

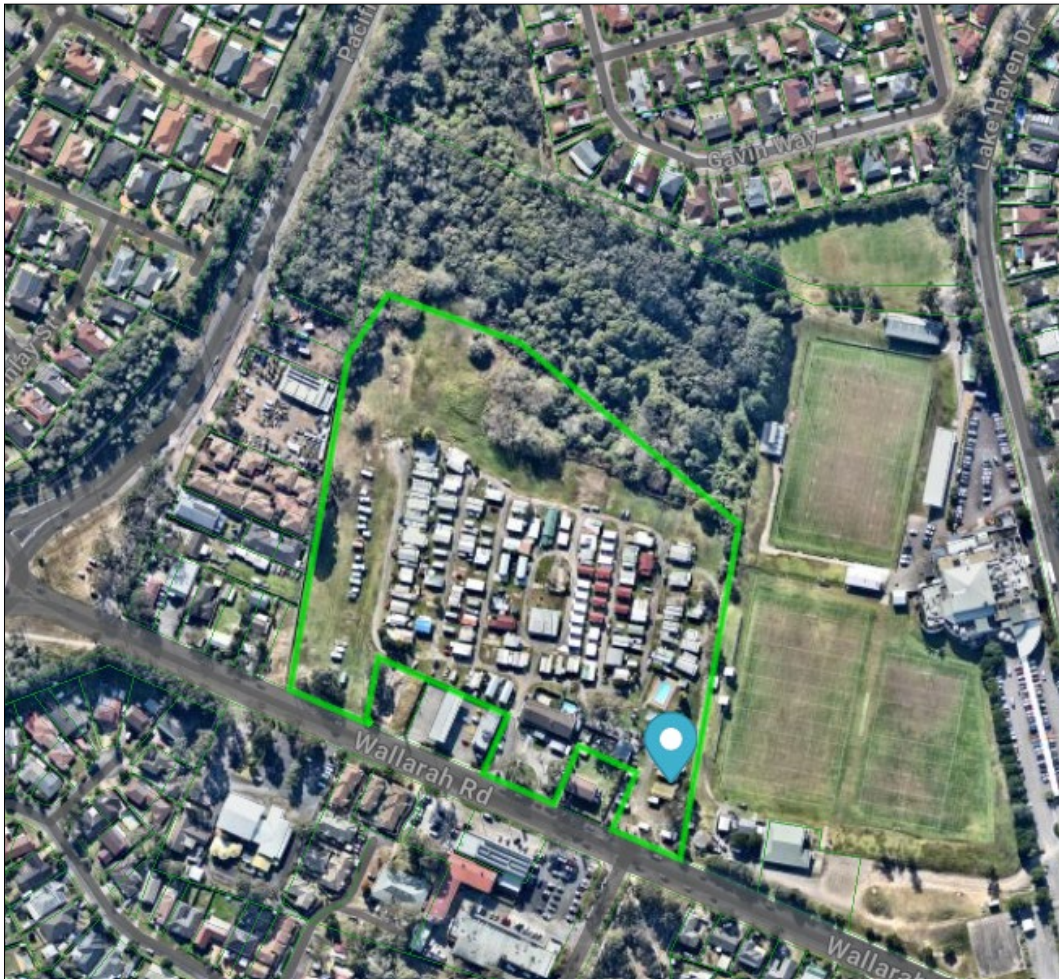


STRATEGIC BUSHFIRE STUDY

OASIS REDEVELOPMENT

207-209 Wallarah Road, Kanwal

Prepared for Oasis Unit Trust



Bushfire Planning Australia

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Disclaimer and Limitation

This report is prepared solely for Oasis Unit Trust (the 'Client') for the specific purposes of only for which it is supplied (the 'Purpose'). This report is not for the benefit of any other person; either directly or indirectly and is strictly limited to the purpose and the facts and matters stated in it and will not be used for any other application.

This report is based on the site conditions surveyed at the time the document was prepared. The assessment of the bushfire threat made in this report is made in good faith based on the information available to Bushfire Planning Australia at the time.

The recommendations contained in this report are considered to be minimum standards and they do not guarantee that a building or assets will not be damaged in a bushfire. In the making of these comments and recommendations it should be understood that the focus of this document is to minimise the threat and impact of a bushfire.

Finally, the implementation of the adopted measures and recommendations within this report will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

Document Status: 2213 - Strategic Bushfire Study

Version	Status	Purpose	Author	Review Date
1	Draft	Draft for Review	Katrina Mukevski	28 July 2023
2	Draft	Draft for Client Review	Stuart Greville	4 August 2023
3	Final	Final for Submission	Stuart Greville	17 August 2023

Certification

As the author of this Bushfire Threat Assessment (BAR), I certify this BAR provides the detailed information required by the NSW Rural Fire Service under Clause 44 of the Rural Fires Regulation 2013 and Appendix 1 of Planning for Bushfire Protection 2019 for the purposes of an application for a bush fire safety authority under section 100B(4) of the Rural Fires Act 1997.



Stuart Greville

Accredited Bushfire Practitioner

BPAD-26202

Date: 17 August 2023



In signing the above, I declare the report is true and accurate to the best of my knowledge at the time of issue.



Executive Summary

Bushfire Planning Australia (BPA) has been engaged by Oasis Unit Trust (the 'Proponent') to undertake a Strategic Bushfire Study (SBS) and a Bushfire Assessment Report (BAR) to support the proposed high density redevelopment of the existing Oasis Caravan Park located at 207-209 Wallarah Road, Kanwal; legally known as Lot 1223 DP1004170. The planning proposal has been selected by NSW Department of Planning and Environment under the State Assessable Planning Pathway (Rezoning Pathways) and will be subject to an accelerated assessment process.

The planning proposal seeks to increase the height and floor space ratio (FSR) to facilitate the redevelopment of the existing caravan park into a mixed use precinct including up to 800 apartments, supermarket, public parklands and retail areas.

This requires the amendment of Central Coast Local Environmental Plan 2022 (CCLEP) to rezone part of the site to E2 Local Centre and maintain the existing R1 residential zone with an additional permitted use to allow for retail and commercial uses.

This BAR found the site was exposed to a medium to high bushfire hazard located primarily to the north of the site which is mapped as Category 3 Vegetation in the Central Coast Bush Fire Prone Land Map.

Subject to the following recommendations, the proposed land use can be considered to be appropriate in its bushfire context:

1. The entire development site; including all residential lots and open space shall be managed as an Inner Protection Area (IPA) as outlined within Section 5.1 of this report;
2. Access/egress will be provided in accordance with Section 5.2 of this report to ensure the safe evacuation of occupants whilst also affording fire fighters safe operational access and a defensible space to work within;
3. Building envelopes will be setback in accordance with minimum APZs to achieve maximum radiant heat levels of 29kW/m² as indicated in Section 5.4 of this report;
4. All new lots are to be connected to a reliable water supply network in accordance with Section 5.3.1 of this report. The water supply is to have suitable fire hydrants located throughout the development site that are outside of parking reserves and road carriageways, clearly marked and provided for the purposes of bushfire protection;
5. Gas and electricity supplies will be provided in accordance with Section 5.3.2 of this report so as to not contribute to fire ignitions within the development.
6. All future buildings to be constructed on the proposed sites shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
7. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site; and
8. A Bushfire Emergency Management and Evacuation Plan (BEMEP) shall be prepared that is consistent with the RFS Guidelines 'Development Planning – A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014'.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (August 2023).

Should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site but they do not and cannot guarantee that the area will not be affected by bushfire at some time.



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Terms and Abbreviations

Abbreviation	Meaning
APZ	Asset Protection Zone
AS2419-2005	Australian Standard – Fire Hydrant Installations
AS3959-2018	Australian Standard – Construction of Buildings in Bush Fire Prone Areas
BAR	Bushfire Assessment Report
BCA	Building Code of Australia
BC Act	NSW Biodiversity Act 2016
BDAR	Biodiversity Development Assessment Report
BMP	Bush Fire Management Plan
BPA	Bush Fire Prone Area (Also Bushfire Prone Land)
BPL	Bush Fire Prone Land
BPLM	Bush Fire Prone Land Map
BPM	Bush Fire Protection Measures
CCC	Central Coast Council
DoE	Commonwealth Department of the Environment
DPI Water	NSW Department of Primary Industries – Water
EPA Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FDI	Fire Danger Index
FMP	Fuel Management Plan
ha	hectare
IPA	Inner Protection Area
LGA	Local Government Area
NPWS	NSW National Parks and Wildlife Service
OPA	Outer Protection Area
OEH	NSW Office of Environment and Heritage
PBP 2019	Planning for Bushfire Protection 2019
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation
RFS	NSW Rural Fire Service
TSC Act	NSW Threatened Species Conservation Act 1995 (as repealed)
VMP	Vegetation Management Plan

1. Introduction

Bushfire Planning Australia (BPA) has been engaged by the Oasis Unit Trust Pty Ltd (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) to support a planning proposal to amend the Central Coast Local Environmental Plan 2022 (CCLEP).

The planning proposal will affect 207-209 Wallarah Road, Kanwal, legally referred to as Lot 1223 DP1004170; hereafter referred to as the 'site' (**Figure 2**).

The assessment aims to consider and assess the bushfire hazard and associated potential bushfire threat relevant to the proposed development, and to outline the minimum mitigative measures which would be required in accordance with the provisions of the New South Wales Rural Fire Service (RFS) publication *Planning for Bushfire Protection 2019* (PBP 2019) that has been released and adopted through the *Environmental Planning and Assessment Amendment* (Planning for Bushfire Protection) *Regulation 2007* and the *Rural Fires Regulation 2022*.

2. Site Description

Table 1: Site Details

Address	207-209 Wallarah Road, Kanwal
Title	Lot 1223 / DP1004170
LGA	Central Coast Council
Site Area	5.06 ha
Land Use Zone	R1 General Residential (Figure 1)
Context	<p>The site is an existing caravan park with primary access provided from Wallarah Road. There are sporting fields located to the east of the site and established residential properties to the west and south, separated by Wallarah Road.</p> <p>Vegetation along the northern boundary is identified as a <i>Coastal Swamp Forest</i> and is mapped as bushfire prone land.</p>
Fire History	The site lies within a local government area with a Fire Danger Index (FDI) rating of 100. The site is identified in the Asset Register (asset ID 1,199) of the Central Coast Bushfire Risk Management Committee.

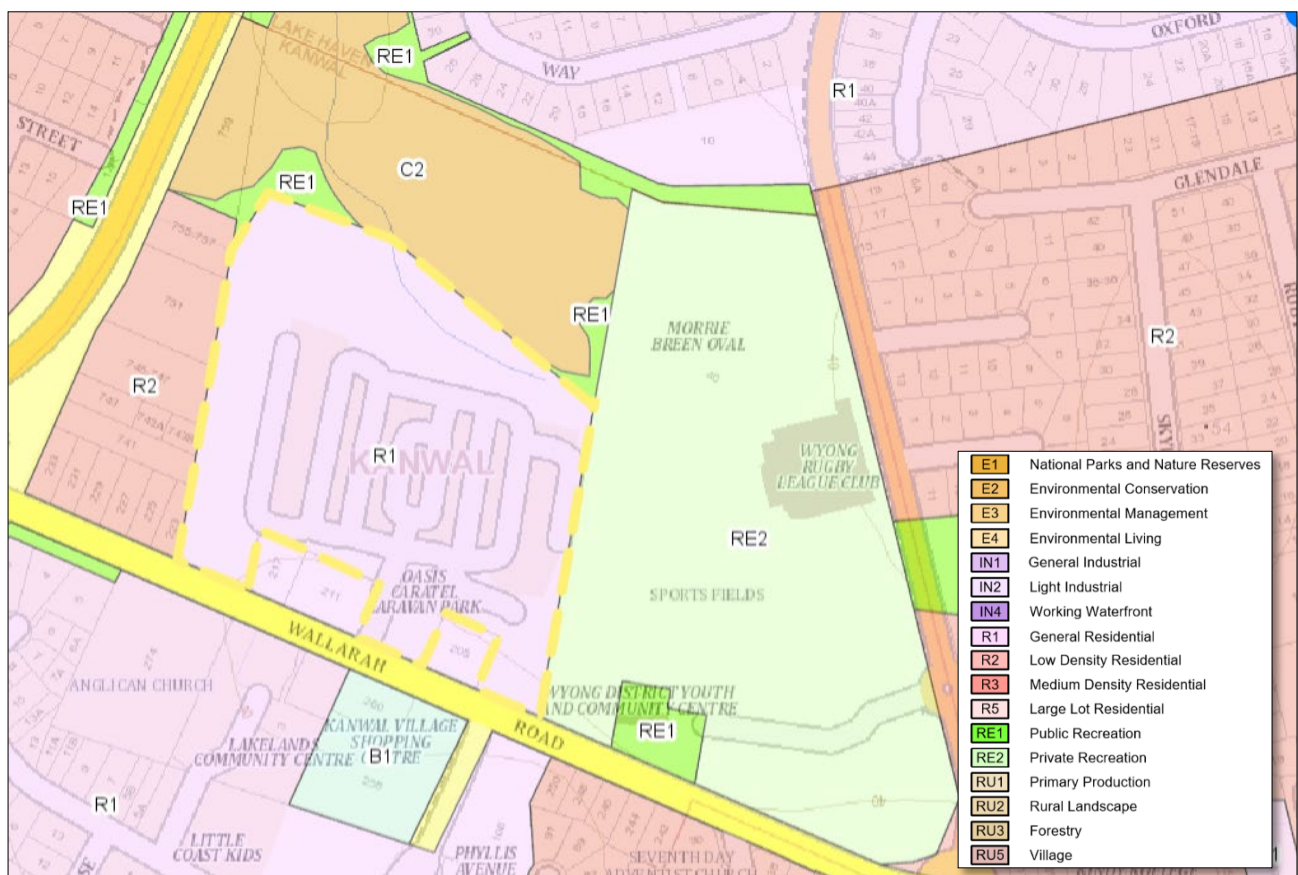


Figure 1: Central Coast Local Environmental Plan 2022 (Land Zoning Map Sheet)

2.1. Bushfire Prone Land

Bushfire activity is prevalent in landscapes that carry fuel and the two predominant bushfire types are grassland and forest fires. Factors such as topographic characteristics and quantity of fuel loads influence the intensity and spread of fire. The scale of a bushfire hazard is tailored to the characteristics of the hazard, the size and characteristics of the affected population, types of land use exposed to bushfire, predicted development growth pressures and other factors affecting bushfire risk.

Figure 3 demonstrates the northern portion of the site is mapped as Vegetation Buffer and Category 3 bushfire prone land whilst the remainder of the site is not identified as bushfire prone land. The Vegetation Category 3 identified on the northern portion of the site, further extends to the north beyond the site's boundary (within 140m) and is identified as the primary bushfire hazard.

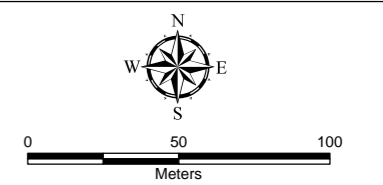
Figure 3

NSW Bushfire Prone Land



- Subject Site
- 140m Buffer
- 100m Buffer
- Required Bushfire Attack Levels (PBP 2019 Table A1.12.5)**
- Vegetation Category 3
- Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2022
Aerial photo: NearMap 16/06/2022
NSW Bush Fire Prone Land: NSW Rural Fire Service 2021



A3 Scale: 1:2,500

File:2213-Kanwal-Fig2-BFPL-220627 Date: 27/06/2022

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2.2. Proposed Development

The Strategic Bushfire Study (SBS) is prepared to support a planning proposal to enable multi-storey residential development on the site. The planning proposal seeks to increase the height and FSR to facilitate the redevelopment of the existing caravan park into a mixed use precinct including up to 800 apartments, supermarket, public parklands and retail areas.

To deliver the proposed development, the planning proposal seeks to amend the Central Coast Local Environmental Plan 2022 (PSLEP) to This requires the amendment of Central Coast Local Environmental Plan 2022 (CCLEP) to rezone part of the site to E2 Local Centre and maintain the existing R1 residential zone with an additional permitted use to allow for retail and commercial uses.

Indicative plans of the proposed development are contained in **Appendix A** and shown in **Figure 4**.



Figure 4: Photomontage of potential redevelopment

3. Strategic Bushfire Study

3.1. Establishing Risk and Applying Treatment

The Strategic Bushfire Study (SBS) was introduced in NSW by Planning for Bush Fire Protection 2019 (PBP 2019). The SBS follows the principles of strategic planning generally in taking a long-term approach to land use planning and development expectations. The SBS aims to minimise or avoid the impact of natural hazards by taking a risk-based approach to the assessment of strategic planning policies and proposals. The SBS uses a macro-scale assessment, creates a risk profile and seeks treatment strategies to respond to the risk.

There are a number of national level guidance documents which provide helpful guidance in preparing strategic studies for natural hazard resilience. At a high level, the stage is set for consideration for natural hazards in strategic planning by the *Sendai Framework for Disaster Risk Reduction 2015 - 2030* (UNDRR, 2015), *The National Disaster Risk Reduction Framework* (Australian Government Department of Home Affairs, 2018), *Profiling Australia's Vulnerability: The interconnected causes and cascading effects of systemic disaster risk* (Australian Government Department of Home Affairs, 2018) and the *National Strategy for Disaster Resilience* (COAG 2011).

The *Land Use Planning for Disaster Resilient Communities* (the Handbook) published in 2020 by the Australian Institute for Disaster Resilience (AIDR) focuses on reducing disaster risk by improving strategic planning processes. The handbook aims to reduce both vulnerability and exposure of communities to natural hazard scenarios.

By considering natural hazards early and through its processes, land use planning can evaluate and select land use mechanisms to treat disaster risk.

The actions proposed by the Handbook are to understand disaster risk, make accountable decisions, establish governance, ownership and responsibility and ultimately, attract enhanced investment to reduce the risk. Ultimately, the goal is to make decisions which avoid risk. However, accepting that some level of risk is inevitable, the concept of risk tolerance and acceptable risk is highlighted. The Handbook uses a key principle introduced by the Planning Institute of Australia *National Land Use Planning Guidelines for Disaster Resilient Communities* (2015) which is the ALARP principle (As Low As Reasonably Practicable). This revolves around identifying risks that are broadly acceptable, tolerable, or generally intolerable and requires the identification of risk treatment options to move more towards the tolerable or broadly acceptable categories.

The Handbook also highlights the role that land use planning can play in climate change mitigation and adaptation. Future climate change models should be identified and utilised in the process of data gathering and analysis, whilst also acknowledging the uncertainties associated with those models.

The relationship with emergency management principles is highlighted by the Handbook. The integration of risk management and land use planning is recommended. The National Emergency Risk Assessment Guidelines produced by AIDR sets out the following structure for evaluating risk and applying risk treatment (taken from NERAG):

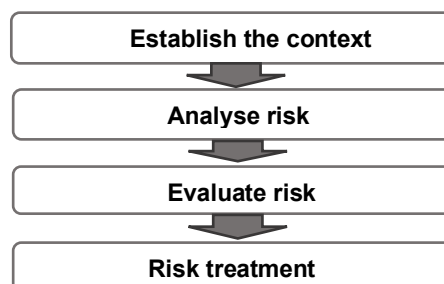


Figure 5: NERAG Risk Assessment Methodology

This process is appropriate for the SBS and will be followed to establish the risk and determine recommended risk treatments.

3.2. Ministerial Directions

Legislatively, planning proposals must follow the Ministerial Directions under Section 9.1(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Direction 4.3 requires a planning proposal, that is in proximity to land mapped as bushfire prone land, to have regard to PBP 2019, introduce controls that avoid placing inappropriate developments in hazardous areas and ensure that bushfire hazard reduction is not prohibited within the APZ.

A planning proposal must, where development is proposed, comply with the following provisions:

3(a) provide an Asset Protection Zone (APZ) incorporating at a minimum:

- i. an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and*
- ii. an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,*

3(b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,

3(c) contain provisions for two-way access roads which link to perimeter roads and/or to fire trail networks,

3(d) contain provisions for adequate water supply for firefighting purposes,

3(e) minimise the perimeter of the area of land interfacing the hazard which may be developed,

3(f) introduce controls on the placement of combustible materials in the Inner Protection Area.

3.3. Aim of the Strategic Bushfire Study

In accordance with PBP 2019, the Strategic Bushfire Study (SBS) is a high level assessment that identifies land affected by natural hazards and directs development away from inappropriate and constrained lands. In a bush fire context, strategic planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bush fire attack. Services and infrastructure that facilitate effective suppression of bush fires also needs to be provided for at the earliest stages of planning.

The bushfire risk is considered at the macro-scale, looking at fire runs, steep slopes and any areas of isolation. The amount of proposed development interfacing vegetation will also be considered. Firefighting access and evacuation potential must be considered and an assessment of traffic volumes and evacuation routes will be required. The potential for these evacuation routes to be non-trafficable during a bush fire event will be factored into the assessment.

This SBS follows the considerations outlined within Table 4.2.1 of PBP 2019 to identify and analyse the risk profile and apply risk treatment measures.

The aim of the SBS is to meet the following principles:

- ensure land is suitable for development in the context of bush fire risk;
- ensure new development on bush fire prone land will comply with PBP 2019;
- minimise reliance on performance-based solutions;
- provide adequate infrastructure associated with emergency evacuation and firefighting operations; and
- facilitate appropriate ongoing land management practices.

3.4. Bushfire Landscape Assessment

A bushfire landscape assessment considers the likelihood of a bushfire approaching an area, its potential severity and intensity, and the resultant impact on life and property in the context of the broader surrounding landscape.

With regard to proposed site, the bushfire hazard, potential fire behaviour, history of bushfires and fire runs, and operational response was assessed with the outcomes addressed in the following sections.

3.4.1. Vegetation

An assessment of vegetation is important in determining risk as different types of vegetation burn differently across the landscape. This is largely due to location and topography, structure and arrangement and available surface, elevated and canopy fuel loads.

Grasses and heath burn more quickly and erratically with fire consuming a large proportion of the plant matter, as they are influenced by finer fuels, open air, exposed drying conditions and variations in wind speed and direction, whilst forests burn with greater intensity due to substantial amounts of taller, dense and woodier fuels. The amount of plant matter consumed by forest fires also varies due to the availability of fine fuel loads, fuel moisture and localised wind conditions.

It is these traits in vegetation that determine potential radiant heat and flame characteristics which in turn define building setback requirements in accordance with PBP 2019.

Vegetation within and surrounding the proposed site area has been mapped by Department of Planning and Environment 2022, with this work supported by onsite field investigations in accordance with the site assessment methodologies within Appendix 1 of PBP 2019 (carried out 2 August 2022).

The vegetation communities within the study area have been characterised into structural formations according to David Keith (2004) *Ocean Shores to Desert Dunes* and PBP 2019 to determine likely maximum fuel loads in accordance with the NSW RFS fact sheet *Comprehensive Vegetation Fuel Loads (2019)*.

Vegetation within a 2km radius of the proposed development site is predominantly largely non-native vegetation (managed residential properties) and various scattered *forest* and *forested wetland* formations which exist closer to the site. Additionally, other vegetation formations that sporadically exist closer to the 2km radius from the site include *freshwater wetlands*, *mangrove swamps* and *saltmarshes*.

Table 2 and **Figure 6** identifies vegetation and their fuel load within 2km radius of the proposed development site.

Table 2: Vegetation Communities and Corresponding Structural Formations and Fuel Loads

Vegetation Community	Structural formation (Keith 2004)	Structural formation (PBP 2019)	Overall fuel load tonnes/ha (including surface, elevated, bark and canopy)
Coastal Swamp Forest	Forested Wetlands	Forest	34.1
Northern Hinterland Wet Sclerophyll Forest	Forest (Grassy)	Forest	33.1
South East Dry Sclerophyll Forest	Forest (Shrubby)	Forest	28
Sydney Coastal Dry Sclerophyll Forest	Forest (Shrubby)	Forest	27.3
Hunter Macleay Dry Sclerophyll Forest	Forest (Shrub / Grass)	Forest	24.6
Coastal Floodplain Wetlands	Forested Wetland (Riverine forest)	Forested Wetland	15.1
Coastal Heath Swamps	Freshwater Wetland	Short Heath	15.0
Coastal Freshwater Lagoons	Freshwater Wetland	Freshwater Wetland	4.4
Mangrove Swamps	Low-threat vegetation	Excluded	N/A
Saltmarshes	Low-threat vegetation	Excluded	N/A
Non-Native vegetation	Low-threat vegetation	Excluded	N/A

Figure 6

NSW State Vegetation Type (2Km)



- | | | | |
|-------------------------|-----------------------------|--|---|
| | Subject Site | | Coastal Swamp Forests |
| | 140m Buffer | | Hunter - Macleay Dry Sclerophyll Forests |
| | 100m Buffer | | Northern Hinterland Wet Sclerophyll Forests |
| Vegetation Class | | | South East Dry Sclerophyll Forests |
| | Coastal Floodplain Wetlands | | Sydney Coastal Dry Sclerophyll Forests |
| | Coastal Freshwater Lagoons | | Not native vegetation |
| | Coastal Heath Swamps | | Unattributed |
| | Mangrove Swamps | | |
| | Saltmarshes | | |



SOURCE:
 Cadastral Boundary: NSW Department of Finance, Services and Innovation 2022
 Aerial photo: NearMap 20/05/2023
 NSW Vegetation Type: NSW Department of Planning, Industry and Environment 2022



0 250 500 750
 Meters

A3 Scale: 1:16,000

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3.4.2. Topography

Topography and slope play a significant role in influencing the rate of fire spread and fire behaviour in relation to the potential for canopy involvement.

Research shows that the speed of an advancing bushfire front will double with every 10 degree increase in slope, so that on a 20 degree slope, its speed of advancement is four times greater than on flat ground. This is because the radiation and convection a fire creates preheats the unburned fuel ahead of the fire front causing it to combust at a quicker rate. This is done more effectively upslope than down. Fuel distributed across every layer of the vegetation community, in effect creating a ladder, also contributes to the likelihood of fire transfer to the canopy. This transfer is also more effective on steeper slopes.

Digital Elevation Modelling (DEM) shows us the topography within the locality of Kanwal ranges from 0 to < 71 metres above sea level. Within the proposed site, the topography peaks at approximately 61 metres above sea level, similar to the topography surrounding the site (**Figure 7** and **Figure 8**).

An assessment of the effective slope (that which sits underneath the bushfire hazardous vegetation) impacting the study area was undertaken using LIDAR point cloud data, DEM (NSW LPI) and results from field investigations carried out on 2 August 2022. An assessment of the slope over a distance of 100m in the hazard direction, as is required within Appendix 1 of PBP 2019, was undertaken. Results revealed slopes within the study area to be mostly flat (less than 5 degrees) with a slight peak along the northern and eastern site boundary whilst the low point is towards the western site boundary.

In accordance with PBP 2019, development on steeper slopes, where the bushfire threat is downhill and has the potential to increase the rate of spread and intensity of bushfire, requires larger setbacks. Section 4 of this report addresses Asset Protection Zones and building setbacks commensurate with slope surveyed within the study area to achieve radiant heat levels $\leq 29\text{kW/m}^2$.

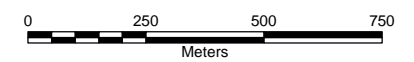
Figure 7

Digital Elevation Model (2Km)



- Subject Site
- 100m Buffer
- 140m Buffer
- Contour (20m)
- Contour (5m)
- Elevation (AHD)**
 - High : 71m
 - Low : 0m

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2022
Surface analysis: Derived from LiDAR - Gosford & Lake Macquarie 1 metre Resolution Digital Elevation Model © Department Finance, Services and Innovation 2014



A3 Scale: 1:16,000

File:2213-Kanwal-Fig4b-DEM-2Km-230731 Date: 31/07/2023

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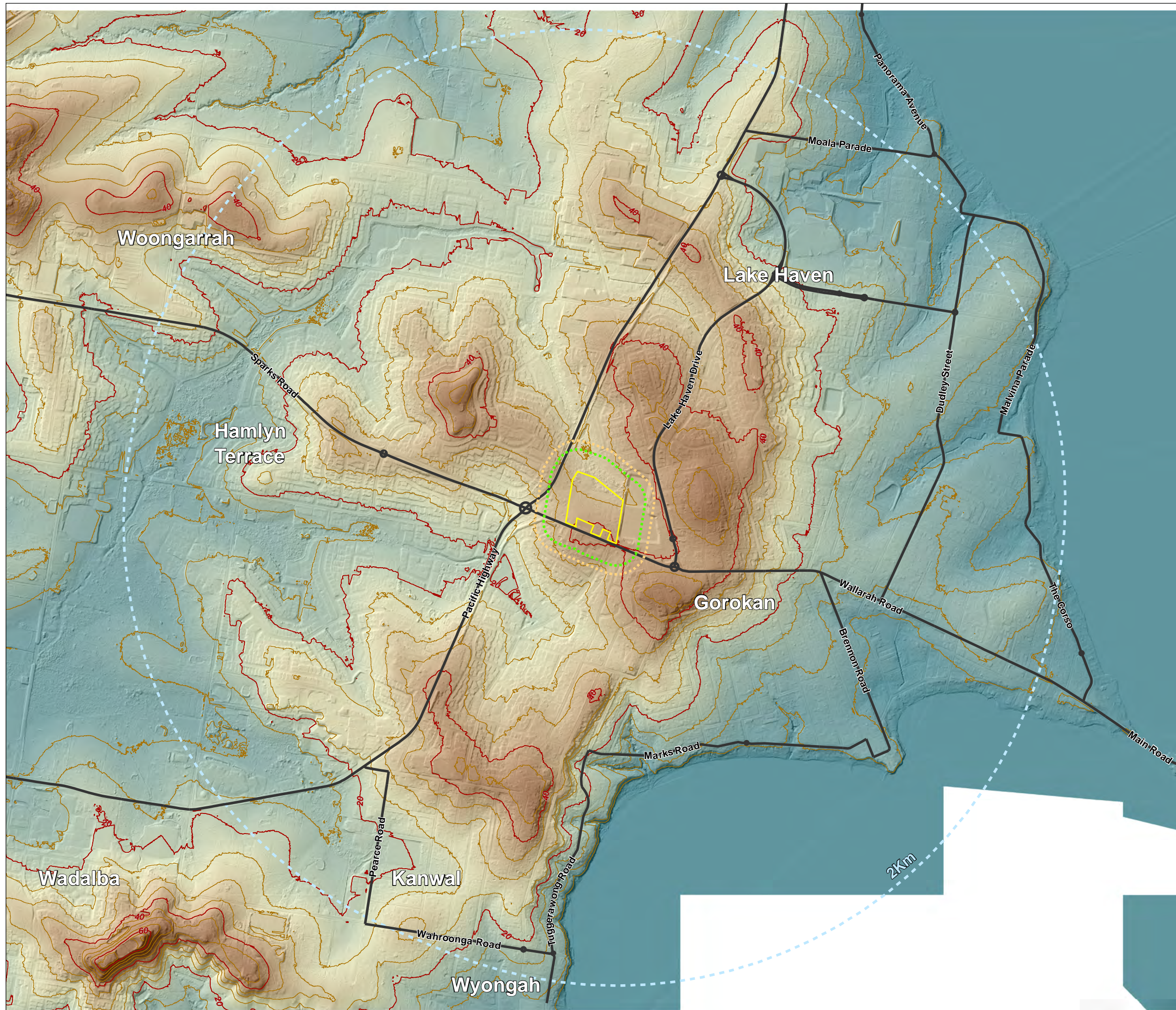


Figure 8

Slope Analysis: LiDAR (2Km)



- Subject Site
 - 100m Buffer
 - 140m Buffer
- Slope**
- 0° - 5°
 - 5° - 10°
 - 10° - 15°
 - 15° - 20°
 - >20°

SOURCE:
 Cadastral Boundary: NSW Department of Finance, Services and Innovation 2022
 Aerial photo: NearMap 16/06/2022
 Surface analysis: Derived from LiDAR - Gosford & Lake Macquarie 1 metre Resolution Digital Elevation Model © Department Finance, Services and Innovation 2014



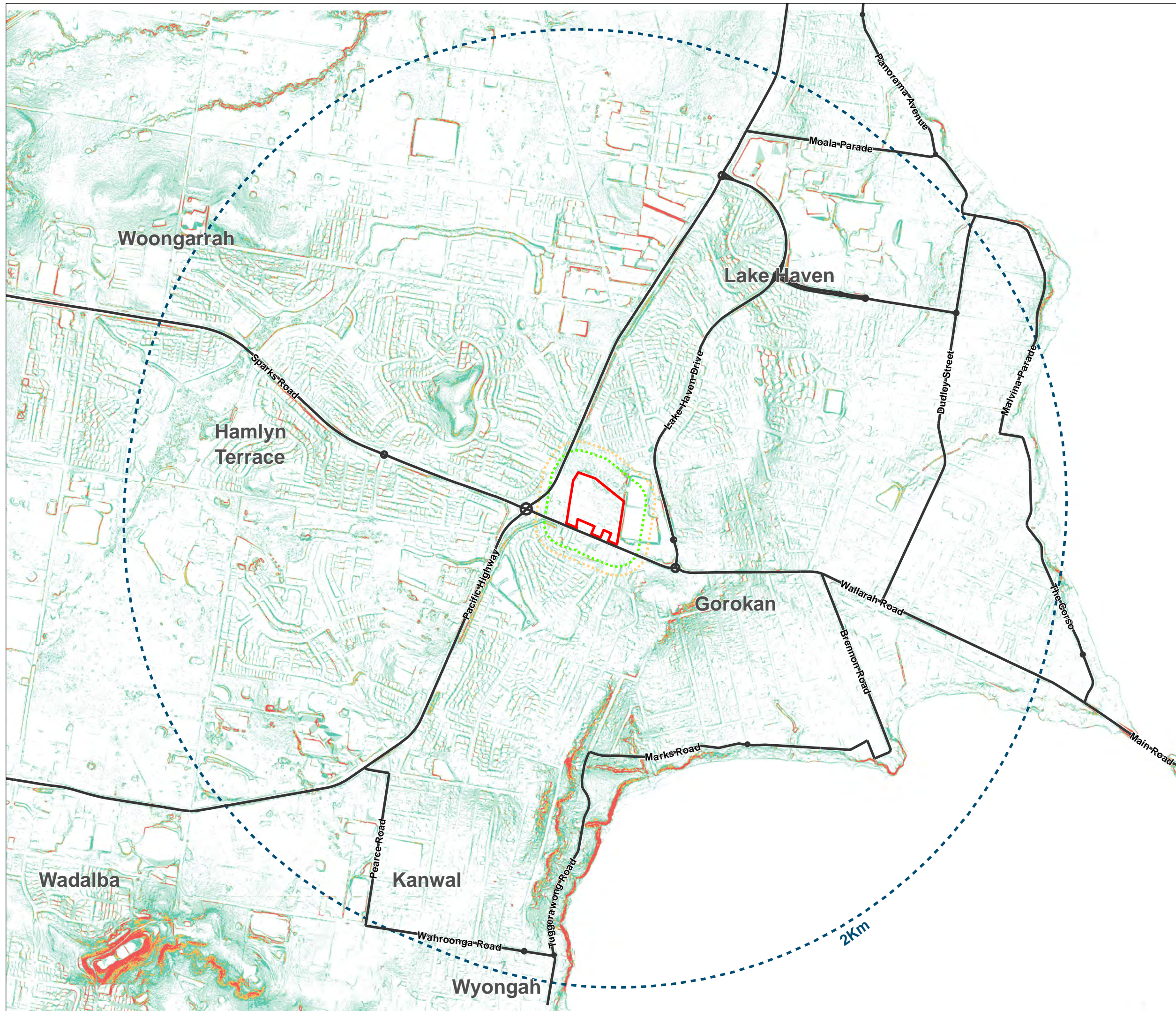
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3.4.3. Weather and Climate

The typical/average climate across the Central Coast LGA is cool temperate with predominantly summer rainfall. The coastal strip is dominated by local coastal weather patterns (predominant coastal winds) and the western areas can be slightly warmer, drier and less humid, often influenced by wider wind systems. According to the *Central Coast Bush Fire Management Committee Bush Fire Risk Management Plan (2020)* (BFRMP), the official bushfire danger period ordinarily begins on 1 August and ends on 30 March.

Prevailing weather conditions associated with the bush fire season in the Central Coast BFMC area are associated with coastal conditions, and more generally north-westerly winds accompanied by high daytime temperatures and low relative humidity. There are also occasional dry lightning storms occurring during the bush fire season.

The Forest Fire Danger Index (FFDI) given to the Central Coast region is 100. The index is calculated from weather station data and is based on representative values of wind speed, temperature, humidity and fuel conditions.

The index represents a 1:50 year fire weather scenario and is applied to methodologies in calculating anticipated bushfire attack levels. It is possible that due to local variations in elevation, slope, and aspect, FFDI values at any point location may reflect values which are higher or lower than 100 resulting in different rates of fire spread across a landscape. **Table 3** provides a brief overview of point location weather data recorded at Norah Head (closest weather station with climate statistics to Norah Head AWS BOM Site Number: 061366).

Table 3: Climate Statistics Recorded at Norah Head Weather Station (BOM Climate Statistics for Australian Locations, August 2023)

Weather Station	Norah Head AWS
Mean maximum temp (degrees)	Highest 26.3 (January), Lowest 17.6 (July)
Highest temp (degrees)	44.0 (18 Jan 2013)
Mean number of days \geq 30 degrees	2.7 (January)
Mean rainfall (mm)	Highest 145.7 (June), Lowest 63.4 (September)
Mean 3pm relative humidity (%)	Highest 72 (February), Lowest 56 (August)
Mean 3pm windspeed (km/h)	Highest 28.6 (November), Lowest 19.1 (Jul)
Lowest temp (degrees)	4.0 (17 July 2007)
Mean minimum temp (degrees)	Highest 20.0 (February), Lowest 9.9 (July)

Climate change is influencing the frequency and severity of dangerous bushfire conditions in Australia. Fire risk is affected by four main factors, fuel load, fuel dryness, weather and ignition. Understanding the impacts of climate change on bushfires in NSW, relies on how climate change might affect these factors.

- ❑ Vegetation (ie fuel) growth will be affected by global increases in greenhouse gas emissions such as carbon dioxide as well as changes to rainfall patterns.
- ❑ Climate models have predicted that NSW will experience warmer drier periods of weather, drying vegetation and increasing bushfire risk. The 2019/2020 Black Summer bushfire season was preceeded by three years of increasing drought conditions.
- ❑ The risk of fire is increased by low rainfall and humidity and high temperature and wind speeds. There have been significant changes observed in recent decades towards more dangerous bushfire weather conditions for various regions of Australia. Observed changes in southern and eastern Australia include an earlier start to the bushfire season with dangerous weather conditions occurring significantly earlier in spring than they ever used to.
- ❑ In relation to fire ignition, there is some indication that climate change could influence the risk of ignitions from dry-lightning storms. Additionally, there has recently been a number of devastating fire events in Australia associated with extreme pyroconvection (including thunderstorm development in a fire plume), with recent research indicating a long-term trend towards increased risk factors associated with pyroconvection in southeast Australia.

According to the BFRMP, temperatures have been increasing in the Central Coast Region in recent decades. This warming trend is expected to continue, with anticipated considerable rainfall variability across seasons and from year to year. These projected changes include increasing maximum and minimum temperatures, increasing number of hot days, decreasing number of cold nights together with winter rainfall and increasing Autumn and Spring rainfall. Average fire weather and severe fire weather days are projected to increase in Summer and Spring.

In addition to the changing weather conditions, it is anticipated that the potential for wildfire ignition will increase and fuels may also change. There is increased capacity for lightning strikes within the landscape due to potentially more volatile weather conditions, increased ignition potential could lead to more challenging firefighting conditions. Over the longer term, fuels can become drier, areas of forested wetland or forest could become drier with a higher propensity to burn. The increased risk of hotter fires occurring on a more regular basis can also increase the risk of vegetation communities, such as forest, being impacted more frequently by fire and taking hundreds of years to recover (environment.nsw.gov.au).

In planning for a climate change future, the following mechanisms are recommended:

- ❑ Required setbacks from bushfire hazardous vegetation commensurate with an FFDI 100;
- ❑ Mechanical fuel reduction, where achievable, as opposed to controlled burning;
- ❑ Alternative landscaping initiatives and garden design that relies more on non combustible elements and use of succulent and drought resistant plantings; and
- ❑ Improved emergency management planning and procedures.

3.4.4. Bushfire Behaviour and Fire History

Information on fire history is a useful factor in understanding fire frequency and bushfire risk. Review of available fire history data within and surrounding the Central Coast LGA indicates there has not been a within 2kms of the proposed development site recorded since the year 2002.

The largest and closest fire to the subject site was recorded in 2020, approximately 2km north of the site, across multiple rural properties (**Figure 9**).

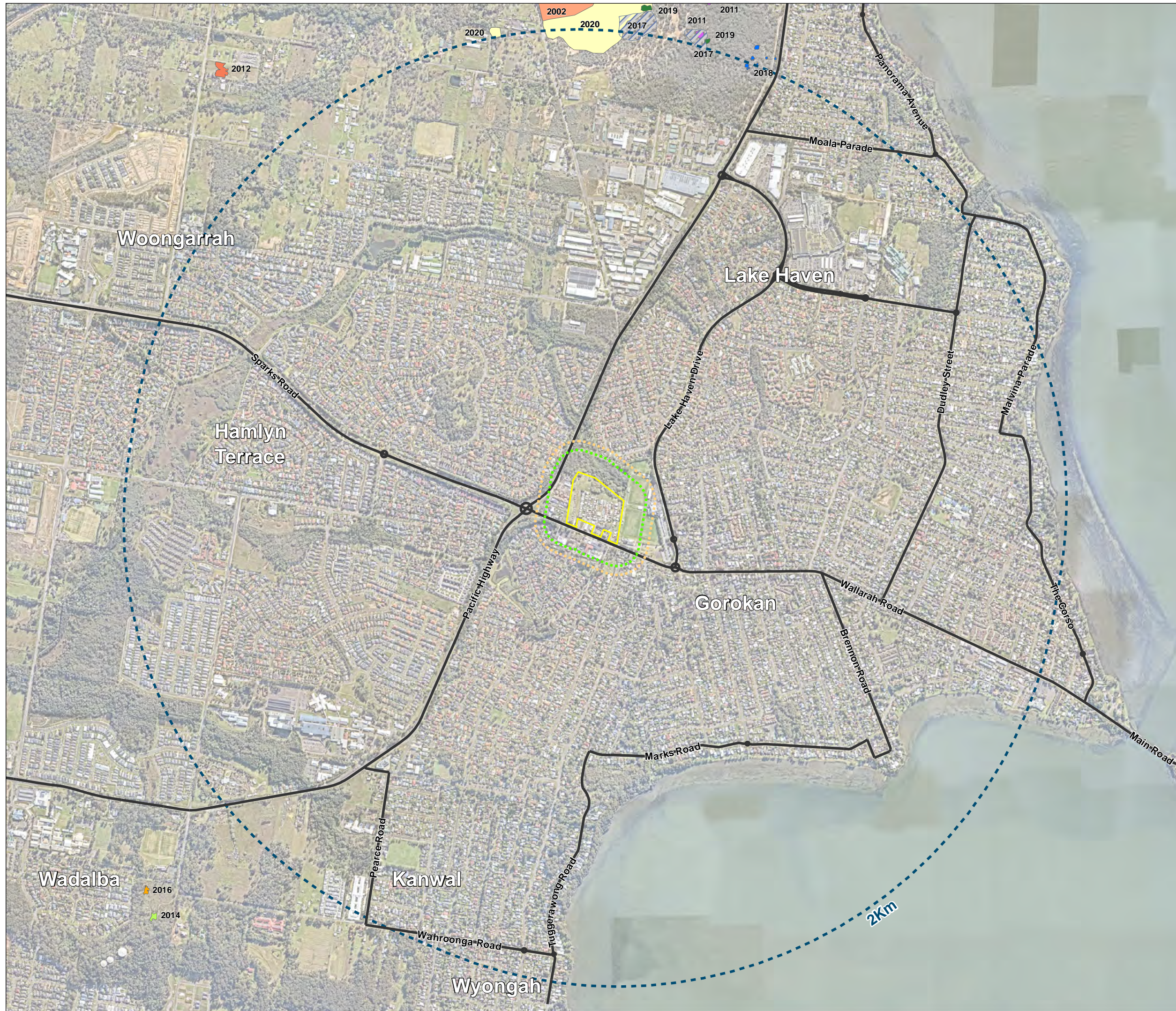
Figure 9 Fire History (2km)



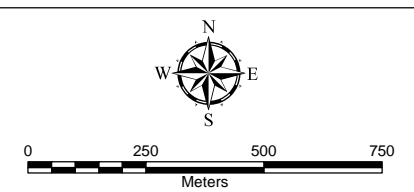
- Subject Site
- 100m Buffer
- 140m Buffer

Year of Fire

- 2002
- 2011
- 2012
- 2014
- 2016
- 2017
- 2018
- 2019
- 2020



SOURCE:
 Cadastral Boundary: NSW Department of Finance,
 Services and Innovation 2022
 Fire History: NSW Rural Fire Service 2021



File:2213-Kanwal-Fig2b-FireHistory-2Km-230731 Date: 31/07/2023

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3.4.4.1. Central Coast Bush Fire Risk Management Plan

According to the Bush Fire Risk Management Plan (BFRMP) the Central Coast LGA has on average 843 bush and grass fire incidents per year, of which 6 to 8 on average can be considered to be major fires. The main sources of ignition include:

- Illegal burning activity;
- Escapes from legal burning;
- Arson and Incendiarism;
- Ignition of abandoned / stolen motor vehicles;
- Lightning; and
- Arcing power lines.

The BFRMP confirms there are a number of assets identified as assets at risk of bushfire impact throughout the Central Coast. **Figure 10** provides a snapshot of the study areas assets at risk as identified within the Central Coast BFRMP and specifically for the Kanwal area.



Figure 10: Human Settlement Assets within Central Coast BFRMP

3.5. Land Use Assessment

A land use assessment identifies the appropriateness of siting different land uses in particular locations based on risk profiles. The planning proposal seeks to allow for high density residential development opportunities for a site surrounded by an area transitioning from residential to low to medium density residential neighbourhoods.

The focus of the SBS is to assess the implications of increased residential densities of the existing lot.

The existing asset (caravan park) on the subject site has been assessed as having a medium risk of bushfire impact. The change of zoning and development for up to 800 high density residences changes the risk profile for the asset in the following ways:

- ❑ The asset would be identified as a “residential” asset.
- ❑ The threat level would be reduced as there would be no change to the vegetation, but mitigation achieved through the planning process, such as the introduction of asset protection zones (APZ) and construction standards would reduce the threat. The threat level will therefore remain ‘low’.
- ❑ The vulnerability of the asset would increase with the addition of residential dwellings, but nevertheless, the vulnerability will increase to high, providing the access and egress can be upgraded to an adequate level.
- ❑ The consequence level, derived by plotting threat level against vulnerability, would be minor, again assuming that the access can be upgraded to an adequate level.
- ❑ The likelihood – frequency of ignition and chance of spread (access, suppression capability, fire run, fire paths) would potentially increase slightly over and above the existing use. Additional people on the site may slightly increase the chance of human ignition, there would be greater need for suppression and good access. The likelihood would therefore increase and highlights the need for improved access and suppression capability.

Overall, the bushfire risk to the site will increase with the introduction of high density residential accommodation to the site. Whilst the threat would potentially reduce, the vulnerability, consequence and likelihood would increase slightly. The increase in risk would be offset by the introduction of APZ, construction requirements and other bushfire protection measures. The access is a key mitigation measure in reducing the bushfire risk to the development.

3.6. Access and Egress

PBP 2019 requires sufficient access with design objectives that enable safe evacuation away from an area whilst facilitating adequate emergency and operational response. All areas affected by bushfire prone land should have an alternate access or egress option dependant on bushfire risk, density of development, population and the chances of roads being cut-off by fire, smoke and accidents for prolonged periods of time.

The proposed development must also ensure there is adequate access/egress. Section 5.3.2 of PBP 2019 requires a development to provide safe operational access to structures and water supply for emergency services while residents are seeking to evacuate.

All new roads would need to comply with the following requirements, in accordance with Table 5.3.2 of PBP 2019:

- All roads are two-wheel drive, sealed, all-weather roads;
- A secondary access is provided to the development;
- Traffic management devices do not prohibit access by emergency services vehicles;
- Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees;
- Carriageway width kerb to kerb shall be a minimum of 5.5 metres and have a minimum vertical clearance of 4 metres to overhanging obstructions and tree branches;
- All parking shall be provided outside of the carriageway width;
- Curves of roads shall have a minimum inner radius of 6 metres and crossfall shall not exceed 3 degrees;
- Dead end roads incorporate a minimum 12 metres outer radius turning circle and are clearly sign posted as a dead end;
- One way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water;
- The capacity of roads/bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes) with bridges/causeways clearly indicating load rating;
- Perimeter roads are two-way with a minimum carriageway width of 8 metres kerb to kerb;
- Where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road.

There is no impediment to these standards being achieved. The proposed development is directly accessible from two separate access points from Wallarah Road (south). The proposed development includes perimeter roads surrounding the development, connecting to Wallarah Road and also to newly proposed non-perimeter roads throughout the development.

A third access to the site from the service road adjoining the Pacific Highway on the western boundary may be considered for emergency access only. The Central Coast Fire Control Centre is located approximately 2km to the north of the site at Arizona Road, Charmhaven and an access directly from the service road will reduce response times to the site and direct access to the only bushfire hazard the site is exposed along the northern boundary.

3.7. Emergency Services

With an increase in population comes a growing demand on emergency services and it is prudent that consideration be given to the future impact on firefighter numbers, appliances, infrastructure, training and response time. Currently within a 15-kilometre radius of the study area there are two (2) Rural Fire Brigades, and 6 (six) Fire and Rescue NSW fire stations (**Table 4**).

Given the number of fire stations, if there was a bushfire and building fire emergency at the site, it is likely a number of fire stations could provide assistance. Similarly, for large scale fires greater than just the site, a number of fire stations would likely be available.

Table 4: Fire Brigades within 15kms of the Study Area

Rural Fire Brigades	Address	Distance to Subject Site
Charmhaven Rural Fire Station	105 Arizona Rd, Charmhaven	2.5km or 5 minutes
Warnervale Rural Fire Service	Warnervale Road, Warnervale	5km or 8 minutes

Fire & Rescue NSW Stations	Address	Distance to Subject Site
Charmhaven	105 Arizona Road, Charmhaven	2.5km or 5 minutes
Hamlyn Terrace	48 Minnesota Road, Hamlyn Terrace	3.3km or 5 minutes
Toukley	302 Main Road, Toukley	6km or 12 minutes
Wyong	5 Hely Street, Wyong	9.4km or 13 minutes
Doyalson	51-53 Pacific Highway, Doyalson	9.5km or 13 minutes
Budgewoi	80 Scenic Drive, Budgewoi	12.6km or 15 minutes

Regardless of the number of Rural Fire Brigades and FRNSW stations there is a significant requirement for the community to understand their risk and ensure they have a bushfire survival plan that outlines their emergency arrangements and course of action. Discussions with NSW RFS confirmed that education of both the existing and proposed community would be a significant benefit in undertaking safe evacuation of the area. It was clear from our discussions that an informed community is easier to evacuate. Providing the community with information regarding potential evacuation routes and timing of evacuation would significantly assist a safe evacuation process.

Potential growth in population should also prompt the Central Coast Council and RFS District Office to assess the implications on resource capabilities and the need for extra bushfire management and community advisory roles, stations, firefighting volunteers, equipment and/or increased training opportunities (ie Breathing Apparatus and village training) to cater for future development and capacity, particularly in those areas adjacent to substantial areas of bushland.

3.8. Infrastructure

An assessment of the issues associated with infrastructure and utilities considers the life safety issues of fire in proximity to high voltage power lines and natural gas supply lines and the pressures a major bushfire event puts on flow rates of reticulated water systems and telecommunications infrastructure.

Above ground low and high voltage power lines exist in the Central Coast region. Generally, the energy authority's vegetation management policies and procedures assist with managing fire risks associated with existing vegetation within close proximity to powerlines to prevent ignitions.

Any new development as a result of rezoning will install electricity, and communication cables underground so as to both reduce the bushfire risk from sparking power lines and protect the infrastructure supply in a bushfire event.

The extent of the existing water supply is such that an increase in demand should not detrimentally impact water pressure and flow to the study area. Additional static water supply systems can be recommended with new development to lessen dependence on reticulated systems.

In accordance with Section 5.3.3 of PBP 2019, any new development shall provide adequate services of water for the protection of buildings during and after the passage of a bushfire and will locate gas and electricity so as not to contribute to the risk of fire to any building.

- Fire hydrant spacing, sizing, flows and pressure will comply with AS 2419.1 – 2005. Hydrants will be located outside of parking reserves and road carriageways.
- All sites within proposed developments will be connected to the internal reticulated water supply.
- All electricity services will be located underground.
- Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 1596-2014.

3.9. Adjoining Land

Consideration of the implications of a change in land use on adjoining land, including increased pressure on bushfire protection measures, should also be undertaken.

The anticipated impact on adjoining land would be:

- An increase in traffic to the local area and added dependence on reticulated water supply, both of which have been addressed in the sections above; and
- Pressures on landowners and management agencies to more frequently manage bushfire hazardous vegetation on their properties.

With regards to the latter, although Asset Protection Zones are expected to be provided for wholly within the boundary of developable sites, there may be increased pressures for prescribed burning to complement bushfire protection measures, particularly in the larger tracts of vegetation throughout the Central Coast area. Given the biodiversity values of the study area, fire frequencies will need to be directed by already known and established fire regimes and seasonality so as to maintain plant growth cycles, habitat and breeding opportunities of fauna species.

4. Bushfire Hazard Assessment

The appropriateness of the proposed development is established through the Strategic Bushfire Study. Assuming that any issues identified within the SBS can be overcome through the re-zoning process, the Bushfire Assessment Report provides an assessment of the proposed development and subdivision against the requirements of section 100B of the *Rural Fires Act 1997* and *Planning for Bush Fire Protection 2019* (PBP 2019) and can be used in an application for a Bush Fire Safety Authority.

The Bushfire Hazard Assessment is conducted on a more localised scale, assessing vegetation categories out to a distance of 140 metres and slope to a distance of 100m, in accordance with the Site Assessment Methodology within Appendix 2 of PBP 2019. This establishes a more localised risk context for the development and specific bush fire protection measures required for the subdivision of the land to occur.

4.1. Aims and Objectives

The assessment aims to consider and assess the bushfire hazard and associated potential bushfire threat relevant to the proposed development, and to outline the minimum mitigative measures which would be required in accordance with the provisions of the New South Wales Rural Fire Service (RFS) publication *Planning for Bushfire Protection 2019* (PBP 2019) and the *Rural Fires Regulation 2013*.

This assessment has been undertaken in accordance with clause 44 of the Rural Fires Regulation 2013. This BAR also addresses the aims and objectives of PBP 2019, being:

- Afford buildings and their occupants protection from exposure to a bushfire;
- Provide a defensible space to be located around buildings;
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available;
- Provide for ongoing management and maintenance of bushfire protection measures (BPMs); and
- Ensure that utility services are adequate to meet the needs of firefighters.

A compliance table demonstrating compliance with PBP 2019 is provided in **Appendix B**.

4.2. Vegetation Assessment

Vegetation classification over the site and surrounding area has been carried out as follows:

- ❑ Aerial Photograph Interpretation to map the vegetation classification
- ❑ Reference to NSW State Vegetation Type, Department of Planning and Environment 2022 (**Figure 11**); and
- ❑ Site inspection completed by Stuart Greville on 2 August 2022 (**Plates 1-6**).

In accordance with PBP 2019, an assessment of the vegetation over a distance of 100m in all directions from the site was undertaken. Vegetation that may be considered a bushfire hazard was identified in all directions from the development footprint. The vegetation classification is based on the revised Table 2.3 in AS3959-2018 and Appendix 1 of PBP 2019. The unmanaged fuel loads detailed in the *RFS Comprehensive Fuel Loads Fact Sheet* (March 2019) have been adopted for the purpose of assessing the bushfire hazard. The findings of the site inspection were compared to the available vegetation mapping. The inconsistencies between the mapping sources and hazardous vegetation mapped on the NSW RFS Bushfire Prone Land maps were quantified during the site inspection.




4.2.1. Reliability Assessment

Although the bushfire prone land mapping is intended to be regularly updated, land use and vegetation cover that contribute to bushfire hazards are subject to change. A reliability assessment was undertaken for the subject site and all land within 140m. In this instance the bushfire prone land mapping is not consistent with existing vegetation present within the site.






Figure 11

NSW State Vegetation Type (Class)

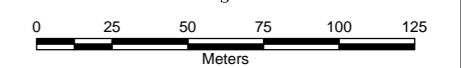


-  Subject Site
-  140m Buffer
-  100m Buffer

Vegetation Class

-  Coastal Floodplain Wetlands
-  Coastal Swamp Forests
-  Hunter-Macleay Dry Sclerophyll Forests
-  Not native vegetation
-  Sydney Coastal Dry Sclerophyll Forests

SOURCE:
 Cadastral Boundary: NSW Department of Finance, Services and Innovation 2022
 Aerial photo: NearMap 16/06/2022
 Vegetation: © State Government of NSW and Department of Planning and Environment 2022



A3 Scale: 1:2,500

File:2213-Kanwal-Fig3-Vegetation-SV-Class-220627 Date: 27/06/2022

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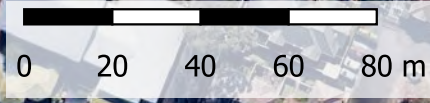


Legend

-  Development Footprint
-  Site Boundary
-  Hydroline
-  Hollow-Bearing Tree (HBT)

Ground-Truthed Vegetation

-  1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands
-  1715 - Prickly-leaved Paperbark - Flax-leaved Paperbark swamp forest on poorly drained soils of the Central Coast
-  1728 - Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
-  Non-Native/Developed/Cleared



Note:
 1. Boundaries are not survey accurate
 2. Do not scale off the plan



Title: Figure 12 - Ground-truthed
 Vegetation Location: 207-209 Wallarah
 Road, Kanwal Client: Vivacity Property

Date: August 2022
 BOAMs REF: 33818
 AEP ref: 2642



Plate 1: Eastern portion of the site to be maintained as an APZ



Plate 2: Northern portion of the site currently cleared



Plate 3: Proposed development footprint contained to cleared and vacant land



Plate 4: Secondary emergency egress to Wallarah Road



Plate 5: Western boundary adjoins existing dwellings and businesses



Plate 6: Primary hazard to the north of the site

4.3. Slope Assessment

The slope assessment was undertaken as follows:

- ❑ Review of LiDAR point cloud data – including DEM (NSW LPI);
- ❑ Detail survey of existing and design contours; and
- ❑ Site inspection completed on 2 August 2022.

An assessment of the slope over a distance of 140m in the hazard direction from the site boundary was undertaken. The effective slope was then calculated under the classified vegetation where there was a fire run greater than 50m. The topography of the site has been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the site.

The effective slope in all directions is shown in **Figure 13**, **Figure 14** and **Table 2**.

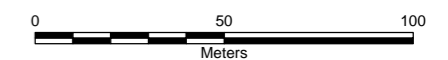
The final bushfire hazard assessment defining vegetation classifications and effective slope is shown in **Figure 15**.

Figure 13 Digital Elevation Model



- Subject Site
- 100m Buffer
- 140m Buffer
- Contour (2m)
- Contour (0.5m)

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2022
Surface analysis: Derived from LiDAR - GOSFORD 1
metre Resolution Digital Elevation Model ©
Department Finance, Services and Innovation 2014



A3 Scale: 1:2,000

File:2213-Kanwal-Fig4-DEM-220627

Date: 27/06/2022

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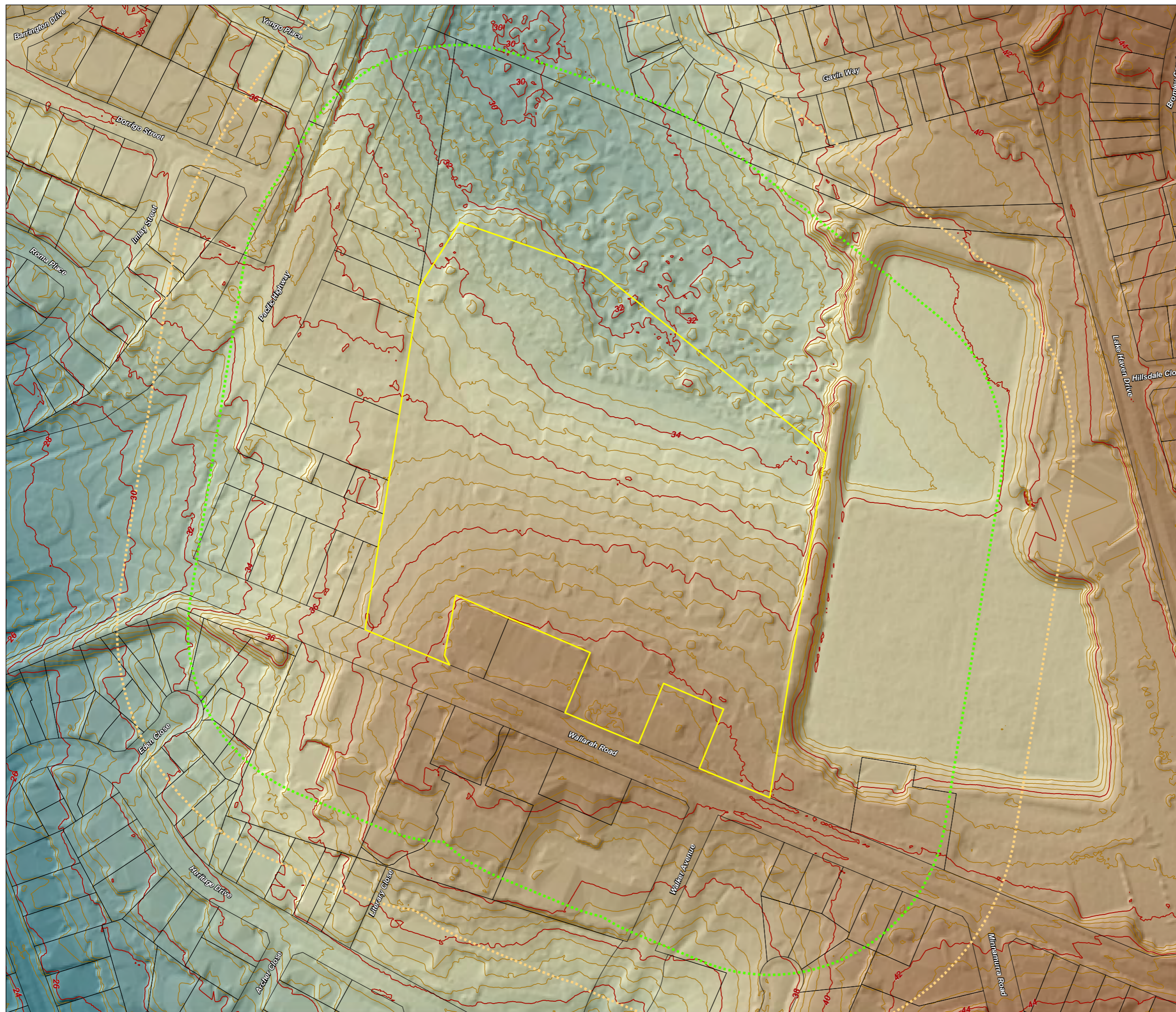












Figure 14

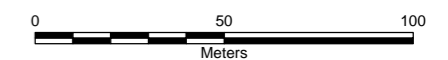
Slope Analysis: LiDAR



BUSHFIRE
PLANNING
AUSTRALIA

-  Subject Site
 -  100m Buffer
 -  140m Buffer
 -  Contour (2m)
 -  Contour (0.5m)
- Slope**
-  0° - 5°
 -  5° - 10°
 -  10° - 15°
 -  15° - 20°
 -  >20°

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2022
Aerial photo: NearMap 16/06/2022
Surface analysis: Derived from LiDAR - GOSFORD 1
metre Resolution Digital Elevation Model ©
Department Finance, Services and Innovation 2014



A3 Scale: 1:2,000

File:2213-Kanwal-Figs-SlopeLiDAR-220627 Date: 27/06/2022

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4.4. Significant Environmental Features

The recommended bushfire protection measures have been designed to minimise any unacceptable impacts on a significant environmental feature.

4.5. Threatened Species, populations or ecological communities

The area of the site to be affected by the proposed development has been identified to minimise impact on any threatened species, population or EEC. All bushfire mitigation measures; including APZs will consider the existing and potential biodiversity values to avoid impact where possible.

4.6. Aboriginal Objects

A search of the AHIMS database (results contained in **Appendix C**) revealed there are no Aboriginal sites or places recorded near the site. All bushfire mitigation measures, such as APZs have considered this and been designed to avoid disturbing any artefacts if identified.

4.7. Results

All vegetation identified within the current Bush Fire Prone Land map was confirmed during the site inspection and in this instance is not consistent.

All vegetation on site and within 140m north of the site was confirmed as a *forest* formation, although varying in classification. Vegetation to the north-west of the site was identified as *Sydney Coastal Dry Sclerophyll Forest* and transitions to a *Coastal Swamp Forest* whilst *Hunter-Macleay Dry Sclerophyll Forest* exists directly to the north of the site. Located to the north-east of the site, additional *Coastal Swamp Forest* was identified.

The results of hazard assessment are detailed in **Table 2** and shown in **Figure 15**.

Table 5: Slope and Vegetation Assessment Results

Transect	Vegetation or Other Infrastructure	Vegetation Classification (PBP 2019)	Slope
T1	Sydney Coastal Dry Sclerophyll Forest transitioning to Coastal Swamp Forest	<i>Forest</i> (Sydney Coastal Dry Sclerophyll Forest)	1.8° Downslope
T2	Partially disturbed forest immediately on the sites northern boundary and extends approximately 100m north of the site	<i>Forest</i> (Coastal Swamp Forest)	0.7° Downslope
T3	Partially disturbed forest immediately on the sites northern boundary and extends approximately 100m north of the site	<i>Forest</i> (Coastal Swamp Forest)	-0.3° Upslope
T4	Riparian coastal swamp forest vegetation, neighbouring onto sporting fields	<i>Forest</i> (Coastal Swamp Forest)	-1.7° Upslope
T5	Neighbouring residential properties to the west of the site	<i>Excluded</i> (Managed land)	2.4° Downslope
T6	Vegetation from the sites north-western boundary to the Pacific Highway	<i>Forest</i> (Sydney Coastal Dry Sclerophyll Forest)	-0.7° Upslope

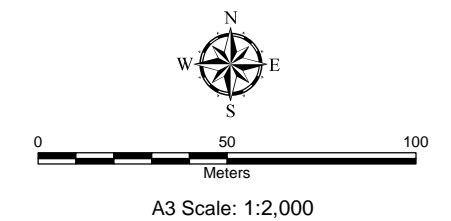
Figure 15 Slope & Vegetation Assessment



- | | |
|--------------------|--|
| Subject Site | Asset Protection Zone (Approved) |
| 100m Buffer | Vegetation Class |
| 140m Buffer | Coastal Floodplain Wetlands |
| Contour (2m) | Coastal Swamp Forests |
| Contour (0.5m) | Sydney Coastal Dry Sclerophyll Forests |
| RL | Not native vegetation |
| Downslope transect | |
| Upslope transect | |

NOTE:
 Position of development footprint is approximate only.

SOURCE:
 Cadastral Boundary: NSW Department of Finance, Services and Innovation 2022
 Aerial photo: NearMap 16/06/2022
 Vegetation: © State Government of NSW and Department of Planning and Environment 2022
 Surface analysis: Derived from LIDAR - GOSFORD 1 metre Resolution Digital Elevation Model © Department Finance, Services and Innovation 2014



File:2213-Kanwal-Fig6-SlopeVeg-230802 Date: 2/08/2023

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5. Bushfire Protection Measures

This BAR has adopted the methodology to determine the appropriate Bushfire Protection Measures (BPMs) detailed in PBP 2019. As part of the BAR, the recommended BPMs demonstrate the aims and objectives of PBP 2019 have been satisfied; including the matters considered by the RFS necessary to protect persons, property and the environment from the danger that may arise from a bushfire.

- APZs
- Access
- Water Supply and Utilities
- Building Construction and Design
- Landscaping
- Emergency Management Arrangements

5.1. Asset Protection Zones

An APZ is an area surrounding a development that is managed to reduce the bushfire hazard to an acceptable level to mitigate the risk to life and property. The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an inner protection area (IPA) and an outer protection area (OPA). In this instance the entire APZ and the balance of the development site shall be managed as an IPA.

An APZ can include the following:

- Lawns;
- Discontinuous gardens;
- Swimming pools;
- Roads, driveways and managed verges;
- Unattached non-combustible garages with suitable separation from the dwelling;
- Open space / parkland; and
- Car parking.

The presence of a few shrubs or trees in the APZ is acceptable provided that they:

- Do not touch or overhang any buildings;
- Are well spread out and do not form a continuous canopy;
- Are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
- Are located far enough away from any dwelling so that they will not ignite the dwelling by direct flame contact or radiant heat emission.

Woodpiles, wooden sheds, combustible material storage areas, large areas / quantities of garden mulch, stacked flammable building materials etc. are not recommended in the APZ.

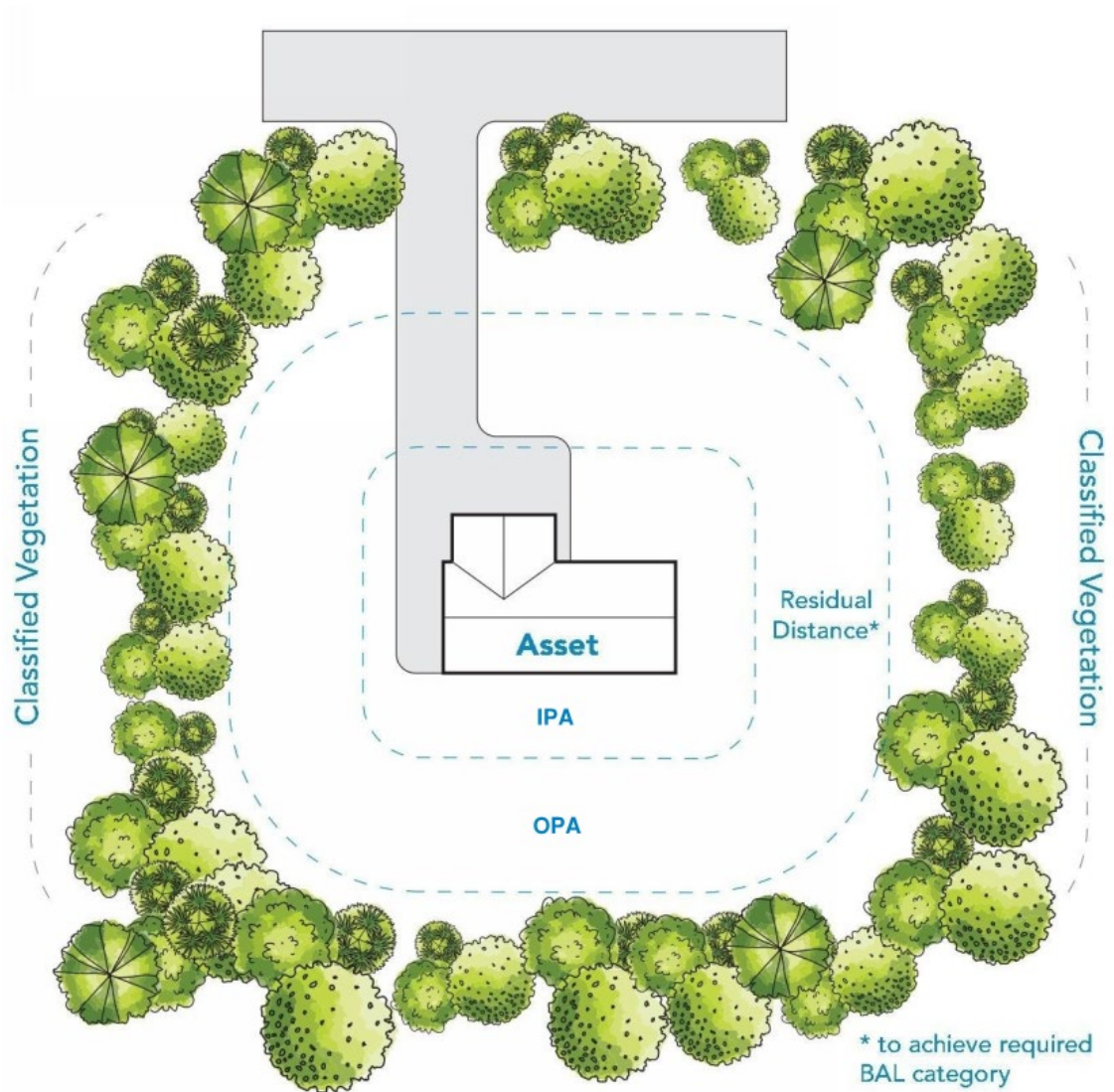


Figure 16: Inner and Outer Asset Protection Zones

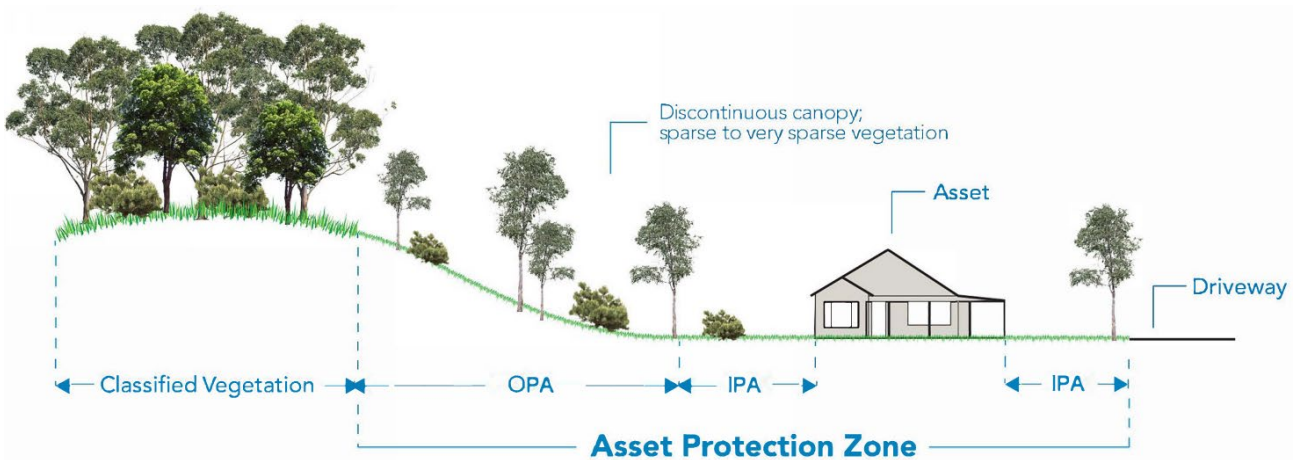


Figure 17: Example of the APZ profile

5.1.1. Determining the Appropriate Setbacks

To achieve compliance with the performance criteria for APZs (Table 6.3a), the Acceptable Solutions outlined in Table A1.12.1 of PBP 2019 may be adopted as a deemed-to-satisfy solution.

Alternatively, the appropriate APZ setback may be determined to achieve the Performance Criteria by adopting a performance-based solution. Based on the unique site characteristics identified by the BAR, the intensity of a bushfire event presented as the radiant heat exposure was calculated at several locations throughout the development site using the NBC Bushfire Attack Assessor V4.1. The nominated fuel loads for the respective vegetation classifications as published by the RFS in March 2019 have been used to determine the APZs and the effective slope obtained from the Digital Elevation Model (DEM) for each transect.

As the site lies within the Central Coast Council LGA, it is assessed under a FDI rating of 100. The Detailed Method (Method 2) outlined in Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas* was used to calculate the potential level of radiant heat flux generated at the nominated locations (see transects T1-T6). To ensure the APZs achieve the intent of Section 6.3 of PBP 2019, the APZs have been determined to ensure all lots are able to accommodate a dwelling that will not be exposed to radiant heat levels exceeding 29kW/m^2 . The NBC Bushfire Attack Assessor report detailing the inputs used is contained in **Appendix D**.

Table 6: Required APZ setbacks

Transect	Vegetation Classification (PBP 2019)	Slope	APZ Table A1.12.2	APZ 29kW/m ²	APZ Provided
T1	<i>Forest</i> (Sydney Coastal Dry Sclerophyll Forest)	1.8° Downslope	29m	24m	24m
T2	<i>Forest</i> (Coastal Swamp Forest)	0.7° Downslope	29m	17m	24m
T3	<i>Forest</i> (Coastal Swamp Forest)	-0.3° Upslope	24m	24m	24m
T4	<i>Forest</i> (Coastal Swamp Forest)	-1.7° Upslope	24m	24m	24m
T5	<i>Excluded</i> (Managed land)	2.4° Downslope	N/A	N/A	>100m
T6	<i>Forest</i> (Sydney Coastal Dry Sclerophyll Forest)	-0.7° Upslope	24m	22m	24m

5.3. Access

In the unlikely event of a serious bushfire, it will be essential to ensure that adequate ingress / egress and the provision of defensible space are afforded in the layout. The following design specifications detailed in PBP 2019 are relevant to the proposed development:

- ❑ Internal roads are two-wheel drive all weather roads;
- ❑ internal perimeter roads are provided with a minimum carriageway width of 8m;
- ❑ be through roads, but if unavoidable then dead ends should be not more than 100 metres in length, incorporate a minimum 12 metres turning circle (either in cul-de-sac or T-head formation) and should be clearly sign posted as dead ends;
- ❑ the capacity of road surfaces is sufficient to carry fully loaded fire fighting vehicles (15 tonnes);
- ❑ curves of roads (other than perimeter roads) are a minimum inner radius of 6 metres and minimal in number, to allow for rapid access and egress;
- ❑ maximum grade for sealed roads do not exceed 12.5°;
- ❑ have a minimum vertical clearance to a height of four metres at all times;

Any future development will be required to provide internal non-perimeter roads with a minimum carriageway of 5.5m and a new perimeter road along the northern interface 8m wide.

In this instance the proposed access arrangements are considered to be acceptable and complies with the relevant Performance Criteria. Moreover, the access arrangements provide an improved bushfire outcome in comparison to the approved development.

Refer to **Appendix A** for proposed development showing access.

5.4. Emergency Services

There is a NSW Rural Fire Station located at 105 Arizona Road, Charmhaven, approximately 2.3km (4 mins) drive away from the site (**Figure 18**). A second NSW Fire & Rescue station is located at 51-53 Pacific Highway, Doyalson, approximately 9.3km (11 mins) from the site (**Figure 19**). In an emergency, either or both of these services could attend the site.

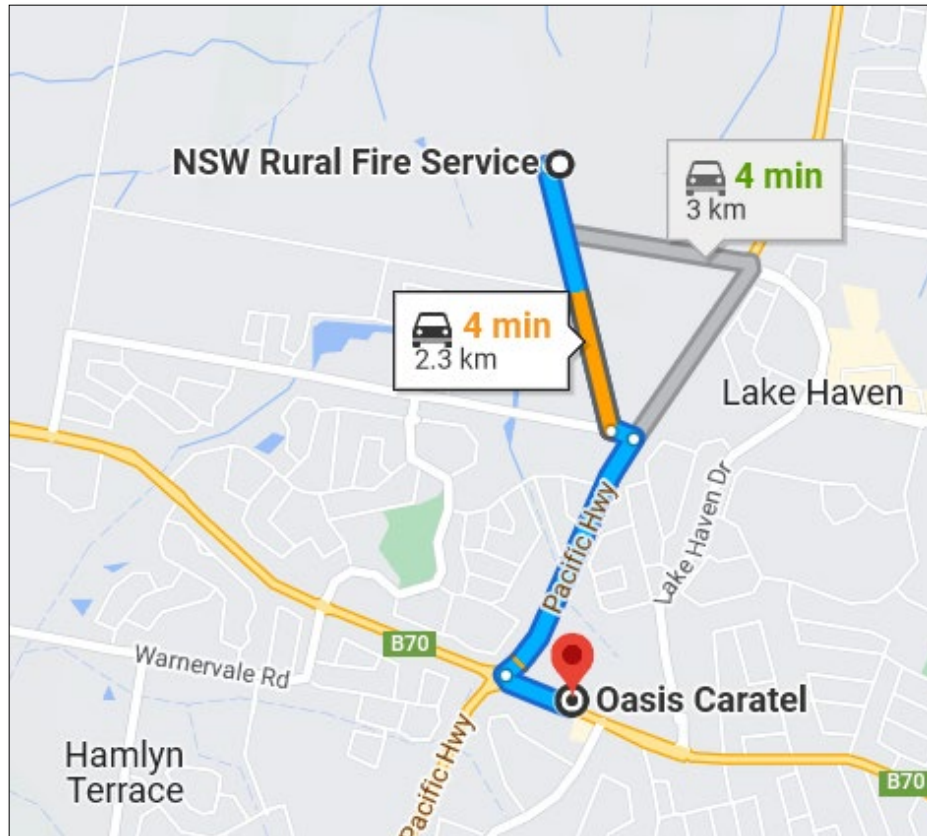


Figure 18: NSW Fire & Rescue - Charmhaven

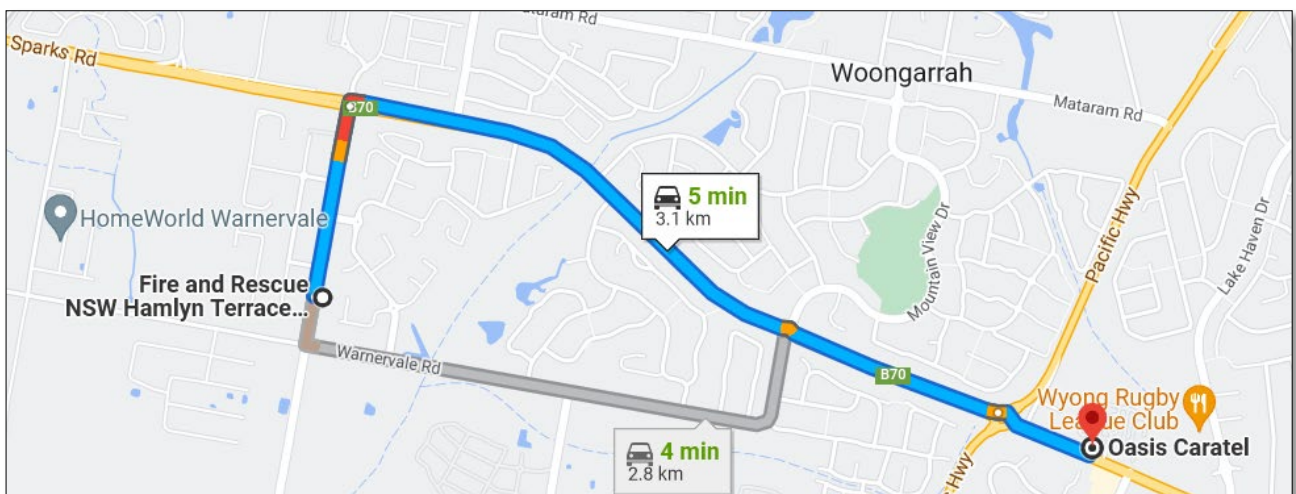


Figure 19: NSW Fire & Rescue - Hamlyn Terrace

5.5. Services - water, electricity and gas

5.5.1. Water

Fire hydrant spacing, sizing and pressure should comply with AS 2419.1-2005. Hydrants are not to be located within any road carriageway.

All lots within the proposed development will be connected to the internal reticulated water supply.

5.5.2. Electricity

All new electricity services are located underground.

5.5.3. Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 159-2002. It is expected that the location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

5.6. Construction Standards - Bushfire Attack Level

All buildings, including multi storey residential development (Class 2 buildings), constructed within the site are recommended to satisfy the Performance Requirements of the National Construction Code: Building Code of Australia (BCA).

Accordingly, all forthcoming habitable buildings shall satisfy the requirements of Part 3.7.4 of the BCA. The *Deemed-to-Satisfy* (DTS) provision of the BCA can only be achieved if dwellings in bushfire prone areas are constructed in accordance with Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas*. Alternatively, the DTS provisions can also be achieved if the habitable building is constructed in accordance with the NASH Standard 'Steel Framed Construction in Bushfire Areas'.

Building design and the materials used for construction of future dwellings should be chosen based on the information contained within AS3959-2018, and accordingly the designer/architect should be made aware of this recommendation.

The determinations of the appropriate bushfire attack level (BAL) is based on the maximum potential radiant heat exposure. BALs are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the BAL is derived by assessing the:

- ❑ Relevant FDI = 100;
- ❑ Flame temperature = 1090K;
- ❑ Slope = variable;
- ❑ Vegetation classification = *forest*; and
- ❑ Building location.

The Detailed Method (Method 2) outlined in AS3959-2018 was used to calculate the Bushfire Attack Level (BAL) for the development. The NBC Bushfire Attack Assessor V4.1 was used to model the bushfire radiant heat exposure which determined the applicable BAL. All sites with the development layout are exposed to BAL-29 or less.

The greatest bushfire hazard was found to the north of the site being a *forest*.

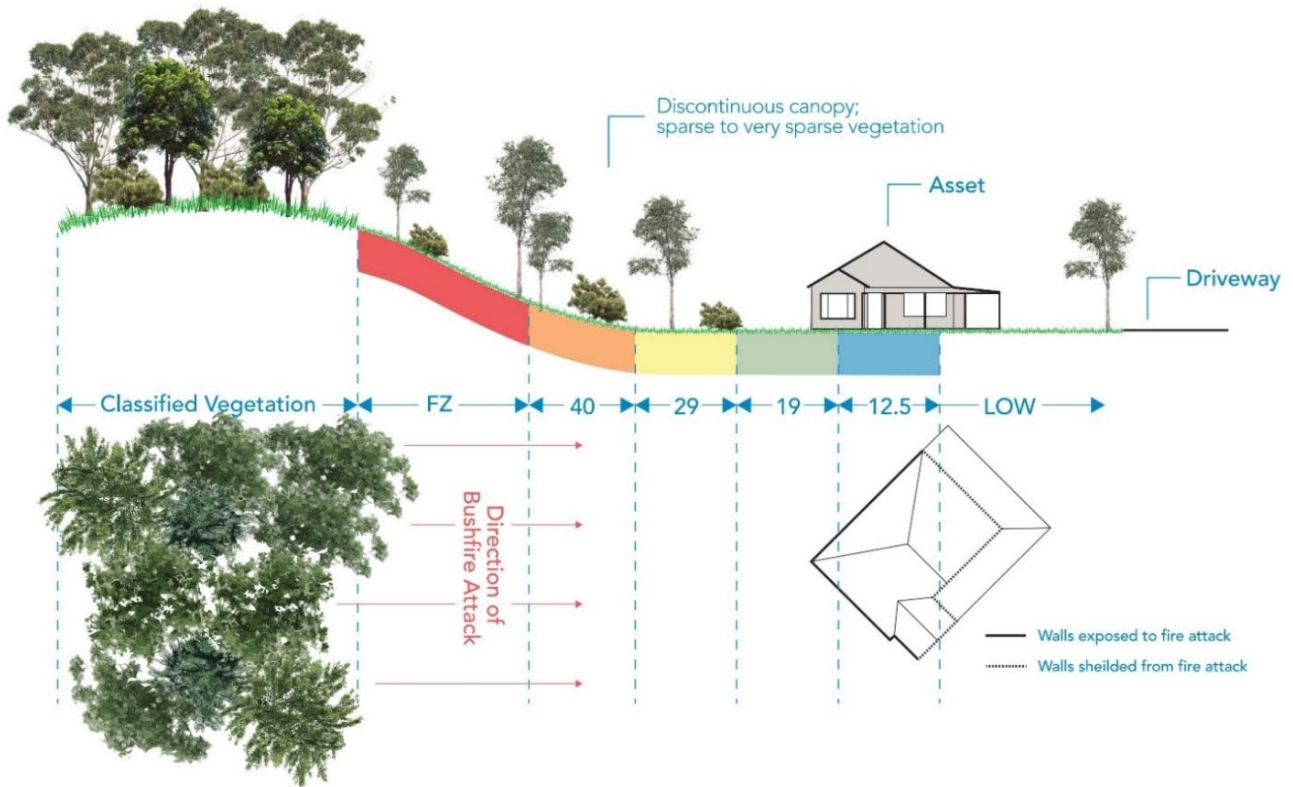


Figure 20: BAL example



Table 7: Bushfire Attack Levels

Transect	Vegetation Classification (PBP 2019)	Slope	APZ Provided	Distance from Hazard	Bushfire Attack Level (BAL)
T1 (North-west)	Forest (Sydney Coastal DSF)	1.8° Downslope	24m	0m-<22m	BAL-FZ
				22m-<24m	BAL-40
				24m-<34m	BAL-29
				34m-<46m	BAL-19
				46m-<100m	BAL-12.5
				68m	10kW/m ²
T2 (North)	Forest (Coastal Swamp Forest)	0.7° Downslope	24m	0m-<15m	BAL-FZ
				15m-<17m	BAL-40
				17m-<24m	BAL-29
				24m-<34m	BAL-19
				34m-<100m	BAL-12.5
				52m	10kW/m ²
T3 (North)	Forest (Coastal Swamp Forest)	-0.3° Upslope	24m	0m-<22m	BAL-FZ
				22m-<23m	BAL-40
				23m-<33m	BAL-29
				33m-<45m	BAL-19
				45m-<100m	BAL-12.5
				67m	10kW/m ²
T4 (North-east)	Forest (Coastal Swamp Forest)	-1.7° Upslope	24m	0m-<22m	BAL-FZ
				22m-<23m	BAL-40
				23m-<33m	BAL-29
				33m-<45m	BAL-19
				45m-<100m	BAL-12.5
				67m	10kW/m ²
T5 (West)	Excluded (Managed land)	2.4° Downslope	>100m	N/A	BAL-LOW
T6 (North-west)	Forest (Sydney Coastal DSF)	-0.7° Upslope	24m	0m-<20m	BAL-FZ
				20m-<22m	BAL-40
				22m-<31m	BAL-29
				31m-<42m	BAL-19
				42m-<100m	BAL-12.5
				64m	10kW/m ²

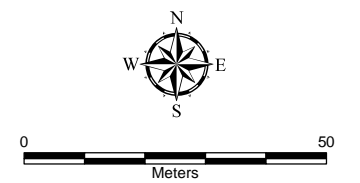
Figure 21

BAL Contour Plan



- Subject Site
 - 100m Buffer
 - 140m Buffer
 - Development Layout
 - Detention Basin
 - 10kW/m2
 - Asset Protection Zone
- Required Bushfire Attack Levels (PBP 2019 Table A1.12.5)**
- BAL - FZ
 - BAL - 40
 - BAL - 29
 - BAL - 19
 - BAL - 12.5

SOURCE:
 Cadastral Boundary: NSW Department of Finance,
 Services and Innovation 2022
 Aerial photo: NearMap 16/06/2022



A3 Scale: 1:1,250

File:2213-Kanwal-Fig7-BALs-221028 Date: 28/10/2022

The information shown on this plan may be insufficient for some types of design. GEOVIEW should be consulted as to the suitability of the information shown herein prior to the commencement of any works based on this plan.

This map is not guaranteed to be free from error or omission. GEOVIEW hereby disclaims liability for any act done or omission made on the basis of the information in this plan, and any consequences of such acts or omissions



5.7. Landscaping and Vegetation Management

In APZs and IPAs, the design and management of the landscaped areas in the vicinity of buildings have the potential to improve the chances of survival of people and buildings. Reduction of fuel does not require the removal of all vegetation. Trees and plants can provide some bushfire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns.

Generally landscaping in and around a bushfire hazard should consider the following:

- Priority given to retaining species that have a low flammability;
- Priority given to retaining species which do not drop much litter in the bushfire season and which do not drop litter that persists as ground fuel in the bush fire season;
- Priority given to retaining smooth barked species over stringy bark; and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Landscaping within APZs and IPAs should give due regard to fire retardant plants and ensure that fuel loads do not accumulate as a result of the selected plant varieties.

The principles of landscaping for bushfire protection aim to:

- Prevent flame impingement on dwellings;
- Provide a defensible space for property protection;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat; and
- Reduce wind speed.

Plants that are less flammable have the following features;

- High moisture content;
- High levels of salt;
- Low volatile oil content of leaves;
- Smooth barks without 'ribbons' hanging from branches or trunks; and
- Dense crown and elevated branches.

Avoiding understorey planting and regular trimming of the lower limbs of trees also assists in reducing fire penetration into the canopy. Rainforest species such as Syzygium and figs are preferred to species with high fine fuel and/or oil content.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage ground fire to spread up to, and then through the crown of trees.

Consideration should be given to vegetation fuel loads present on site with particular attention to APZs.

Careful thought must be given to the type and physical location of any proposed site landscaping. Inappropriately selected and positioned vegetation has the potential to 'replace' any previously removed fuel load.

Bearing in mind the desired aesthetic and environment sought by site landscaping, some basic principles have been recommended to help minimise the chance of such works contributing to the potential hazard on site.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered.

It is reiterated again that it is essential that any landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

5.8. Multi-storey residential development

Residential development containing buildings exceeding three (3) storeys are considered multistorey buildings. Multi-storey buildings used as a residential flat building are required to assess additional considerations to ensure the design of the building is able to adequately address the bush fire risk.

Subsequent to the successfully rezoning of the site resulting in residential flat buildings exceeding three or more storeys, any future development application must be supported by a Bushfire Assessment Report that addresses the issues and considerations detailed in Table 8.2.2 of PBP 2019.

6. Conclusion and Recommendations

Bushfire Planning Australia (BPA) has been engaged by Oasis Unit Trust (the 'Proponent') to undertake a Strategic Bushfire Study (SBS) and a Bushfire Assessment Report (BAR) to support the proposed medium to high density redevelopment of the existing Oasis Caravan Park located at 207-209 Wallarah Road, Kanwal; legally known as Lot 1223 DP1004170. The planning proposal has been selected by NSW Department of Planning and Environment under the State Assessable Planning Pathway (Rezoning Pathways) and will be subject to an accelerated assessment process.

The planning proposal seeks to increase the height and floor space ratio (FSR) to facilitate the redevelopment of the existing caravan park into a mixed-use precinct including up to 800 apartments, supermarket, public parklands and retail areas.

This requires the amendment of Central Coast Local Environmental Plan 2022 (CCLEP) to rezone part of the site to E2 Local Centre and maintain the existing R1 residential zone with an additional permitted use to allow for retail and commercial uses.

This BAR found the site was exposed to a medium to high bushfire hazard located primarily to the north of the site which is mapped as Category 3 Vegetation in the Central Coast Bush Fire Prone Land Map.

This BAR has been prepared in accordance with the submission requirements detailed in Appendix 2 of PBP 2019 and has demonstrated the proposed development is able to satisfy the Aims and Objectives of PBP 2019, and has been found to be an appropriate use of the site.

Subject to the following recommendations, the proposed land use can be considered to be appropriate in its bushfire context:

1. The entire development site; including all residential lots and open space shall be managed as an Inner Protection Area (IPA) as outlined within Section 5.1 of this report;
2. Access/egress will be provided in accordance with Section 5.2 of this report to ensure the safe evacuation of occupants whilst also affording fire fighters safe operational access and a defensible space to work within;
3. Building envelopes will be setback in accordance with minimum APZs to achieve maximum radiant heat levels of 29kW/m² as indicated in Section 5.4 of this report;
4. All new lots are to be connected to a reliable water supply network in accordance with Section 5.3.1 of this report. The water supply is to have suitable fire hydrants located throughout the development site that are outside of parking reserves and road carriageways, clearly marked and provided for the purposes of bushfire protection;
5. Gas and electricity supplies will be provided in accordance with Section 5.3.2 of this report so as to not contribute to fire ignitions within the development.
6. All future buildings to be constructed on the proposed sites shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
7. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site; and
8. A Bushfire Emergency Management and Evacuation Plan (BEMEP) shall be prepared that is consistent with the RFS Guidelines 'Development Planning – A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014'.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (August 2023).

Should the above recommendations be implemented, the proposed modification to the approved development will result in a better bushfire outcome as the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

7. References

- ❑ NSW Rural Fire Service (2005). Standards for Asset Protection Zones. NSW Rural Fire Service.
- ❑ NSW Rural Fire Service (2019). Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.
- ❑ Ramsay, GC and Dawkins, D (1993). Building in Bushfire-prone Areas – Information and Advice. CSIRO and Standards Australia.
- ❑ Rural Fires and Environmental Assessment Legislation Amendment Act 2002.
- ❑ Standards Australia (2018). AS 3959 – 2018: Construction of Buildings in Bushfire-prone Areas.

Appendix A: Proposed Concept Plans of Oasis Redevelopment



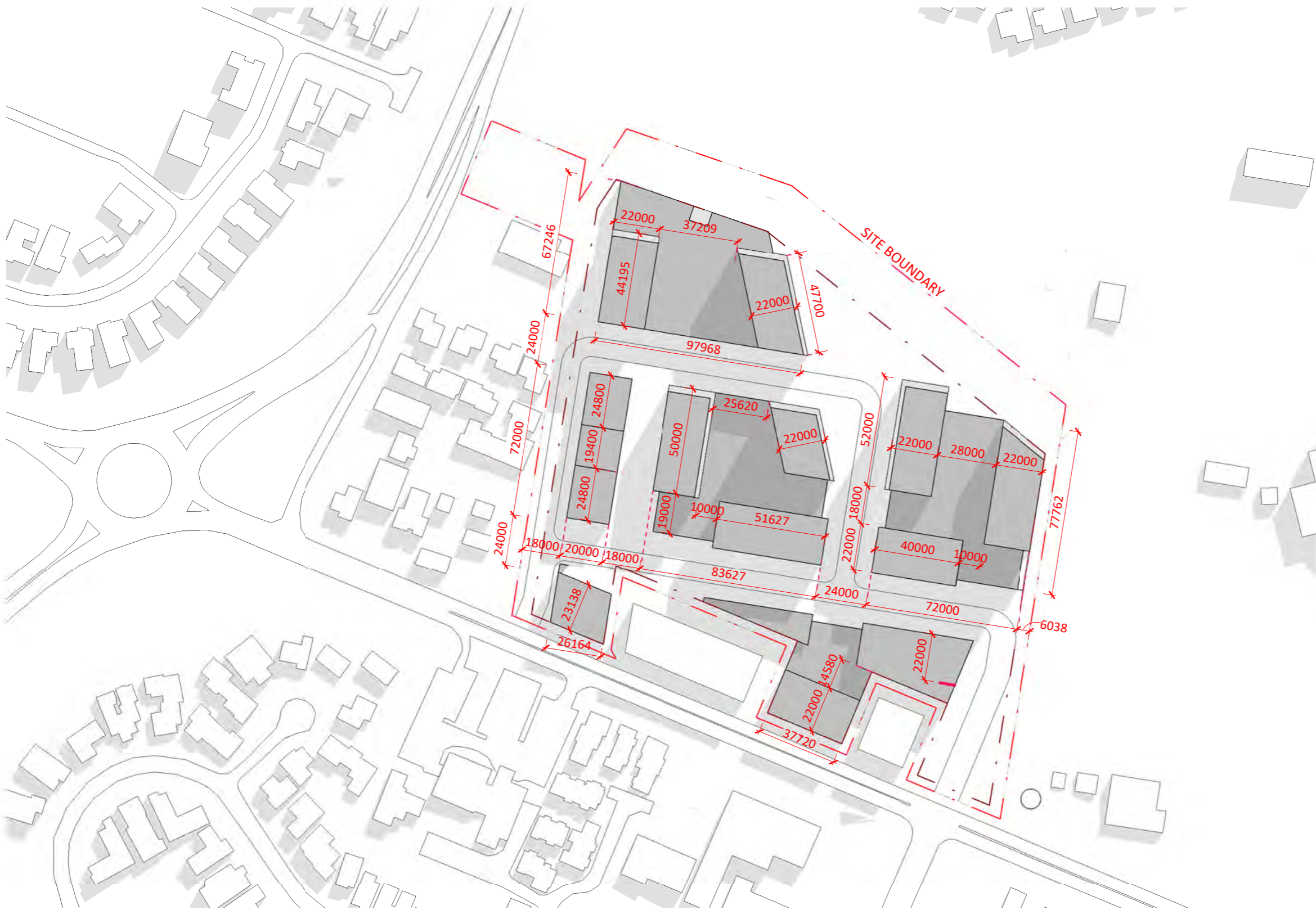
Public Open Space Plan

LEGEND

PUBLIC OPEN SPACES



Building separation and dimension plan



View from the south



Overview of Uses





Cafe overlooking new landscaped area

Biofiltration system and water feature

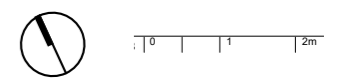
Public open space for recreation

Blockplans - Typical



LEGEND

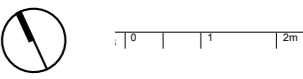
- 1 BEDROOM
- 2 BEDROOMS
- 3 BEDROOMS
- COMMERCAIL



Blockplans - L1 (Upper ground)

LEGEND

- 1 BEDROOM
- 2 BEDROOMS
- 3 BEDROOMS
- COMMERCAIL

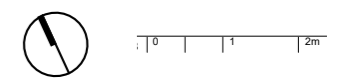


Blockplans - Ground floor



LEGEND

- 1 BEDROOM
- 2 BEDROOMS
- 3 BEDROOMS
- COMMERCIAL



View from the north



Appendix B: Planning for Bushfire Protection 2019 Compliance Tables

Table 1: Aims and Objectives of Planning for Bushfire Protection 2019

Objectives	Satisfied	Comment
<ul style="list-style-type: none"> Afford buildings and their occupants protection from exposure to a bush fire 	<p style="text-align: center;">✓</p>	<p>APZs along the interface with the vegetation within the site is provided by perimeter roads that separate the sites from the primary threat and adequate setbacks provide defensible space from areas of reduced vegetation. The APZs extend beyond the perimeter roads to the north. Furthermore, the APZ will be extended along the entire northern boundary to provide additional protection for the existing dwellings. Consequently there will be no dwellings exposed to radiant heat levels greater than 29kW/m².</p>
<ul style="list-style-type: none"> Provide for a defensible space to be located around buildings 	<p style="text-align: center;">✓</p>	<p>Where required, each site is provided with an APZ that accommodates a building footprint that will not be exposed to radiant heat levels exceeding 29kW/m². The APZ provides a defensible space that is capable of providing an environment in which a person can undertake property protection after the passage of bushfire with some level of safety. An APZ will also be provided to ensure all existing dwellings within the site; including along the northern boundary, have sufficient defensible space.</p>
<ul style="list-style-type: none"> Provide appropriate separation between a hazard and buildings, which, in combination with other measures, prevent the likely fire spread to buildings 	<p style="text-align: center;">✓</p>	<p>The APZs have been calculated to provide a suitable buffer between any future dwellings and the bushfire hazard; commensurate with the vegetation formation and slope.</p>
<ul style="list-style-type: none"> Ensure that safe operational access and egress for emergency service personnel and residents is available 	<p style="text-align: center;">✓</p>	<p>All residents have direct access to multiple internal roads that lead away from the development site in the opposite direction to the bushfire hazard. Due to the proposed road widths and road layout within the development site, emergency service personnel will continue to have unobstructed access to the site whilst residents are evacuating in the opposite direction.</p>
<ul style="list-style-type: none"> Provide for ongoing management and maintenance of BPMs 	<p style="text-align: center;">✓</p>	<p>All APZs are contained with common property or within land owned by operator and will be maintained by the operator of the MHE in accordance with Appendix 4 of the PBP 2019 and Standards for APZs.</p>
<ul style="list-style-type: none"> Ensure that utility services are adequate to meet the needs of firefighters 	<p style="text-align: center;">✓</p>	<p>The development includes all essential utility services to meet the needs of firefighters; including a reliable water supply.</p>

Table 2: Performance Criteria and Acceptable Solutions for SFPP Developments (Chapter 6 PBP 2019)

Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment	
<p>6.8.1 ASSET PROTECTION ZONES</p> <p>Table 6.8a</p> <p>To provide suitable building design, construction and sufficient space to ensure that radiant heat levels at buildings does not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants.</p>	Radiant heat levels of greater than 10kW/m ² (1200K) are not experienced at any part of the building.	The building is provided with an APZ in accordance with Table A1.12.1. in Appendix 1.	PS	The proposed expansion to the existing MHE has been designed to ensure APZs are provided to achieve the Performance Criteria for residential infill development.	
	APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated.	The APZ is not located on lands with a slope exceeding 18°	✓	All APZs are located on land with slopes 5° or less.	
	<p>APZs are managed and maintained to prevent the spread of a fire towards the building.</p> <p>The APZ is provided in perpetuity.</p>	The APZ is managed in accordance with the requirements of Appendix 4 of PBP 2019 and is wholly within the boundaries of the development site.	✓	<p>The APZ will be required to be maintained in accordance with Appendix 4 of the PBP 2019 and Standards for APZs by the operator of the MHE.</p>	
		Mechanisms are in place to provide for the maintenance of the APZ over the life of the development.	✓		
		Other structures located within the APZ need to be located further than 6m from the refuge building.	✓		Any ancillary structures will be greater than 6m from the primary structure.
	<p>VARIATIONS: Manufactured Home Estates</p>	An APZ in accordance with Table A1.12.1 in Appendix 1 of this document is provided to all new dwellings; or	<p>An APZ in accordance with Table A1.12.2 in Appendix 1 of this document is provided where it is demonstrated that all new dwellings will be constructed in accordance with BAL-29.</p>	✓	<p>The site layout has been designed to ensure all sites are provided with sufficient area to provide a dwelling exposed to 29kW/m² or less.</p> <p>Whilst the proposed development does not seek consent for the construction of any new dwellings, the Community Management Statement shall include the BAL Contour Plan (Figure 15) and require each dwelling to be constructed to the nominated BAL rating. Furthermore, a suitably worded instrument(s) must be created pursuant to section 88 of the Conveyancing Act 1917 clearly outlining the require BAL ratings for each dwelling.</p> <p>It is not considered reasonable for ALL new dwellings to be construction in accordance with BAL-29 (including dwellings >100m from any hazard). In this regard the dwellings have been assessed as a typical residential property.</p>

Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
LANDSCAPING	Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is in accordance with APZ standards (see Appendix 4). Fencing is constructed in accordance with section 7.6.	✓	All new landscaping will be designed and planted in accordance with the guidelines relevant at the time of planting.
CONSTRUCTION	The proposed building can withstand bush fire attack in the form of wind, smoke, embers, radiant heat and flame contact.	A construction level of BAL-12.5 under AS3959 or NASH and Table 6.8a is applied	✓	<p>Whilst the proposed development does not seek consent for the construction of any new dwellings, the Community Management Statement shall include the BAL Contour Plan (Figure 15) and require each dwelling to be constructed to the nominated BAL rating. Furthermore, a suitably worded instrument(s) must be created pursuant to section 88 of the Conveyancing Act 1917 clearly outlining the require BAL ratings for each dwelling.</p> <p>It is not considered reasonable for ALL new dwellings to be construction in accordance with BAL-29 (including dwellings >100m from any hazard). In this regard the dwellings have been assessed as a typical residential property.</p>
	VARIATIONS: Manufactured Home Estates	<p>Where an APZ in accordance with Table A1.12.1 in Appendix 1 of this document the construction standards for BAL-12.5 shall apply; or</p> <p>Where an APZ in accordance with Table A1.12.2 in Appendix 1 of this document the construction standards for BAL-29 shall apply.</p>		
6.8.2 ACCESS Table 6.8b To provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area.	Firefighting vehicles are provided with safe all weather access to structures and hazard vegetation.	SFPP access roads are two-wheel drive, all-weather roads	✓	All roads are all-weather, sealed roads allowing safe and direct access for fire fighting vehicles to all lots.
FIREFIGHTING VEHICLES		Access is provided to all structures and hazard vegetation.	✓	
		Traffic management devices are constructed to not prohibit access by emergency services vehicles.	✓	
		Access roads must provide suitable turning areas in accordance with Appendix 3.	✓	
ACCESS ROAD CAPACITY	The capacity of access roads is adequate for firefighting vehicles.	The capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.	✓	All new roads will have sufficient capacity to carry fully loaded fire fighting vehicles.



Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
ACCESS TO WATER	There is appropriate access to water supply.	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.	✓	All new sites will be connected to a new water supply main.
		Hydrants are provided in accordance with AS2419.1:2005	✓	
		There is suitable access for Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	✓	
PERIMETER ROADS	Perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	There are two-way sealed roads.	✓	The proposed internal road network provides perimeter roads and a secondary egress to Wallarah Road.
		8m carriageway width kerb to kerb.	✓	
		Hydrants are to be located clear of parking areas.	✓	
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	✓	
		Curves of roads have a minimum inner radius of 6m.	✓	
		The maximum grade road is 15° and average grade is 10°.	✓	
		The road crossfall does not exceed 3°.	✓	
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; and	✓	
NON-PERIMETER ROADS	Non-perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating.	Minimum 5.5m width kerb to kerb.	✓	The proposed new internal roads provide safe circulation throughout the MHE offering multiple egress routes from every site.
		Parking is provided outside of the carriageway.	✓	
		Hydrants are to be located clear of parking areas.	✓	
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	✓	
		Curves of roads have a minimum inner radius of 6m.	✓	
		The maximum grade road is 15° and average grade is 10°.	✓	

Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment	
		The road crossfall does not exceed 3°.	✓		
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; and	✓		
6.8.3 SERVICES Table 6.8c To provide adequate services for water for the protection of buildings during and after the passage of a bushfire, and not to locate gas and electricity so as not to contribute to the risk of fire to a building.	A water supply is provided for firefighting purposes	Reticulated water is to be provided to the development, where available	✓	A reticulated water supply is provided.	
		A static water supply is provided where no reticulated water is available	N/A		
	Water supplies are located at regular intervals	Fire hydrant spacing, design and sizing comply with AS2419.1:2005;	✓	A series of fire hydrants will be located throughout the MHE.	
		Hydrants are not located within any road carriageway;	✓		
	WATER The water supply is accessible and reliable for firefighting operations	Flows and pressures are appropriate	Reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads.	✓	A new water supply ring main will be provided throughout the new component of the MHE.
			Fire hydrant flows and pressures comply with AS2419.1:2005.	✓	
The integrity of the water supply is maintained			All above ground water service pipes are metal, including and up to any taps.	N/A	
ELECTRICITY	Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings.	Where practicable, electrical transmission lines are underground.	✓	All transmission lines will be located underground.	



Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
		Where overhead electrical transmission lines are proposed as follows: <ul style="list-style-type: none"> - lines are installed with short pole spacing (30 metres), unless crossing gullies, gorges or riparian areas; and - no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines 	N/A	
GAS	Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS 1596:2014 and the requirements of relevant authorities, metal piping is to be used.	✓ Able to comply	All tanked gas stored on site will be sited and secured with appropriate shielding from the bushfire hazard.
		All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side;	✓	
		Connections to and from gas cylinders are metal:	✓	
		Polymer-sheathed flexible gas supply lines are not used; and	✓	
		Above-ground gas service pipes are metal, including and up to any outlets.	✓	
6.8.4 EMERGENCY MANAGEMENT PLANNING Table 6.8d To provide suitable emergency and evacuation arrangements for occupants of SFPP developments	A bush fire emergency and evacuation management plan is prepared.	Bush fire emergency management and evacuation plan is prepared consistent with the: <ul style="list-style-type: none"> ❑ the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan; and ❑ AS3745:2010 Planning for emergencies in facilities. 	✓ Able to comply	A Bushfire Management Plan is recommended to be prepared for the MHE.
		The emergency and evacuation management plan should include a mechanism for the early relocation of occupants.	✓ Able to comply	



Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
	Appropriate and adequate management arrangements are established for consultation and implementation of the bush fire emergency and evacuation management plan.	An Emergency Planning Committee is established to consult with residents and staff in developing and implementing an Emergency Procedures Manual.	✓ Able to comply	Where required, consultation with staff and residents will be undertaken during the preparation of the Bushfire Management Plan.
		Detailed plans of all emergency assembly areas including 'on-site' and 'off-site' arrangements as started in AS3745 are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.	✓ Able to comply	

Appendix C: AHIMS Report

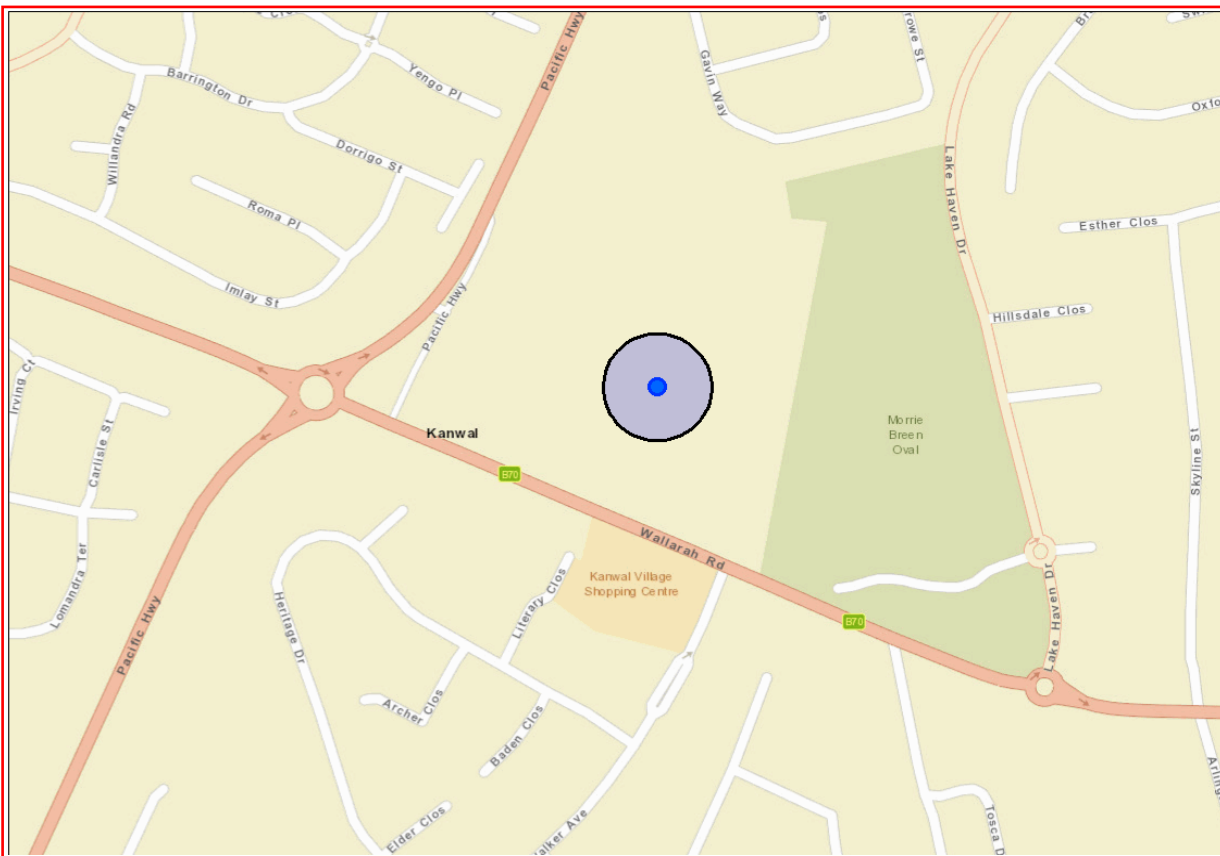
Katrina Greville
21 Costata Crescent
Adamstown New South Wales 2289
Attention: Katrina Greville
Email: klmukevski@bigpond.com

Date: 31 October 2022

Dear Sir or Madam:

AHIMS Web Service search for the following area at Address : 142 207-209 WALLARAH ROAD KANWAL 2259 with a Buffer of 50 meters, conducted by Katrina Greville on 31 October 2022.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Appendix D: NBC Bushfire Attack Assessor V4.1 Report



NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 21/07/2022

Assessment Date: 20/07/2022

Site Street Address: 2213 207-209 Wallarah Road, Kanwal

Assessor: Stuart Greville; Bushfire Planning Australia

Local Government Area: Central Coast

Alpine Area: No

Equations Used

Transmissivity: Fuss and Hammins, 2002

Flame Length: RFS PBP, 2001/Vesta/Catchpole

Rate of Fire Spread: Noble et al., 1980

Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005

Peak Elevation of Receiver: Tan et al., 2005

Peak Flame Angle: Tan et al., 2005

Run Description: T1 - north

Vegetation Information

Vegetation Type: Sydney Coastal DSF

Vegetation Group: Dry Sclerophyll Forests (Shrubby)

Vegetation Slope: 2 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 21.3

Overall Fuel Load(t/ha): 27.3

Vegetation Height(m): 1.4

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 0 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 24

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg): 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 9.76

Radiant Heat(kW/m²): 29

Flame Angle (degrees): 61

Flame Length(m): 22.32

Maximum View Factor: 0.457

Rate Of Spread (km/h): 2.93

Inner Protection Area(m): 0

Transmissivity: 0.835

Outer Protection Area(m): 0

Fire Intensity(kW/m): 41387

BAL Thresholds

BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m²: Elevation of Receiver:

Asset Protection Zone(m): 18 24 34 46 68 6

Run Description: T2 - north west

Vegetation Information

Vegetation Type: Hunter Macleay DSF

Vegetation Group: Dry Sclerophyll Forests (Shrub/Grass)

Vegetation Slope: 1 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 14

Overall Fuel Load(t/ha): 24.6

Vegetation Height(m): 0.9

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 0 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 17

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg) 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 6.53

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 63

Flame Length(m): 14.65

Maximum View Factor: 0.447

Rate Of Spread (km/h): 1.8

Inner Protection Area(m): 0

Transmissivity: 0.853

Outer Protection Area(m): 0

Fire Intensity(kW/m): 22878

BAL Thresholds

BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver:

Asset Protection Zone(m): 13 17 24 34 52 6

Run Description: T3 - north

Vegetation Information

Vegetation Type: Hunter Macleay DSF

Vegetation Group: Dry Sclerophyll Forests (Shrub/Grass)

Vegetation Slope: 2 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 14

Overall Fuel Load(t/ha): 24.6

Vegetation Height(m): 0.9

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 0 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 18

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg) 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 6.84

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 62

Flame Length(m): 15.5

Maximum View Factor: 0.448

Rate Of Spread (km/h): 1.93

Inner Protection Area(m): 0

Transmissivity: 0.852

Outer Protection Area(m): 0

Fire Intensity(kW/m): 24512

BAL Thresholds

BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver:

Asset Protection Zone(m): 13 18 25 35 54 6

Run Description: T4 - north east

Vegetation Information

Vegetation Type: Coastal Swamp Forests

Vegetation Group: Forested Wetlands

Vegetation Slope: 0 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 22.6

Overall Fuel Load(t/ha): 34.1

Vegetation Height(m): 1.4

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 0 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 24

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg) 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 9.49

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 61

Flame Length(m): 21.71

Maximum View Factor: 0.456

Rate Of Spread (km/h): 2.71

Inner Protection Area(m): 0

Transmissivity: 0.837

Outer Protection Area(m): 0

Fire Intensity(kW/m): 47781

BAL Thresholds

BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver:

Asset Protection Zone(m): 18 23 33 45 67 6

Run Description: T6 - north-west

Vegetation Information

Vegetation Type: Sydney Coastal DSF

Vegetation Group: Dry Sclerophyll Forests (Shrubby)

Vegetation Slope: 0 Degrees

Vegetation Slope Type: Upslope

Surface Fuel Load(t/ha): 21.3

Overall Fuel Load(t/ha): 27.3

Vegetation Height(m): 1.4

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 0 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 22

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg) 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 8.71

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 61

Flame Length(m): 19.92

Maximum View Factor: 0.454

Rate Of Spread (km/h): 2.56

Inner Protection Area(m): 0

Transmissivity: 0.841

Outer Protection Area(m): 0

Fire Intensity(kW/m): 36052

BAL Thresholds

BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver:

Asset Protection Zone(m): 17 22 31 42 64 6