          | ✓                         |                         |
|                                                                                                                                                                                                                                  | 4.7<br>5.7<br>6.4        | Separation from stored and constructed combustible items                      | ✓                                                                                              | Highest                      |                                                                                                                                       |                           | ✓                                     | ✓                          |                           |                          | ✓                         |                         |
| Establish shielding from relevant                                                                                                                                                                                                | 4.8<br>5.8<br>6.5        | Constructed barrier – shielding from bushfire                                 |                                                                                                | Medium                       |                                                                                                                                       | ✓                         |                                       |                            |                           |                          |                           |                         |

| <b>ALL STRUCTURES &amp; MATERIALS STORED OUTDOORS</b><br><b>EXPOSURE REDUCING PROTECTION MEASURES <sup>1</sup></b><br><b>All Implemented ('Existing' &amp; 'Planned') and 'Additionally Recommended' Protection Measures</b>                                                         |                     |                                                         | <b>IDENTIFICATION OF 'ADDITIONALLY RECOMMENDED' MEASURES AND THEIR IMPLEMENTATION PRIORITY</b> |                              | <b>APPLICATION GUIDANCE</b><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                           |                                              |                            |                           |                          |                           |                         |
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|                                                                                                                                                                                                                                                                                      |                     |                                                         |                                                                                                |                              | <b>PLANNING FUTURE DEVELOPMENT</b>                                                                                                |                           | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b> |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                                                                                                                             | Ref No              | Brief Description <sup>1</sup>                          | EXTRA MEASURE                                                                                  | PRIORITY RATING <sup>2</sup> | Bushfire Manage. Plan (Planning)                                                                                                  | Inform Design & Construct | Bushfire Manage. Plan (Guidance)             | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| bushfire hazard threats                                                                                                                                                                                                                                                              | 4.9<br>5.9<br>6.6   | Constructed barrier – shielding from consequential fire | ✓                                                                                              | Medium                       |                                                                                                                                   | ✓                         |                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                                                                                                                      | 4.11<br>5.11<br>6.8 | Planted vegetation barrier                              | ✓                                                                                              | Medium                       | ✓                                                                                                                                 |                           | ✓                                            |                            | ✓                         |                          |                           |                         |
|                                                                                                                                                                                                                                                                                      | 4.12<br>5.12        | Shield operation critical non-structural elements       | ✓                                                                                              | Highest                      |                                                                                                                                   | ✓                         | ✓                                            |                            |                           |                          | ✓                         |                         |
| <sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Sections 5.3.3.1. and Section 5.3.4.1 & 5.3.5.1<br><sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation. |                     |                                                         |                                                                                                |                              |                                                                                                                                   |                           |                                              |                            |                           |                          |                           |                         |

#### 5.5.4 VULNERABILITY REDUCING MEASURES – PERSONS

| <b>PERSONS</b><br><b>VULNERABILITY REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br>All Implemented ('Existing' & 'Planned') and<br>'Additionally Recommended' Protection Measures |                                                |                                                                                              | <b>IDENTIFICATION OF<br/>'ADDITIONALLY<br/>RECOMMENDED'<br/>MEASURES AND THEIR<br/>IMPLEMENTATION<br/>PRIORITY</b> |                                         | <b>APPLICATION GUIDANCE</b><br><br>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures |                                 |                                                                                                                     |                                  |                                 |                                |                                 |                               |
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|                                                                                                                                                                                        |                                                |                                                                                              |                                                                                                                    |                                         | <b>PLANNING FUTURE<br/>DEVELOPMENT</b>                                                                                         |                                 | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b><br>BPP: remove non-applicable document headings and leave column blank |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                        |                                                |                                                                                              | <b>EXTRA<br/>MEASURE</b>                                                                                           | <b>PRIORITY<br/>RATING <sup>2</sup></b> | Bushfire<br>Manage.<br>Plan<br>(Planning)                                                                                      | Inform<br>Design &<br>Construct | Bushfire<br>Manage.<br>Plan<br>(Guidance)                                                                           | Site<br>Operations<br>Procedures | Annual Site<br>Works<br>Program | Prescribed<br>Burning<br>Guide | Site<br>Emergency<br>Plan/Guide | Bushfire<br>Emergency<br>Plan |
| The Protection Mechanism                                                                                                                                                               | Ref No                                         | Brief Description <sup>1</sup>                                                               |                                                                                                                    |                                         |                                                                                                                                |                                 |                                                                                                                     |                                  |                                 |                                |                                 |                               |
| Transport and multiple evacuation destinations and routes available                                                                                                                    | Persons Located Onsite and Temporarily Offsite |                                                                                              |                                                                                                                    |                                         |                                                                                                                                |                                 |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                        | 7.1                                            | Sufficient evacuation transport available                                                    |                                                                                                                    | Lowest                                  |                                                                                                                                |                                 | ✓                                                                                                                   |                                  |                                 |                                | ✓                               | ✓                             |
|                                                                                                                                                                                        | 7.2                                            | Multiple safer offsite locations available                                                   |                                                                                                                    | High                                    |                                                                                                                                |                                 | ✓                                                                                                                   |                                  |                                 |                                | ✓                               | ✓                             |
| Provision of bushfire emergency information and education                                                                                                                              | 7.3                                            | Develop a bushfire emergency plan                                                            |                                                                                                                    | High                                    |                                                                                                                                |                                 | ✓                                                                                                                   |                                  |                                 |                                | ✓                               | ✓                             |
|                                                                                                                                                                                        | 7.4                                            | Relevant operational documents to contain the bushfire protection measures to be implemented | ✓                                                                                                                  | High                                    |                                                                                                                                |                                 | ✓                                                                                                                   |                                  |                                 |                                | ✓                               | ✓                             |
|                                                                                                                                                                                        | 7.5                                            | Prominent display of bushfire emergency information                                          |                                                                                                                    | High                                    |                                                                                                                                |                                 | ✓                                                                                                                   |                                  |                                 |                                | ✓                               | ✓                             |
|                                                                                                                                                                                        | 7.6                                            | Direct to Persons Emergency Messaging System                                                 | ✓                                                                                                                  | High                                    |                                                                                                                                |                                 | ✓                                                                                                                   |                                  |                                 |                                | ✓                               |                               |
|                                                                                                                                                                                        | 7.7                                            | Egress pathway signage                                                                       | ✓                                                                                                                  | Medium                                  |                                                                                                                                |                                 | ✓                                                                                                                   |                                  |                                 |                                | ✓                               |                               |

| <b>PERSONS</b><br><b>VULNERABILITY REDUCING PROTECTION MEASURES <sup>1</sup></b><br>All Implemented ('Existing' & 'Planned') and<br>'Additionally Recommended' Protection Measures |                                               |                                                                  | <b>IDENTIFICATION OF<br/>'ADDITIONALLY<br/>RECOMMENDED'<br/>MEASURES AND THEIR<br/>IMPLEMENTATION<br/>PRIORITY</b> |                              | <b>APPLICATION GUIDANCE</b><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                           |                                                                                                                     |                            |                           |                          |                           |                         |
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|                                                                                                                                                                                    |                                               |                                                                  |                                                                                                                    |                              | <b>PLANNING FUTURE<br/>DEVELOPMENT</b>                                                                                            |                           | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b><br>BPP: remove non-applicable document headings and leave column blank |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                           | Ref No                                        | Brief Description <sup>1</sup>                                   | EXTRA MEASURE                                                                                                      | PRIORITY RATING <sup>2</sup> | Bushfire Manage. Plan (Planning)                                                                                                  | Inform Design & Construct | Bushfire Manage. Plan (Guidance)                                                                                    | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
|                                                                                                                                                                                    | 7.8                                           | Personnel are trained to implement the bushfire emergency plan   |                                                                                                                    | Highest                      |                                                                                                                                   | ✓                         | ✓                                                                                                                   |                            | ✓                         |                          | ✓                         | ✓                       |
| Onsite persons capable of managing a bushfire emergency are available                                                                                                              | 7.12                                          | Onsite persons available to manage bushfire emergency procedures | ✓                                                                                                                  | Highest                      |                                                                                                                                   |                           | ✓                                                                                                                   | ✓                          |                           |                          | ✓                         |                         |
|                                                                                                                                                                                    | 7.13                                          | Onsite persons can operate firefighting equipment                | ✓                                                                                                                  | Highest                      |                                                                                                                                   |                           |                                                                                                                     |                            |                           |                          |                           |                         |
|                                                                                                                                                                                    | 7.14                                          | External emergency response services available                   |                                                                                                                    | Highest                      |                                                                                                                                   |                           | ✓                                                                                                                   |                            |                           |                          | ✓                         | ✓                       |
| Lower risk road construction (design and materials)                                                                                                                                | Persons on Access / Egress Routes in Vehicles |                                                                  |                                                                                                                    |                              |                                                                                                                                   |                           |                                                                                                                     |                            |                           |                          |                           |                         |
|                                                                                                                                                                                    | 8.1                                           | Greater road width                                               | ✓                                                                                                                  | Medium                       |                                                                                                                                   | ✓                         |                                                                                                                     |                            |                           |                          |                           |                         |
|                                                                                                                                                                                    | 8.4                                           | Stable road surfaces                                             |                                                                                                                    | Medium                       | ✓                                                                                                                                 | ✓                         | ✓                                                                                                                   |                            | ✓                         |                          |                           |                         |

| <b>PERSONS</b><br><b>VULNERABILITY REDUCING PROTECTION MEASURES <sup>1</sup></b><br><b>All Implemented ('Existing' &amp; 'Planned') and 'Additionally Recommended' Protection Measures</b>                                                                               |        |                                              | <b>IDENTIFICATION OF 'ADDITIONALLY RECOMMENDED' MEASURES AND THEIR IMPLEMENTATION PRIORITY</b> |                              | <b>APPLICATION GUIDANCE</b><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                           |                                                                                                                            |                            |                           |                          |                           |                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|-------------------------|
|                                                                                                                                                                                                                                                                          |        |                                              |                                                                                                |                              | <b>PLANNING FUTURE DEVELOPMENT</b>                                                                                                |                           | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b><br><i>BPP: remove non-applicable document headings and leave column blank</i> |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                                                                                                                 | Ref No | Brief Description <sup>1</sup>               | EXTRA MEASURE                                                                                  | PRIORITY RATING <sup>2</sup> | Bushfire Manage. Plan (Planning)                                                                                                  | Inform Design & Construct | Bushfire Manage. Plan (Guidance)                                                                                           | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| Evacuees are self-sufficient and have local awareness                                                                                                                                                                                                                    | 8.8    | Self-sufficient persons with local awareness | ✓                                                                                              | High                         |                                                                                                                                   |                           | ✓                                                                                                                          | ✓                          |                           |                          | ✓                         |                         |
| Evacuees are self-sufficient and have local awareness and own transport                                                                                                                                                                                                  | 8.9    | Onsite persons have own transport            | ✓                                                                                              | Medium                       |                                                                                                                                   |                           | ✓                                                                                                                          | ✓                          |                           |                          | ✓                         |                         |
| <sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Section 5.4.1.1 and Section 5.3.5.1<br><sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation. |        |                                              |                                                                                                |                              |                                                                                                                                   |                           |                                                                                                                            |                            |                           |                          |                           |                         |

### 5.5.5 VULNERABILITY REDUCING MEASURES – STRUCTURES

| <b>STRUCTURES</b><br><b>VULNERABILITY REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br>All Implemented ('Existing' & 'Planned') and<br>'Additionally Recommended' Protection Measures |                             |                                                                           | <b>IDENTIFICATION OF<br/>'ADDITIONALLY<br/>RECOMMENDED'<br/>MEASURES AND THEIR<br/>IMPLEMENTATION<br/>PRIORITY</b> |                                         | <b>APPLICATION GUIDANCE</b><br><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                                 |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------|--------------------------------|---------------------------------|-------------------------------|
|                                                                                                                                                                                           |                             |                                                                           |                                                                                                                    |                                         | <b>PLANNING FUTURE<br/>DEVELOPMENT</b>                                                                                                |                                 | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b><br>BPP: remove non-applicable document headings and leave column blank |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           |                             |                                                                           | <b>EXTRA<br/>MEASURE</b>                                                                                           | <b>PRIORITY<br/>RATING <sup>2</sup></b> | Bushfire<br>Manage.<br>Plan<br>(Planning)                                                                                             | Inform<br>Design &<br>Construct | Bushfire<br>Manage.<br>Plan<br>(Guidance)                                                                           | Site<br>Operations<br>Procedures | Annual Site<br>Works<br>Program | Prescribed<br>Burning<br>Guide | Site<br>Emergency<br>Plan/Guide | Bushfire<br>Emergency<br>Plan |
| The Protection Mechanism                                                                                                                                                                  | Ref No                      | Brief Description <sup>1</sup>                                            |                                                                                                                    |                                         |                                                                                                                                       |                                 |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           | 9.1<br>10.1                 | Construct to AS 3959:2018                                                 |                                                                                                                    | Medium                                  |                                                                                                                                       | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           | 9.2<br>10.2                 | Construct to NASH Standard                                                | ✓                                                                                                                  | Highest                                 |                                                                                                                                       | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           | 9.3<br>10.3                 | Construction materials for external and internal cavity building elements | ✓                                                                                                                  | Medium                                  |                                                                                                                                       | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           | 9.4<br>12.4<br>14.4<br>15.1 | Construction materials for consequential fire fuels                       | ✓                                                                                                                  | Medium                                  |                                                                                                                                       |                                 | ✓                                                                                                                   | ✓                                |                                 |                                | ✓                               | ✓                             |
|                                                                                                                                                                                           | 9.5<br>10.5                 | Construction design/materials resistant to high wind damage               | ✓                                                                                                                  | High                                    |                                                                                                                                       | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           | 9.7<br>10.7                 | Construction of electricity supply                                        | ✓                                                                                                                  | High                                    |                                                                                                                                       | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           | 9.8<br>10.8                 | Minimise re-entrant detail to minimise debris and ember accumulation      | ✓                                                                                                                  | Lowest                                  |                                                                                                                                       | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                           | 9.9<br>10.9                 | Minimise debris and ember trapping surfaces                               | ✓                                                                                                                  | Lowest                                  |                                                                                                                                       | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |



| <b>STRUCTURES</b><br><b>VULNERABILITY REDUCING PROTECTION MEASURES <sup>1</sup></b><br>All Implemented ('Existing' & 'Planned') and<br>'Additionally Recommended' Protection Measures |               |                                                                                 | <b>IDENTIFICATION OF<br/>'ADDITIONALLY<br/>RECOMMENDED'<br/>MEASURES AND THEIR<br/>IMPLEMENTATION<br/>PRIORITY</b> |                                 | <b>APPLICATION GUIDANCE</b><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                                 |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------|--------------------------------|---------------------------------|-------------------------------|
|                                                                                                                                                                                       |               |                                                                                 |                                                                                                                    |                                 | <b>PLANNING FUTURE<br/>DEVELOPMENT</b>                                                                                            |                                 | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b><br>BPP: remove non-applicable document headings and leave column blank |                                  |                                 |                                |                                 |                               |
| The<br>Protection<br>Mechanism                                                                                                                                                        | Ref<br>No     | Brief Description <sup>1</sup>                                                  | EXTRA<br>MEASURE                                                                                                   | PRIORITY<br>RATING <sup>2</sup> | Bushfire<br>Manage.<br>Plan<br>(Planning)                                                                                         | Inform<br>Design &<br>Construct | Bushfire<br>Manage.<br>Plan<br>(Guidance)                                                                           | Site<br>Operations<br>Procedures | Annual Site<br>Works<br>Program | Prescribed<br>Burning<br>Guide | Site<br>Emergency<br>Plan/Guide | Bushfire<br>Emergency<br>Plan |
|                                                                                                                                                                                       | 9.10<br>10.10 | Protect roof plumbing to minimise debris and ember accumulation                 | ✓                                                                                                                  | Medium                          |                                                                                                                                   | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                       | 9.11<br>10.11 | Minimise construction cavities to minimise debris and ember accumulation        |                                                                                                                    | Highest                         |                                                                                                                                   | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                       | 9.12<br>10.12 | Minimise external openings to limit flame / radiant heat / ember / debris entry | ✓                                                                                                                  | High                            |                                                                                                                                   | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                       | 9.13<br>10.13 | Screen and seal gaps and penetrations                                           | ✓                                                                                                                  | High                            |                                                                                                                                   | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                       | 9.14<br>10.14 | Screen external doors and windows                                               | ✓                                                                                                                  | High                            |                                                                                                                                   | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
|                                                                                                                                                                                       | 10.16         | Construction materials for critical non-structural elements                     | ✓                                                                                                                  | Highest                         |                                                                                                                                   | ✓                               |                                                                                                                     |                                  |                                 |                                |                                 |                               |
| Availability of<br>a firefighting<br>response<br>capability                                                                                                                           | 9.16<br>10.17 | Firefighting water supply                                                       |                                                                                                                    | Highest                         | ✓                                                                                                                                 | ✓                               | ✓                                                                                                                   | ✓                                |                                 |                                | ✓                               |                               |
|                                                                                                                                                                                       | 9.17<br>10.18 | Firefighting equipment actively operated                                        | ✓                                                                                                                  | Highest                         |                                                                                                                                   |                                 | ✓                                                                                                                   | ✓                                |                                 |                                | ✓                               |                               |
|                                                                                                                                                                                       | 9.18<br>10.19 | Firefighting equipment passively operated                                       | ✓                                                                                                                  | Highest                         |                                                                                                                                   |                                 |                                                                                                                     |                                  |                                 |                                |                                 |                               |

| <b>STRUCTURES</b><br><b>VULNERABILITY REDUCING PROTECTION MEASURES <sup>1</sup></b><br><b>All Implemented ('Existing' &amp; 'Planned') and 'Additionally Recommended' Protection Measures</b>                                                                   |        |                                                          | <b>IDENTIFICATION OF 'ADDITIONALLY RECOMMENDED' MEASURES AND THEIR IMPLEMENTATION PRIORITY</b> |                                     | <b>APPLICATION GUIDANCE</b><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                           |                                                                                                                            |                            |                           |                          |                           |                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|-------------------------|
|                                                                                                                                                                                                                                                                 |        |                                                          | <b>EXTRA MEASURE</b>                                                                           | <b>PRIORITY RATING <sup>2</sup></b> | <b>PLANNING FUTURE DEVELOPMENT</b>                                                                                                |                           | <b>OPERATIONAL – AS RELEVANT TO SITE USE</b><br><i>BPP: remove non-applicable document headings and leave column blank</i> |                            |                           |                          |                           |                         |
| The Protection Mechanism                                                                                                                                                                                                                                        | Ref No | Brief Description <sup>1</sup>                           |                                                                                                |                                     | Bushfire Manage. Plan (Planning)                                                                                                  | Inform Design & Construct | Bushfire Manage. Plan (Guidance)                                                                                           | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
|                                                                                                                                                                                                                                                                 | 9.19   | Firefighting equipment operability maintained            | ✓                                                                                              | Highest                             |                                                                                                                                   | ✓                         | ✓                                                                                                                          | ✓                          |                           |                          | ✓                         |                         |
|                                                                                                                                                                                                                                                                 | 10.20  | Access via firebreaks provided                           |                                                                                                | Medium                              | ✓                                                                                                                                 |                           | ✓                                                                                                                          |                            | ✓                         |                          |                           |                         |
| Manage and maintain effectiveness of applied protection measures                                                                                                                                                                                                | 9.21   | Formal documents created to guide and enforce management | ✓                                                                                              | High                                |                                                                                                                                   |                           | ✓                                                                                                                          | ✓                          | ✓                         |                          | ✓                         |                         |
| <sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Sections 5.4.3.1 & 5.4.3.4<br><sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation. |        |                                                          |                                                                                                |                                     |                                                                                                                                   |                           |                                                                                                                            |                            |                           |                          |                           |                         |

## 5.5.6 VULNERABILITY REDUCING MEASURES – NON-BUILDING ACCOMMODATION & MATERIALS STORED OUTDOORS

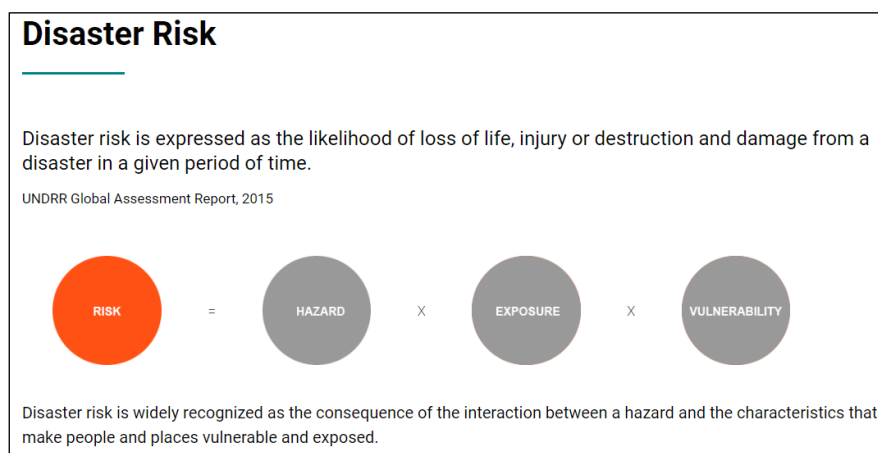
| <b>NON-BUILDING ACCOMMODATION &amp; MATERIALS STORED OUTDOORS</b><br><b>VULNERABILITY REDUCING PROTECTION MEASURES <sup>1</sup></b><br><br><b>All Implemented ('Existing' &amp; 'Planned') and 'Additionally Recommended' Protection Measures</b>                        |        |                                                          | <b>IDENTIFICATION OF 'ADDITIONALLY RECOMMENDED' MEASURES AND THEIR IMPLEMENTATION PRIORITY</b> |                              | <b>APPLICATION GUIDANCE</b><br><br><b>Identification of the Document(s) Recommended to Contain the Applicable Protection Measures</b> |                           |                                                                                                              |                            |                           |                          |                           |                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|-------------------------|
| The Protection Mechanism                                                                                                                                                                                                                                                 | Ref No | Brief Description <sup>1</sup>                           | EXTRA MEASURE                                                                                  | PRIORITY RATING <sup>2</sup> | PLANNING FUTURE DEVELOPMENT                                                                                                           |                           | OPERATIONAL – AS RELEVANT TO SITE USE<br>BPP: remove non-applicable document headings and leave column blank |                            |                           |                          |                           |                         |
|                                                                                                                                                                                                                                                                          |        |                                                          |                                                                                                |                              | Bushfire Manage. Plan (Planning)                                                                                                      | Inform Design & Construct | Bushfire Manage. Plan (Guidance)                                                                             | Site Operations Procedures | Annual Site Works Program | Prescribed Burning Guide | Site Emergency Plan/Guide | Bushfire Emergency Plan |
| Construction design and materials                                                                                                                                                                                                                                        | 11.1   | Construction materials for consequential fire fuels      | ✓                                                                                              | High                         |                                                                                                                                       | ✓                         |                                                                                                              |                            |                           |                          |                           |                         |
| Availability of a firefighting response capability                                                                                                                                                                                                                       | 11.2   | Firefighting water supply                                |                                                                                                | Highest                      | ✓                                                                                                                                     | ✓                         | ✓                                                                                                            | ✓                          |                           |                          | ✓                         |                         |
|                                                                                                                                                                                                                                                                          | 11.3   | Firefighting equipment actively operated                 | ✓                                                                                              | High                         |                                                                                                                                       |                           | ✓                                                                                                            | ✓                          |                           |                          | ✓                         |                         |
|                                                                                                                                                                                                                                                                          | 11.4   | Firefighting equipment passively operated                | ✓                                                                                              | Highest                      |                                                                                                                                       | ✓                         | ✓                                                                                                            | ✓                          |                           |                          | ✓                         |                         |
|                                                                                                                                                                                                                                                                          | 11.5   | Firefighting equipment operability maintained            | ✓                                                                                              | Highest                      |                                                                                                                                       |                           |                                                                                                              |                            |                           |                          |                           |                         |
|                                                                                                                                                                                                                                                                          | 11.6   | Access via firebreaks provided                           | ✓                                                                                              | Medium                       |                                                                                                                                       |                           | ✓                                                                                                            | ✓                          |                           |                          | ✓                         |                         |
| Manage and maintain effectiveness of applied protection measures                                                                                                                                                                                                         | 11.7   | Formal documents created to guide and enforce management | ✓                                                                                              | Highest                      |                                                                                                                                       |                           | ✓                                                                                                            | ✓                          | ✓                         |                          | ✓                         |                         |
| <sup>1</sup> The full description of each bushfire protection measure, the detail of the assessment and any recommendation, is presented in Section 5.4.5.1 and Section 5.4.5.2<br><sup>2</sup> Refer to Appendix A1.2.5 for implementation priority rating explanation. |        |                                                          |                                                                                                |                              |                                                                                                                                       |                           |                                                                                                              |                            |                           |                          |                           |                         |



## APPENDIX 1: THE APPLIED RISK ASSESSMENT PROCESS

### A1.1 THE RISK ASSESSMENT FRAMEWORK

To conduct the risk assessment, Bushfire Prone Planning (BPP) has adapted the concept for 'Understanding Disaster Risk' as recognised by the United Nations Office for Disaster Risk Reduction [46] and presented in Figure A1.1. This concept is also applied by CSIRO within their Bushfire Best Practice Guide [48].

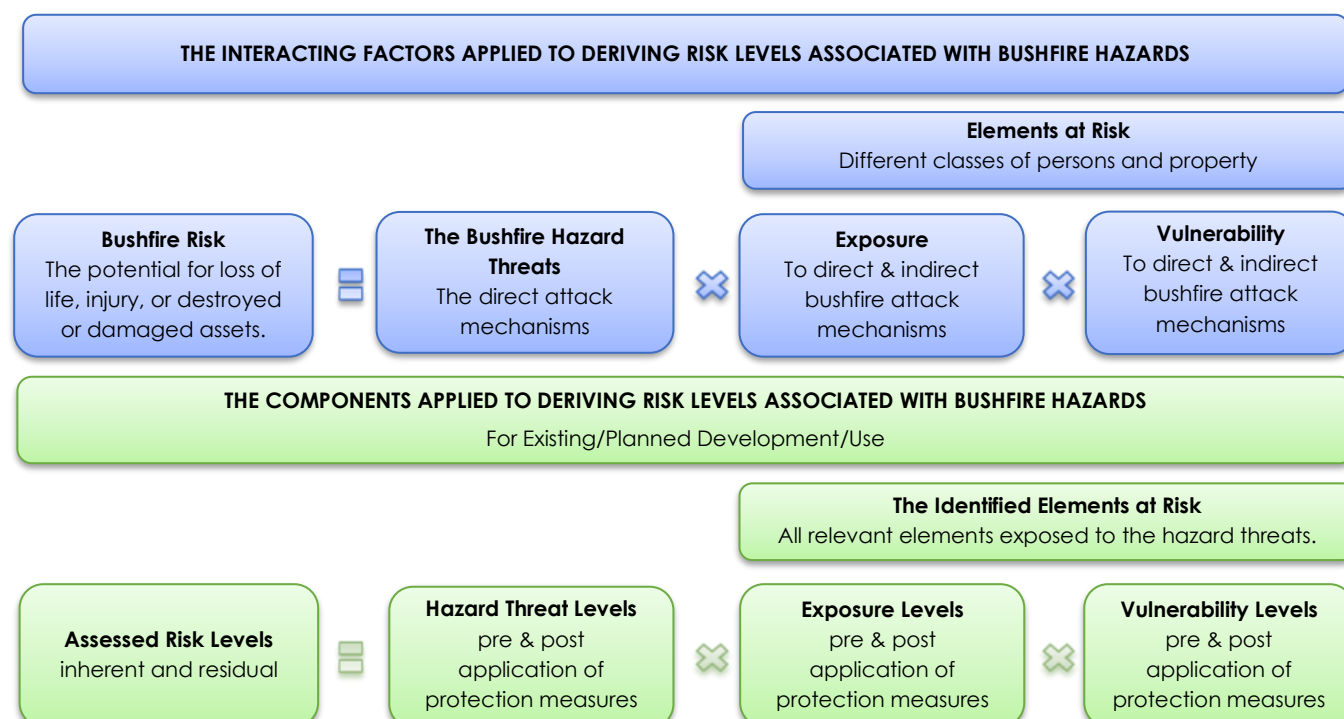


**Figure A1.1:** Concept for 'Understanding Disaster Risk' as recognised by the UN Office for Disaster Risk Reduction.

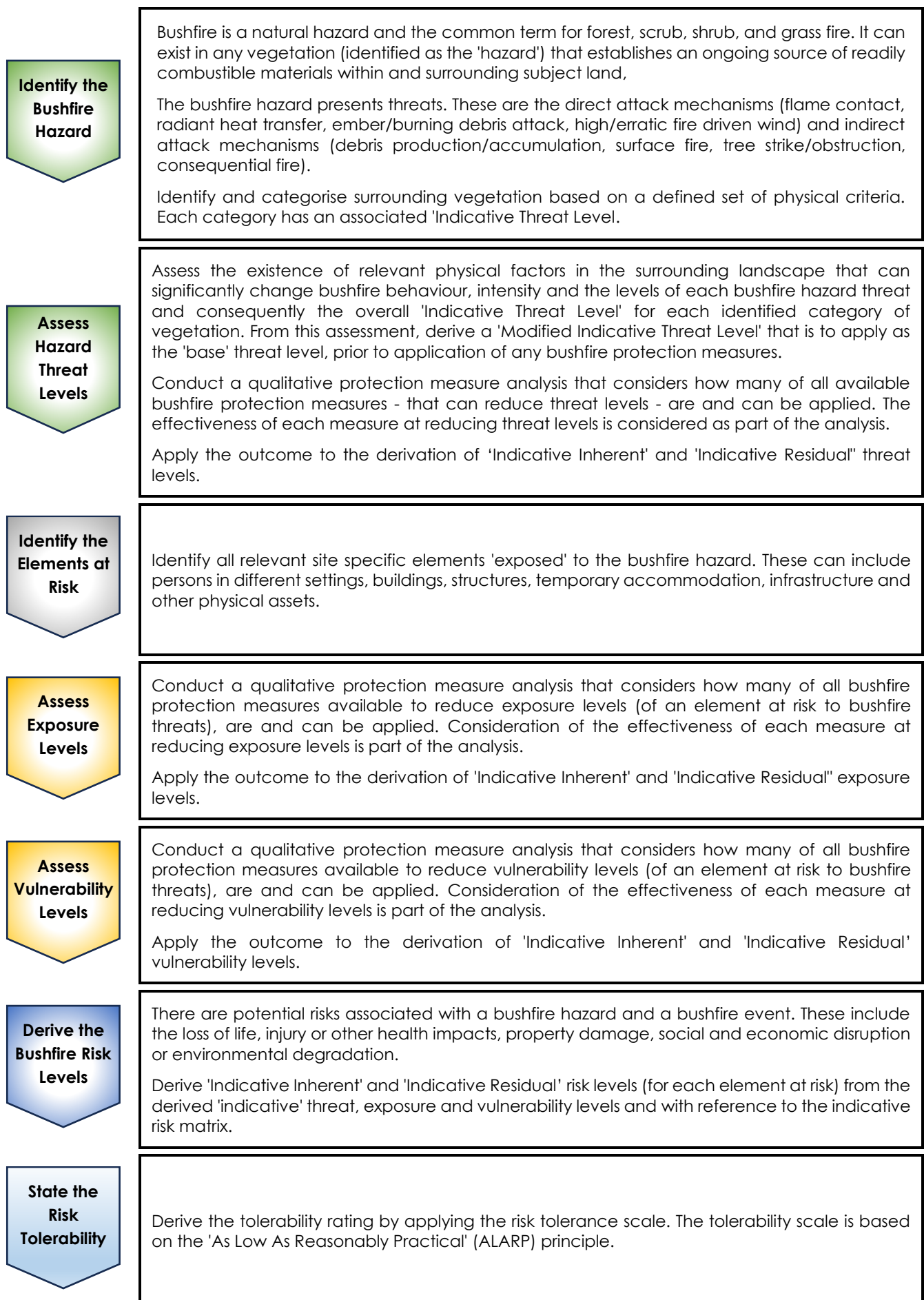
In applying this concept, bushfire risk can be considered a consequence of the interaction of bushfire hazard threats and the exposure and vulnerability of the elements at risk from those threats (i.e., the 'exposed elements' which can include various classes of persons and/or property).

The application of available bushfire protection measures will lower the level of risk associated with a bushfire by either (a) Reducing the number and/or level of hazard threats and/or (b) Reducing the level of exposure and/or vulnerability of the identified elements at risk.

Additional detail of the adaptation is presented in Figure A1.2 and Figure A1.3 (refer to the glossary for terminology information).



**Figure A1.2:** The framework of the applied bushfire risk assessment process.



**Figure A1.3:** Detail of applied indicative bushfire risk assessment process.



## A1.2 RISK ANALYSIS EXPLANATORY GUIDANCE

The risk analysis will derive risk levels as the outcome of the assessment. The risk level analysis can be conducted for either each element at risk separately and/or the proposed or existing development/use overall.

Different labels are applied to reported risk levels to indicate how they have been derived and what they refer to. These labels are:

1. The labels '**Indicative Risk Level**' and '**Determined Risk Level**' are used to identify what methodology has been applied in conducting the risk analysis. (Note: This Bushfire Risk Report **does not** derive 'determined' risk levels (but information is included to explain why); and
2. The labels '**Inherent Risk**' and '**Residual Risk**' are used to identify the point in time for which the risk level is being reported i.e., the existing state or a future state.

Additional detail is provided in the following sections and in the Glossary.

### A1.2.1 INDICATIVE RISK LEVEL AND DERIVATION MATRIX

Deriving 'Indicative Risk Levels' requires conducting a qualitative assessment. This establishes a subjective understanding of the level of risk that potentially exists and is intended to inform and assist with making planning and operational decisions.

The indicative risk level is derived from a mostly qualitative assessment of the site (some components of the assessment are quantitative in nature), the existing or planned development/use, the assessment of observable physical facts and the knowledge and relevant experience of the bushfire practitioner. The outcome is the provision of an informed and justifiable opinion regarding the levels of risk associated with a bushfire event.

This is an applicable and valuable process when the quantitative information required to derive a 'determined' risk level (refer to next section) is either not available or is not possible to generate for practical or economic reasons.

### JUSTIFICATION OF QUALITATIVE ANALYSIS APPROACH

Justification for deriving 'indicative' risk levels is based on the following assumptions:

1. There is a limited number of 'bushfire protection mechanisms' that can be applied to reducing hazard threats and the exposure and vulnerability of at risk elements.
2. There will be a range of individual bushfire protection measures associated with each 'protection mechanism'. The number of available protection measures for each 'protection mechanism' will vary dependent on the specifics of the site and its use, including scale, but effectively these will also have a practical limit.
3. Individual bushfire protection measures will vary in their standalone effectiveness at reducing hazard threat levels and reducing the exposure and vulnerability levels of elements at risk (refer to A1.2.4).
4. The greater the number of effective bushfire protection mechanisms and associated measures that are able to be applied, the lower the indicative risk level will be.

### DERIVATION OF THE INDICATIVE RISK LEVEL

For a given site/development/use, an indication of the level of risk associated with a bushfire event and its tolerability is derived by:

1. Assessing the 'indicative' hazard threat levels and the 'indicative' exposure and vulnerability levels of elements at risk by:
  - a) Assessing the potential levels of threat presented by the direct and indirect bushfire attack mechanisms of the identified bushfire hazard;
  - b) Assessing how many bushfire protection mechanisms and their associated protection measures are applicable and can be applied, compared to the total available; and
  - c) Applying an effectiveness weighting to each protection measure.
2. Derive the indicative risk level by applying the risk matrix presented in Table A1.1;

- Establish the tolerability of the risk by applying the 'As Low as Reasonably Practicable' (ALARP) principle and associated risk tolerance scale (refer to s A1.2.5).

Table A1.1: Risk matrix for deriving indicative risk levels from the assessed relative levels of hazard threats, and the exposure and vulnerability of elements at risk.

| INDICATIVE RISK LEVEL MATRIX |                               |                                    |         |              |          |             |
|------------------------------|-------------------------------|------------------------------------|---------|--------------|----------|-------------|
| Indicative Threat Level (a)  | Indicative Exposure Level (b) | Indicative Vulnerability Level (c) |         |              |          |             |
|                              |                               | Very Low (1)                       | Low (2) | Moderate (3) | High (4) | Extreme (5) |
| Very Low (1)                 | Very Low (1)                  | VL1                                | VL2     | VL3          | L4       | L5          |
|                              | Low (2)                       | VL2                                | VL3     | L4           | L5       | L6          |
|                              | Moderate (3)                  | VL3                                | L4      | L5           | L6       | M7          |
|                              | High (4)                      | L4                                 | L5      | L6           | M7       | M8          |
|                              | Extreme (5)                   | L5                                 | L6      | M7           | M8       | H9          |
| Low (2)                      | Very Low (1)                  | VL2                                | VL3     | L4           | L5       | L6          |
|                              | Low (2)                       | VL3                                | L4      | L5           | L6       | M7          |
|                              | Moderate (3)                  | L4                                 | L5      | L6           | M7       | M8          |
|                              | High (4)                      | L5                                 | L6      | M7           | M8       | H9          |
|                              | Extreme (5)                   | L6                                 | M7      | M8           | H9       | H10         |
| Moderate (3)                 | Very Low (1)                  | VL3                                | L4      | L5           | L6       | M7          |
|                              | Low (2)                       | L4                                 | L5      | L6           | M7       | M8          |
|                              | Moderate (3)                  | L5                                 | L6      | M7           | M8       | H9          |
|                              | High (4)                      | L6                                 | M7      | M8           | H9       | H10         |
|                              | Extreme (5)                   | M7                                 | M8      | H9           | H10      | H11         |
| High (4)                     | Very Low (1)                  | L4                                 | L5      | L6           | M7       | M8          |
|                              | Low (2)                       | L5                                 | L6      | M7           | M8       | H9          |
|                              | Moderate (3)                  | L6                                 | M7      | M8           | H9       | H10         |
|                              | High (4)                      | M7                                 | M8      | H9           | H10      | H11         |
|                              | Extreme (5)                   | M8                                 | H9      | H10          | H11      | E12         |
| Extreme (5)                  | Very Low (1)                  | L5                                 | L6      | M7           | M8       | H9          |
|                              | Low (2)                       | L6                                 | M7      | M8           | H9       | H10         |
|                              | Moderate (3)                  | M7                                 | M8      | H9           | H10      | H11         |
|                              | High (4)                      | M8                                 | H9      | H10          | H11      | E12         |
|                              | Extreme (5)                   | H9                                 | H10     | H11          | E12      | E13         |

Indicative risk level key: VL = very low, L = low, M = moderate, H = high, E = extreme.  
The qualitative relative levels are assigned a numerical value.  
The indicative risk value is calculated as = (a + b + c) – 2 and range from 1 (lowest) to 13 (greatest).  
The indicative risk levels are derived from an assigned a numerical range: very low = 1-3, low = 4-6, moderate = 7-8, high = 9-11, extreme = 12-13.

### A1.2.2 DETERMINED RISK LEVEL

**IMPORTANT: THIS BUSHFIRE RISK REPORT DOES NOT DERIVE DETERMINED BUSHFIRE RISK LEVELS.**

Deriving 'determined' risk levels requires conducting a quantitative assessment. This establishes an objective understanding of the level of risk that potentially exists and is intended to inform and assist with making planning and operational decisions.

The key difference from an 'indicative' risk level assessment is the requirement to apply a quantitative set of risk factor criteria against which hazard threat levels and the exposure and vulnerability levels of identified elements at risk to these threats can be objectively assessed.

These risk factor criteria would be developed and supported by a relevant government authority (exercising their responsibility), accepted by persons relying on the assessment and be available for the assessor to use. In addition, the corresponding risk level matrix and the risk tolerability scale are required.

It is necessary that:

1. The risk factor criteria reflect society's and/or community's expectations and preparedness/capacity to tolerate risk;
2. The information is standardised to the greatest extent possible so that it provides an accepted basis from which the determined risk level can be derived and be relied upon in making decisions;
3. The corresponding risk level matrix and the risk tolerability scale are developed to derive a risk level and tolerance level from the derived threat, exposure and vulnerability levels; and
4. Responsibility for development of the reference information is not left to individual assessors who have varied expertise, qualification and no approved responsibility to provide such information. Such an approach would not result in consistent and reliable assessment outcomes.

**Limitations:** Where the required reference information (that is researched, effective, functional and acceptable) has not been established and provided by the responsible authorities, determined risk levels cannot be derived.

#### RISK FACTOR CRITERIA

The required risk factor criteria would need to establish:

- What factors are to define the different 'determined' levels of hazard threats;
- What factors are to define the different 'determined' levels of exposure of elements at risk; and
- What factors are to define the different 'determined' levels of vulnerability of elements at risk.

#### RISK LEVEL MATRIX

The matrix would need to establish how the 'determined' levels of threat, exposure and vulnerability are to be applied in deriving the 'determined' risk level. Different sets of matrices to account for different development types, uses and scales would likely be required.

Different development types, uses and scales are potentially capable of tolerating different levels of risk and still be considered by the relevant authority (who are reflecting the understood society/community position), to remain acceptable or at least tolerable.

#### RISK TOLERANCE SCALE

After the 'determined' risk level has been derived after an assessment applying the risk factor criteria and the risk level matrix, a methodology is required to classify the risk level as either unacceptable, tolerable or acceptable.

### A1.2.3 INHERENT AND RESIDUAL RISK

In this Bushfire Risk Report, inherent risk is considered to be current situation risk after accounting for bushfire protection measures that are either already in place (for existing development/use) and/or are currently planned to be incorporated into the proposed development/use.

Inherent risk levels are derived before the application of any additional protection measures that have been identified and recommended by the bushfire consultant, and which subsequently determines the residual risk. If there are none, the residual risk is the same as the inherent risk. Refer to the Glossary for additional supporting information.

## A1.2.4 PROTECTION MEASURE EFFECTIVENESS RATINGS

### DERIVING AN EFFECTIVENESS RATING

As part of the qualitative risk assessment process, an effectiveness rating, established by the application of this table, is applied to each bushfire protection measure. The rating weights each bushfire protection measure's ability to reduce a hazard's threat levels or reduce the exposure and/or vulnerability levels of the elements at risk.

The greater the effectiveness the greater the contribution of a protection measure to the reduction in levels of risks associated with a bushfire event. It is also an important factor applied to the determination of the bushfire protection measure's implementation priority.

The effectiveness ratings incorporate the qualities of:

1. **Independent/Dependent:** A qualitative assessment of the extent to which a protection measure can reduce 'indicative' threat, exposure and vulnerability levels as a standalone measure as opposed to only providing an additive reduction by being a part of a package of protection measures; and
2. **Risk Reduction Potential:** A qualitative assessment of a protection measure's capacity to reduce the levels of risks associated with a bushfire event as a standalone risk measure.

The rating methodology assumes the greater the independence and risk reduction potential of a bushfire protection measure, the greater its effectiveness.

### DERIVING EFFECTIVENESS RATINGS FOR BUSHFIRE PROTECTION MEASURES

| Rating              | Protection Measure Characteristics and Capability                                                                                                                                                             |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Very High</b>    | Very significant risk reduction as an independent (standalone) measure. Impact on risk reduction is immediate and persistent in all scenarios.<br>A priority measure to be implemented wherever possible.     |
| <b>High</b>         | Material risk reduction as an independent (standalone) measure;                                                                                                                                               |
| <b>Medium</b>       | Alone the measure will have limited impact on risk reduction. It is dependent on providing additive value when combined with other protection measures to create a 'package' of bushfire protection measures. |
| <b>Not Relevant</b> | The measure is not relevant to the type of development/use. This is different to not being able to be applied – it is just not relevant to any configuration of the subject development/use.                  |

### A1.2.5 PROTECTION MEASURE IMPLEMENTATION PRIORITY RATINGS

The effectiveness of a bushfire protection measure at reducing 'relative' threat, exposure and vulnerability levels, is the primary determinant of the implementation priority rating (refer to Section A1.2.3 for effectiveness rating explanation).

However, the implementation priority rating, corresponding to each effectiveness rating, can be modified with appropriate consideration of factors that may constrain the implementation and ongoing management of the measure. A justifiable weighting for each of the factors may be incorporated into the assessment for differing scenarios, either by the consultant or applied later by the landowner/operator with their greater knowledge of specific factors.

The matrix is applied qualitatively to the determination of the implementation priority rating that will apply to a recommended bushfire protection measure in this Bushfire Risk Report.

#### DERIVING THE IMPLEMENTATION PRIORITY FOR BUSHFIRE PROTECTION MEASURES

| Deriving the Implementation Priority for Bushfire Protection Measures |                                          |                                                                                                                                                         |                                                                                     |                                                                                      |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|-----------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Derived Implementation Priority Rating                                | Primary Determinant Effectiveness Rating | Secondary Determinants - Constraints to Implementation and Management<br>[less constraints = potentially higher implementation priority and vice versa] |                                                                                     |                                                                                      |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|                                                                       |                                          | Restrictions from Government / Regulations                                                                                                              | Owner / Operator Acceptance                                                         | Community Acceptance                                                                 | Control of Land Restrictions                                                          | Financial Cost / Affordability                                                        | Knowledge and Ability to Apply Protection Measure                                     | Practicality and Ease of Implementation                                               | Requirement for Ongoing Implementation and Management                                 |
| Highest                                                               | Very High                                |                                                                      | Likely Alignment with Management Intent & Values                                    | Likely Majority Accept                                                               | No Constraints                                                                        | Likely Within Current Resource Capacity                                               | Past / Current Application Experience                                                 | Well Within Existing Capabilities                                                     | None - Passive                                                                        |
| High                                                                  | High                                     |                                                                                                                                                         |  |  |  |  |  |  |  |
| Medium                                                                | Medium                                   |                                                                                                                                                         |                                                                                     |                                                                                      |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
| Lowest                                                                |                                          | Significant Constraints                                                                                                                                 | Likely Strong Conflict with Management Intent & Values                              | Likely Majority Do Not Accept                                                        | Significant Constraints                                                               | Unlikely to be Affordable                                                             | None – Extensive Education / Training Required                                        | Not Practical                                                                         | Necessary - Active                                                                    |

## A1.2.6 RISK TOLERANCE SCALE

The application of a risk tolerance scale is necessary to:

1. Identify which exposed elements must be given priority for the development and application of bushfire protection measures; and
2. When planning approval is being sought, to identify if the residual risk levels can be considered as tolerable or acceptable and therefore potentially be approved for this factor.

### THE APPLIED SCALE

The risk tolerance scale applied in this Bushfire Risk Report is presented in Table A1.2. It incorporates the application of the 'As Low as Reasonably Practicable' (ALARP) Principle. An overview of this principle and justification for its application is presented on the following pages.

Table A1.2: The applied risk tolerance scale

| THE APPLIED RISK TOLERANCE SCALE - INCORPORATING THE ALARP PRINCIPLE |                                                                                                                                                                                                                                                                                                                                                             |                                              |                                        |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------|
| Indicative / Determined Risk Level                                   | Tolerability Description and Action Required                                                                                                                                                                                                                                                                                                                |                                              | Risk Tolerance Level <sup>1</sup>      |
| Extreme                                                              | The risks are unacceptable and require immediate implementation of risk management measures to eliminate or reduce risk to tolerable or acceptable levels.<br><br>Proposed development giving rise to risks in this region would not be approved unless there are exceptional reasons for the development to proceed.                                       |                                              | Unacceptable                           |
| High                                                                 | The risks are the most severe that can be tolerated but not unduly high. They require monitoring in the short term as risk management measures are likely to be needed in the short term given the intent should be to drive residual risk lower down the tolerable range where possible.                                                                   | Tolerance Regions Subject to ALARP Principle | Intolerable<br>- if <u>not</u> ALARP - |
| Moderate                                                             | The risk is approaching an acceptable level. It can be tolerated and requires monitoring in the short to medium term. Need to consider potential changes over time in the risk and/or techniques for reducing/eliminating risk.<br><br>Risk management measures may be needed to reduce risk to more acceptable levels where possible – or accept the risk. |                                              | Tolerable<br>- if ALARP -              |
|                                                                      |                                                                                                                                                                                                                                                                                                                                                             |                                              | Tolerable<br>- if <u>not</u> ALARP -   |
| Low                                                                  | The risk is accepted as it is generally regarded as insignificant or adequately controlled by existing measures. No additional risk management measures will be required in the short to medium term other than monitoring.                                                                                                                                 |                                              | Acceptable<br>- if ALARP -             |
| Very Low                                                             |                                                                                                                                                                                                                                                                                                                                                             |                                              | Acceptable                             |

<sup>1</sup> Refer to the glossary for definitions of the tolerance levels.

## THE ALARP PRINCIPLE

The 'As Low as Reasonably Practicable' (ALARP) Principle is based on the belief it is not possible to completely eliminate all risk involved, there will always be a certain level of risk remaining known as residual risk. The term is used to express the expected level of residual risk within a system, activity or, relevant to this document, within a proposed development/use, when good practice, judgement and duty of care are applied to decisions and operations.

The origins of the ALARP (As Low as Reasonably Practicable) principle are from United Kingdom case law and their regulatory framework. It is applied by their Health and Safety Executive (HSE) and is used by regulators and companies around the world as it provides a logical basis for managing risks.

The ALARP principle has been defined by the United Kingdom Health and Safety Executive (HSE-UK, 2001) to depict the concept that efforts to reduce risk should be continued until the incremental cost in doing so is grossly disproportionate to the value of the incremental risk reduction achieved (see figure). Incremental cost is defined in terms of time, effort, finance or other expenditure of resources – including loss of natural resources. Usually, each incremental reduction in risk will require a greater expenditure of resources.

This concept is depicted in Figure A3.1 where the triangle represents the decreasing risk and the diminishing proportional benefit as risk is reduced. There are also three regions shown in the figure into which general levels of residual risk can fall. The residual risk should fall either in the broadly acceptable region, or near the bottom of the tolerable region. This approach allows higher levels of safety to be provided where it is feasible.

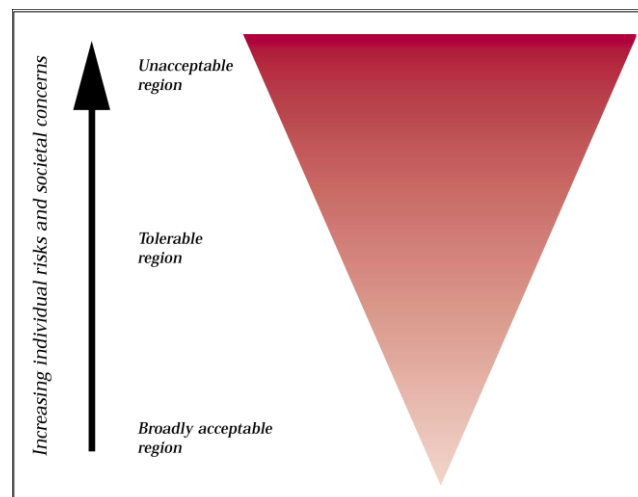


Figure A1.2: HSE framework for the tolerability of risk (source: HSE-UK, 2001)

Moving up the triangle from the region considered broadly acceptable, through a tolerable region (for which a greater range of risk can be considered), to an unacceptable region, represents increasing levels of 'risk' for a particular hazard or hazardous activity (determined through relevant risk analysis). Table A3.1 describes the risks that define each region.



Table A1.3: The risks associated with the risk tolerance regions (adapted from HSE-UK, 2001)

| THE ALARP PRINCIPLE – DEFINING THE REGIONS OF RISK TOLERANCE                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Unacceptable Region</b>                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>For practical purposes, a particular risk falling into this region is regarded as unacceptable whatever the level of benefits associated with the activity.</p> <p>Any activity, practice or use of land giving rise to risks falling in this region would, as a matter of principle, be not approved unless the activity or practice can be modified to reduce the degree of risk so that it falls in one of the regions below, or there are exceptional reasons for the activity, practice or use to be retained.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Tolerable Region</b>                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>Risks in this region are typical of the risks from activities that people are prepared to tolerate in order to secure benefits, in the expectation that:</p> <ul style="list-style-type: none"> <li>• The nature and level of the risks are properly assessed, and the results used properly to determine control measures. The assessment of the risks needs to be based on the best available scientific evidence and, where evidence is lacking, on the best available scientific advice;</li> <li>• The residual risks are not unduly high and kept as low as reasonably practicable. This is the region to which the ALARP principle applies; and</li> <li>• The risks are periodically reviewed to ensure that they still meet the ALARP criteria, for example, by ascertaining whether further or new control measures need to be introduced to take into account changes over time, such as new knowledge about the risk or the availability of new techniques for reducing or eliminating risks.</li> <li>• In practice and where possible, the intent should be that residual risk continues to be driven down the tolerable range so that it falls either in the broadly acceptable region or is near the bottom of the tolerable region, in keeping with the duty to ensure health, safety and welfare so far as is reasonably practicable as per the ALARP principal.</li> </ul> |
| <b>Broadly Acceptable Region</b>                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>Risks falling into this region are generally regarded as insignificant and adequately controlled. Regulators would not usually require further action to reduce risks unless reasonably practicable measures are available.</p> <p>The levels of risk characterising this region are comparable to those that people regard as insignificant or trivial in their daily lives. They are typical of the risk from activities that are inherently not very hazardous or from hazardous activities that can be, and are, readily controlled to produce very low risks.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>Note:</b> The risk tolerability framework is a conceptual model. The factors and processes that ultimately decide whether a risk is unacceptable, tolerable or broadly acceptable are dynamic in nature and are sometimes governed by the particular circumstances, time and environment in which the activity, practice or use occurs or is proposed. Standards change and public expectations vary between societies and change with time.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

#### APPLICATION OF THE ALARP PRINCIPLE IN AUSTRALIA

To contribute to justification for the use of the Principle in this bushfire risk report, it is noted that the following Australian guidelines also apply adaptations of the Principle:

- Australian Institute for Disaster Resilience, 2020; Land use Planning for Disaster Resilient Communities;
- WA Department of Mines, Industry Regulation and Safety, 2020; Petroleum safety and major hazard facility – guide. ALARP demonstration;
- NOPSEMA (Australia's offshore energy regulator), 2020; ALARP and risk assessment guidance notes;
- Department of Planning Lands and Heritage (DPLH), 2019; Coastal hazard risk management and adaptation planning guidelines;

- Planning Institute of Australia, 2015; National Land Use Planning Guidelines for Disaster Resilient Communities; and
- NERAG 2010, an earlier version of NERAG 2020, applied the ALARP Principle.

The following is taken from the 'National Land Use Planning Guidelines for Disaster Resilient Communities' (Planning Institute of Australia, 2015) and is also referred to in the document 'Land use Planning for Disaster Resilient Communities' (Australian Institute for Disaster Resilience, 2020).

*Of relevance to planners in the NERAG is the ALARP principle and how it is used in evaluating risks. According to NERAG, the ALARP principle is applied to define boundaries between risks that are generally intolerable, tolerable or broadly acceptable. The ALARP principle will help to prioritise a risk hierarchy and determine which risks require action and which do not. Those that are broadly acceptable naturally require little, if any, action while risks that are at an intolerable level require attention to bring them to a tolerable level.*

*According to NERAG, it is entirely appropriate and accepted practice that risks may be tolerated, provided that the risks are known and managed.*

*The ALARP principle is particularly relevant to planners and other built environment professionals as it provides the means to categorise risks according to their severity, and to assign risk treatment options accordingly.*

*It is important to note that the effect each hazard has on a community and its settlement is different, and therefore land use planning and building responses may not always be appropriate to treat the risk borne by a particular hazard. Equally, the effectiveness or strength of response provided by land use planning or building may not be sufficient to fully address the risk.*

*In addition, it is likely that through a normal natural hazard management process a range of treatment measures will be proposed, tested and implemented to provide a comprehensive approach to risk treatment that may involve other measures working in concert with land use planning or building responses.*

*The manner in which land use planning and building responses are deployed to treat specific instances of natural hazard risk will vary depending on location, information availability, community views, broader development intent for the settlement under analysis and the effect of complementary risk treatment measures.*

*However, the ALARP principle provides a good reference for demonstrating the land use responses for the various ALARP risk categories. Generally speaking, in areas of intolerable risk the strongest land use planning and building responses should apply. Conversely, in areas of acceptable risk only minimal controls should apply, if at all.*

*The most complex risk category for which to prescribe treatment from a land use and building perspective is those areas of tolerable risk. Such risks in existing settlements may not be sufficiently concerning to warrant severe use restrictions or relocation, however they will need treatment over time to ensure the risk does not increase. Treatment options in this instance may include limiting vulnerable uses in this area, restricting significant intensification of development, and promoting resilient urban design. Such areas of tolerable risk are also best avoided from a greenfield perspective to limit increases in future risk and costs associated with infrastructure failure in these locations that could otherwise been avoided.*

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## A1.2.7 ADDRESSING THE LIKELIHOOD OF A BUSHFIRE EVENT OCCURRING

### USING THE QUALITATIVE RISK ASSESSMENT APPROACH (NOTE: APPLIED IN THIS BUSHFIRE RISK REPORT)

In using a subjective approach the pragmatic assumption that a bushfire will occur is made. It is assumed a bushfire can occur within any timeframe and could result in loss or life or injury, or unacceptable damage to property and or unacceptable disruption to services.

This approach acknowledges that the requirements for fire of fuel, ignition source and oxygen will always exist. That is:

- The fire fuels being considered will always be there unless physically removed permanently;
- A potential ignition source will always exist through lightning and/or human activities; and
- The potential for adverse fire weather conditions to exist at some point within each year will always be present.

Additionally, the subjective assessment of the site specific indicative threat levels of the direct and indirect bushfire attack mechanisms associated with the bushfire hazard, by default and indirectly, effectively incorporate a likelihood component.

Also, where the costs of implementing the required bushfire protection measures to lower indicative risk levels is not excessive, it makes sense not to try to avoid these costs by considering that risk is reduced because likelihood is lower.

### USING THE QUANTITATIVE RISK ASSESSMENT APPROACH (NOTE: NOT APPLIED IN THIS BUSHFIRE RISK REPORT)

A quantitative approach will necessarily be based on the historical record of past bushfire events and determining the mathematical probability of a future event. This approach is problematic to achieving increased bushfire resilience at all stages of existing or proposed development/use for these reasons:

- Historical data may not be available or have enough data sets to be accurate;
- Historical data does not account for future changes in climate that may result in a different occurrence period. Consequently, further assumptions need to be made;
- Siting, design and construction of development to resist bushfire threats is easier, more practical (and likely economical), to incorporate at initial planning stages rather than the retro-establishment of protection measures when the considered likelihood of events increases over time for various reasons or tolerance of risk decreases;
- Time spent conducting historical research, performing statistical calculations and modifying risk levels, apart from being costly, is likely better spent assessing potential threat, exposure and vulnerability levels and developing appropriate protection measures; and
- The likelihood of occurrence cannot modify the levels of hazard threats, exposure or vulnerability. It can only be applied to reduce the overall risk level. That is, it would be applied as a modifying factor via the established risk level matrix and not the established risk factor criteria. The validity of incorporating such a factor may be indicated when, despite the existence of vegetation that can burn, there are other mitigating physical conditions that exist at the specific site that make the likelihood of ignition and severity of bushfire behaviour very low. How this is applied would need to be established by the authority establishing the relevant risk level matrix.

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## APPENDIX 2: ASSESSING BUSHFIRE HAZARD THREATS

### DEFINING THE BUSHFIRE HAZARD AND ITS THREATS

#### THE BUSHFIRE

For this assessment, a bushfire is considered to be the unplanned burning of a fire in vegetation of any type and structure. It is applied as a generic term to refer to forest fires, scrub/shrub fires and grass fires, which have differences of behaviour within and between the fire types, dependant on a range of variables. Key fire behaviours include rate of spread, flame height, intensity and spotting (i.e., ignition ahead of the fire front by embers/burning debris).

**Grassfire:** Note that grass fires are significantly different, and this is recognised in the assessment. Grass fire behaviour results in a much shorter duration fire, the embers produced being mostly consumed within the flame front and radiant heat flux dropping more quickly with distance from the fuel load - as indicated in the application of AS 3959:2018 methodology where 'Grassland' achieves a BAL-LOW rating at half the separation distance of all other classified vegetation. These differences are acknowledged in other jurisdictions:

*The risk posed by grass fires is different to that of fires in other vegetation types. Grass fires burn at a higher intensity and spread more rapidly with a shorter residence time. Embers produced by grass fires are smaller and fewer in number than those produced from forest fires. In recognition of the characteristics of grassland fire behaviour, the NSW RFS has developed a simplified set of Deeming Provisions for residential infill development (Planning for Bushfire Protection, RFS NSW, 2019).*

*While pastures, crops and native grasslands often experience fast moving fires, their intensity is usually insufficient to justify a land use planning response (Justin Leonard et al (2014): A new methodology for State-wide mapping of bushfire prone areas in Queensland, CSIRO, Australia)*

#### THE BUSHFIRE HAZARD

A bushfire hazard is the natural process/phenomenon of a bushfire event that gives rise to the associated risks of loss of life or injury or destroyed or damaged assets, which results in personal loss and economic loss.

The term bushfire hazard is necessarily applied to both the relevant vegetation as the source of the hazard and the bushfire event itself. This approach is aligned with the definition applied by the United Nations Office for Disaster Risk Reduction.

#### LAND USE PLANNING AND THE BUSHFIRE HAZARD THREATS TO BE ASSESSED

The bushfire hazard is a potential source of direct and indirect bushfire attack mechanisms (refer to A2.3 for additional information), that present threats to persons and property and give rise to the associated risks of loss of life or injury or destroyed or damaged assets.

**Direct Attack Mechanisms:** Of most relevance to land use planning are the bushfire threat levels generated by the direct attack mechanisms of:

- Flame contact;
- Radiant heat transfer; and
- Ember/burning debris attack.

Consequently, these are the bushfire hazard threats that are to be considered when assessing the potential bushfire hazard threat levels. Due consideration of winds generated by fire/terrain interactions, is applied when the physical requirements exist for development of landscape scale fire and extreme bushfire events.

**Indirect Attack Mechanisms:** The indirect attack mechanisms are considered within a risk assessment section of a Bushfire Risk Report when this is required, as the threat levels from these mechanisms is determined by the degree to which available bushfire protection measures are or will be implemented in mitigating risk.

## FACTORS INFLUENCING BUSHFIRE BEHAVIOUR

There are three primary factors that influence the intensity, speed and spread of a bushfire. Any increase in these behaviours will result in greater threat levels, to exposed elements, from the bushfire attack mechanisms.

### 1. VEGETATION AND OTHER FUELS

Key characteristics that will influence fire behaviour include:

- **Fuel size and shape** – anything less than 6mm diameter/thickness is considered a fine fuel and will ignite and burn quickly. Larger/heavier fuels take longer to ignite but burn for longer, so the threat exists for longer;
- **Fuel load** – the quantity of available fuel (t/ha) will influence the size of the fire. In particular it is the fine fuel load that determines the intensity of the bushfire and the flame sizes. Vegetation type and period over which it can accumulate will determine fuel loads;
- **Vegetation type** – this influences the size, shape and quantity of available fuels. For bushfire purposes vegetation types include the classifications of forest, woodland, scrub, shrubland and grassland (with total fuel loads typically decreasing in that order);
- **Fuel arrangement** – will influence two factors of fire behaviour (1) the speed and intensity of burning and (2) how much of the total fuels are likely to be involved in the fire simultaneously. The first factor is a function of how densely packed or aerated the fuels are with the more available arrangement burning with greater intensity. The second factor is a function of the availability of 'ladder' fuels (i.e. near surface, elevated and bark fuels) to carry fire up the vegetation profile, and the continuity of fuels to carry the fuel across the land; and
- **Fuel moisture content** – drier fuels will ignite easily and burn quickly. The inherent moisture content of the vegetative fuels is a function of the vegetation type and arrangement and/or the positioning of the vegetation complex near readily available sources of moisture.

Greater quantities of finer, dryer, aerated and connected fuels will result in more severe behaviours and elevated bushfire threat levels. Large extents of vegetation (surrounding landscape scale) can have additional implications for the development of extreme bushfire events and the consequent increase in bushfire threat levels (refer to Appendix 3 for additional information).

### 2. WEATHER

Adverse fire weather that results in more severe behaviours and elevated threat levels includes strong winds, high temperatures, low relative humidity and extended periods of these factors.

Weather events at the surrounding landscape scale can have implications for the development of extreme bushfire events and consequent increase in bushfire threat levels (refer to Appendix 3 for additional information).

### 3. TOPOGRAPHY

The physical terrain can influence the severity of fire behaviour. At a local scale, it is the influence of ground slope on the rate a fire spreads, that is most relevant. Fire travels faster up slopes (rule of thumb is a doubling of speed for every 10 degrees increase in slope). Greater rates of spread increase fire intensity and the resultant threat levels.

At the surrounding landscape scale, the impact of topography can be significant and includes establishing the potential for development of certain dynamic fire behaviours that can lead to extreme bushfire events and elevated threat levels (refer to Appendix 3 for additional information).

## BUSHFIRE THREATS - DIRECT ATTACK MECHANISMS

### ORIGINATING FROM THE BUSHFIRE PRONE VEGETATION

#### FLAME CONTACT

When flames make contact with buildings/structures they can flow over, under and around – impacting surfaces not directly facing the bushfire. Flames can enter small gaps and crevices. This results in a significant risk that combustible parts of buildings/structures.

Flames will be longer when fine fuel loads are higher and will move faster up slopes and generally, slower down slopes.

Flame temperatures are highest in the lower parts of the flame and decrease towards the tip. The flame has two distinct regions - the lower solid body flame and the upper part that is a transitory flame (intermittently present). Both flame regions can damage structures.

Note: AS 3959:2018 *Construction of buildings in bushfire prone areas*, establishes both the construction requirements corresponding to each Bushfire Attack Level (BAL) and the methodology for determining a BAL. For a bushfire modelled using this methodology, the derived flame length only provides an estimate of the solid body flame length.

#### RADIANT HEAT TRANSFER

This heat is produced from combustion of a fuel source, radiates in all directions from the fire and can potentially be felt from hundreds of meters away.

The amount of heat that a fire can transfer to other objects, through radiation, is influenced by its flame size and flame temperature. These are a function of the characteristics of the fuels being burnt including fuel size, dryness, structure, arrangement and quantity. The bushfire is additionally influenced by weather and topography factors that can intensify fire behaviour (described at start of this section with additional detail provided in Appendix 3).

The radiant heat:

- Can ignite combustible materials such as timber (doors, cladding, external framework), some plastics (which if not ignited will melt and distort (cladding, pipes, gutters, tanks). This breaches the building's envelope allowing flames and embers to enter, increasing the likelihood of damage or destruction;
- Can dry and heat vegetation and other fuels (combustible materials such as timber) to a temperature at which they ignite or are more easily ignited by existing flames or embers; and
- Is an extremely significant threat to persons (occupants, firefighters) when they are not physically shielded. Protective clothing can provide only limited protection.

#### EMBER / BURNING DEBRIS ATTACK

*Note: The importance of establishing protection measures to mitigate the potential impact of consequential fire ignited by the ember attack mechanism, cannot be overstated.*

An ember is a small particle of burning material that is transported in the winds that accompany a bushfire (larger particles can exist as firebrands from certain vegetation types). Typically these consist of plant materials such as bark, leaves and twigs that exist as part of the standing vegetation or have accumulated on the ground. Experimental scientific work has shown that embers greater than 2mm are effective at igniting combustible materials.

#### **Ember attack is the most common way for buildings/structures to ignite in a bushfire:**

Scientific research indicates that at least 80% of building losses from past Australian bushfires can be attributed to ember/firebrand attack (mostly in isolation but also in combination with radiant heat), and the resultant consequential fires. (Leonard J.E. et.al; 2004 – Blanche R. et.al. 2005 - Blanche R. et.al. 2006).

Embers are the primary ignition source for consequential fire:

- They accumulate around and on vulnerable parts of structures such as low angle surfaces windows and wherever re-entrant corners exist (e.g., roofs, gutters, doors, windows etc);
- They enter gaps in structure envelopes to vulnerable materials within internal cavities and spaces (e.g., roof, sub-floor, living areas); and

- They ignite surface materials such as walls and decks and any accumulated vegetative debris.

Embers can attack structures for a significant length of time before and after the passage of the fire front, as well as during. This potential length of exposure is an important factor in the consideration of the level of threat embers present.

### **The importance of bark as an ember source:**

*(Sources: CSIRO Climate and Disaster Resilience Report 2020 and Overall Fuel Hazard Assessment Guide 4<sup>th</sup> edition July 2010, Victoria DSE and Cruz, MG (2021) The Vesta Mk 2 rate of fire spread model: a user's guide. CSIRO).*

Bark is the primary source of embers and spotting in Australian eucalypt forests due to the key attributes of ease of ignition, extended burnout time and the favourable size to weight ratio and aerodynamic properties. Differences in these attributes strongly influence the spotting potential from different forest types – and therefore the potential hazard rating of the bark.

The type of tree bark will determine the size, shape and number of embers/firebrands which, along with the prevailing fire behaviour and weather conditions will dictate the spotting distances and density of ignitions.

Fine fibrous barks - including stringybarks (e.g. jarrah), have loosely attached fibrous flakes and can produce massive quantities of embers (prolific spotting) for shorter (up to 0.75 km) and medium distances (up to 5 km).

Short distance spotting (including ember showers) are generally the result of embers and firebrands blown directly ahead of the fire with little or no lofting. Density tends to decrease with distance from the fire front.

Medium distance spotting results from embers and firebrands that are lofted briefly in a convection column or blown from an elevated position (e.g., from treetops on ridges). With sufficient density and coalescing spot fires, this can rapidly increase the size of a fire (deep flaming) leading to dynamic fire behaviours and extreme fire events.

Ribbon/candle type barks - have longer burnout time, extended flight paths and are more likely to be responsible for longer distance spotting > 5 km (with up to 30 km having been authenticated). This results from significant lofting of large firebrands (e.g. curled hollow tubes of bark that can burn for 40 minutes) in well-developed convection columns. These develop as separate, independent fires. Very long distance spotting requires Intense fire, maintenance of a strong convection column (to lift firebrands aloft) and strong winds aloft (to transport the firebrands).

Other bark types - that include coarsely fibrous (e.g. marri) / slab or smooth / platy and papery barks - produce lower quantities of embers and shorter distance spotting. Their highest bark hazard ratings that are lower than fine fibrous or ribbon barks.

### **HIGH / ERRATIC FIRE DRIVEN WIND ATTACK**

High winds resulting from bushfire / vegetation / terrain / fire weather interactions, can directly damage the external envelope of a building or structure by:

- Positive and negative pressure dislodging building parts; and/or;
- Causing solid materials (e.g., branches or parts of other structures) to break loose and be transported to impact and damage the building's envelope. This provides openings for other bushfire attack mechanisms to enter and ignite internal cavities.

Strong winds are common during serious bushfire events as they are a necessary requirement for bushfires to develop higher intensities and greater severity levels.

Increased wind speeds can be the result of:

1. General weather patterns that will present as strong prevailing winds; and
2. The more complex interactions of prevailing winds along with vegetation types and structures, terrain factors and fire weather factors - that can lead to the development of dynamic fire behaviours resulting in intensification of fire behaviour and generation of local and erratic high winds.

For highest risk scenarios, the bushfire can couple with the atmosphere as a pyro-convective event resulting in extreme bushfire events and gusty, severe windspeeds (refer to Appendix 3 for more detail).

It is the potential for the interactions and outcomes of the latter that will be considered as a direct bushfire attack mechanism for the relevant bushfire hazard threat level assessment in this report.



## BUSHFIRE THREATS - INDIRECT ATTACK MECHANISMS

### PRIMARILY ORIGINATING FROM WITHIN AN ASSET PROTECTION ZONE (APZ)

For the following indirect bushfire attack mechanisms to impact relevant exposed elements, certain requirements need to exist within an APZ (i.e., the area immediately surrounding a subject building/structure).

Where these requirements exist, they increase the exposure of the subject building/structure to the indirect bushfire attack mechanisms.

In this Report, it is the exposure component of the risk assessment that will assess the potential impact from the bushfire threat indirect attack mechanisms.

### DEBRIS PRODUCTION AND ACCUMULATION

The relevant debris are combustible fine fuels that can accumulate, by falling and/or being windblown to be close to or against buildings, surrounding structures and other heavy fuels.

This makes the ignition of these structures/heavy fuels more likely through flame contact and radiant heat generated by the accumulated debris that has been ignited by embers and/or surface fire attack (i.e. a consequential fire).

This debris can accumulate over long time periods (years) in locations such as:

- On horizontal or close to horizontal surfaces and rough timber surfaces;
- Within re-entrant corners and roof gutters/valleys;
- Against vertical surfaces; and
- Within internal spaces /cavities and under sub-floors when gaps are present.

The threat level of this attack mechanism will be determined by:

- The presence of vegetation types that produce significant quantities of combustible debris and produce this in the driest and hottest part of the year; and
- The extent of the vegetation producing this threat.

The level of exposure of the telecommunications infrastructure is dependent on the proximity of this threat generating vegetation.

### SURFACE FIRE

These are low intensity fires with short flames that burn along the ground and are not considered to be part of the 'bushfire' in identified bushfire prone vegetation. They are typically patchy and erratic in their direction, consuming low-lying vegetation, ground litter, mulch and other debris and are short lived (<40 seconds) when burning in the absence of heavier fuels.

Surface fires are considered to be those that can occur on the land immediately surrounding buildings, associated structures and other heavy consequential fire fuels. Surface fires bring the threats of direct flame contact, higher radiant heat and embers closer to the relevant elements at risk than the bushfire itself can.

To reduce the exposure of relevant elements at risk to this indirect bushfire threat, the area of land typically recognised as an APZ, should be maintained in a minimal fuel / low threat state.

### TREE STRIKE/OBSTRUCTION

Branches or trees, subject to strong winds and/or tree burnout, can:

- Damage the envelope of a structure creating openings for direct attack mechanisms of bushfire (or consequential fire) to ignite internal cavities or living space; and/or
- Fall and obstruct access to or egress from, a structure or site being impacted by bushfire.

To reduce the exposure of relevant elements at risk to this indirect bushfire threat, consideration of the locations and susceptibility of trees needs to form part of the assessment of exposure and site management.

## CONSEQUENTIAL FIRE

**Note: The importance of establishing protection measures to mitigate the potential impact of consequential fire cannot be overstated.**

Consequential fire is the burning of vulnerable (combustible/flammable) materials, items and structures that exist within the area surrounding the subject building or structure – the surrounding vulnerable elements. These vulnerable surrounding elements can also include other buildings in proximity.

The burning of these surrounding vulnerable elements can result in the subject building/ structure being exposed to the direct fire attack mechanisms (threats) of flame, radiant heat, embers and surface fire from a close distance.

These consequential fire threats are separate from and additional to the threats generated by the bushfire front itself - which can be and often is, a considerable distance away.

### Consequential Fire Fine fuels:

- Dead plant material such as leaves grass, bark and twigs thinner than 6mm (or live material less than 3mm thick that can be consumed in a fire involving dead material); and
- Originate from the indirect bushfire attack mechanism of 'debris accumulation' and potentially from other areas of landscaped vegetation.

### Consequential Fire Heavy and Large Heavy Fuels:

- Stored combustible / flammable items:
  - Building materials, packaging materials, firewood, sporting/playground equipment, outdoor furniture, matting, rubbish bins etc;
  - Large quantities of dead vegetation materials stored as part of site use;
  - Liquids and gases; and
  - Vehicles, caravans and boats, etc.
- Constructed combustible items:
  - Surrounding landscaping items - fences/screens, retaining walls, gazebos, plastic water tanks etc;
  - Attached structures - decks, verandahs, stairs, carports, garages, pergolas, patios, etc;
  - Adjacent structures - houses, sheds, garages, carports, etc. Structure to structure fire is a common cause of overall building loss in post bushfire event assessments [9].

The assessment of the potential risk impact of the existence, types and proximity of consequential fire fuels to subject buildings/structures, is conducted by assessing the exposure level of

The level of risk associated with the potential contribution of consequential fire to overall risk levels, is derived by assessing the exposure of relevant elements at risk to consequential fire fuels – which considers the existence, type and proximity of these fuels.

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## APPENDIX 3: DYNAMIC FIRE BEHAVIOURS AND EXTREME BUSHFIRE EVENTS

The content of this appendix is an overview of information that supports the assessment approach of section 5.2 of this report. It considers the risk implications arising from what is being learnt from the latest research work within the bushfire science of dynamic fire propagation and extreme fire development.

Any potential for extreme fire events to develop in the surrounding landscape surrounding the subject site, will result in increased in bushfire hazard threat levels to exposed elements and must be accounted for in the risk assessment.

The selected compilation of information is taken from various sources including peer reviewed research papers [references 1-3, 12, 15, 21, 27, 28, 41, 42].

### RECENT BUSHFIRE RESEARCH

Traditionally, bushfire modelling conducted to determine rates of spread, intensity, flame lengths, radiant heat etc and provide measurements of threat levels, has been based on the quasi-steady fire state (i.e. a fire propagating under constant and uniform fuel, weather and topography – after it has finished its growth phase).

More recent research has provided important insights into the dynamic nature of fire spread in the landscape and identified local drivers of bushfire risk and highlighted the role of environmental factors that are significant for large and extreme fire development.

These environmental factors include aspects of the vertical structure of the atmosphere, meso-scale fire weather processes (e.g., sea breezes, cold fronts, squall lines, convective complexes), interactions between the fire and the atmosphere, and the modification of fire weather and fire behaviour due to the local topography.

From this work, a number of processes that can contribute significantly to the level of risk posed by a bushfire have been identified. These include:

- Extreme fire weather processes;
- Dynamic fire propagation; and
- Violent pyroconvection and pyrogenic winds.

Of particular relevance to this risk assessment are the topographic aspects of the surrounding landscape surrounding the subject site and the potential it might present for dynamic fire propagation, development of extreme fire events and therefore increased bushfire hazard threat levels and consequent risk.

### DYNAMIC FIRE BEHAVIOURS

Dynamic fire behaviours (DFBs) result from interactions between the physical factors of fuel, terrain, fire weather conditions, atmosphere and different parts of the bushfire itself. They are physical phenomenon that involve rapid changes of fire behaviour and occur under specific conditions.

Certain DFBs occur at various scales and time frames (e.g. spotting), others only at large scales (e.g., conflagrations and pyroconvective events) and others at small scales and short time spans (e.g. junction fires, fire whirls). The following fire behaviours are considered DFBs:

#### Spotting

The production of embers/firebrands, carried by the wind/convective currents that ignite spot fires ahead of the bushfire front. Under extreme conditions, with the necessary fuels, mass spotting events can occur. Dependent on fuel types, winds and convective currents, embers can be consumed by the fire front itself or travel tens of kilometres. Spot fire occurrence can be so prevalent that spotting becomes the dominant propagation mechanism – with the fire spreading as a cascade of spot fires forming a 'pseudo' front.

#### Fire Whirl / Tornado

Various sized (<1m - >150m) spinning vortices of ascending hot air and gases that carry smoke, debris, and flame. The intensity of larger whirls compares to tornados. Can induce fire spread contrary to prevailing wind and ignite spot fires away from the fire front.

#### Junction Fire

Is associated with merging fire fronts that produces very high rates of spread and have the potential to generate fire whirls / tornadoes.

## Crown Fire

Types of tree crown fires have been categorised according to their degree of dependence on the surface fire phase - passive, active, independent - with the last two being considered dynamic fire behaviour.

Active crown fire is "a fire in which a solid flame develops in the crowns of trees, but the surface and crown phases advance as a linked unit dependent on each other."

Independent crown fires "advance in the tree crowns alone, not requiring any energy from the surface fire to sustain combustion or movement."

For a crown fire to start, a surface fire of sufficient intensity is first necessary. The distance between the heat source at the ground surface and the canopy-fuel layer will determine how much of the surface fire's energy is dissipated before reaching the fuels at the base of the canopy. The higher the canopy base, the lower the chance of crowning.

The existence of trees themselves, separated from surface fuels, can offer a degree of protection by absorbing radiant heat, trapping embers and shielding from winds. Necessary considerations include:

- Eliminating understorey fuels;
- Species Issue: Understanding the extent to which the trees will contribute to fuels (leaves/bark/twigs etc) that accumulate on the ground and when moved (wind) become involved in consequential fire away from the tree during the fire season. This needs to be considered against the maintenance capability (regular removal of material) of the responsible entity; and
- Species / Positioning Issue: Requirements include not being highly flammable, no loose stringy bark, less able to trap embers, not being prone to branches breaking in high winds potentially causing structural damage to buildings (allowing ember entry) and keeping crowns separated as an additional measure of safety and allow wind to permeate rather than be totally blocked.

## Eruptive Fire

Behaviour where the head fire accelerates rapidly on sufficiently steep terrain with sufficiently strong wind – as a result of fire plume attachment to the surface, bathing it in flames ahead of the front (pre-heating).

### Fire Channelling / VLS (vorticity-driven lateral spread)

Behaviour where rapid lateral fire spread, in generated vortices, occurs across a sufficiently steep leeward slope in a direction approximately transverse to the prevailing winds. This results in the rapid increase in width of the fire front. VLS are highly effective at producing mass spotting events.

## Conflagrations

These are large, intense, destructive fires. They have a moving front as distinguished from a fire storm (blow up / pyroconvective fire). With sufficient vegetation extent, fuel loads and the development of dynamic fire behaviours, the large amounts of heat and moisture released can cause its plume to rise into the atmosphere and develop large cumulus or cumulonimbus flammagenitus cloud (pyrocumulus or pyrocumulonimbus). Where the extent of vertical development is limited (e.g. a stable atmosphere, or insufficient flaming zone), the fire is likely to remain a surface based event.

## Downbursts

These are strong wind downdrafts associated with convective columns of heated air (and associated cloud forms). The consequent falling columns of cooled air induce an outburst of strong winds on or near the ground that radially spread causing fire spread in directions contrary to the prevailing wind.

## Pyroconvective Event

A pyro-convective event is an extreme manifestation of a conflagration that develops in an unstable atmosphere and can transition into a towering pyrocumulus or a pyrocumulonimbus (pyroCb's) that can extend to the upper troposphere or lower stratosphere. With the fire/atmosphere coupling, it has evolved beyond a purely surface based fire into dynamic fire propagation rather than quasi-steady propagation. In the violent pyroconvective system:

- As a fire's plume reaches higher into the atmosphere, larger scale mixing can cause drier and higher-momentum upper air to be transferred back to the surface, thereby further exacerbating the potential for more intense fire behaviour, including fire spread contrary to the prevailing wind direction;
- Pyrogenic winds can cause considerable damage to structures, directly or indirectly, increasing their vulnerability to bushfire attack mechanisms; and

- The pyroCb's carry dense ember loads, fire and other burning debris and generate lightning, all with very little rain or hail that would typically occur with an ordinary thunderstorm.

## DRIVERS OF DEEP FLAMING

Deep flaming is the fire condition when the active flaming zone is unusually large and flame-front intensity is simultaneously great, resulting in large quasi-instantaneous energy release.

Deep flaming can be produced by numbers of mechanisms on varying terrain (flat, undulating or rugged) when a large enough area of sufficiently heavy fuels is present. These mechanisms include:

- Very strong winds – so the head fire advances more rapidly than the back of the flaming zone;
- Change in wind direction – so the long flank of a fire is transformed into a fast running head fire;
- Eruptive fire behaviour – where steep slopes can cause a fire to accelerate rapidly;
- Vorticity-driven lateral spread (wind channelling) – where strong winds and steep terrain interact to rapidly drive a fire laterally, accompanied by downwind mass spotting and consequent coalescing of spot fires forming large areas of flame (can include the DFB of 'junction fire').

Research has identified strong links between:

- Eruptive fire behaviour, VLS and the occurrence of deep flaming; and
- The development of deep flaming and extreme bushfire events.

## EXTREME BUSHFIRE EVENTS

Extreme bushfire events create disproportionate risks to human and environmental. Their development is affected by dynamic feedback processes that result in unpredictable behaviour, and the worsening of rates of spread and intensities - even when environmental conditions are consistent.

The term 'extreme bushfire' is applied in the recent bushfire science literature in two ways:

1. Where it refers to large, intense bushfires in which one or more DFBs are simultaneously involved; and
2. Where it more specifically refers to a fire that exhibits deep or widespread flaming in an atmospheric environment conducive to the development of violent pyroconvection, often manifesting as towering pyrocumulus (pyroCu) or pyrocumulonimbus (pyroCb) storm(s) – also referred to as blow-up fire event(s).

A distinguishing feature of these types of fires is that they involve a coupling of the fire with an unstable atmosphere to a much greater vertical extent, well above the mixed layer, which modifies or maintains the fire's propagation (e.g. through mass spotting, blustering winds and lightning);

**Relevance to Risk Assessment:** Given that this risk assessment is concerned with identifying the potential for the landscape surrounding the subject site to increase bushfire risk, the following common aspects of the two above descriptions are relevant:

- An extreme fire is a large intense fire, so it requires a sufficient area and sufficient fuels in which to develop; and
- An extreme fire of scale requires the formation of deep flaming to develop.

Consequently, the risk assessment is primarily focused on the extent and fuel types/loads of bushfire prone vegetation and the existence of terrain (topography) properties necessary for the relevant dynamic fire behaviours - rather than the potential for adverse fire weather / atmospheric conditions - whose likely occurrence can be assumed as possible.

Note also that the second description requires an unstable atmosphere - to enable deep/violent pyroconvection and subsequent significant cloud formation and latent heat release. This is not essential for the first. Consequently, this identifies a potential difference between the two defined extreme bushfire events to be considered when assessing risk:

- Large, intense bushfires can occur without deep convective column development. These fires remain as surface fires (essentially wind-driven fires), with a greater predictability of behaviour; and
- Large, intense bushfire that couple with an unstable atmosphere are no longer surface based. They are associated with a higher level of energy, chaos, and nonlinearity due to the enhanced (fire-induced)

interaction between the boundary layer and the free troposphere, which may introduce factors that act to maintain or enhance widespread flaming. The fire behaviour is much more unpredictable.

## PHYSICAL REQUIREMENTS OF TERRAIN, FUEL LOAD (AND WINDSPEED) FOR DEEP FLAMING

The dynamic fire behaviours of eruptive fire and VLS with associated mass spotting, along with potential for topographically modified winds to develop, are strongly linked with the development of deep flaming, which is a prerequisite for extreme bushfire events.

There are certain environmental thresholds that are required to be met for these dynamic fire behaviours to occur. These are described below and form part of the assessment of the bushfire hazard in Section 5.3.

### Eruptive Fire Behaviour

Eruptive fires are characterised by a rapid acceleration of the head fire rate of spread (exponential increases in rate of spread have been observed). It results in a rapid deepening of the flaming zone (larger area of active flame), from which heat is released into the atmosphere.

Eruptive fire results from the interaction between the slope of the terrain and the fire's plume. In the absence of wind, plume attachment can be expected on terrain that is inclined at roughly 24° or more and the effects of wind could cause plume attachment on slopes inclined at angles of 24° or lower. Consequently, the primary topographic requirement for eruptive fire is sufficiently steep terrain and sufficiently strong wind.

"This mode of fire propagation is completely contrary to that expected under the quasi- steady fire spread paradigm ... eruptive fire behaviour poses a serious threat to the successful containment of a bushfire and provides a mechanism that can substantially elevate the risk posed by a bushfire in areas that are prone to its occurrence".

Rugged terrain (areas with local topographic relief >300m), is particularly prone to eruptive fire (and dynamic fire behaviours in general).

### Fire Channelling (Vorticity-Driven Lateral Spread)

Fire channelling (VLS) exists when a fire exhibits rapid spread in a direction transverse to the synoptic winds as well as in the usual downwind direction. It is characterised by intense lateral and downwind spotting and production of extensive flaming zones.

VLS is highly effective at producing mass spotting events. A link between deep flaming events caused by VLS and the formation of pyroCb has been demonstrated. Under extreme conditions, spot fire occurrence can be so prevalent that spotting becomes the dominant propagation mechanism.

VLS can only be expected to occur on parts of the landscape, and under certain fire weather conditions. VLS occurrence depends critically on the following:

- Leeward slopes greater than 20-25° are required;
- Wind direction must be within 30-40° of the topographic aspect;
- Wind speed in excess of about 20 km h<sup>-1</sup> are required;
- Generally VLS is only observed in heavy forest fuel types with load in excess of 15-20 t ha; and
- Fuel moisture content – dense spotting and downwind extension of the flaming zone are far more likely when fuel moisture contents are around 5% or less.

### Topographically Modified Surface Winds - Downslope Winds

In WA the scarp winds are the well-known local occurrence of downslope winds. Similar meteorological phenomena (typically as foehn winds) occur in the lee of mountain ranges in many parts of the world, particularly on ranges with gentle windward and steep leeward slopes.

Scarp winds are nocturnal, strong and gusty winds that develop near the base of the scarp through summer months. The local mechanism is for a synoptic easterly flow, causing air to rise to the top of the scarp from further inland, at which point it is cooler and denser than the surrounding airmass. This produces an unstable situation and consequently the air flows down the scarp as a turbulent density current.

There are implications for enhanced fire activity for a fire located in a region of downslope winds, as they provide a clear mechanism for rapid, irregular direction of fire spread as well as turbulent transport of firebrands and plume development. If a 'hydraulic jump' is also present, the strong vertical motion in the jump region is a mechanism for lofting and dispersal of firebrands further ahead of the bushfire front.

## APPENDIX 4: EXPLAINING BUSHFIRE ATTACK LEVEL (BAL)

Bushfire attack levels are determined using the methodology established by AS 3959:2018 Construction of buildings in bushfire prone areas. The Standard defines a bushfire attack level (BAL) as a "means of measuring the severity of a building's exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kW/m<sup>2</sup>."

Each BAL rating represents a set range of radiant heat flux (see table below). The amount of radiant heat and flame lengths generated by a bushfire is dependent on many factors that are modelled using the Standard's fire behaviour and flame length models. Key factors include vegetation type, terrain and a range of fire weather factors. The variation that can exist in these factors will result in varying separation distances, away from bushfire prone vegetation, corresponding to a given BAL rating. These distances can be presented as data in a table or illustrated by mapping – the 'BAL Contour Map'

The different BAL ratings effectively incorporate the threat levels of flame contact, radiant heat transfer and ember/firebrand attack:

- The highest ratings of BAL-FZ and BAL-40 indicate direct or likely exposure to the flame contact threat;
- Each BAL rating represents a defined range (in kW/m<sup>2</sup>), of the radiant heat transfer threat, with the threat level increasing from BAL-LOW to BAL-FZ; and
- Each higher BAL rating assumes an increased exposure to the ember/burning debris attack threat. This is based on the practical acknowledgement that the closer the element at risk is to the source of ember production the greater the likely exposure level. In practice, this strong correlation does not exist for all bushfire event scenarios. However, AS 3959 is only intending to apply the same construction response to ember/firebrand attack for each BAL rating above BAL-LOW as consequential fire from any source other than from within the subject structure itself is not being considered by the Standard.

| Bushfire Attack Level            | Explanation<br>[Source AS3959:2018]                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BAL – LOW</b>                 | There is insufficient risk to warrant specific construction requirements but there is still some risk.<br><i>Important Note: For AS3959:2018 purposes, BAL-LOW will exist at 100m from classified vegetation (50m for Grassland).</i><br><i>However, embers/firebrands from certain vegetation types can ignite spot fires ahead of the fire front for significant distances – short range spotting up to 740m, medium range spotting up to 5km and long range spotting has been authenticated up to 30km.</i> |
| <b>BAL – 12.5</b>                | There is a risk of ember attack. Construction elements are expected to be exposed to heat flux not greater than 12.5 kW/m <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                         |
| <b>BAL – 19</b>                  | There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m <sup>2</sup> .                                                                                                                                                                                                                                                                       |
| <b>BAL – 29</b>                  | There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m <sup>2</sup> .                                                                                                                                                                                                                                      |
| <b>BAL – 40</b>                  | There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux not greater than 40kW/m <sup>2</sup> .                                                                                                                                                                       |
| <b>BAL – FZ<br/>(Flame Zone)</b> | There is an extremely high risk of ember attack and burning debris ignited by windborne embers, and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux greater than 40 kW/m <sup>2</sup> .                                                                                                                                                                                    |



## APPENDIX 5: THE SURROUNDING LANDSCAPE - VEGETATION CATEGORY AND HAZARD DETERMINATION CRITERIA

### DETERMINATION OF VEGETATION CATEGORIES AND THE BASE BUSHFIRE HAZARD SCENARIO

The following criteria are applied to the categorisation of vegetation on the surrounding landscape and the establishment of the base bushfire hazard scenario, for the purpose of deriving indicative bushfire threat levels. These threat levels are subsequently applied in the determination of risk levels associated with a bushfire event.

#### Vegetation Categories

These are established to enable a comprehensive assessment of the type and severity of the bushfire attack mechanisms (i.e., the bushfire threats), potentially generated by bushfire prone vegetation on surrounding land. This enables variations in vegetation composition and structure to be more appropriately accounted for in the determination of the levels of risk associated with a local bushfire event.

The variations in indicative threat level ranges assigned to each vegetation category in the table below are the result of these differences.

The 'Categories' are necessarily different to the vegetation 'Classifications' applied in the BAL determination methodology of AS 3959:2018. The building Standard primarily considers the flame contact and radiant heat attack mechanisms and does not fully address ember/firebrand attack or other threats.

#### The Base Bushfire Hazard Scenario and Indicative Threat Levels

The assumptions that make up the base bushfire hazard scenario are applied to deriving the midpoint of each indicative threat level range for each category of vegetation. Variations from the base scenario will potentially modify the indicative threat level (i.e., increase or decrease it within the relevant range). The assessment of the subject site for the existence of threat modifying physical factors, is presented in Section 5.1.4 of this report.

The applied components of the Base Bushfire Hazard Scenario is:

- The extent of bushfire prone vegetation is sufficiently large such that a fully developed fire can be supported. Parameters applied to the design fire of AS 3959:2018 BAL determination methodology are applied. Specifically, a head fire width of at least 100 metres is physically possible and sufficient fire run length exists to allow a quasi-steady rate of spread (after the initial growth phase) to be attained and a head fire width of 100 metres to develop from a single point of ignition. Typically, but not in every scenario, this will equate to areas of vegetation greater than 3ha and within which fire runs directly at an element at risk will be greater than 50 -100 metres in length;
- The fire fuels are continuous, and the terrain is flat to undulating with no slopes greater than ten degrees; and
- It is assumed to be possible for the most adverse fire weather to occur at the subject locality.

| SURROUNDING LANDSCAPE VEGETATION MAPPING - CATEGORY DETERMINATION CRITERIA |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                 |                             |                               |                                                         |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------|-------------------------------|---------------------------------------------------------|
| Category Code                                                              | Category Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                 |                             |                               |                                                         |
|                                                                            | Total Fuel Loads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Most Relevant Fuel <sup>1</sup> | Spotting Range <sup>2</sup> | Spotting Density <sup>2</sup> | Indicative Threat Level (Property) <sup>3 &amp; 4</sup> |
| Tree-1                                                                     | Moderate to High                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Fine, fibrous, long strand bark | Short to Medium             | Very High                     | Moderate to Extreme                                     |
|                                                                            | <p><b>Trees and Bark Hazard:</b> Tree dominated vegetation including tall species. At least 10% of the trees present have fine, longer strand fibrous barks (stringybarks). "These barks are easily dislodged from the trunk, allowing simultaneously for vertical fire propagation into the overstorey and profuse short to medium range spot fire ignitions."</p> <p><b>Spotting Threat:</b> The fine, longer strand fibrous barks (stringybarks) have the potential to produce the highest short range (up to 500-750 metres) spotting density (quantity) and can spot out to medium ranges (up to 5 km) under conducive fuel, terrain and fire weather conditions.</p> <p>Potential spotting (ember / firebrand attack) threat levels range from moderate to extreme.</p> <p><b>Fuel Loads:</b> Surface and near surface fuel loads (t/ha) range from moderate to very high (note: the worst potential fuel load for the location is applied, regardless of time since last burnt).</p> <p><b>Example Eucalyptus Species:</b> Includes jarrah, messmate stringybark and brown/red stringybark. Marri can be included in this category due to the potential high density spotting but will be limited to the shorter spotting range.</p>                                                                                                                                                                                                                                   |                                 |                             |                               |                                                         |
| Tree-2                                                                     | Moderate to Very High                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Ribbon, candle bark             | Short to Long               | Moderate                      | Moderate to Extreme                                     |
|                                                                            | <p><b>Trees and Bark Hazard:</b> Tree dominated vegetation including tall species. Less than 10% of trees present will have fine, longer strand fibrous barks (stringybarks). The predominant trees are smooth bark species where the bark sheds in long ribbons (ribbon/candle barks), and often hangs on the branches. "These bark types provide aerodynamically efficient, firebrand material that can remain alight for long periods and be transported over considerable distances."</p> <p><b>Spotting Threat:</b> These bark types have the longest distance spotting potential (greater than 5 km) due to the long burnout time of the firebrands. However, the potential ember/firebrand density (quantity) will be lower than for fine, longer strand fibrous barks.</p> <p>Potential spotting (ember / firebrand attack) threat levels range from moderate to very high.</p> <p><b>Fuel Loads:</b> Surface and near surface fuel loads (t/ha) range from moderate to very high (note: the worst potential fuel load for the location is applied, regardless of time since last burnt).</p> <p><b>Example Eucalyptus Species:</b> Includes manna gum, blue gum, alpine ash and woollybutt, mallee species. Karri can be included in this category on the basis that while spotting distance is unlikely to be long range (as the bark is shed in short ribbons/small polygonal flakes), the potential for extreme fuel loads is relevant to the categorisation.</p> |                                 |                             |                               |                                                         |

| SURROUNDING LANDSCAPE VEGETATION MAPPING - CATEGORY DETERMINATION CRITERIA |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                 |                             |                               |                                                 |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------|-------------------------------|-------------------------------------------------|
| Category Code                                                              | Category Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                 |                             |                               |                                                 |
|                                                                            | Total Fuel Loads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Most Relevant Fuel <sup>1</sup>                                 | Spotting Range <sup>2</sup> | Spotting Density <sup>2</sup> | Indicative Threat Level (Property) <sup>3</sup> |
| Tree/Shrub                                                                 | Moderate to High                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Smooth, platy, papery, coarsely fibrous bark and/or Shrub fuels | Short                       | Low to Moderate               | Moderate to High                                |
|                                                                            | <p>This category can have the most variation in vegetation types that are present. It can consist of predominantly trees with the stated bark types or be predominately shrub type vegetation or any combination. Can include areas of grass.</p> <p><b>Trees and Bark Hazard:</b> Trees can be of any height. Bark types are more varied and have the characteristics of being tightly held onto the trunk, producing short strands, or producing chunks or small flakes which fall to the ground. These bark types are described as smooth, platy, papery and coarsely fibrous.</p> <p><b>Shrub Fuels:</b> Scrub, shrub, heath type fuels of vertically oriented, well aerated, with live and dead vegetation extending from the surface to the top of the vegetation complex and up to 6 metres high.</p> <p><b>Spotting Threat:</b> Trees with the stated bark types can produce limited quantities of embers and shorter spotting distances (up to 500-750 metres). Shrub fuels can produce moderate to high quantities of smaller and shorter burn duration embers, resulting in mostly short distance spotting.</p> <p><b>Fuel Loads:</b> Surface, near surface and elevated fuel loads (t/ha) range from moderate to high (note: the worst potential fuel load for the location is applied, regardless of time since last burnt).</p>                                                                                                                                                                                                                                                                                                                                             |                                                                 |                             |                               |                                                 |
| Shrub                                                                      | Low to High                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Shrub fuels                                                     | Short                       | Low                           | Low to Moderate                                 |
|                                                                            | <p><b>Shrub Fuels:</b> Scrub, shrub, heath type fuels of smaller sized, vertically oriented, well aerated fuels, with continuous live and dead vegetation extending from the surface to the top of the vegetation complex and up to 2 metres high. Can include areas of grass.</p> <p><b>Spotting Threat:</b> Shrub fuels can produce limited quantities of small and short burn duration embers resulting in low density short distance spotting (up to 500-750 metres).</p> <p><b>Fuel Loads:</b> Surface, near surface and elevated fuel loads (t/ha) range from moderate to high (note: the worst potential fuel load for the location is applied, regardless of time since last burnt).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                 |                             |                               |                                                 |
| Grass                                                                      | Low to Moderate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Fine grass fuels                                                | Very Short                  | Low                           | Low to Moderate                                 |
|                                                                            | <p><b>Fuel Types:</b> Will be varied and includes the following groups that each have similar structural characteristics - tropical grasslands, tussock grasslands, hummock grasslands, and improved pastures / crop lands comprised of species that cure. These fuels are typically much finer than other vegetation types with a low bulk density. Where trees are present, they make up no more than 10% of canopy cover and will have no influence on fire behaviour.</p> <p><b>Fuel Loads:</b> Are much lower than other types of vegetation complexes. For example, default total fuel loads applied in AS 3959:2018 BAL determination methodology for Grassland range from 43% to 85% less than other vegetation classifications.</p> <p><b>Fire Behaviour:</b> Combustion rates are faster in grasslands than forest fuels due to the finer materials and more aerated structure. This gives rise to the main cause of differences in fire behaviour between grassfires and fires in other fuel types - the residence time is much shorter. This is the period during which flames remain burning over one spot on the ground. Using pastures as an example, the residence time is in the order of 5 seconds in fine light pastures and 10-15 seconds in heavy pastures. This results in grassfires spreading more quickly, reacting very quickly to changes in wind direction and speed and being a shorter duration threat to a specific exposed element.</p> <p><b>Spotting Threat:</b> Embers produced by grass fires are smaller and fewer in number than those produced from forest fires and burn for shorter durations. Typically, spotting in grassfires occurs over</p> |                                                                 |                             |                               |                                                 |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
|               | very short distances and are generally not noticed as they are quickly overrun by the main fire. Potential spotting (ember / firebrand attack) threat levels are low.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |
| No/Low Threat |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | No Threat to Low |
|               | <p>Areas of land will satisfy this category when the following factors apply:</p> <ul style="list-style-type: none"> <li>Low threat vegetation characteristics including low flammability, high moisture content (including non-curing crops) and minimal fuel load. Low threat examples established in AS 3959:2018 include: managed grassland, mangroves/saline wetlands, maintained lawns, golf courses, public reserves/parklands, sporting fields, vineyards, orchards, banana plantations, market gardens, commercial nurseries, nature strips and windbreaks; and</li> <li>Areas permanently cleared of vegetation, including natural features such as rocky outcrops and manmade infrastructure.</li> </ul> |                  |

**Note 1:** The fuel type/s that are most relevant for the categorisation of area of vegetation are stated. This has particular relevance where certain bark types and quantity are a significant component of total fuel loads, resulting in higher threat levels for the ember/firebrand direct attack mechanism. Bark fuels are the primary source of fuel for the ember/firebrand attack threat (refer to Appendix 2 for additional information).

**Note 2:** Understanding and assessing the threat level generated by the ember/firebrand direct attack mechanism (spotting) is important to the management of risks associated with any bushfire hazard. With respect to categorising surrounding landscape vegetation, based on threat levels, the following points identify why the assessment of the spotting threat is important:

- At distances beyond 100 metres from a subject land the direct attack mechanisms of flame contact and radiant heat transfer cannot significantly and directly impact the building elements at risk within that site;
- However, embers/firebrands can impact subject land through the ignition of consequential fire (as an indirect attack mechanism of bushfire), in fuels and structures surrounding, upon and within the relevant elements at risk (e.g., habitable buildings). Consequential fires bring the direct attack mechanisms of flame and radiant heat much closer than the bushfire itself can. Assessments of past bushfire events indicate that ember attack and consequential fire be the cause of 80% or greater of property losses; and
- Spotting can significantly influence the increase scale of the bushfire event and its consequent intensity, both within the surrounding landscape and within the 100 metres surrounding a subject land. From Cruz M.G. *et al* (2015): *A Guide to Rate of Fire Spread Models for Australian Vegetation*. CSIRO, AFAC). "Spotting is an important, at times dominant, fire propagation process in high intensity fires in eucalypt forests. The type of tree bark will determine the size, shape, and number of firebrands, which the prevailing weather conditions will dictate the spotting distances and density of ignitions." Refer to Appendix 2 for additional information.

**Note 3:** The stated indicative threat levels identify the threat level range that is associated with the stated vegetation category as it applies to constructed property, as opposed to persons in the open or travelling access routes in vehicles, which will be separately assessed.

Subsequent assessment of bushfire hazard and terrain factors within the surrounding landscape that can increase or decrease the indicative threat levels, will then complete the surrounding landscape assessment for the subject land.



## APPENDIX 6: THE IDENTIFIED BUSHFIRE HAZARDS

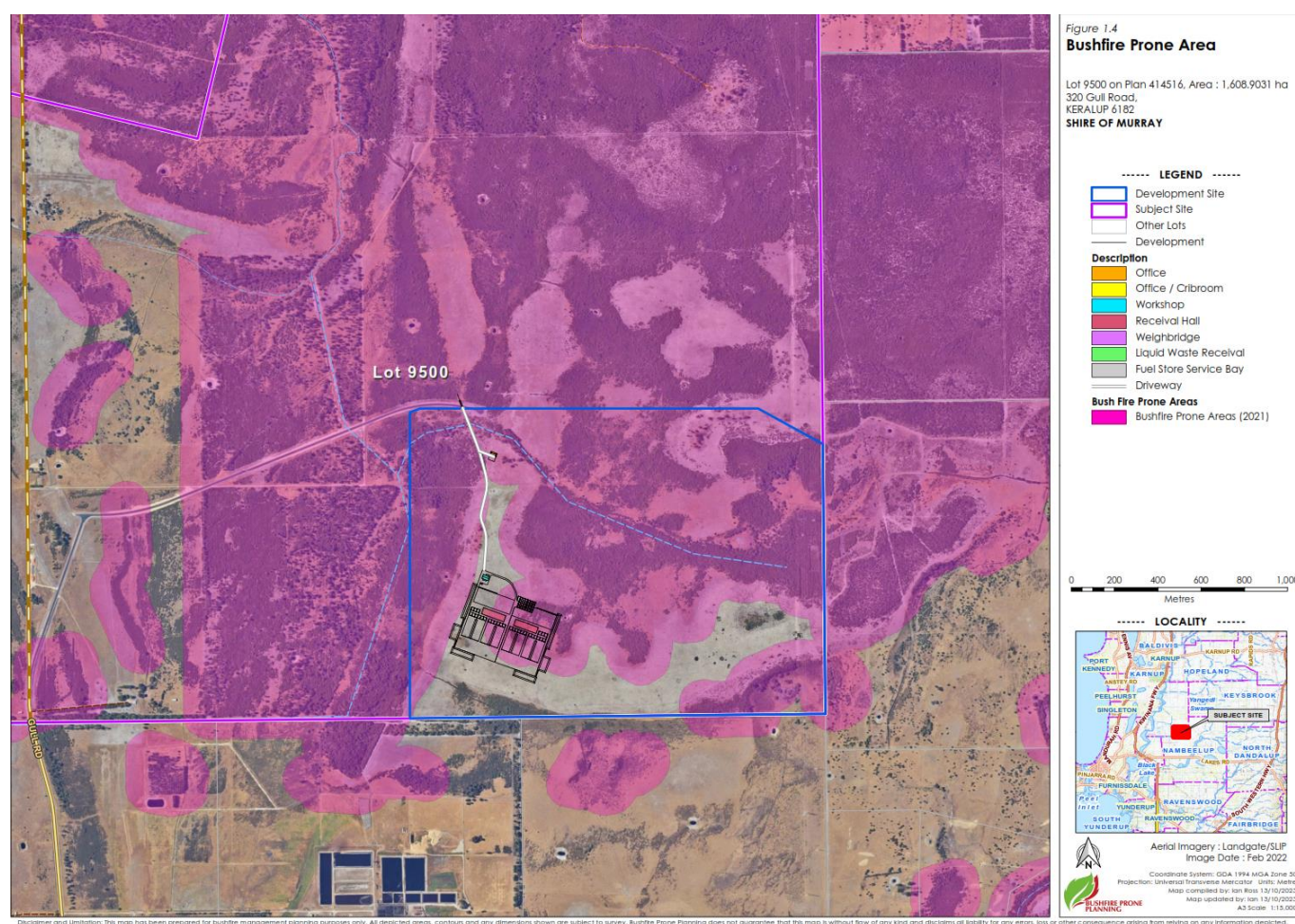
### A6.1 LOCATION OF SUBJECT LAND RELATIVE TO DESIGNATED AREAS OF BUSHFIRE PRONE LAND

Relevant State/Territory authorities have determined what is to be considered bushfire prone vegetation and how areas of land will be identified as presenting bushfire risk, by their designation on maps.

The mapping then functions as a trigger, for development and uses within the designated areas of land, to apply one or more of the following, as applicable to the jurisdiction:

- Legislated bushfire planning provisions/controls;
- Legislated bushfire building provisions/controls; and/or
- Legislated fire controls.

The location of the subject site relative to the relevant mapping is presented in Figure A5.1.



**Figure A6.1:** Subject site is within a Bushfire Prone Area

## A6.2 SURROUNDING LANDSCAPE - VEGETATION CATEGORISATION – PHOTO EVIDENCE

| PHOTO EVIDENCE - CATEGORISED VEGETATION                                                                     |                                                                                    |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Categorisation in accordance with the criteria established in Appendix 5 <div>Tree-1 &amp; Tree Scrub</div> |                                                                                    |
| Additional Justification:                                                                                   | Not Required.                                                                      |
| Tree 1                                                                                                      | Tree/shrub                                                                         |
|                            |  |
| FIGURE 5.1 PHOTO ID: 5                                                                                      | Tree                                                                               |
|                           |                                                                                    |
| Grass                                                                                                       |                                                                                    |



## A6.3 SURROUNDING LANDSCAPE – BARK HAZARD – PHOTO EVIDENCE

| PHOTO EVIDENCE – BARK HAZARD                                                       |                                                                                     |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Vegetation Location: All Areas Categorised as Tree-1                               |                                                                                     |
|   |   |
| Jarrah                                                                             | Marri                                                                               |
|  |  |
| Paperbark                                                                          | Kunzia                                                                              |



## A6.4 SUBJECT LAND + 150M EXTENT – VEGETATION CLASSIFICATION (SUPPORTING DATA)

### INFORMATION TO ASSIST INTERPRETATION

#### Vegetation Types and Classification

In accordance with AS 3959:2018 clauses 2.2.3 and C2.2.3.1, all vegetation types within 100 metres of the 'site' (defined as "the part of the allotment of land on which a building stands or is to be erected"), are identified and classified. Any vegetation more than 100 metres from the site that has influenced the classification of vegetation within 100 metres of the site, is identified and noted. The maximum excess distance is established by AS 3959: 2018 cl 2.2.3.2 and is an additional 100 metres.

Additional classification resources include:

- The Visual Guide for Bushfire Risk Assessment in WA (WA Department of Planning February 2016); and
- Relevant FPA Australia practice notes.
- PBP 2019 Appendix 1 – vegetation formation information (Keith framework).
- Keith D.A. and Simpson C.C. (2010) Vegetation Formations of NSW (v3.0), Appendix 2. An identification key to the vegetation formations of NSW (from Keith 2004)

#### Modified Vegetation

The vegetation types have been assessed as they will be in their natural mature states, rather than what might be observed on the day. Vegetation destroyed or damaged by a bushfire or other natural disaster has been assessed on its expected re-generated mature state. Modified areas of vegetation can be excluded from classification if they consist of low threat vegetation or vegetation managed in a minimal fuel condition, satisfying AS 3959:2018 s2.2.3.2(f), and there is sufficient justification to reasonable expect that this modified state will exist in perpetuity.

#### The Influence of Ground Slope

Where significant variation in effective slope exists under a consistent vegetation type, these will be delineated as separate vegetation areas to account for the difference in potential bushfire behaviour, in accordance with AS 3959:2018 clauses 2.2.5 and C2.2.5.

### THE INFLUENCE OF VEGETATION GREATER THAN 100 METRES FROM THE SUBJECT SITE

Vegetation area(s) within 100m of the site whose classification has been influenced by the existence of bushfire prone vegetation from 100m – 200m from the site:

No.

Assessment Statement:

No vegetation types exist close enough, or to a sufficient extent, within the relevant area to influence classification of vegetation within 100 metres of the subject site.

## A6.4.1 VEGETATION CLASSIFICATION PHOTOS AND JUSTIFICATION

| VEGETATION AREA 1                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                 |                |                          |                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------|---------------------------|
| Classification                                                                                                                                                                                           | D. SCRUB                                                                                                                                                                                                                                                                        |                |                          |                           |
| Types Identified                                                                                                                                                                                         | Open scrub D-14                                                                                                                                                                                                                                                                 |                |                          |                           |
| Effective Slope                                                                                                                                                                                          | Measured                                                                                                                                                                                                                                                                        | Flat 0 degrees | Applied Range (Method 1) | Upslope or flat 0 degrees |
| Dominant & Sub-Dominant Layers (species as relevant)                                                                                                                                                     | Mixed shrubs and scrub species growing up to 3 metres in height across undulating terrain.                                                                                                                                                                                      |                |                          |                           |
| Understorey:                                                                                                                                                                                             | Pastural Grasses and sedges with scattered seasonal herbs.                                                                                                                                                                                                                      |                |                          |                           |
| Additional Justification:                                                                                                                                                                                | Not Required.                                                                                                                                                                                                                                                                   |                |                          |                           |
| Post Development Assumptions:                                                                                                                                                                            | Vegetation is classified as worst-case scenario. Classified vegetation located within the asset protection zone will be managed to a low threat state by subject site landowner.<br><br>Note: Any offsite vegetation cannot be managed or removed by the subject site landowner |                |                          |                           |
| <div><div></div><div></div></div>   |                                                                                                                                                                                                                                                                                 |                |                          |                           |
| PHOTO ID: 1                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                 |                | PHOTO ID: 2              |                           |
| <div><div></div><div></div></div> |                                                                                                                                                                                                                                                                                 |                |                          |                           |
| PHOTO ID: 3                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                 |                | PHOTO ID: 4              |                           |

| VEGETATION AREA 2                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                |                |                    |                          |      |                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------------|------|---------------------------|
| Classification                                                                                                                                                                                                                                                                                       | A. FOREST                                                                                                                                                                                                                                                                      |                |                    |                          |      |                           |
| Types Identified                                                                                                                                                                                                                                                                                     | Open forest A-03                                                                                                                                                                                                                                                               |                |                    |                          |      |                           |
| Exclusion Clause                                                                                                                                                                                                                                                                                     | N/A                                                                                                                                                                                                                                                                            |                |                    |                          |      |                           |
| Effective Slope                                                                                                                                                                                                                                                                                      | Measured                                                                                                                                                                                                                                                                       | flat 0 degrees |                    | Applied Range (Method 1) |      | Upslope or flat 0 degrees |
| Foliage Cover (all layers)                                                                                                                                                                                                                                                                           | 30-70%                                                                                                                                                                                                                                                                         |                | Shrub/Heath Height |                          | 1-2m | Tree Height<br>Over 30m   |
| Dominant & Sub-Dominant Layers (species as relevant)                                                                                                                                                                                                                                                 | Mixed eucalyptus and corymbia species found in low-lying wet areas and creeklines.                                                                                                                                                                                             |                |                    |                          |      |                           |
| Understorey:                                                                                                                                                                                                                                                                                         | Mixed native shrubs and pastoral grasses.                                                                                                                                                                                                                                      |                |                    |                          |      |                           |
| Additional Justification:                                                                                                                                                                                                                                                                            | Not Required.                                                                                                                                                                                                                                                                  |                |                    |                          |      |                           |
| Post Development Assumptions:                                                                                                                                                                                                                                                                        | Vegetation is classified as worst-case scenario. Classified vegetation located within the asset protection zone will be managed to a low threat state by subject site landowner<br><br>Note: Any offsite vegetation cannot be managed or removed by the subject site landowner |                |                    |                          |      |                           |
| <div><div><div>34°47'01.15"S 151°03'41.45"E<br/>Altitude: 311 m ± 3 m<br/>Address: Keralia Rd, 6207 AU<br/>Location: Private Property</div><div><div>Taken With</div><div>Context Camera</div></div></div></div>   |                                                                                                                                                                                                                                                                                |                |                    |                          |      |                           |
| PHOTO ID: 7                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                |                |                    | PHOTO ID: 8              |      |                           |
| <div><div><div>34°47'01.15"S 151°03'41.45"E<br/>Altitude: 311 m ± 3 m<br/>Address: Keralia Rd, 6207 AU<br/>Location: Private Property</div><div><div>Taken With</div><div>Context Camera</div></div></div></div>  |                                                                                                                                                                                                                                                                                |                |                    |                          |      |                           |
| PHOTO ID: 9                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                |                |                    | PHOTO ID: 10             |      |                           |
| <div><div><div>34°47'01.15"S 151°03'41.45"E<br/>Altitude: 311 m ± 3 m<br/>Address: Keralia Rd, 6207 AU<br/>Location: Private Property</div><div><div>Taken With</div><div>Context Camera</div></div></div></div> |                                                                                                                                                                                                                                                                                |                |                    |                          |      |                           |





Figure 3.1  
**Classified Vegetation & Topography**  
Lot 9500 on Plan 414516, Area : 1,608.9031 ha  
320 Gull Road,  
KERALUP 6182  
**SHIRE OF MURRAY**

----- **LEGEND** -----

Development Site  
 Subject Site  
 Other Lots  
 Development  
 Photo & Direction

**Description**

Office  
 Office / Cribroom  
 Workshop  
 Receiving Hall  
 Weighbridge  
 Liquid Waste Receiving  
 Fuel Store Service Bay  
 Driveway

**150m Vegetation Assessment Area**  
 150m from Subject Site

**Classified Vegetation**

Class (A) Forest  
 Class (D) Scrub  
 Class (G) Grassland  
 Exclusion 2.2.3.2

0 100 200 300 400 500  
Metres

----- **LOCALITY** -----

Aerial Imagery : Landgate/SLIP  
Image Date : Feb 2022

Coordinate System: GDA 1994 MGA Zone 50  
Projection: Universal Transverse Mercator Units: Metre  
Map compiled by: Ian Ross 13/10/2023  
Map updated by: Ian 13/10/2023  
A3 Scale 1:7,500

**Disclaimer and Limitation:** This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence arising from relying on any information depicted.  
Map Document Path / Name: K:\Projects\Jobs 2022\220666 - 320 Gull Road Keralup (BMP)\Mapping\MXD\220666\_Fig3-1\_VEG\_320 Gull Road Keralup.mxd



## A6.6 RADIANT HEAT MODELLING – CALCULATION INPUT / OUTPUT DATA

Table A6.6.2: The applicable 'Landowner' APZ Dimensions when indicative BAL ratings have been established by the BMP.

| THE CALCULATED VEGETATION SEPARATION DISTANCES CORRESPONDING TO THE STATED LEVEL OF RADIANT HEAT TRANSFER <sup>1</sup>                                                                         |            |                                                                             |        |        |        |         |         |                           |                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------|--------|--------|--------|---------|---------|---------------------------|---------------------|
| The Bushfire Hazards<br>Vegetation Classification (AS 3959:2018)                                                                                                                               |            | Separation Distances Corresponding to Stated Level of Radiant Heat (metres) |        |        |        |         |         |                           |                     |
|                                                                                                                                                                                                |            | Bushfire Attack Level                                                       |        |        |        |         |         | Maximum Radiant Heat Flux |                     |
|                                                                                                                                                                                                | Class      | BAL-FZ                                                                      | BAL-40 | BAL-29 | BAL-19 | BAL12.5 | BAL-LOW | 10 kW/m <sup>2</sup>      | 2 kW/m <sup>2</sup> |
|                                                                                                                                                                                                | (A) Forest | <16                                                                         | 16-<21 | 21-<31 | 31-<42 | 42-<100 | >100    | 63.2                      | Select.             |
|                                                                                                                                                                                                | (D) Scrub  | <10                                                                         | 10-<13 | 13-<19 | 19-<27 | 27-<100 | >100    | 44.1                      | Select.             |
|                                                                                                                                                                                                | (G) Grass  | <6                                                                          | 6-<8   | 8-<12  | 12-<17 | 17-<50  |         | 29.5                      |                     |
| <p>The summary 'printouts' of calculation input and output values for each area of classified vegetation are presented on the following pages.</p> <p>Note: 10kWm2 calculated using 1200k.</p> |            |                                                                             |        |        |        |         |         |                           |                     |

## SUMMARY CALCULATOR INPUT AND OUTPUT VALUES FOR EACH AREA OF CLASSIFIED VEGETATION

| Minimum Distance Calculator - AS3959-2018 (Method 2) |              |                                              |                                                                                        |
|------------------------------------------------------|--------------|----------------------------------------------|----------------------------------------------------------------------------------------|
| Inputs                                               |              | Outputs                                      |                                                                                        |
| Fire Danger Index                                    | 80           | Rate of spread                               | 2.4 km/h                                                                               |
| Vegetation classification                            | Forest       | Flame length                                 | 19.8 m                                                                                 |
| Understorey fuel load                                | 25 t/ha      | Flame angle                                  | 63 °, 68 °, 73 °, 75 °, 77 ° & 82 °                                                    |
| Total fuel load                                      | 35 t/ha      | Elevation of receiver                        | 8.82 m, 9.17 m, 9.460000000000001 m, 9.56 m, 9.640000000000001 m & 9.800000000000001 m |
| Vegetation height                                    | n/a          | Fire intensity                               | 43,400 kW/m                                                                            |
| Effective slope                                      | 0 °          | Transmissivity                               | 0.843, 0.822, 0.796, 0.775, 0.764 & 0.712                                              |
| Site slope                                           | 0 °          | Viewfactor                                   | 0.4235, 0.3149, 0.2132, 0.144, 0.1168 & 0.0313                                         |
| Flame width                                          | 100 m        | Minimum distance to < 40 kW/m <sup>2</sup>   | 22.9 m                                                                                 |
| Windspeed                                            | n/a          | Minimum distance to < 29 kW/m <sup>2</sup>   | 29.9 m                                                                                 |
| Heat of combustion                                   | 18,600 kJ/kg | Minimum distance to < 19 kW/m <sup>2</sup>   | 41.2 m                                                                                 |
| Flame temperature                                    | 1,200 K      | Minimum distance to < 12.5 kW/m <sup>2</sup> | 54.9 m                                                                                 |
|                                                      |              | Minimum distance to < 10 kW/m <sup>2</sup>   | 63.2 m                                                                                 |

| Minimum Distance Calculator - AS3959-2018 (Method 2) |              |                                              |                                                |
|------------------------------------------------------|--------------|----------------------------------------------|------------------------------------------------|
| Inputs                                               |              | Outputs                                      |                                                |
| Fire Danger Index                                    | 80           | Rate of spread                               | 4.16 km/h                                      |
| Vegetation classification                            | Scrub        | Flame length                                 | 11.62 m                                        |
| Understorey fuel load                                | 25 t/ha      | Flame angle                                  | 65 °, 71 °, 76 °, 79 °, 80 ° & 84 °            |
| Total fuel load                                      | 25 t/ha      | Elevation of receiver                        | 5.26 m, 5.49 m, 5.64 m, 5.7 m, 5.72 m & 5.78 m |
| Vegetation height                                    | m            | Fire intensity                               | 53,815 kW/m                                    |
| Effective slope                                      | 0 °          | Transmissivity                               | 0.865, 0.848, 0.824, 0.8, 0.788 & 0.732        |
| Site slope                                           | 0 °          | Viewfactor                                   | 0.413, 0.3045, 0.2058, 0.1396, 0.1134 & 0.0304 |
| Flame width                                          | 100 m        | Minimum distance to < 40 kW/m <sup>2</sup>   | 13.9 m                                         |
| Windspeed                                            | 45 km/h      | Minimum distance to < 29 kW/m <sup>2</sup>   | 18.7 m                                         |
| Heat of combustion                                   | 18,600 kJ/kg | Minimum distance to < 19 kW/m <sup>2</sup>   | 27 m                                           |
| Flame temperature                                    | 1,200 K      | Minimum distance to < 12.5 kW/m <sup>2</sup> | 37.5 m                                         |
|                                                      |              | Minimum distance to < 10 kW/m <sup>2</sup>   | 44.1 m                                         |



| Minimum Distance Calculator - AS3959-2018 (Method 2) |              |                                              |                                                      |
|------------------------------------------------------|--------------|----------------------------------------------|------------------------------------------------------|
| Inputs                                               |              | Outputs                                      |                                                      |
| Grassland Fire Danger Index                          | 110          | Rate of spread                               | 14.3 km/h                                            |
| Vegetation classification                            | Grassland    | Flame length                                 | 6.87 m                                               |
| Understorey fuel load                                | 4.5 t/ha     | Flame angle                                  | 66 °, 72 °, 78 °, 81 °, 82 ° & 86 °                  |
| Total fuel load                                      | 4.5 t/ha     | Elevation of receiver                        | 3.13 m, 3.26 m, 3.36 m, 3.39 m, 3.4 m & 3.42 m       |
| Vegetation height                                    | n/a          | Fire intensity                               | 33,247 kW/m                                          |
| Effective slope                                      | 0 °          | Transmissivity                               | 0.881, 0.869, 0.85, 0.828, 0.8159999999999999 & 0.75 |
| Site slope                                           | 0 °          | Viewfactor                                   | 0.4037, 0.2976, 0.1994, 0.1344, 0.1096 & 0.0297      |
| Flame width                                          | 100 m        | Minimum distance to < 40 kW/m <sup>2</sup>   | 8.4 m                                                |
| Windspeed                                            | n/a          | Minimum distance to < 29 kW/m <sup>2</sup>   | 11.4 m                                               |
| Heat of combustion                                   | 18,600 kJ/kg | Minimum distance to < 19 kW/m <sup>2</sup>   | 16.9 m                                               |
| Flame temperature                                    | 1,200 K      | Minimum distance to < 12.5 kW/m <sup>2</sup> | 24.6 m                                               |
|                                                      |              | Minimum distance to < 10 kW/m <sup>2</sup>   | 29.5 m                                               |

## GLOSSARY

| APPLIED TERMINOLOGY     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <b>Consequence</b>      | <p>The outcome of an event or situation expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. In the emergency risk management context, consequences are generally described as the effects on persons, society, the environment and the economy. (Source: DPLH 2019)</p> <p>An impact on the natural, economic, built or social environments as a result of the hazard. The consequences are influenced by the vulnerability of elements at risk, by the exposure of elements at risk to the hazard, and by the characteristics of the hazard. (Source: PIA, 2015).</p> <p>The outcome of an event that affects objectives. Can be a range of consequences; can be certain or uncertain; can have positive or negative effects; can be expressed qualitatively or quantitatively; can escalate through knock-on effects. (Source: ISO Guide 73:2009)</p> |
| <b>Controls</b>         | <p>A measure that maintains and/or modifies risk. Controls include, but are not limited to, any process, policy, device, practice, or other conditions and/or actions which maintain and/or modify risk. (Source: AIDR Knowledge Hub; Glossary)</p> <p>A control is any measure or action that modifies or regulates risk. Controls include any policy, procedure, practice, process, technology, technique, method, or device that modifies or regulates risk. Risk treatments become controls, or modify existing controls, once they are implemented. (Source: Praxiom)</p> <p><i>Note: 'Protection Measures' and 'Risk Treatments' will be alternative terms used in this risk assessment report.</i></p>                                                                                                                                                                              |
| <b>Decision Maker</b>   | <p>The Minister for Planning, State Administrative Tribunal, Western Australian Planning Commission, Development Assessment Panel, any other State decision-making authorities, and/or the relevant local government and their delegates that make decisions regarding the application of this Policy. (Source: SPP 3.7)</p> <p>For proposed development or use that is not subject to planning approval, the relevant decision makers are those tasked with the development and management of a development or use. Typically this might be an existing development/use for which an improved bushfire performance is being sought.</p>                                                                                                                                                                                                                                                   |
| <b>Elements At Risk</b> | <p>The population, buildings and civil engineering works economic activities, public services and infrastructure, etc. exposed to hazards. (Australian Institute for Disaster Resilience, 2019)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Exposure</b>         | <p>Refers to the people and things in the path of potential hazards. (Source: AIDR LUPDR, 2020)</p> <p>The elements within a given area that have been, or could be, subject to the impact of a particular hazard. Bushfire exposure can refer to property that may be endangered by a fire burning in another structure or by a bushfire. (Source: AIDR Knowledge Hub; Glossary)</p> <p>The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard prone areas. Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability and capacity of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest. (Source: UNDRR, 2017)</p>                                 |

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| <b>Hazard</b>                | <p>A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.</p> <p>Hazards may be natural, anthropogenic or socionatural in origin.</p> <ul style="list-style-type: none"> <li>• <b>Natural hazards</b> are predominantly associated with natural processes and phenomena (note: disasters often follow natural hazards, but there is no such thing a natural disaster);</li> <li>• <b>Anthropogenic hazards</b> are human-induced – being induced entirely or predominantly by human activities and choices;</li> <li>• <b>Socionatural hazards</b> are associated with a combination of natural and anthropogenic factors, including environmental degradation and climate change.</li> </ul> <p>Hazards may be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity or magnitude, frequency and probability.</p> <p>(Source: UNDRR Terminology 2017)</p> <p>A source of potential harm or a situation with a potential to cause loss. A potential or existing condition that may cause harm to people, or damage to property or the environment. A source of risk. (Source: AIDR Knowledge Hub; Glossary)</p> |
| <b>Hazardous Event</b>       | <p>The manifestation of a hazard in a particular place during a particular period of time.</p> <p>[Severe hazardous events can lead to a disaster as a result of the combination of hazard occurrence and other risk factors.]</p> <p>(Source: United Nations Office for Disaster Risk Reduction, 2017)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hazard Identification</b> | <p>The process of recognising that a hazard exists and defining its characteristics. (Australian Institute for Disaster Resilience, 2019)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Hazard - Bushfire</b>     | <p>A fuel complex, defined by amount, type condition, arrangement, and location, that determines the degree of hazard. (Source: AIDR Knowledge Hub; Glossary)</p> <p>The term 'bushfire hazard' in this assessment report is intended to refer to both bushfire prone vegetation and the associated potential bushfire event itself. The term 'bushfire' is being applied as the common term for forest, scrub, shrub, and grass fire events.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hazard - Urban Fire</b>   | <p>1. Susceptibility of a material to burn. 2. The presence of combustible materials. 3. A process or activity posing a fire risk if not adequately controlled. (Source: AIDR Knowledge Hub; Glossary)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hazardous Material</b>    | <p>A substance or material which has been determined by an appropriate authority to be capable of posing an unreasonable risk to health, safety and property. (Source: AIDR Knowledge Hub; Glossary)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Impact</b>                | <p>Describes as a quantitative or qualitative measure, the relative potential ability of a threat to adversely affect an exposed element or of a protection measure to reduce threat, exposure or vulnerability levels and consequently, risk levels.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Likelihood</b>            | <p>Chance of something happening. The likelihood level reflects the probability of <b>both the emergency event and the estimated consequences</b> occurring as a result of the event. (Source: AIDR NERAG, 2020)</p> <p>In risk management terminology, the word 'likelihood' is used to refer to the chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically - such as a probability or a frequency over a given time period. (Source: ISO Guide 73:2009)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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|                    | <p>The chance of an event occurring. Likelihood may be represented as a statistical probability (such as Annual Exceedance Probability), or where this is not possible, it can be represented qualitatively using such measures as 'likely', 'possible', and 'rare'. (Source: PIA, 2015).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Mitigation</b>  | <p>The lessening or minimizing of the adverse impacts of a hazardous event. The adverse impacts of hazards, in particular natural hazards, often cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques and hazard-resistant construction as well as improved environmental and social policies and public awareness. (Source: UNDRR, 2017)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Reliability</b> | <p>Refers to the expected reliability of a designed solution (protection measure). Over time it will be a function of:</p> <ul style="list-style-type: none"> <li>• Its Initial likely reliability;</li> <li>• Its durability which may or may not be a function of maintenance;</li> <li>• The level of maintenance required;</li> <li>• The likelihood of solution being modified over time; and</li> <li>• The influence of other adjoining/adjacent structures or stored materials that may be installed after the initial construction.</li> </ul> <p>(Adapted from Kelly M. et al; <i>Structural Design Options for Residential Buildings in Bushfire Areas</i>, Australasian Structural Engineering Conference November 2016)</p>                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Resilience</b>  | <p>The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. (United Nations Office for Disaster Risk Reduction, 2017)</p> <p>Is that property of a building, system, or community that facilitates its return to a functional state following an overload. In the context of bushfire damage, resilience will be maximised when:</p> <ul style="list-style-type: none"> <li>• There is a high probability of an attacked building remaining fit for purpose; and</li> <li>• There is a low time and cost to make badly damaged buildings fit for purpose.</li> </ul> <p>(Adapted from Kelly M. et al; <i>Structural Design Options for Residential Buildings in Bushfire Areas</i>, Australasian Structural Engineering Conference November 2016)</p>                                                                                                                         |
| <b>Robustness</b>  | <p>Refers to that property of structural systems that seeks to achieve proportionality of damage to the severity of an overloading event. It will be maximised when bushfire design solutions:</p> <ul style="list-style-type: none"> <li>• Have few 'weak links' that allow progressive spread of damage from minor sources;</li> <li>• Consist of materials and assemblies that retain physical properties when thermally loaded beyond their design capacity; and</li> <li>• Include protection of inherently vulnerable and brittle elements. Such as openings to internal parts of structures (including doors and windows) and essential services that maintain required functioning (e.g. cabling and plumbing).</li> </ul> <p>(Adapted from Kelly M. et al; <i>Structural Design Options for Residential Buildings in Bushfire Areas</i>, Australasian Structural Engineering Conference November 2016)</p> <p>As a design principle it means that the design and materials are not easily damaged or compromised, and do not require manual operation or intervention to work (Source: State Government of Queensland, CSIRO, 2020)</p> |

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| <b>Redundancy</b>          | <p>Refers to design that ensures the fate of the subject building/structure is not reliant on the effective performance of a single element. (State Government of Queensland, CSIRO, 2020)</p> <p>An example is a roof system that does not rely solely on the roof cladding to resist bushfire threats. It has additional layers of resistance including non-combustible roof/ceiling framing, insulation and ceiling lining, and the sealing/screening of gaps into internal operating spaces.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Risk</b>                | <p>Disaster risk is the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity. (Source: UNDRR, 2017)</p> <p>Disaster risk is a product of a hazard (a sudden event or shock), exposure (the people and things in the path of potential hazards), vulnerability (the potential for those people and things to be adversely impacted by a hazard) and the capacity (the ability for those people and assets and systems to survive and adapt). (Source: ADR LUPDRC, 2020)</p> <p>Risk is the chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood. In <u>emergency management</u> it is a concept used to describe the likelihood of harmful consequences arising from the interaction of hazards, communities and the environment. (Source: PIA, 2015)</p>                                                                                                                                                                                                                                                               |
| <b>Risk Management</b>     | <p>Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses. (Source: UNDRR, 2017)</p> <p>Coordinated activities of an organisation or a government to direct and control risk. The risk management process includes the activities of:</p> <ul style="list-style-type: none"> <li>• Communication and consultation;</li> <li>• Establishing the context;</li> <li>• Risk Assessment (risk identification, risk analysis, risk evaluation);</li> <li>• Risk Treatment; and</li> <li>• Monitoring and Review. (Source: ADR NERAG, 2020)</li> </ul> <p><b>Risk management vs. risk mitigation:</b> Though risk management and risk mitigation are often used interchangeably, the two terms refer to slightly different things. Risk mitigation involves limiting the effect that risks can have (i.e. making less severe). It is a single component of the larger risk management process. Risk management refers to the overall practice of assessing and addressing the relevant risk. (an explanation of the use of these terms as applied by Bushfire Prone Planning)</p> |
| <b>Risk Identification</b> | <p>Process of finding, recognising and describing sources of risks, their causes and their potential consequences. (Source: ISO Guide 73:2009)</p> <p>It is a process used to find, recognise, and describe the risks that could affect the achievement of objectives. (Source: Praxiom)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Risk Source</b>         | <p>An element which, alone or in combination, has the intrinsic potential to give rise to risk. (Source: ISO Guide 73:2009)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Risk Assessment</b>     | <p>Disaster risk assessment is a qualitative or quantitative approach to determine the nature and extent of disaster risk by analysing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people property, services and livelihoods and the environment on which they depend. Assessments include the identification of hazards; a review of the technical characteristics of hazards such as their location, intensity, frequency, and probability; the analysis of exposure and</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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|                             | <p>vulnerability, including the physical, social, health, environmental and economic dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities with respect to likely risk scenarios. (Source: UNDRR, 2017)</p> <p>The overall process of risk identification, risk analysis and risk evaluation. (Source: ISO Guide 73:2009)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Risk Analysis</b>        | <p>The process to comprehend the nature of risk and determine the level of risk. Provides the basis for risk evaluation and decisions about risk treatment. (Source: ISO Guide 73:2009)</p> <p>Is a process that is used to understand the nature, sources, and causes of the risks that you have identified and to estimate the level of risk. It is also used to study impacts and consequences and to examine the controls that currently exist. How detailed your risk analysis ought to be will depend upon the risk, the purpose of the analysis, the information you have, and the resources available. (Source: Praxiom)</p> <p>In this risk assessment report, risk analysis is the part of the risk assessment process that assesses the hazard threat levels, identifies the protection measures (and their effectiveness) that can be applied and derives the levels of exposure and vulnerability of the identified elements at risk, based on the ability to apply protection measures.</p> <p>From this information indicative risk levels can be derived. Where relevant sets of risk factor criteria and a risk level matrix have been established by the relevant authorities, a determined risk level can be derived.</p> <p>The required risk level analysis can be conducted for either each exposed element separately and/or the proposed or existing development/use overall.</p> |
| <b>Risk Evaluation</b>      | <p>The process used to determine risk management priorities by evaluating and comparing the level of risk against predetermined standards, target risk levels or other criteria. (Source: PIA, 2015)</p> <p>In this risk assessment report, it is the process of classifying the acceptability of the levels of risk, derived from the risk analysis, by reference to an established risk tolerance scale. The relevant tolerance scale will be that derived from the application of the 'as low as reasonably practicable' principle – 'ALARP' (refer to Appendix 1 for further information).</p> <p>This process can only be conducted when <u>determined</u> risk levels have been derived.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Risk Factor Criteria</b> | <p>In this risk assessment report, the risk factor criteria establish the parameters that will define the different hazard threat levels, the different levels of exposure of elements at risk and the different levels of vulnerability of elements at risk. Different sets of risk factor criteria can exist corresponding to different development types, uses and scale. They are applied as part of the risk analysis.</p> <p>These criteria are established by the relevant authorities as they must reflect societies preparedness to tolerate risk and be determined by those authorities exercising their responsibilities.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Risk Level Matrix</b>    | <p>In this risk assessment report, the risk level matrix establishes how the assessed levels of hazard threats, exposure and vulnerability are to be analysed in deriving a determined risk level. It is applied as part of the risk analysis.</p> <p>The matrix is established by the relevant authorities as they must reflect societies preparedness to tolerate risk and be determined by those authorities exercising their responsibilities.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Risk Tolerance Scale</b> | <p>In this risk assessment report the applied risk tolerance scale defines the acceptability of determined risk levels based on the 'as low as reasonably practical' principle (ALARP).</p> <p>The risk tolerance scale can be applied within the risk assessment report when the required risk factor criteria and risk level matrix are available.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



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| <p><b>Risk - Inherent</b></p> | <p>In this risk assessment report, inherent risk is considered to be current risk after accounting for existing and any 'planned' protection measures (controls / risk treatments) but before the application of any additional protection measures that have been identified and recommended by the bushfire consultant – and which subsequently determines the residual risk (this approach is supported by the relevant information sourced from the two references below).</p> <p>'Planned' protection measures are those that are incorporated into the site development plans and those that exist in an approved Bushfire Management Plan (BMP) and/or Bushfire Emergency Plan (BEP) and for which a responsibility for their implementation has been created.</p> <p>If a BMP or BEP is yet to be developed or is being developed concurrently, the additional protection measures it contains (including any that are part of relevant 'acceptable solutions' established by the 'Guidelines for planning in bushfire prone areas', DPLH as amended), are considered to be additionally recommended protection measures.</p> <p><b>1. Source: <a href="http://www.fairinstitute.org">www.fairinstitute.org</a></b></p> <p><i>"Confusion exists between Inherent Risk and Residual Risk ... Here are the standard definitions of the two concepts:</i></p> <ul style="list-style-type: none"> <li><i>Inherent risk represents the amount of risk that exists in the absence of controls.</i></li> <li><i>Residual risk is the amount of risk that remains after controls are accounted for.</i></li> </ul> <p><i>Sounds straightforward. But these two terms seem to fall apart when put into practice. Applying the above definitions to the clients' scenario uncovered the fact that the 'inherent' risk being described was not a 'no controls' environment, but rather, one that only excluded some controls.</i></p> <p><i>The flaw with inherent risk is that in most cases, when used in practice, it does not explicitly consider which controls are being included or excluded. A truly inherent risk state, in our example, would assume no employee background checks or interviews are conducted and that no locks exist on any doors. This could lead to almost any risk scenario being evaluated as inherently high. Treating inherent risk therefore can be quite arbitrary. According to Jack Jones, author of Measuring and Managing Information Risk: A FAIR Approach and creator of the FAIR model, much more realistic and useful definitions would be:</i></p> <ul style="list-style-type: none"> <li><i>Inherent risk is current risk level given the existing set of controls rather than the hypothetical notion of an absence of any controls; and</i></li> <li><i>Residual risk would then be whatever risk level remain after additional controls are applied."</i></li> </ul> <p><b>2. Source: Wikipedia:</b></p> <p><i>Inherent risk, in risk management is:</i></p> <ul style="list-style-type: none"> <li><i>an assessed level of raw or untreated risk; that is, the natural level of risk inherent in a process or activity without doing anything to reduce the likelihood or mitigate the severity of a mishap, or the amount of risk before the application of the risk reduction effects of controls; or</i></li> <li><i>Another definition is that inherent risk is the current risk level given the existing set of controls, which may be incomplete or less than ideal, rather than an absence of any controls.</i></li> </ul> |
| <p><b>Risk - Residual</b></p> | <p>In this risk assessment report, residual risk is that which remains after the application of protection measures that are additional to those that already exist or are 'planned' and that establish the inherent risk (see Risk – Inherent in glossary)</p> <p>It is the disaster risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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|                                | <p>capacities must be maintained. The presence of residual risk implies a continuing need to develop and support effective capacities for emergency services, preparedness, response and recovery, together with socioeconomic policies such as safety nets and risk transfer mechanisms, as part of a holistic approach. (Source: UNDRR, 2017)</p> <p>It is the risk left over after you've implemented a risk treatment option. It's the risk remaining after you've reduced the risk, removed the source of the risk, modified the consequences, changed the probabilities, transferred the risk, or retained the risk. (Source: Praxiom)</p> <p>It is the risk remaining after any risk treatment has been applied to reduce its potential likelihood and/or its potential consequences. Residual risk can also be any risk that is chosen to be retained rather than treated (Source: AIDR LUPDRC, 2020)</p> <p>Residual risk can contain unidentified risk. Residual risk can also be known as retained risk. (Source: ISO Guide 73:2009)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Risk Level - Determined</b> | <p>Magnitude of a risk or a combination of risks. In this risk assessment report, as an outcome of the risk analysis, a determined risk level is derived from:</p> <ol style="list-style-type: none"> <li>1. The determination of threat, exposure and vulnerability levels by reference to an established set of risk factor criteria that corresponds to each risk level (for each factor); and</li> <li>2. The determination of the risk level by reference to an established risk level matrix that incorporates threat, exposure and vulnerability levels.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Risk Level - Indicative</b> | <p>Magnitude of a risk or a combination of risks. In this risk assessment report, as an outcome of the risk analysis, an indicative risk level is derived from analysis of the number of bushfire protection measures able to be implemented compared to the number of measures available, and the relative effectiveness of each at reducing threat, exposure and/or vulnerability levels.</p> <p>Overall, more applicable and applied measures is better and the measures with a higher effectiveness rating have greater weighting in the analysis.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Risk - Acceptable</b>       | <p>Risks that do not need further treatment. The expression acceptable level of risk refers to the level at which it is decided that further restricting or otherwise altering the activity is not worthwhile e.g. additional effort will not result in significant reductions in risk levels. (Source: DPLH, 2019)</p> <p>That level of risk that is sufficiently low that society is comfortable with it. Society does not generally consider expenditure in further reducing such risks justifiable. (Source: AIDR Knowledge Hub)</p> <p>An acceptable risk is a risk that is sufficiently low to require no new treatments or actions to reduce the risk as communities can live with this level of risk without further action. (Source: Queensland Government 2019: Natural hazards, risk and resilience – Bushfire: State Planning Policy – state interest guidance material)</p> <p>Acceptable risk or tolerable risk is an important sub-term (of disaster risk). The extent to which a disaster risk is deemed acceptable or tolerable depends on existing social, economic, political, cultural, technical and environmental conditions. (Source: UNDRR, 2017)</p> <p><b>Note:</b> It is generally accepted that nothing can be absolutely free of risk, everything under some circumstance can cause harm. There are differing levels of risk and consequently levels of safety. In practice, attaining zero risk is not possible. Nevertheless, after risk avoidance, reduction/mitigation, transfer or acceptance - the residual risk may be determined as acceptable, as judged by the participants in an activity and decision makers (who apply societies expectations). For certain land uses, the residual risk may exist at higher levels but still be judged by to be acceptable (or tolerable) on this basis.</p> |

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|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Risk - Tolerable</b>                       | <p>The willingness to live with a risk to secure benefits and achieve objectives, on the understanding that it is being properly controlled. 'Tolerability' does not mean 'acceptability'. Tolerating a risk does not mean that it is regarded as negligible, or something we may ignore, but rather as something that needs to be kept under review and reduced further. (Source: DPLH, Guidelines v1.4)</p> <p>Certain levels of risk may be tolerated, provided that the risks are known and managed. (Source: AIDR LUPDRC, 2020)</p> <p>A tolerable risk is a risk that is low enough to allow the exposure to a natural hazard to continue while at the same time high enough to require new treatments or actions to reduce risk. Communities can live with level of risk but as much as is reasonably practical should be done to further reduce the risk. (Source: Queensland Government 2019: Natural hazards, risk and resilience – Bushfire: State Planning Policy – state interest guidance material)</p> <p>Risk tolerance is defined as the organisations or stakeholder's readiness to bear the risk, after risk treatment, in order to achieve its objectives. Risk tolerance can be influenced by legal or regulatory requirements. (Source: ISO Guide 73:2009)</p> <p>A level of risk that defines the ALARP region, as risks that should be driven to the broadly acceptable region. (Source: PIA, 2015)</p> |
| <b>Risk - Intolerable</b>                     | <p>A level of risk that is so high that require risk treatment measures whatever their cost, or the elimination of the risk. (Source: PIA, 2015)</p> <p>Risk that is unacceptable in any circumstances or at any level. (Source: DPLH, 2019)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Risk Treatment</b>                         | <p>Risk treatment options available as part of the risk management process are generally categorised as follows:</p> <ul style="list-style-type: none"> <li>• Risk Avoidance: Measures taken to avoid risks from natural hazards. Can include avoiding development in hazardous areas, relocating people or assets away from hazardous areas, or developing buffer zones to the hazard;</li> <li>• Risk reduction/mitigation: Measures undertaken to reduce the risks from natural hazards. Includes building control and development controls;</li> <li>• Risk Transfer: Measures taken to transfer the risk from natural hazards from one party to another; and</li> <li>• Risk Acceptance: The acceptance of risk from a natural hazard. Any realised losses will be borne by those parties exposed to the hazard. This is not specifically a treatment option as no action is taken, but it is an option for addressing risk.</li> </ul> <p>(Source: AIDR LUPDRC, 2020)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Retrofitting</b>                           | <p>Reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards.</p> <p>Retrofitting requires consideration of the design and function of the structure, the stresses that the structure may be subject to from particular hazards or hazard scenarios and the practicality and costs of different retrofitting options. (Source: UNDRR, 2017)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Structural and Non-Structural Measures</b> | <p>Structural measures are any physical construction to reduce or avoid possible impacts of hazards, or the application of engineering techniques or technology to achieve hazard resistance and resilience in structures or systems.</p> <p>Non-structural measures are measures not involving physical construction which use knowledge, practice or agreement to reduce disaster risks and impacts, in particular through policies and laws, public awareness raising, training and education.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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|                             | Common non-structural measures include building codes, land-use planning laws and their enforcement, research and assessment, information resources and public awareness programmes. <i>(Source: UNDRR, 2017)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Threats</b>              | The mechanisms by which hazards can impact exposed elements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Vulnerability</b>        | <p>The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards. <i>(United Nations Office for Disaster Risk Reduction, 2017)</i></p> <p>The characteristic or property of a community, system or object that makes it susceptible to the damaging effects of a specific hazard.</p> <p>Can be defined according to the responses of people, houses and assets in mitigating the impacts of a hazard. Specifically, it refers to the extent to which a community, building, services or location is likely to be damaged or disrupted by the impacts of a hazard, such as a bushfire.</p> <p>Building vulnerability refers to weak points in a building caused by its design, construction, use of materials and management (including maintenance). These weak points are identified in the context that they are not able to withstand the level of hazard they are exposed to.</p> <p>Climate and weather may directly influence the buildings vulnerability through several processes including (i) moisture content of combustible elements around and within buildings (ii) gaps between materials that may shrink and expand due to changes in moisture content and temperature (iii) wind action causing damage or dislocation of elements. <i>(Source: State Government of Queensland, CSIRO, 2020; Bushfire Resilient Building Guidance for Queensland Homes)</i></p> |
| <b>'Vulnerable' Persons</b> | <p>These are persons who are considered to be at-risk members of the community and may be more susceptible to the impacts of bushfire.</p> <p>These persons are likely to present relocation (including evacuation) challenges in the event of a bushfire. Attributes of this group of persons includes:</p> <ul style="list-style-type: none"> <li>• Less physically or mentally able to relocate themselves; and/or</li> <li>• Are unfamiliar with their surroundings; and/or</li> <li>• Large numbers of persons in a building(s) or in the open, on a single site, such that the numbers present practical challenges.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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