Bushfire Assessment Report
Proposed Residential Building Development
Lot 187 DP 16902
19 The Outlook
Bilgola Plateau NSW 2107

7 February 2022

Author:	Scott Jarvis BPAD-Level 3 Certified Practitioner BPD-PA-18593 FPAA Member No. 18593	
Reviewed by:		

Executive Summary – Achievable (Recommended) AS 3959:2018 Level of Compliance

Construction Standard	**Building Elevation**
Flame Zone	**North, South & East Elevation ('Alterations & Additions' Only)**
BAL 40	**West Elevation ('Alterations & Additions' Only)**
BAL 29	
BAL 19	
BAL 12.5	**Upgrade existing/retained elements (where practicable)**
NCC Provisions Only	

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General Introduction

The following report outlines an assessment for the statutory compliance of the proposed residential building development to occur within 19 The Outlook, Bilgola Plateau NSW 2107 – Lot 187 DP 16902 (herewith 'the subject property'), and at least 140m beyond (herewith 'the study area'). Appendix 1 / Map 1 denote the subject property and study area.

Methodology for this site assessment for bushfire attack is based on the planning guideline '*Planning for Bush Fire Protection 2019* (*PBP 2019*)', produced by the NSW Rural Fire Service.

'Australian Standard 3959:2018 – Construction of buildings in bush fire prone areas', or alternately *'NASH Steel Framed Construction in Bush Fire Areas (NASH 2014)',* pursuant to the *'National Construction Code – Building Code of Australia 2021 (NCC – BCA 2021)'*, are the primary building compliance documents considered for this assessment.

Terrain (slope) considered by this assessment is based on the Department of Lands Online Six Viewer contours and a site inspection (9/11/2021) of the subject property. Vegetation extent within the subject area has been derived from available online public vegetation mapping studies, aerial photo interpretation and a site inspection (9/11/2021) conducted prior to finalising this report.

The extent and location of the proposed Alterations & Additions' to an existing residence, are based on drawings by Willoughby Architects, Willoughby (Job No. 20016, A002 – A110, Revision No. A, Dated 19/11/21).

Photographic evidence of the subject property and surrounds is appended to this report (Appendix 4 – Site Photos, Dated 9/11/2021).

<u>Note:</u> The following additional information is provided at the request of the NSW Rural Fire Service (Reference No. DA20220114000338, Dated 30 January 2022).

Method 2 (AS3959-2018) calculations (See Appendix 3) support the reduction of bushfire ratings to the front (Western) elevation. This is due to the calculated flame length being less than the available separation distances between the bushfire risk and the front elevation.

1.0 Property Details

Applicants Name: Gary Barber (herewith, 'the proponent')

Council: Northern Beaches Council (Northern Beaches LGA)

Council Reference: N/A

Lot: 187 **DP:** 16902 **Area:** 977.2m^2

Address/Location: 19 The Outlook, Bilgola Plateau NSW 2107.

Zoning: 'E4 – Environmental Living'
Pittwater LEP 2014

Bushfire Prone Land: YES

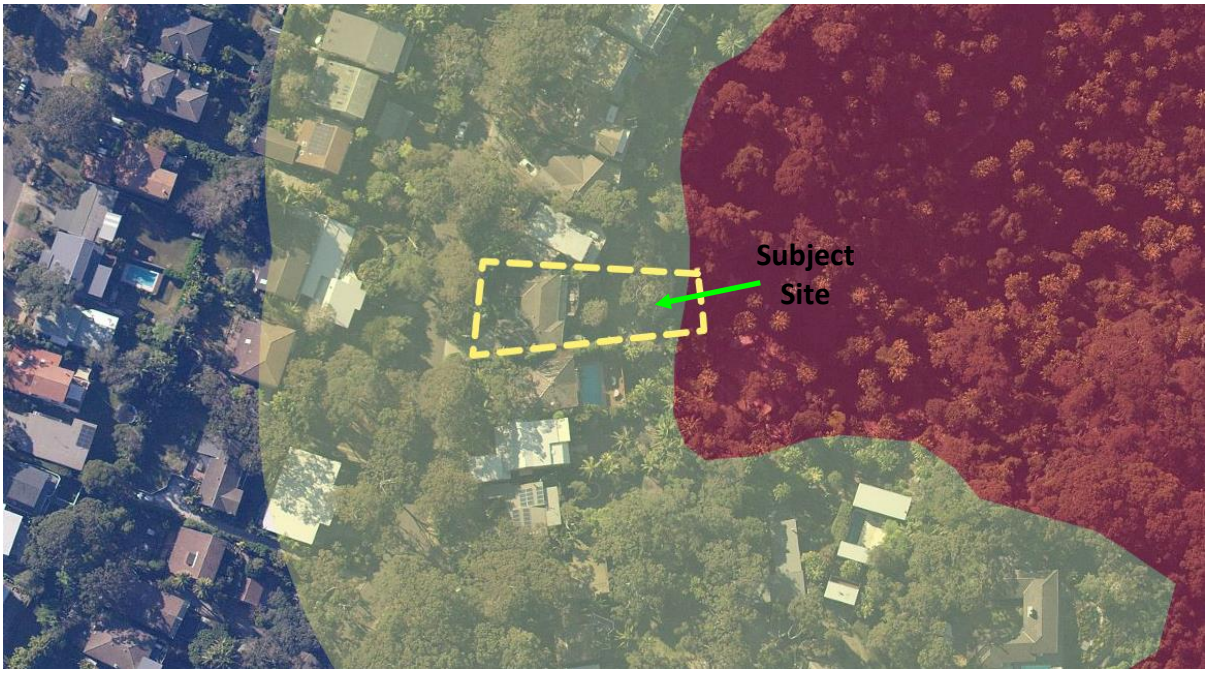
The subject property is mapped as being bushfire prone as currently shown by Northern Beaches Council LGA Bushfire Prone Land Map (*s10.3 EP&A Act 1979*). The site is constrained by vegetation classified as 'Category 1 Bushfire Vegetation'. In this regard, any new building development should conform to the specifications and requirements of the document *'Planning for Bush Fire Protection 2019'*, produced by the NSW Rural Fire Service, that are relevant to the development; as otherwise required under *Section 4.14 Environmental Planning & Assessment Act 1979 (EP&A Act 1979).*

Other Known Constraints:

It is **not** a recommendation of this assessment to remove or alter any significant vegetation within the study area, as part of the bushfire protection measures.

A desktop assessment of the publicly available council mapping and planning enquiry system has found no constraints to be considered in regard to development upon the subject property.

No known significant environmental features have been noted, recorded or advised of as part of this assessment.



Extract Northern Beaches Council LGA Bushfire Prone Land Map

2.0 Description of Proposal

☐ New Building	☑ **Urban**	☐ Secondary Dwelling
☐ Rural Residential	☑ **Alterations/Additions**	☐ Isolated Rural

Proposal Description

The proposed building development is to construct 'Alterations & Additions' to an existing residential building (Class 1 (a) – as defined by NCC – BCA).

The extent and location of the proposed Alterations & Additions' to an existing residence, are based on drawings by Willoughby Architects, Willoughby (Job No. 20016, A002 – A110, Revision No. A, Dated 19/11/21).

The approximate location/site of the proposed building (herewith 'the subject development') is as denoted in Appendix 1 – Map 1.

3.0 Bushfire Assessment

3.1 Vegetation (bushfire hazard) within 100m of the proposed building

The vegetation within the study area is mapped as 'Bushfire Prone Vegetation Category 1' on Council Bushfire Prone Land Maps.

The vegetation constraining the development is located within the adjoining bushland reserves (Hewitt Park & Hamilton Reserve), generally North East – South East of the subject development. The vegetation is mapped as 'Lilly Pilly – Cabbage Tree Palm Littoral Rainforest' (as per previous assessments/approvals).

Based on a determination of vegetation formation using the Keith 2004 Identification Key, the future bushfire vegetation having the potential to affect the subject development, based on a site visit, is most representative of 'Rainforest'.

The subject development would potentially be prone to bushfire attack from the East. The extent of the current bushfire vegetation (hazard) is clearly denoted in Appendix 1 – Map 1.

PBP 2019 (*Appendix 1 Section A1.10*) states, *'The following exclusions of AS3959 apply, and are not required to be considered for the purposes of PBP, as detailed below:*

- *Single areas of vegetation less than 1 hectare in area and greater than 100metres separation from other areas of Category 1 and 2 vegetation.*
- *Multiple areas of vegetation less than 0.25 hectares in area and not within 20m of the site, or each other or of other areas of vegetation being classified vegetation.*
- *Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or other areas of vegetation being Category 1, 2 or 3 vegetation.*
- *Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load, including grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses such as playing areas and fairways, maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens and other non-curing crops, cultivated gardens, arboretums, commercial nurseries, nature strips and windbreaks.*
- *Existing areas of managed gardens and lawns within curtilage of buildings.*
- *Non-vegetated areas including waterways, roads, footpaths, buildings and rocky outcrops.*

The proposed development is located within an established residential subdivision and within a well-established urban residential area.

Adjoining residential sites are generally clear of persistent vegetation and could be considered 'cleared and managed lands'.

The proposed development adjoins a road reserve (The Outlook) along its Western boundary.

The approximate / estimated extent of these managed lands is clearly denoted in Appendix 1 – Map 1.

Relevant photos attached (Appendix 2 Site Photos).

3.2 Distance/Separation between building line and bushfire hazard

For the purposes of bushfire safety compliance, this assessment notes that the subject property is clear of all persistent bushfire vegetation. Considering the location of the proposed development and the extent of the bushfire vegetation on adjoining lands, the achievable separation distance has been assessed as:

Direction	East
Distance	**>27m (Balcony – Lower Terrace)** **>28m (Balcony – Ground Floor)** **>31m (Balcony – First Floor)** **>30m (Additions – Lower Terrace)** **>34m (Additions – Ground Floor)** **>34m (Additions – First Floor)**

3.3 Effective slope that will influence bushfire behaviour

The effective slope within approximately 100m of the subject development site, which would influence bushfire behaviour, has been assessed as predominately;

Direction	East
Slope	**21 – 23 Degrees Downslope (see Appendix 2)**

3.4 Fire Danger Index (FDI) for Local Government Area (LGA)

☑ **100** ☐ 80 ☐ 50

The Northern Beaches Council – Greater Sydney Region

(*NSW Local Government Areas Community Resilience May 2017 – NSW RFS*)

3.5 Determination of Bushfire Attack Level (Table A1.12.2 PBP 2019)

Direction	Vegetation	Slope	Minimum Distance	BAL Exposure Level
East to Lower Terrace Balcony	**Rainforest**	**21 – 23 Degrees Downslope**	**>27m**	**BAL – FZ**
East to Ground Floor Balcony			**>28m**	**BAL – FZ**
East to First Floor Balcony			**>31m**	**BAL – FZ**

East to Lower Terrace Additions			**>30m**	**BAL – FZ**
East to Ground Floor Additions			**>34m**	**BAL – FZ**
East to First Floor Additions			**>34m**	**BAL – FZ**

4.0 AS 3959:2018 Construction Standard for Bushfire Attack Level (*NCC – BCA DtS*)

Elevations	Vegetation	Slope	Minimum Distance	BAL Construction
North, South & East Elevations	**Rainforest**	**21 – 23 Degrees Downslope**	**>27m – 34m**	**BAL – FZ**
West Elevation	**Rainforest**	**21 – 23 Degrees Downslope**	**>43m**	**BAL – 40**

Method 2 (AS3959-2018) calculations (See Appendix 3) support the reduction of bushfire ratings to the front (Western) elevation. This is due to the calculated flame length being less than the available separation distances between the bushfire risk and the front elevation.

PBP 2019 Fuel Loadings combined with 21 Degrees Downslope

Radiant Heat Flux 32.54 kW/m2
Flame Length 34.81m

PBP 2019 Fuel Loadings combined with 22 Degrees Downslope

Radiant Heat Flux 34.49 kW/m2
Flame Length 37.18m

PBP 2019 Fuel Loadings combined with 23 Degrees Downslope

Radiant Heat Flux 36.6 kW/m2
Flame Length 39.728m

Considering the subject developments location and the calculated extent of the APZ area recommended by this report, the subject development is technically capable of complying with *AS 3959:2018 / NASH 2014*.

5.0 Bushfire Protection Measures

Pursuant to '*PBP 2019 – Section 7 Residential Infill Development'*, there is a requirement to address certain 'Bushfire Protection Measures' (BPM) under the *Section 4.14 EP&A Act 1979* for new residential 'infill' development in bushfire prone areas.

The intent of the BPM's *'is to minimise the risk of bushfire attack and provide protection for emergency services personnel, residents and others assisting firefighting activities'*.

It is also *noted 'where a development expectation arises from the zoning of the land to build, rebuild, alter or add to a dwelling in pre-existing subdivisions, attempts should be made to find a solution taking into account the risk present. The expectation of building or altering a house is recognised even though the ability to provide for APZs or access requirements now required for residential development may not be possible'*.

Proposals for 'infill development' are to:

- Provide a defendable space to enable unimpeded access for firefighting around the building.
- Provide better bushfire outcomes on a redevelopment site than currently exists, commensurate to the level of development.
- Provide access, services and landscaping to aid firefighting operations.
- Not impose an increased bushfire management and maintenance responsibility on adjoining land owners.
- Increase the level of bushfire protection to existing dwellings based on the scale of the proposed work and level of bushfire risk.

5.1 Asset Protection Zones

PBP 2019 acceptable solutions for Asset Protection Zones (for this specific development location) state that;

- An APZ is provided in accordance with Table A1.12.2 or A.1.12.3 in Appendix 1.
- APZs are managed in accordance with the requirements of Appendix 4 of PBP.
- APZs are wholly within the boundaries of the development site.
- APZs are located on lands with a slope less than 18 degrees.

The subject site benefits from managed lands within the site, and external to the site (being adjacent urban residential lands and a managed road reserve).

Asset Protection Zone recommendations are as listed in Section 6.1 (Bushfire Safety & Compliance Recommendations).

5.2 Access (Property Access)

PBP 2019 acceptable solutions for access (for this specific development location) state that;

'There are no specific access requirements apply in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles'.

Access to the subject property will continue to be by way of a short sealed all-weather driveway, directly off The Outlook, which is part of the public road system. The Outlook is a sealed all weather road, 7m in width, within a road reserve of 19m. The local speed limit is 50 kph.

The public road system servicing the proposed development is able to provide safe operational access for emergency services and egress in varying directions for evacuating residents.

Access recommendations are as listed in Section 6.3 (Bushfire Safety & Compliance Recommendations).

5.3 Water Supplies (Reticulated)

☑ **Yes** ☐ No ☑ **Proposed**

PBP 2019 acceptable solutions for a reticulated water supply area (relevant to the subject development) state that:

- Reticulated water is to be provided to the development.
- Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005.
- Hydrants are not located within any road carriageways.
- Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.
- All above-ground water service pipes external to the building are metal, including and up to any taps.

The subject development is currently connected to a reticulated water supply which services the existing residential area within The Outlook, supplemented by an onsite pool (SWS).

Apart from the above, the proponent has not provided any specific advice (at the time of this assessment) regarding the reticulated water infrastructure and mains size, supply pressure or guarantee of delivery.

Considering the building site denoted by this report (and corresponding access / driveways), the subject building would be approximately 60m from the nearest and reasonably available fire hydrant connection point as denoted in attached Map 1.

Firefighting water supply recommendations are as listed in Section 6.4 (Bushfire Safety & Compliance Recommendations).

5.4 Electricity Services

PBP 2019 acceptable solutions for electrical services (relevant to the subject development) state that:

- *Where practicable, electrical transmission lines are located underground; and*
- *Where overhead electrical transmission lines are proposed, as follows:*
    - *Lines are installed with short pole spacings (30m), 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'.*

The subject development site is currently serviced by an aboveground electrical supply grid which services the residential subdivision within The Outlook.

It is not proposed to alter this arrangement as part of the development proposal.

Electrical service recommendations are as listed in Section 6.5 (Bushfire Safety & Compliance Recommendations).

5.5 Gas Services

Reticulated Gas: ☑ **Yes** ☐ No

Bottled Gas: ☐ Yes ☑ **No**

PBP 2019 acceptable solutions for gas services (relevant to the subject development) state that:

- Reticulated or bottled gas is installed and maintained with AS/NZ 1596:2014 and the requirements of relevant authorities, and metal piping is used.
- Polymer-sheathed flexible gas supply lines are not used.

Gas service recommendations are as listed in Section 6.6 (Bushfire Safety & Compliance Recommendations).

6.0 Bushfire Safety & Compliance Recommendations

6.1 Defendable Space / Asset Protection Zone (APZ) Recommendations

Recommendation 1.

Inner Protection Area

As denoted in Appendix 1 – Map 1, the area identified as **'Inner Protection Area' (IPA)'** is to be managed / maintained as an APZ for the life of the development.

The IPA is the area closest to the building and creates a fuel managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defendable space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well maintained gardens. When establishing and maintaining an IPA the following requirements apply.

Trees

- Tree canopy cover should be less than 15% at maturity;
- Trees at maturity should not touch or overhang the building;
- Lower limbs should be removed up to a height of 2m above the ground;
- Tree canopies should be separated by 2m to 5m; and
- Preference should be given to smooth barked and evergreen trees.

Shrubs

- Create large discontinuities or gaps in the vegetation, to slow down or break the progress of fire towards buildings;
- Shrubs should not be located under trees
- Shrubs should not form more than 10% ground cover; and
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- Grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- Leaves and vegetation debris should be removed.

6.2 Construction Standard Recommendations

Construction standards have been determined from the following sections of the planning guidelines and are based on the relevant bushfire assessment as discussed above.

AS 3959:2018 Section 3 Construction General
(See Recommendation 2)

AS 3959:2018 Section 5 Construction for Bushfire Attack Level 12.5 (BAL – 12.5)
(See Recommendation 3)

AS 3959:2018 Section 8 Construction for Bushfire Attack Level 40 (BAL – 40)
(See Recommendation 3)

AS 3959:2018 Section 9 Construction for Bushfire Attack Level FZ (BAL – FZ)
(See Recommendation 3)

Steel Framed Construction in Bushfire Areas (NASH 2014)

Recommendation 2.

Where any part of a garage, carport, veranda or similar roofed structure is attached to, or shares a common roof space with, or is within 6m of, a building required to comply with the standard, the entire structure shall comply with the construction requirements of the standard (as per Recommendation 3), as applicable to the subject building.

Alternatively, the structure may be separated from the subject building by a wall complying with *AS 3959:2018 Section 3.2.1 a) or b)* i.e. fire rated construction as specified.

Recommendation 3.

Predicated upon the maintenance of the APZ area as per Recommendation No. 1 of this report, it is recommended the proposed development incorporate, as a minimum, the following levels of construction as per *AS 3959:2018 Construction of buildings in bushfire prone areas;*

North, South & East Elevations ('Alterations & Additions' Only)

Construction for Bushfire Attack Level Flame Zone (BAL – FZ) – Section 9 (AS 3959:2018)

West Elevation ('Alterations & Additions to Residence Only)'

Construction for Bushfire Attack Level 40 (BAL – 40) – Section 8 (AS 3959:2018)

Alternately, the relevant sections of '*NASH Standard – Steel Framed Construction in Bushfire Areas (NASH 2014)*' may be applied.

Existing / Retained Building Elements

The existing / retained building elements are required to be upgraded to improve ember protection, as per the *Building Best Practice Guide – Upgrading of Existing Buildings (Development Assessment & Planning, NSW Rural Fire Service, Reference 0914*).

This is to be achieved by enclosing all openings (excluding roof tile spaces) or covering openings with a non-corrosive metal screen mesh with a maximum aperture of 2mm.

Where applicable, this includes any sub floor areas, open able windows, vents, weepholes and eaves. External doors are to be fitted with draft excluders.

Recommendation 4.

Sarking

All sarking used shall be:

- Non-combustible, **or**
- Breather type sarking complying with AS/NZS 4200.1 and with a flammability index of not more than 5 (see AS 1530.2) and sarked on the outside of the frame, **or**
- An insulation material conforming to the appropriate Australian Standard for that material.

Fences & Gates

All new fences and gates should be constructed of a non-combustible material.

Retaining Walls

All new retaining walls should be constructed of a non-combustible material.

6.3 Vehicle Access / Egress Recommendations

Recommendation 5.

The proposed building development will continue to incorporate an all-weather driveway area for vehicle access and parking within the subject property. The access road / driveway will continue to provide direct access from The Outlook. No additional vehicle access requirements are recommended.

6.4 Water Supplies Recommendations

Recommendation 6.

- Reticulated water is to be provided to the development.
- Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005 (**reasonably assumed**).
- All exposed water pipes external to the building are metal, including any fittings.
- Hydrants are not located within any road carriageways.

6.5 Electricity Services Recommendations

Recommendation 7.

As the electricity supply will be located aboveground, no part of a tree is to be closer to a power line than the distance set out in accordance with the specifications in *'ISSC3 Guideline for Managing Vegetation Near Power Lines'*.

6.6 Gas Services Recommendations

Recommendation 8.

- Any future / new reticulated gas connection is installed and maintained with AS/NZ 1596:2014 and the requirements of relevant authorities.
- Metal piping should be used.
- Polymer sheathed flexible gas supply lines to gas meters adjacent to the building are not used.

6.7 Bush Fire Survival Plan Recommendations

Recommendation 9.

Discuss and prepare a simple 'Bush Fire Survival Plan' pursuant to the NSW Rural Fire Service's advice (https://www.rfs.nsw.gov.au/plan-and-prepare/bush-fire-survival-plan).

7.0 Compliance or non-compliance with PBP 2019 Specific Objectives for Infill Development (as per *PBP 2019 Section7.3*)

Specific Objective	Comment
Provide a defendable space to enable unimpeded access for firefighting around the building	A complying APZ (defendable space) has been recommended. This space consists of an area maintained as an IPA.
Provide better bushfire outcomes on a redevelopment site than currently exists, commensurate with the scale of works proposed.	Bushfire fuel management, and other bushfire protection measures, contained within the subject property will effectively reduce the risk to both the subject property and adjoining premises.
Design and construct buildings commensurate with the bushfire risk.	Recommendations, relating to the construction of the residence include BAL FZ & BAL 40 building construction standards.
Provide access, services and landscaping to aid firefighting operations.	The recommendations (above) relating to the design and construction of the development include a range of 'bushfire protection measures' that will enhance the chances of occupant and building survival.
Not impose an increased bushfire management and maintenance responsibility on adjoining landowners.	The subdivision is pre-existing. The construction of this development will not increase the bushfire risk to adjoining land, nor increase bushfire management and maintenance responsibility on adjoining landowners.
Increase the level of bushfire protection to existing dwellings based on the scale of the proposed work and level of bushfire risk.	The site is located within an established residential subdivision. The existing residence will be subject to a minor upgrade to improve ember proofing.

8.0 Compliance or non-compliance with PBP 2019 Performance Criteria and intent for bushfire safety protection measures for infill development.

Performance Criteria	**Comment**
APZ APZs are provided commensurate with the construction of the building. A defendable space is provided.	**Can Comply** – Recommendation No. 1 A defendable space will be provided within the site boundaries with the entire site being maintained as an IPA.

APZs are managed and maintained to prevent the spread of fire to the building. The APZ is provided into perpetuity. APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	This is complimented by 'cleared and managed lands' on adjoining properties.
Access Firefighting vehicles are provided with safe all-weather access to structures and hazard vegetation. The capacity of access roads is adequate for firefighting vehicles. There is appropriate access to water supply. Firefighting vehicles can access the dwelling and exit the property safely.	**Can Comply** – Recommendation No. 5 Access/Egress is provided from The Outlook. The access arrangements are sufficient for operational firefighting and emergency egress.
Water Supplies An adequate water supply is provided for firefighting purposes. Water supplies are located at regular intervals. The water supply is accessible and reliable for firefighting operations. Flows and pressures are appropriate. The integrity of the water supply is maintained. A static supply is provided for firefighting purposes in areas where reticulated water is not available.	**Can Comply** – Recommendation No. 6
Electrical Services Location of the electrical services limits the possibility of ignition of surrounding bushland or the fabric of the buildings.	**Can Comply** – Recommendation No. 7
Gas Services Location and design of the gas services will not lead to of ignition of surrounding bushland or the fabric of the buildings.	**Can Comply** – Recommendation No. 8

Construction Standards The proposed building can withstand bushfire attack in the form of embers, radiant heat and flame contact. Proposed fences and gates are designed to minimise the spread of bushfire. Proposed Class 10a buildings are designed to minimise the spread of bushfire.	**Can Comply** – Recommendation Nos. 2 – 4 Predicated upon the recommended APZ areas and siting requirements, BAL FZ & BAL 40 building construction standards can achieve the performance requirements of the planning legislation.
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.	**Can Comply** – Recommendation No. 1

9.0 Statement assessing the environmental impact of any proposed bushfire protection measures.

Bushfire Protection Measure	Likely Environmental Impact	Comment
APZ (Rec. No. 1)	Insignificant	The subject property is currently clear of all persistent vegetation.
Construction Standard (Rec. Nos. 2 - 4)	Insignificant	Building to be constructed within approved / current building envelope.
Water Supply for fire fighting (Rec. No. 6)	Insignificant	A reticulated water supply currently services the existing development, supplemented by a proposed inground pool.
Utility service protection (Rec. Nos. 6 - 8)	Insignificant	Utilities are currently located within the APZ, or underground.
Vehicle Access (Rec. No. 5)	Insignificant	Direct access to public road system is by way of short cleared driveway.

10.0 Conclusion/Summary

Based on the above assessment and the 9 recommendations to protect persons and property from danger that may arise from a bushfire, the Consent Authority should determine that this development proposal can comply with *Planning for Bush Fire Protection 2019* as required under *Section 4.14 of the Environmental Planning and Assessment Act 1979.*

As a considered opinion, the recommended mitigation measures and construction requirements as stated in this report would reasonably address the aims and objectives of *PBP 2019*, consistent within the relative and current bushfire risk to the subject development site. As infill development, the residence will be able to fully comply with the Acceptable Solutions provided within *PBP 2019*.

In this regard, the subject development can reasonably facilitate *PBP 2019* objectives in as far as:

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

Should any of the above information require clarification or further discussion, please contact the author.

Scott Jarvis
Graduate Diploma Design for Bushfire Prone Areas
Diploma of Building Surveying
Diploma of Public Safety (Fire Fighting Management) (Dip PSFM)
Cert. IV Residential Building Studies
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BPAD-Level 3 Certified Practitioner BPD-PA-18593
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(Note: Scott Jarvis is a recognised / suitably qualified consultant pursuant to Rural Fire Service of NSW requirements - Community Resilience Fact Sheet - Requirements for Suitably Qualified Consultants 8/15, Fast Fact 5/10 Version 3 Dated 7 March 2011 & Development Control Practice Note 1/10 Version 2 Dated 4 February 2011)

References/Further Reading

Australian Standard 3959:2018, Construction of buildings in bushfire prone areas – Standards Australia.

Building Best Practice Guide – Upgrading of Existing Buildings (Development Assessment & Planning, NSW Rural Fire Service, Reference 0914).

NASH Standard – Steel Framed Construction in Bushfire Areas (2014) – National Association of Steel-Framed Housing Inc.

National Construction Code – Building Code of Australia (2021) – Australian Building Codes Board, Canprint.

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

- Section 4.14 Consultation and Development Consent Certain Bushfire Prone Land
- Section 10.3 Bushfire Prone Land

Rural Fires Act (1997) – NSW Government Printer

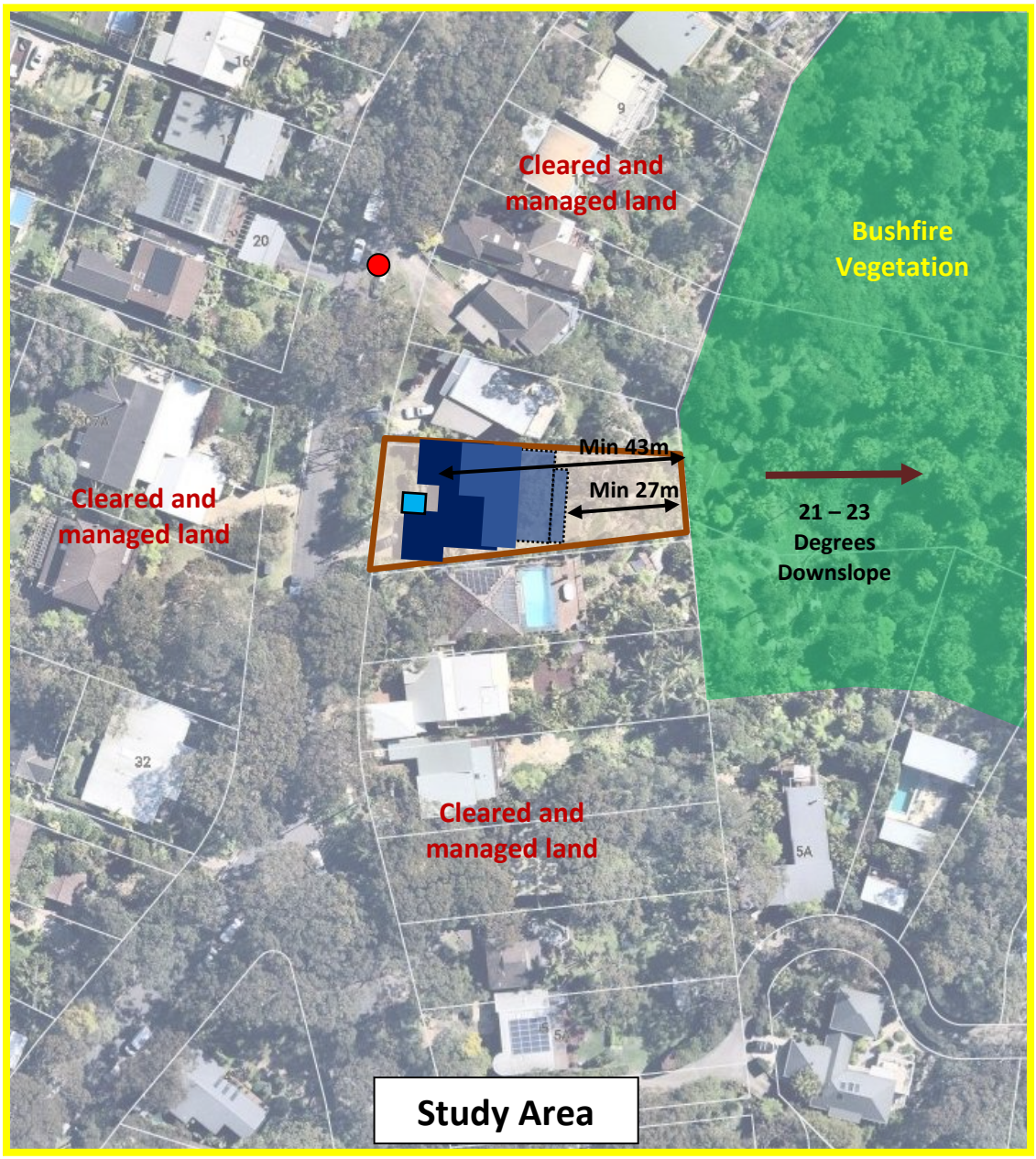
Landscape and building design for bushfire areas (2003) – Ramsay G C & Rudolf L, CSIRO Publishing, Collingwood Victoria.

Ocean shores to desert dunes: the native vegetation of NSW and the ACT (2004) – Keith D, NSW Dept of Environment and Conservation, Hurstville NSW.

Planning for Bush Fire Protection. A guide for councils, planners, fire authorities and developers (November 2019) – NSW Rural Fire Service.

Appendix 1

Map 1 – Study Area / Subject Lot / Slopes / APZ extent



Appendix 2 – Slope Assessment

Appendix 3 – Radiant Heat Flux & Flame Length Calculations (Method 2)

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 7/02/2022 **Assessment Date:** 3/02/2022

Site Street Address:	19 The Outlook, Bilgola
Assessor:	Please Enter Your Name; Please Enter Company Name
Local Government Area:	Northern Beaches **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:	East at 21 Degrees		
Vegetation Information			
Vegetation Type:	Rainforest		
Vegetation Group:	Forest and Woodland		
Vegetation Slope:	21 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	13.2
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	
Site Information			
Site Slope:	28 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	27
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 FZ	**Peak Elevation of Receiver(m):**	2.67
Radiant Heat(kW/m2):	32.54	**Flame Angle (degrees):**	78
Flame Length(m):	34.8	**Maximum View Factor:**	0.521
Rate Of Spread (km/h):	5.11	**Inner Protection Area(m):**	27
Transmissivity:	0.821	**Outer Protection Area(m):**	0
Fire Intensity(kW/m):	34854		

Run Description:	East at 22 Degrees		
Vegetation Information			
Vegetation Type:	Rainforest		
Vegetation Group:	Forest and Woodland		
Vegetation Slope:	22 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	13.2
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	
Site Information			
Site Slope:	28 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	27
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 FZ	**Peak Elevation of Receiver(m):**	3.6
Radiant Heat(kW/m2):	34.49	**Flame Angle (degrees):**	75
Flame Length(m):	37.18	**Maximum View Factor:**	0.55
Rate Of Spread (km/h):	5.48	**Inner Protection Area(m):**	27
Transmissivity:	0.825	**Outer Protection Area(m):**	0
Fire Intensity(kW/m):	37344		

Run Description:	East at 23 Degrees		
Vegetation Information			
Vegetation Type:	Rainforest		
Vegetation Group:	Forest and Woodland		
Vegetation Slope:	23 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	13.2
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	
Site Information			
Site Slope:	28 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	27
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 FZ	**Peak Elevation of Receiver(m):**	4.53
Radiant Heat(kW/m2):	36.6	**Flame Angle (degrees):**	72
Flame Length(m):	39.72	**Maximum View Factor:**	0.581
Rate Of Spread (km/h):	5.87	**Inner Protection Area(m):**	27
Transmissivity:	0.829	**Outer Protection Area(m):**	0
Fire Intensity(kW/m):	40012		

Appendix 4 – Site Photos (9/11/2021)

Subject site, front elevation, looking North East

Rear elevation, looking West

The Outlook, looking South

The Outlook, looking North

Aboveground electrical supply

Reticulated water supply

Existing rear yard, looking North East to Public Reserve

Public Reserve, looking East

Public Reserve, looking South East

Public Reserve, looking South to other residential development.