BLACKASH
BUSHFIRE CONSULTING

Bushfire Hazard Assessment

SSD-79500208

Honeman Close Industrial Facility

Honeman Close,

Huntingwood

Prepared for

Goodman Property Services (Aust.) Pty Ltd

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Version 1.2

24 March 2025

Project Name:	Honeman Close Industrial Facility: SSD-79500208
Site Details	Honeman Close, Huntingwood
Client Details:	Lachlan O'Reilly Planning & Infrastructure Manager Goodman The Hayesbery 1-11 Hayes Road, ROSEBERY, NSW 2018
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1. Abbreviations

APZ	Asset protection zone
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2018*
BAL	Bushfire Attack Level
NCC	*National Construction Code*
BFSA	Bush Fire safety authority
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPA Reg	*Environmental Planning and Assessment Regulation 2000*
GTA	General terms of approval
PBP	*Planning for Bush Fire Protection 2019*
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
RFR	*Rural Fires Regulation* 2013

2. Glossary

AS3959	Australian Standard AS 3959 Construction of buildings in bushfire-prone areas, Standards Australia, 2018, that outlines construction standards applicable to residential developments in bush fire prone areas
Bushfire Prone Area	An area of land that can support a bush fire or is likely to be subject to bush fire attack.
Bush fire safety authority	An approval of the Commissioner of the RFS required for a subdivision for residential or rural residential purpose or for a special fire protection purpose listed under section 100B of the *Rural Fires Act 1997*.
Infill Development	Refers to the development of land by the erection of or addition to a residential building (or buildings) which does not require the spatial extension of services including public roads, electricity or water and is within an existing allotment.

3. Property, Proposal & Summary

Address:	Honeman Close, Huntingwood
Lot/ DP:	Lot 1 DP1098102 Lot 16 & 19 in DP1024111 and Lot 19 in DP819317 (Intersection upgrade)
Suburb, town or locality:	Huntingwood
Local Government Area:	Blacktown
Type of development:	Infill development – Other (Industrial)
Existing use	Vacant
Intended use	Industrial

4. Compliance with *Planning for Bush Fire Protection 2019*

Type of Development	Infill - Other
Aim of PBP	Yes
Objectives of PBP	Yes
Specific Objectives for Infill	Yes
BAL	See Figure 7

5. Introduction

Blackash Bushfire Consulting has been engaged by Goodman Property Services (Aust.) Pty Ltd (Goodman) to provide a Bushfire Hazard Assessment report to support the proposed industrial warehouse development at Honeman Close, Huntingwood.

The site is shown in Figure 1.

The site is not located on bushfire-prone land, so new development is not required to adhere to the NSW Rural Fire Service's *Planning for Bush Fire Protection 2019* (PBP 2019) guidelines. Although compliance with PBP 2019 is not mandatory, an assessment of the site and the proposed development has still been conducted.

PBP 2019 recognises that infill development proposals will be constrained by existing situations – pre-existing subdivision patterns and existing built forms surrounding the subject site. Consequently, each proposal must be considered on its merits and in accordance with the intent and performance criteria for infill development. Industrial development such as the proposed development is designated as "other" development in PBP 2019. As "other" development, the proposed development has considerable flexibility, and the nature of the development often results in the structures providing a higher degree of bushfire resistance that required by the NSW Rural Fire Service (NSW RFS). As "other" development, a key issue for the proposal will be meeting the aim and objectives of *Planning for Bushfire Protection* and the performance requirements for commercial development.

This report has been completed having regard to Secretary for Planning and Environment's (the Secretary) Environmental Assessment Requirements (SEARs) issued for the proposal on 31 January 2025. The SEARs require the following in relation to bushfire:

> *"If the development is on mapped bush fire prone land, or a bush fire threat is identified on or adjoining the site, provide a bush fire assessment that details proposed bush fire protection measures and demonstrates compliance with Planning for Bush Fire Protection."*

This report demonstrates that an appropriate combination of protection measures have been provided to meet the aims and objectives of *Planning for Bush Fire Protection 2019*.

This assessment has been prepared by Corey Shackleton, Principal Bushfire and Resilience, Blackash Bushfire Consulting. Corey is a person who is recognised by the NSW RFS as a qualified consultant in bush fire risk assessment (FPAA BPAD-Level 3 Certified Practitioner No. BPD-PA-34603).

Figure 1: Site Location

6. Site Description & Proposal

The subject site is a 20ha greenfield development site located at Honeman Close, Huntingwood. The site comprises the following:

- Lot 1 in DP 1098102 – to facilitate the proposed two warehouse and distribution centre buildings with ancillary offices zoned IN1 General Industrial; and
- Great Western Highway, Lot 16 & 19 in DP1024111, and Lot 19 in DP819317 – to facilitate intersection upgrade works and formal access, zoned both SP2 Classified Road and IN1 General Industrial.

The broader site is located to the north of the M4 Motorway, West of Reservoir Road, and South of Great Western Highway.

The site is affected by the following constraints that have all been considered as part of the masterplan and assessment reports for the site;

- State and Local Heritage classification of Honeman Close
- Threatened Ecological Communities / Serious and Irreversible Impact (SAII) entities;
- First and Second Order watercourse's
- TrfNSW Crash lab design consideration for access
- Sydney Water Potable Water Service
- Aboriginal Heritage artefacts
- Contamination (Compromising of Friable & Non-Friable Asbestos and Septic Tank contamination)

This application seeks approval for the construction, operation, use and fit-out approval of two warehouses spanning 52,935 sqm GLA and associated infrastructure and lead-in works.

Approval is sought for 24/7 operation of the proposed Warehouse and Distribution use.

The development is proposed to be constructed in one stage and will generally consist of the following scope:

- Infrastructure and Lead-in Works
  - Estate wide infrastructure and preparation works including vegetation clearing, bulk earthworks and remediation, watercourse realignment, retaining walls, internal services reticulation;
  - Lead in services including stormwater, sewer, potable water, electrical and communications
  - New Left in, Left out intersection at Great Western Highway / new proposed estate road including services relocation and eventual dedication;

- Warehouse with ancillary office development;
  - Construction, operation, fit-out and use of two warehouses, totalling 52,935 sqm GLA of warehouse, including ancillary office spaces, access and hardstand, guardhouses, loading bays, landscaping, car parking, electric vehicle charging, solar panels and signage;
  - Warehouse proposed height limit of 15m
  - 24/7 operation
  - Warehouse and distribution use with generic racking layout

7. Bushfire Prone Land

Bushfire prone land maps provide a trigger for the development assessment provisions and consideration of sites that are bushfire prone.

Bushfire prone land (BFPL) is land that has been identified by council, which can support a bushfire or is subject to bushfire attack. Bushfire prone land maps are prepared by local council and certified by the Commissioner of the NSW RFS.

Figure 4 shows the Bushfire Prone Land Map for the site. The extract from the Blacktown Bushfire Prone Map shows that there is no bushfire prone land within the site.

Figure 2: Proposed Development

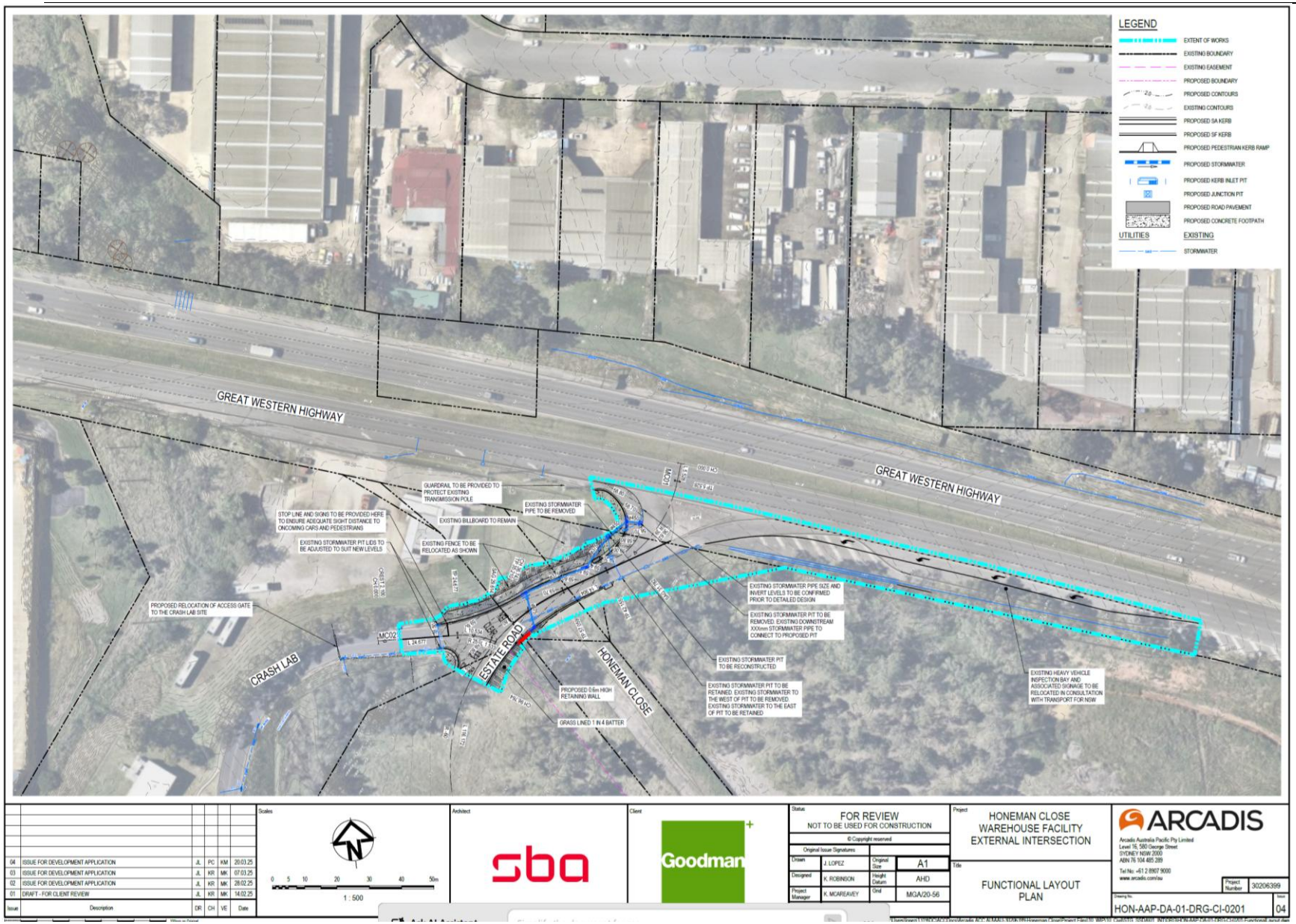

Figure 3: Proposed Plan of TfNSW intersection upgrade

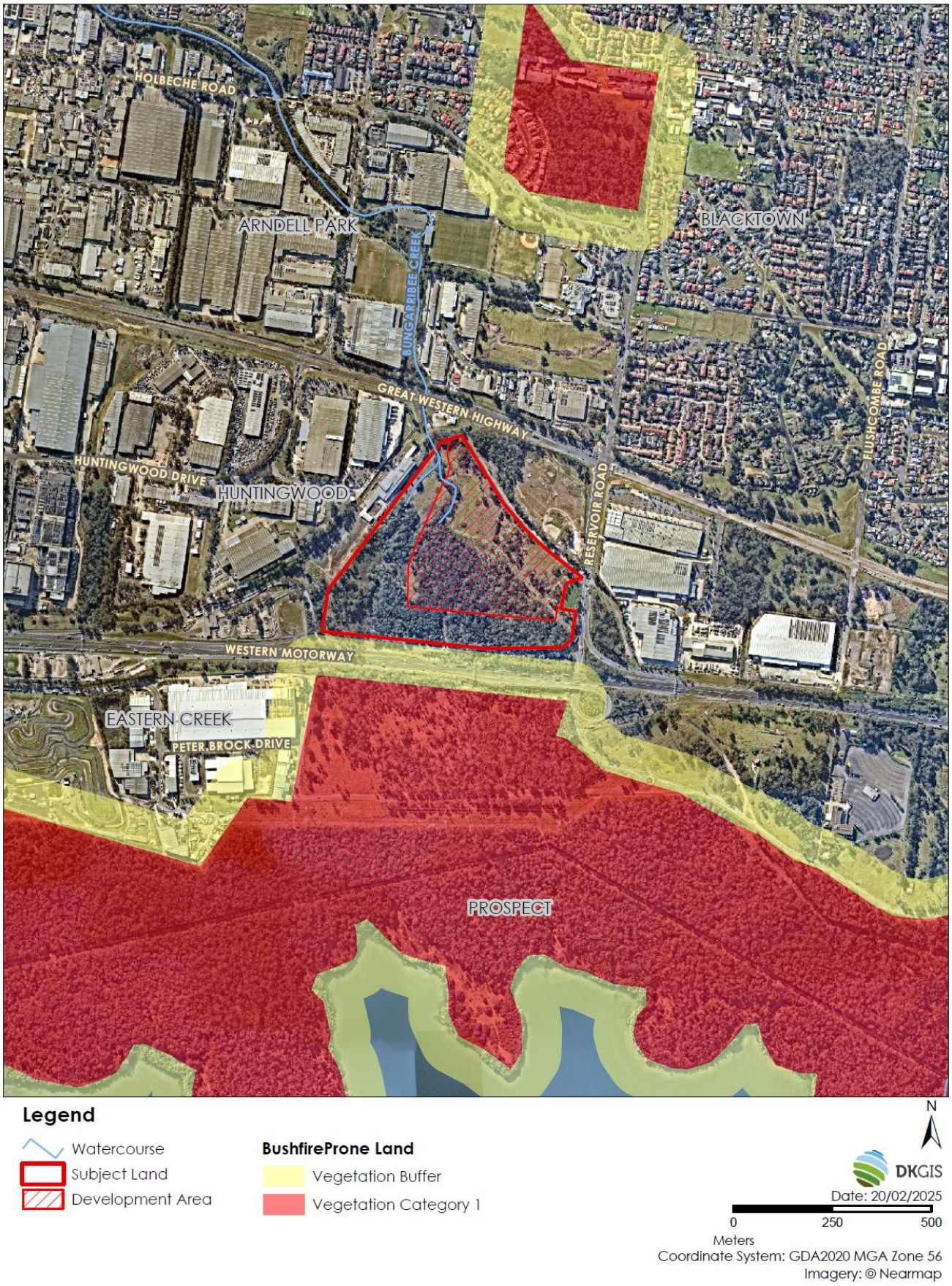

Figure 4: Bushfire Prone Land

8. Legislative Framework

The site is not identified as 'bushfire prone land' (see Figure 3) for the purposes of Section 10.3 of the *Environmental Planning and Assessment Act, 1979* (EPA Act) and therefore the legislative requirements for development on bushfire prone lands are not applicable. While not applicable, all development on bushfire prone land must consider and comply with PBP 2019. However, as the site is not located on bushfire-prone land, it is not required to comply with PBP 2019. Although compliance with PBP 2019 is not mandatory, an assessment of the site and the proposed development has still been conducted.

A defendable space is provided through onsite setbacks. This coupled with the suite of bushfire protection measures ensures the proposed warehouse can comply with PBP 2019.

As "other" development, the proposed industrial development is addressed through demonstrating compliance with the aim and objectives of PBP.

Because of their size, complexity, importance and/or potential impact, the Department of Planning, Housing & Infrastructure (DPHI) is predominantly responsible for assessing development applications relating to State Significant Development. The Minister for Planning is the consent authority for SSD applications.

Applications designated as state significant projects are exempt from requiring a bushfire safety authority (BFSA). Given their scale however, the requirements of PBP should still be applied, although consultation with the NSW RFS is not required.

9. NSW RFS Comments

The NSW RFS provided the following comments on 6 February 2025.

> *"Given the type of development proposed, the report should examine compliance with the following sections of PBP 2019 (where applicable):*
> - *8.3.1 – Buildings of Class 5 to 8 under the NCC*
> - *8.3.9 – Hazardous Industry*
> - *8.3.10 – Commercial and industrial development"*

The proposed development does not fall under the classification of a hazardous industry. The bushfire protection measures incorporated into the design align with the objectives for Class 5-8 buildings under the NCC (section 8.3.1 of PBP 2019) and meet the requirements for commercial and industrial developments outlined in section 8.3.10 of PBP 2019.

10. Bushfire Assessment Requirements

The subject land is not identified as being bushfire prone land on the Blacktown Bushfire Prone Land Map. As State Significant Development, the proposed development is to be assessed by DPHI and while this assessment is still considering PBP 2019, consultation with the NSW RFS is not required.

PBP 2019 recognises the unique attributes of infill development and promotes detailed site analysis and the application of a combination of bushfire protection measures (BPMs) to achieve an acceptable outcome.

The BPMs work in combination to provide a suite of measures that meet the aim and objective and Section 4.3 of PBP 2019. The BPMs are shown in Figure 5.

Appropriate combinations depend upon geographic location and site circumstances.

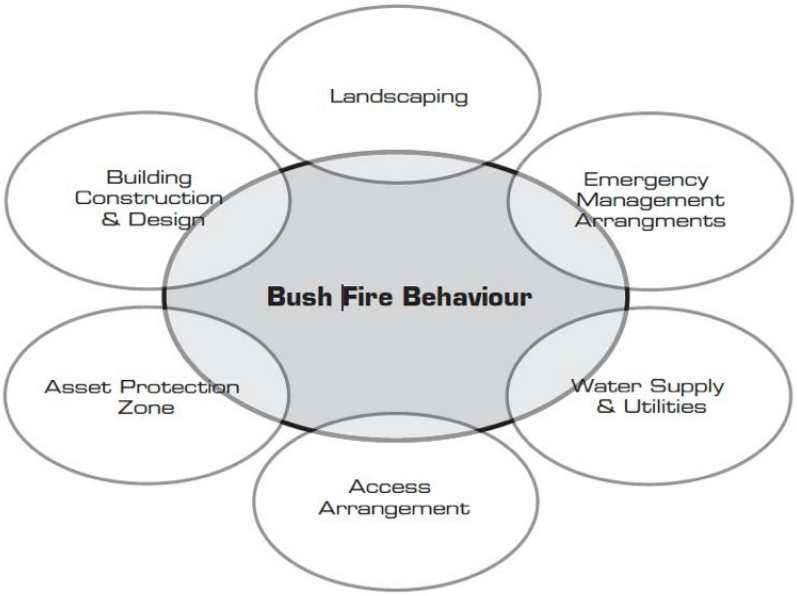

Figure 5: Bushfire Protection Measures in Combination (source PBP 2019 p. 26)

Methodology

PBP 2019 provides a methodology to determine the bushfire threat posed to a site and Australian Standards for the *Construction of Buildings in Bushfire Prone Areas* (AS3959) is used to determine the construction requirement to reduce potential bushfire attack.

The following assessment is prepared in accordance with PBP 2019 and Method 1 from AS3959. This assessment is based on a detailed desktop assessment of the site utilising the following resources:

- *Planning for Bushfire Protection* (NSW RFS, 2019);
- Aerial mapping; and
- Detailed GIS analysis.

Bushfire Hazard

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as Asset Protection Zone (APZ) locations and dimensions and future building construction requirements in accordance with AS3959. The vegetation formations (bushfire fuels) and the topography (effective slope) combine to create the bushfire threat that may affect bushfire behaviour at the site, and which determine the building response of PBP 2019.

Fire weather

The fire weather is dictated by PBP and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds. The site has a Fire Danger Index (FDI) of 100 as per PBP 2019.

Vegetation

Predominant Vegetation is classified by structure or formation using the system adopted by Keith (2004) and by the general description using PBP 2019. Vegetation types give rise to radiant heat and fire behaviour characteristics.

The predominant vegetation is determined over a distance of at least 140 metres in all directions from the proposed site boundary or building footprint on the development site. Where a mix of vegetation types exist, the type providing the greater hazard is said to predominate.

Although the site is not classified as bushfire-prone, the narrow, isolated bushland being retained within the site to the south and west of the proposed warehouse consists of Coastal Valley Grassy Woodland.

Slopes Influencing Bushfire Behaviour

The 'effective slope' influencing fire behaviour approaching the sites has been assessed in accordance with the methodology specified within PBP 2019. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 metre transect measured outwards from the development boundary or the existing/ proposed buildings.

The land is relatively flat with slopes ranging from 1.1 degrees downslope to 1.5 degrees upslope (Figure 6).

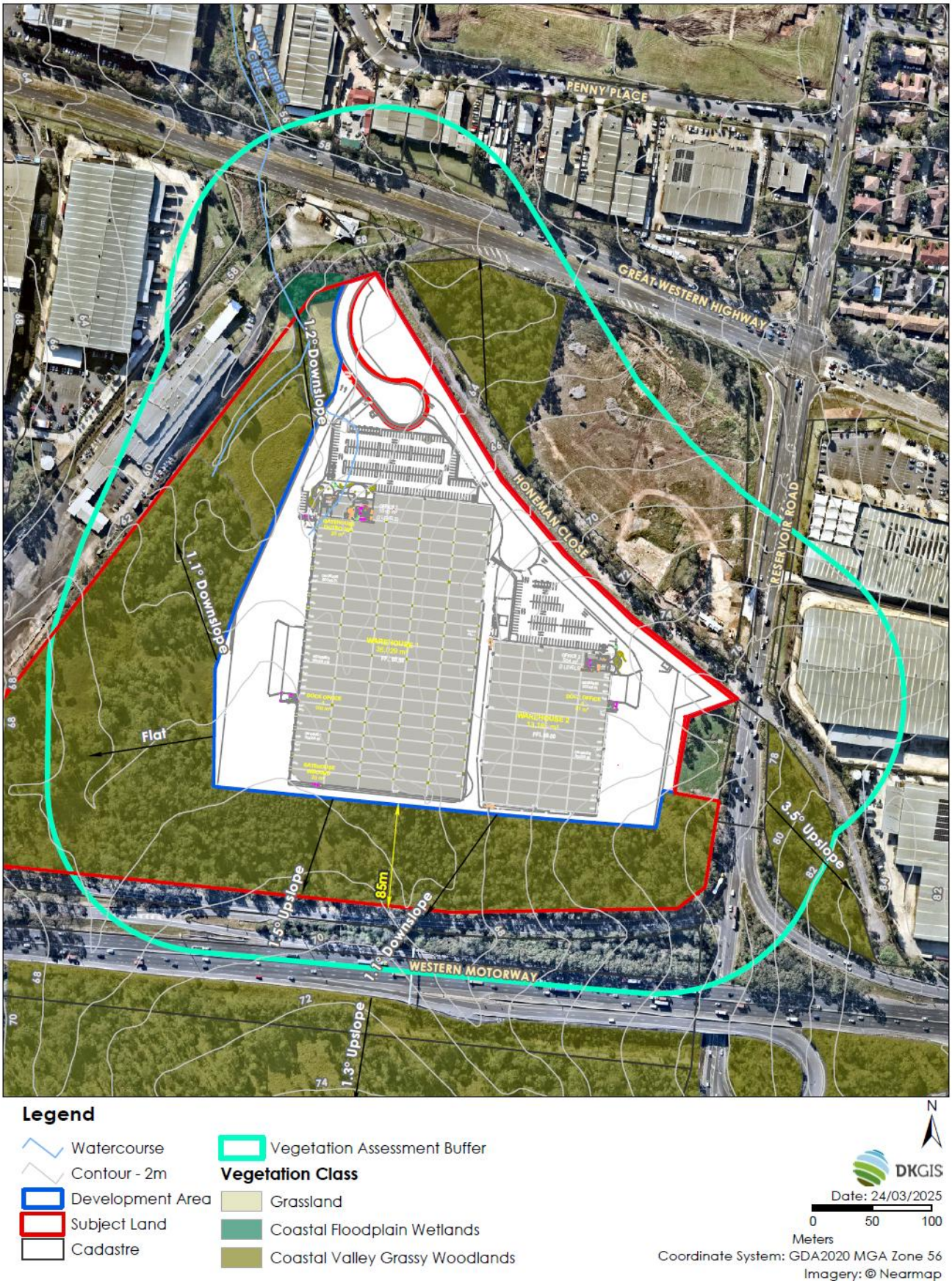

Figure 6: Vegetation and Slope

11. Asset Protection Zones

An Asset Protection Zone (APZ) is a buffer zone between a bushfire hazard and buildings. The APZ is managed progressively to minimise fuel loads and reduce potential radiant heat levels, flame, smoke and ember attack. The appropriate APZ distance is based on vegetation type, slope and the nature of the development.

The APZ can include roads or properties managed to be consistent with APZ standards set out in NSW RFS document *Standards for Asset Protection Zones*. The APZ provides a fuel-reduced, physical separation between buildings and bush fire hazards is a key element in the suite of bush fire measures and dictates the type of construction necessary to mitigate bushfire attack.

PBP 2019 requires APZs for commercial and industrial development to provide a defendable space and minimise material ignition.

The site will be managed and maintained to prevent the spread of a bushfire towards the building and to prevent the spread of fire onto or from the site in accordance with section 63 of the *Rural Fires Act, 1997* (RF Act). The area around the building is cleared and maintained to mineral earth or non-combustible surfaces and is not a fire hazard.

Table 2 (below) provides a summary of the APZ for the proposed development and Figure 7 depicts them across the site.

Table 2: APZ Assessment.

Direction	Slope	Vegetation	Flame Zone Width	APZ Proposed
North	NA	No hazard	Nil	Nil
East	NA	No hazard	Nil	Nil
South	1.1° Downslope	Coastal Valley Grassy Woodland	5.5 metres*	>10 metres
West	1.1° Downslope	Coastal Valley Grassy Woodland	9 metres*	>27 metres

**Note: The extent of the Flame Zone for the building is based on Radiant Heat Modelling (see section 11.1.1).*

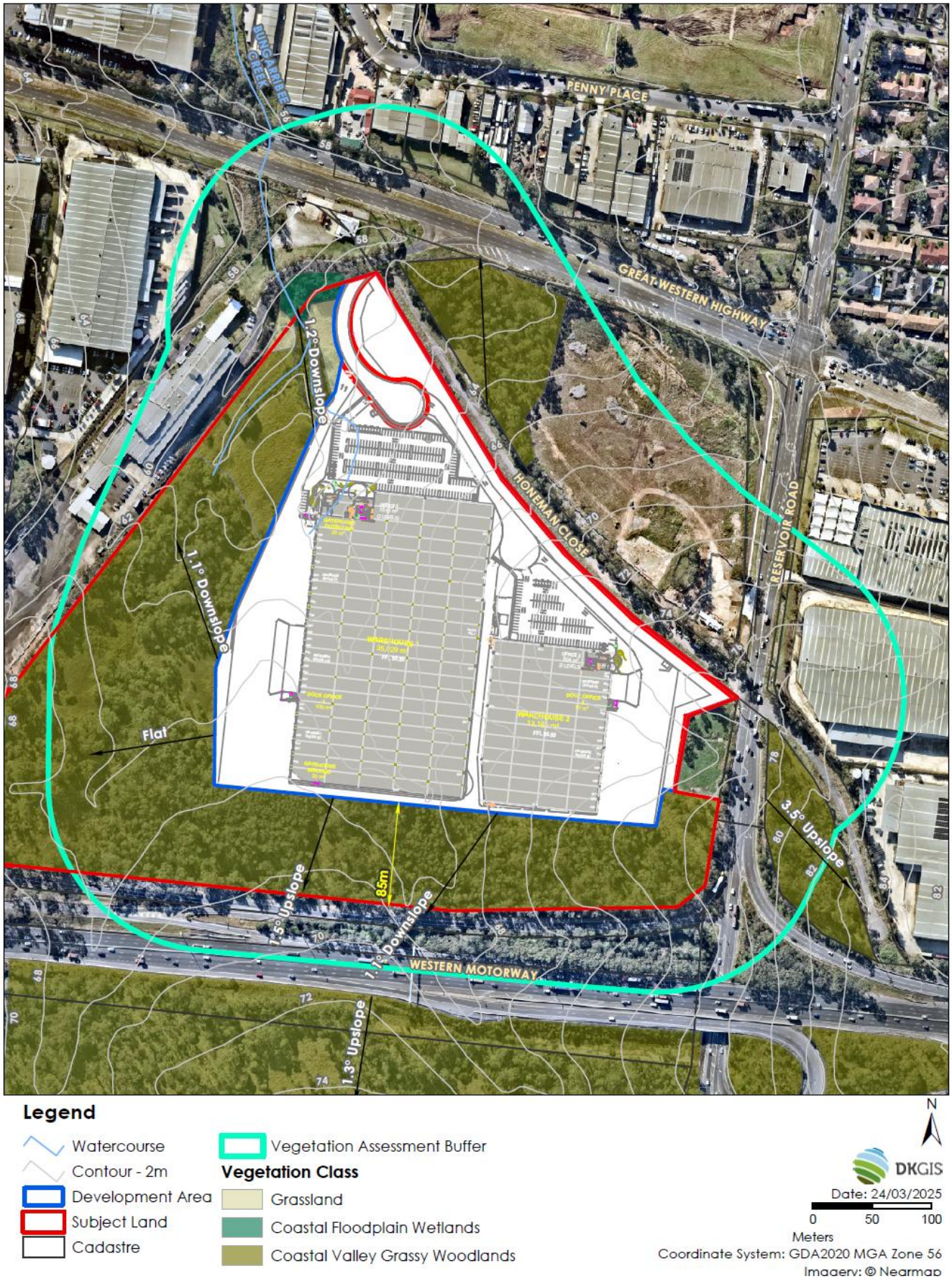

Figure 7: Asset Protection Zones

12. Bushfire Attack Levels

The Bushfire Attack Level (BAL) is a means of measuring the severity of a buildings or sites potential exposure to ember attack, radiant heat and direct flame contact. In the Building Code of Australia, the BAL is used as the basis for establishing the requirements for residential construction to improve protection of building elements.

The Bushfire Attack Levels to the site has been completed using the distances from the PBP 2019 Table A1.12.5 (Table 3). The BAL for the site is shown in Figure 8.

As "Other" development, the development must comply with objective 3 of PBP 2019 which requires that the development:

> *3. Provide appropriate separation between a hazard and buildings, which, in combination with other measures, prevent the likely fire spread to buildings.*

Asset Protection Zones (see section 7.5) will be provided around the development that include existing roads, hardstand areas, development, and managed land.

Table 3 provides a summary of the BALs, and Figure 8 depicts the BAL requirements across the site.

Table 3: Bushfire Attack Levels.

Direction	Slope	Vegetation	APZ Proposed	Bushfire Attack Level
North	NA	No hazard	Nil	See Figure 7*
East	NA	No hazard	Nil	See Figure 7*
South	1.1° Downslope	Coastal Valley Grassy Woodland	>10 metres	See Figure 7*
West	1.1° Downslope	Coastal Valley Grassy Woodland	>27 metres	See Figure 7*

**Note: The extent of the BAL for the building is depicted in detail in Figure 7 and Appendix 2 and Appendix 3 show the detailed modelling results.*

12.1. Radiant Heat Modelling

Detailed radiant heat modelling has been undertaken for the southern and western elevations due to the site-specific inputs. Table 4 below is a summary of the key inputs, while the detailed outputs can be found in Appendix 2 and 3.

The radiant heat modelling has focused on the southern and western scenarios, identified as the only realistic bushfire scenarios for the site.

South Fire Scenario – The reasonable worst-case scenario involves a fire run originating from the south near the Western Motorway, burning towards the site through the isolated Coastal Valley Grassy Woodland. This scenario assumes a 1.1 degree downslope effective slope. The fire run is limited to 86 metres; however, it has been modelled as a 150 metre fire run to ensure a robust and conservative assessment. For the purposes of the modelling, the effective slope has been conservatively rounded up to 2 degrees.

West Fire Scenario – The reasonable worst-case scenario involves a fire run originating from the west, burning towards the site through the isolated Coastal Valley Grassy Woodland. This scenario assumes a 1.1 degree downslope effective slope. The fire run is limited; however, for conservatism, a short fire run has not been used. For the purposes of the modelling, the effective slope has been conservatively rounded up to 2 degrees.

Table 4: Modelling inputs for the Flame Zone width.

Direction	Slope	Vegetation	Short Fire Run	Separation	Radiant Heat
South	2° Downslope	Coastal Valley Grassy Woodland	150 metres	5.5 metres	38.68kW/m^2
West	2° Downslope	Coastal Valley Grassy Woodland	NA	9 metres	39.71kW/m^2

12.2. Application of AS3959 (2018)

Construction must comply with the corresponding Bushfire Attack Level (BAL) as shown in Figure 8.

The application of each BAL is defined in Figure 7 and not broadly applied across the entire elevation/building. The construction must comply with corresponding sections of the Australian Standard AS3959-2018 *Construction of buildings in bush fire-prone areas* or NASH Standard (1.7.14 updated) *National Standard Steel Framed Construction in Bushfire Areas* – 2014 as appropriate, and Section 7.5 of *Planning for Bush Fire Protection 2019*.

The construction for the remainder of the proposed buildings not denoted with a BAL in Figure 8 is greater than 100 metres from any bushfire hazard. Consistent with AS3959, construction greater than 100 metres from a bushfire hazard is classified as BAL-Low. AS3959 describes BAL-Low as "*There is insufficient risk to warrant specific construction requirements*". Therefore, the construction for the

remainder of the proposed building not denoted with a BAL in Figure 7, is appropriately BAL-Low.

The construction of the buildings in this manner complies with *Planning for Bush Fire Protection 2019* and the National Construction Code (NCC).

The modelled potential flame height from the adjoining bushfire hazard is less than 6.5 metres. Given the building's height and elevated position, radiant heat will not impact the roof. Consequently, ember attack is the sole bushfire attack mechanism relevant to the roof's bushfire protection.

13. Water Supply and Utilities

PBP 2019 (p. 47) requires that adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

Suitable water supply arrangements will be provided for firefighting that meet the NSW RFS requirements. A reticulated water supply for potable water supply and fire hydrants will be provided to the site. The fire-fighting water supply to the proposed buildings shall comply with the Building Code of Australia [BCA] and A.S. 2419.1 – 2005.

14. Access

PBP 2019 requires that the design of access roads enables safe access and egress for people attempting to leave the area while emergency service personnel are arriving to undertake firefighting operations.

Figure 3 shows the site plan which includes the access to the site.

Vehicular access to the warehouse will be provided via a new cul-de-sac which links to the Great Western Highway.

The new road will be constructed to provide heavy rigid and articulated vehicle access to the proposed warehouse. The road is designed to provide access for a prime mover and semi-trailer. This design is more than adequate to accommodate fire-fighting appliances like NSW RFS Category 1 Tankers and Fire & Rescue NSW Composite and Aerial Appliances.

Given the comprehensive nature of the road design, and the site not being bushfire prone, the access is considered consistent with the requirements of PBP 2019.

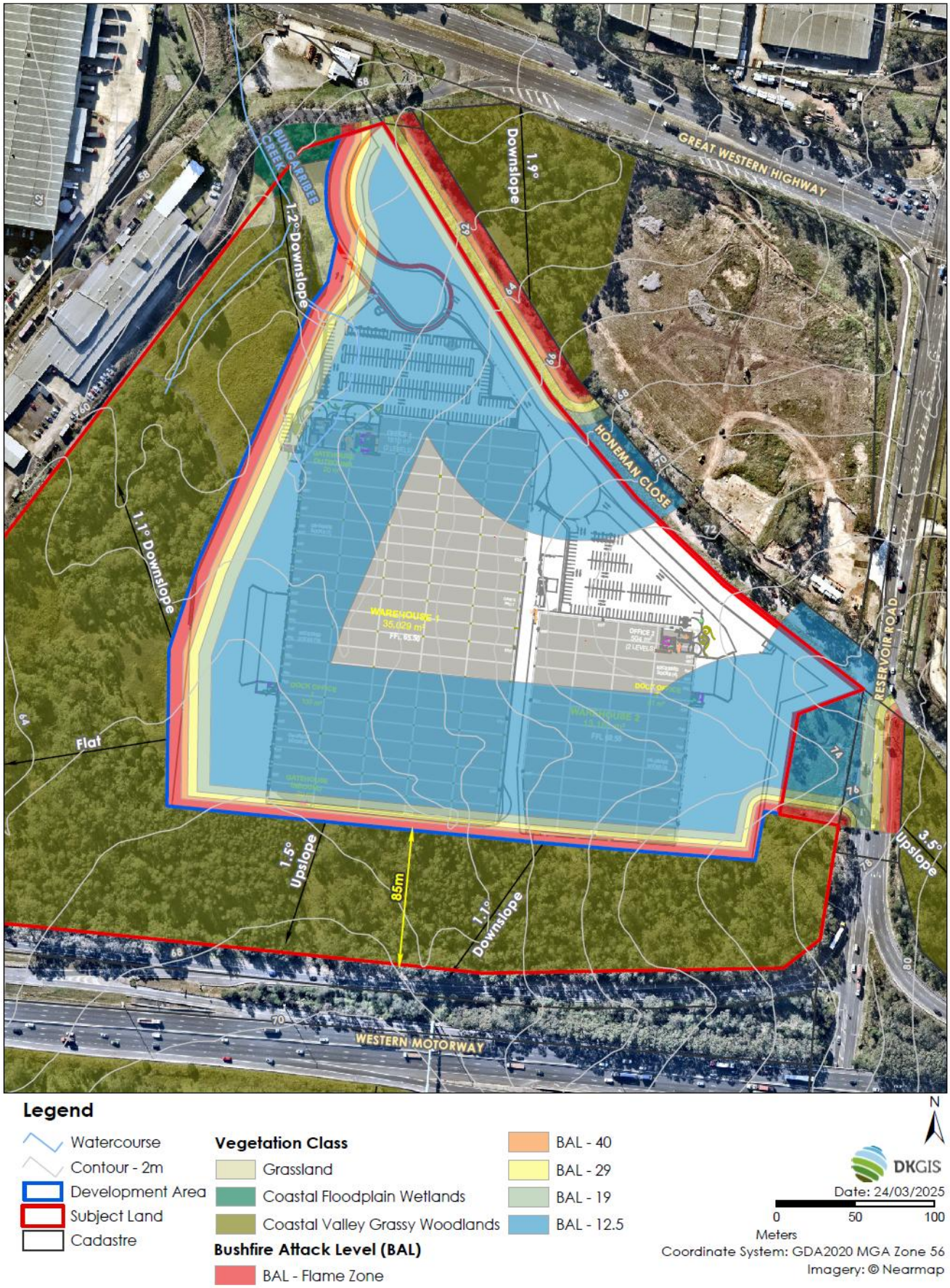

Figure 8: Bushfire Attack Levels

15. Assessment Against the Aim and Objective of PBP

All development in Bushfire Prone Areas needs to comply with the aim and objectives of PBP. Table 2 shows the compliance with PBP.

Table 2: Compliance with Aim & Objectives of PBP.

Aim	Meets Criteria	Comment
The aim of PBP is to use the NSW development assessment system to provide for the protection of human life (including fire fighters) and to minimise impacts on property from the threat of bushfire, while having due regard to development potential, onsite amenity and the protection of the environment.	Yes	Landscaping, defendable space, access and egress, emergency risk management and construction standards are in accordance with the requirements of PBP and the aims of PBP have been achieved.
Objectives	**Meets Criteria**	**Comment**
Afford occupants of any building adequate protection from exposure to a bushfire.	Yes	The development provides opportunity for all occupants to be shielded from any external bushfire. Construction will comply with the NCC and AS3959 (2018).
Provide for a defendable space to be located around buildings.	Yes	Defendable space is provided around the building.
Provide appropriate separation between a hazard and buildings, which, in combination with other measures, prevent the likely fire spread to buildings.	Yes	The building is separated from the vegetated areas and provide APZs and commensurate construction in accordance with the NCC.
Ensure that safe operational access and egress for emergency service personnel and occupants is available.	Yes	The site has direct access to public roads, and access and egress for emergency vehicles and evacuation is adequate.
Provide for ongoing management and maintenance of bushfire protection measures.	Yes	The site will be managed including all APZ and landscaping in accordance with PBP 2019.
Ensure that utility services are adequate to meet the needs of firefighters.	Yes	Utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting).

The suite of bushfire protection measures provided for the proposed development satisfies the objectives for buildings of Class 5-8 under the NCC as identified in section 8.3.1 of PBP 2019.

16. Recommendations

The following recommendation has been made within this report to ensure the proposed new warehouse is compliant with *Planning for Bush Fire Protection 2019*:

Recommendation 1: At the commencement of building works and in perpetuity, the entirety of the site, with the exception of the 'Ecological Area' shall be maintained as an Asset Protection Zone. The APZ shall be established and maintained as an inner protection area as outlined within *Planning for Bushfire Protection 2019* and the NSW RFS document '*Standards for Asset Protection Zones*'.

Recommendation 2: Fire hydrants are provided in accordance with Building Code of Australia E1.3, AS2419.1:2005, including the ring main requirements for large, isolated buildings and those identified in Section 9.

Recommendation 3: The warehouse is to be constructed to comply with the National Construction Code (2019), Australian Standard AS 3959:2018, *Construction of buildings in bush fire-prone areas* and/or NASH Standard (1.7.14 updated), *National Standard Steel Framed Construction in Bushfire Areas – 2014*, and Section 7.5 of *Planning for Bush Fire Protection 2019* on a prescriptive (deemed to satisfy and/or acceptable solution) basis and/or performance basis to the extent depicted in Figure 8 and described in Section 12.2.

Recommendation 4: All proposed roads must comply with section 5.3.2 of *Planning for Bush Fire Protection 2019* as appropriate.

17. Conclusion

This assessment confirms that the proposed industrial development complies with *Planning for Bush Fire Protection 2019* (PBP 2019). The recommendations outlined ensure compliance while also incorporating considerable redundancy in the design to enhance bushfire resilience.

The site is located on bushfire-prone land, and as a commercial/industrial development, it falls under the "other development" category in PBP 2019. This classification provides flexibility in bushfire protection measures, with industrial structures often exceeding the bushfire resistance requirements set by PBP 2019 and AS3959.

The proposed development integrates appropriate bushfire protection measures in accordance with PBP 2019. This Bush Fire Hazard Assessment provides the necessary information to demonstrate compliance with the aims and objectives of PBP 2019.

While the proposed development is not directly within a designated bushfire hazard area, this assessment ensures that appropriate bushfire protection measures are in place, reinforcing the development's resilience and adherence to PBP 2019.

As a person recognized by the NSW RFS as a qualified consultant, this report confirms that the proposed development conforms to the Aim and Objectives of *Planning for Bush Fire Protection 2019*.

Corey Shackleton | Principal Bushfire & Resilience
Blackash Bushfire Consulting
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Fire Protection Association of Australia BPAD Level 3 - 34603

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Appendix 1: References

Australian Building Codes Board Building Code of Australia Volumes 1&2

Councils of Standards Australia AS3959 (2018) – Australian Standard Construction of buildings in bushfire-prone areas

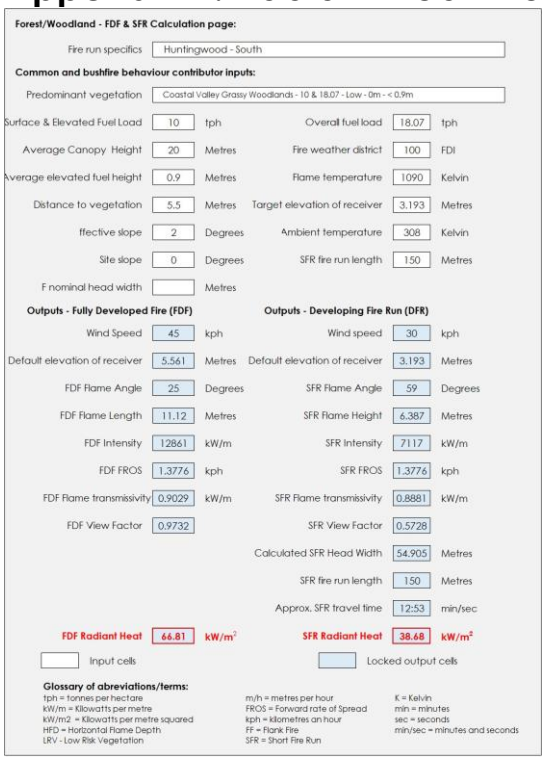
Keith, David (2004) – Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT. The Department of Environment and Climate Change

NSW Rural Fire Service (2015) Guide for Bushfire Prone Land Mapping

NSW Rural Fire Service (NSW RFS). 2019. Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.

NSW Government (1979) Environmental Planning and Assessment Act 1979. NSW Government Printer

Appendix 2: Radiant Heat Modelling - South



Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood - South

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	5.5	Metres	Target elevation of receiver	3.193	Metres
ffective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length	150	Metres
F nominal head width		Metres			

Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	25	Degrees	SFR Flame Angle	59	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.9029	kW/m	SFR Flame transmissivity	0.8881	kW/m
FDF View Factor	0.9732		SFR View Factor	0.5728	
			Calculated SFR Head Width	54.905	Metres
			SFR fire run length	150	Metres
			Approx. SFR travel time	12:53	min/sec
FDF Radiant Heat	66.81	kW/m²	**SFR Radiant Heat**	38.68	kW/m²

Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

South: BAL-40

Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood - South

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	7.5	Metres	Target elevation of receiver	3.193	Metres
ffective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length	150	Metres
F nominal head width		Metres			

Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	39	Degrees	SFR Flame Angle	66	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.8910	kW/m	SFR Flame transmissivity	0.8785	kW/m
FDF View Factor	0.7381		SFR View Factor	0.4227	
			Calculated SFR Head Width	54.905	Metres
			SFR fire run length	150	Metres
			Approx. SFR travel time	12:53	min/sec
FDF Radiant Heat	50.00	kW/m²	**SFR Radiant Heat**	28.23	kW/m²

Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

South: BAL-29

Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood - South

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	11	Metres	Target elevation of receiver	3.193	Metres
ffective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length	150	Metres
F nominal head width		Metres			

Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	55	Degrees	SFR Flame Angle	72	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.8722	kW/m	SFR Flame transmissivity	0.8639	kW/m
FDF View Factor	0.4903		SFR View Factor	0.2848	
			Calculated SFR Head Width	54.905	Metres
			SFR fire run length	150	Metres
			Approx. SFR travel time	12:53	min/sec
FDF Radiant Heat	32.51	kW/m²	**SFR Radiant Heat**	18.71	kW/m²

Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

South: BAL-19

Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood - South

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	16	Metres	Target elevation of receiver	3.193	Metres
ffective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length	150	Metres
F nominal head width		Metres			

Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	67	Degrees	SFR Flame Angle	77	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.8505	kW/m	SFR Flame transmissivity	0.8456	kW/m
FDF View Factor	0.3365		SFR View Factor	0.1888	
			Calculated SFR Head Width	54.905	Metres
			SFR fire run length	150	Metres
			Approx. SFR travel time	12:53	min/sec
FDF Radiant Heat	21.76	kW/m²	**SFR Radiant Heat**	12.14	kW/m²

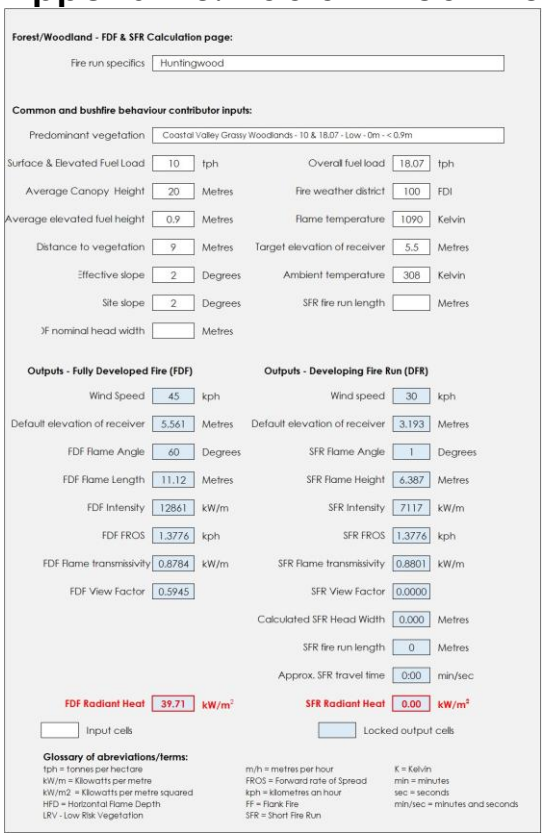
Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

South: BAL-12.5

Appendix 3: Radiant Heat Modelling - West



Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	9	Metres	Target elevation of receiver	5.5	Metres
Effective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	2	Degrees	SFR fire run length		Metres
)F nominal head width		Metres			

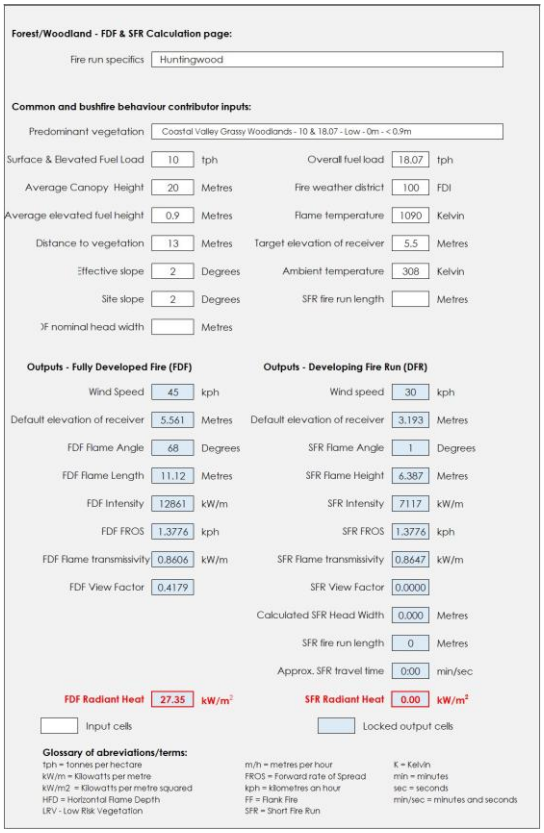
Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	60	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.8784	kW/m	SFR Flame transmissivity	0.8801	kW/m
FDF View Factor	0.5945		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	39.71	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

West: BAL-40



Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	13	Metres	Target elevation of receiver	5.5	Metres
Effective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	2	Degrees	SFR fire run length		Metres
)F nominal head width		Metres			

Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	68	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.8606	kW/m	SFR Flame transmissivity	0.8647	kW/m
FDF View Factor	0.4179		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	27.35	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

West: BAL-29

Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	19	Metres	Target elevation of receiver	5.5	Metres
Effective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	2	Degrees	SFR fire run length		Metres
)F nominal head width		Metres			

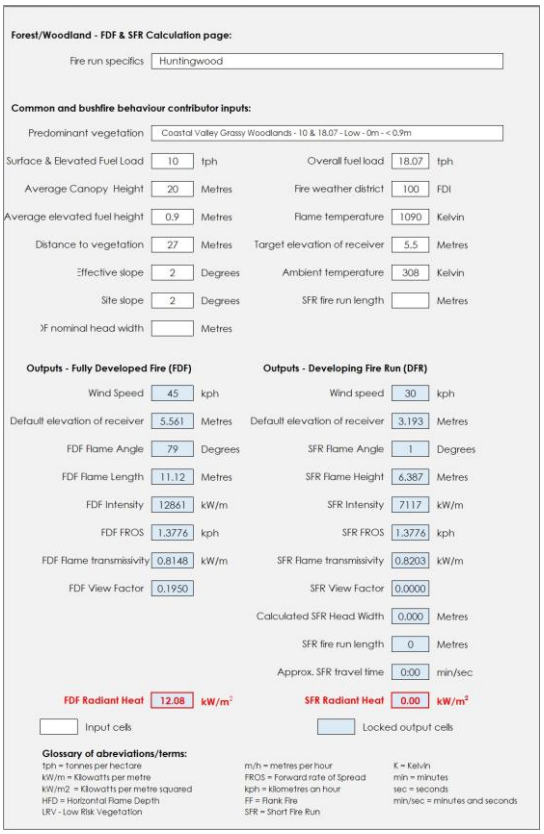
Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	75	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.8384	kW/m	SFR Flame transmissivity	0.8439	kW/m
FDF View Factor	0.2845		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	18.13	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

West: BAL-19



Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics: Huntingwood

Common and bushfire behaviour contributor inputs:

Predominant vegetation: Coastal Valley Grassy Woodlands - 10 & 18.07 - Low - 0m - < 0.9m

Surface & Elevated Fuel Load	10	tph	Overall fuel load	18.07	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	0.9	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	27	Metres	Target elevation of receiver	5.5	Metres
Effective slope	2	Degrees	Ambient temperature	308	Kelvin
Site slope	2	Degrees	SFR fire run length		Metres
)F nominal head width		Metres			

Outputs - Fully Developed Fire (FDF)			Outputs - Developing Fire Run (DFR)		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	5.561	Metres	Default elevation of receiver	3.193	Metres
FDF Flame Angle	79	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	11.12	Metres	SFR Flame Height	6.387	Metres
FDF Intensity	12861	kW/m	SFR Intensity	7117	kW/m
FDF FROS	1.3776	kph	SFR FROS	1.3776	kph
FDF Flame transmissivity	0.8148	kW/m	SFR Flame transmissivity	0.8203	kW/m
FDF View Factor	0.1950		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	12.08	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells | Locked output cells

Glossary of abreviations/terms:

tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

West: BAL-12.5

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