BUSHFIRE & EVACUATION SOLUTIONS

SYDNEY - ILLAWARRA - SHOALHAVEN

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Bush Fire Assessment Report

Proposed Inclinator

Lot 2 (No. 100A) Wakehurst Parkway

ELANORA HEIGHTS NSW

14 August 2020

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BUSHFIRE HAZARD RISK ASSESSMENT CERTIFICATE (section 4.14 EP & A Act 1979)

PROPERTY ADDRESS:	100A Wakehurst Parkway Elanora Heights
DESCRIPTION OF PROPOSAL:	Proposed Inclinator with landings
PLAN REFERENCE:	YSCO Geomatics: Draft Plan (Ref: 3620/1; dated 29/07/2019
HIGHEST BAL RATING:	BAL-29
DOES THE PROPOSAL RELY ON ALTERNATE SOLUTIONS?	YES NO (if YES, application to be referred to NSW RFS for assessment)
BUSHFIRE ASSESSMENT REPORT REFERENCE:	I - 20099
REPORT DATE	14 August 2020
ACCREDITATION SCHEME/ CERTIFICATION No	FPAA Australia Bushfire Planning & Design Scheme/ **BPAD-23038**

I (Kieran Taylor) hereby certify the following:

I. That I am a person who is recognised by the NSW Rural Fire Service as a suitable qualified consultant in bushfire risk assessment; and

II. That subject to compliance with the recommendations contained herein the proposed development conforms to the specifications and requirements of the document entitled *Planning for Bush Fire Protection* 2019 (i.e. as prescribed under Section 4.14 of the *Environmental Planning and Assessment Act* 1979); and

III. Any recommendations or findings of this report are based on an honest appraisal of the constraints that existed at the site at the time of investigation, subject to the scope, resources and information available and provided at the time. Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.

Principal Consultant

BUSHFIRE & EVACUATION SOLUTIONS

14 August 2020

Version Control

Version:	Date/ amendments	Authorised by
1	14 August 2020	**KT**

GLOSSARY

Term/ Abbreviation	Meaning
APZ	*Asset Protection Zone*
AS 2419.1 - 2017	*Australian Standard – Fire hydrant installations*
AS 3959 - 2018	*Australian Standard – Construction of buildings in bushfire prone areas*
BAL	*Bushfire Attack Level*
BFRMP	*Bushfire Risk Management Plan*
BPL Map	*Bushfire prone land map*
BPMs	*Bushfire Protection Measures*
EP & A Act	*Environmental Planning & Assessment Act 1979*
FFDI	*Forest Fire Danger Index*
IPA	*Inner Protection Area*
LGA	*Local Government Area*
NCC	*National Construction Code*
NSW RFS	*New South Wales Rural Fire Service*
OPA	*Outer Protection Area*
PBP	*Planning for Bush Fire Protection 2019*
RF Act	*Rural Fires Act 1997*
NBC	*Northern Beaches Council*

Asset Protection Zone:

An area surrounding a development managed to reduce the bushfire hazard to an acceptable level. The width of the required asset protection zone varies with slope, vegetation and Fire Danger Index (FDI). The asset protection zone ensures there is no fire path between the hazard and the building.

AS 3959-2018 Construction of buildings in bushfire-prone areas:

The relevant Australian Standard for bushfire prone construction detailing the deemed to satisfy construction provisions for building development in NSW assessed as BAL-12.5 to BAL-40.

Bushfire Attack:

Attack by burning embers, radiant heat or flame generated by a bushfire, which might result in ignition and subsequent damage to, or destruction of a building.

Bushfire Prone Land:

An area that is subject to, or likely to be subject to bushfire attack. In general, a bushfire prone area is an area mapped for a local government area that identifies the vegetation types and associated buffer zones. Bushfire prone land maps are prepared by local councils and certified by the Commissioner of the NSW RFS.

Bushfire Attack Level (BAL):

A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact using increments of radiant heat expressed in kilowatts per metre squared (kW/m^2), and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.

Bush Fire Protection Measures:

A range of measures (controls) available to minimise the risk arising from a bushfire. BPMs include APZs, construction standards, suitable access arrangements, water and utility services, emergency management arrangements and landscaping.

Bush Fire Safety Authority

An approval of the Commissioner of the NSW RFS required for subdivision for residential or rural residential purpose or for a special fire protection purpose listed under section 100B (6) of the *Rural Fires Act*. This form of development is considered to be integrated development.

Forest Fire Danger Index:

An index providing a determination of the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long and short-term drought effects.

Planning for Bush Fire Protection 2019:

Legislative planning guideline produced by the NSW Rural Fire Service detailing the specifications and requirements for bushfire prone development in NSW.

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SECTION 1: INTRODUCTION - EXECUTIVE SUMMARY

Bushfire and Evacuation Solutions have been commissioned to provide a bushfire assessment report for a proposed development within an existing residential allotment known Lot 2 DP 1177671, No. 100A Wakehurst Parkway Elanora Heights (herewith 'the subject property').

The subject development is for construction of an inclinator (Class 9b as defined by the NCC) and three (3) landings (Class 10a as defined by the NCC) along the eastern side of the existing dwelling.

The subject property is mapped by Northern Beaches Council as bushfire prone land. The proposal is therefore subject to compliance with the provisions of the NSW Rural Fire Service document entitled *'Planning for Bush Fire Protection' 2019* (PBP).

The proposed development is primarily constrained by remnant vegetation (hazard) located at the top of the cliff face to the rear of the dwelling. Given the proximity of this vegetation (and relevant bushfire parameters), the highest bushfire attack level (BAL) affecting the proposed building development is assessed as **BAL – 29**.

The proposal is assessed against the specifications of PBP section 7 (infill development) and section 8.3.2 (specific requirements for Class 10 structures). The proposed landings are located within six (6) metres of the subject and neighbouring dwellings and the relevant bushfire construction standards are therefore applicable.

Where the recommendations of this report are incorporated, it is determined that the proposal is suitable in terms of satisfying the specifications and requirements of PBP for a Class 10 building development as required under section 4.14 of the Environmental Planning and Assessment Act 1979.

1.1 Purpose of Report

The primary purpose of this assessment is to determine compliance (or otherwise) of the subject development when assessed against the aim and objectives (specifications and requirements) of PBP. Based on these requirements, this report seeks to:

- Determine the bushfire parameters relevant to the site (i.e. vegetation (hazard) formation; effective slope underlying the hazard; separation distance between the building and hazard; and FFDI for the local council area);
- Determine the expected fire behaviour and bushfire attack level (BAL) affecting the subject development;
- Assess the proposal with reference to PBP;

- Identify appropriate bushfire protection measures designed to mitigate the bushfire risk and protect occupants of the building against bushfire attack;
- Assist the Consent Authority (NBC) in the determination of the suitability of the proposed development.

The recommendations contained herein may assist in forming the basis of any specific bushfire conditions that Council and/ or the NSW Rural Fire Service may elect to place within the consent conditions issued for the subject development application.

Note: The scope of this report is limited to the bushfire assessment for the proposed development and only contains recommendations for the subject property. Where reference is made to adjacent lands, this report does not purport to assess those lands

1.2 Statutory Framework

The bushfire legislation and statutory controls relevant to the proposed development include:

(I) ***Environmental Planning and Assessment Act 1979***

Section 4.14 - Consultation and development consent – certain bush fire prone land

This section details the legislative requirements for development consent for infill development on bushfire prone land.

(II) ***Planning for Bush Fire Protection 2019***

- **Section 7 – Planning controls for infill development on bush fire prone land.**

  Section 7.4 details the specifications and requirements (Acceptable Solutions) for bushfire protection measures for infill development.

- **Section 8.3.2 Class 10 structures.**

  PBP Section 8.3.2 states the following: *'There is no bush fire protection requirements for Class 10a buildings located more than 6m from a dwelling in bush fire prone areas. Where a Class 10a building is located within 6m of a dwelling it must be constructed in accordance with the NCC'.*

- **Appendix 1 and Appendix 2:**

  These sections detail the required assessment methodology and submission requirements for development on bushfire prone land.

(III) ***Australian Standard 3959 - 2018:*** *Construction of buildings in bushfire prone areas*:

Standard detailing the (NCC) Deemed to Satisfy provisions for bushfire prone construction.

SECTION 2: PROPERTY DETAILS/ PROPOSED DEVELOPMENT

Address/Location: 100A Wakehurst Parkway NSW.

Lot 5034 in **DP** 1233738

Lot Size: Approximately 1290m².

Bushfire Prone Land: **Yes –** mapped as bushfire prone land (refer Figure 1).

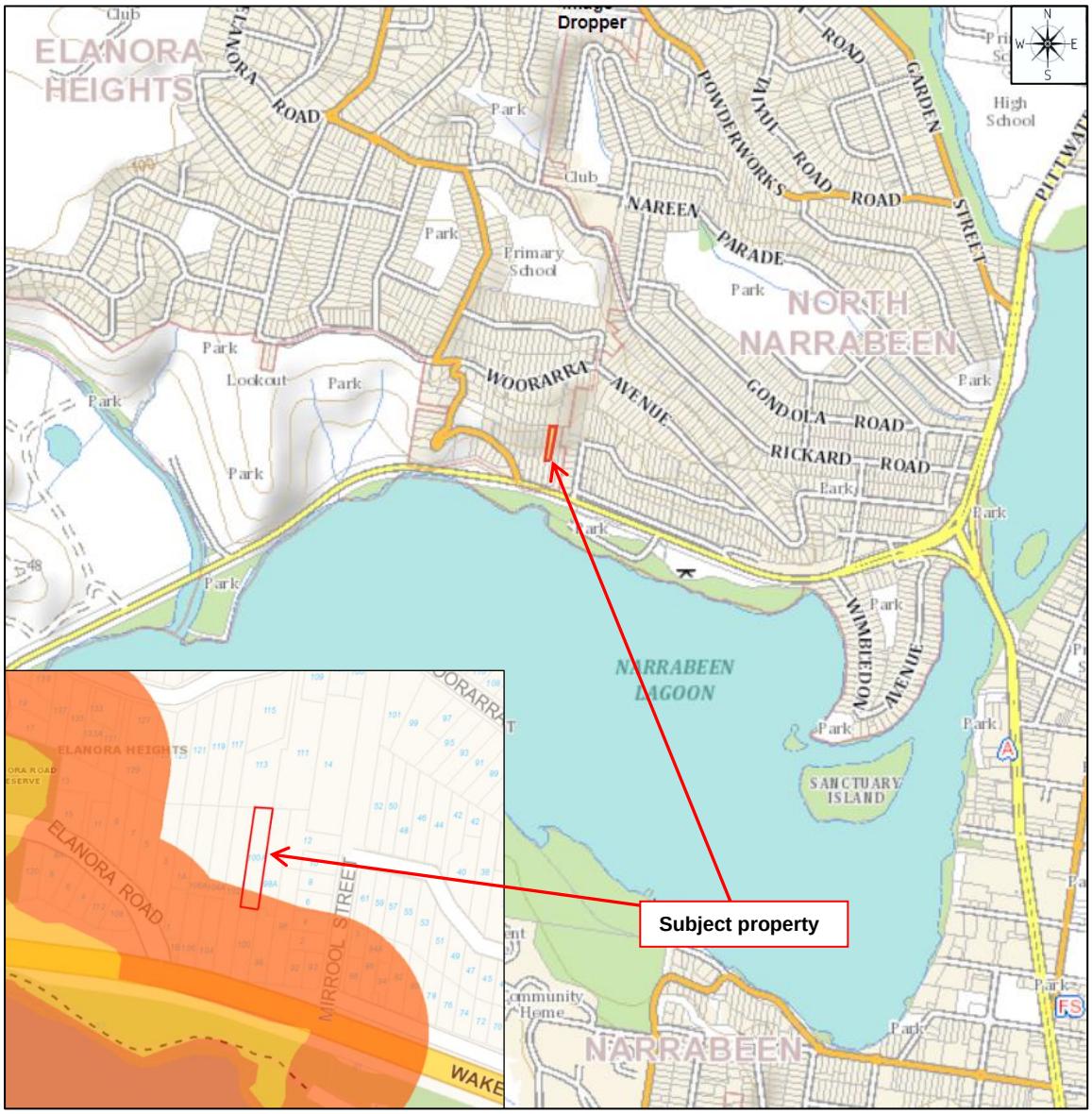

Figure 1: Locality Map (Insert – NSW Planning Portal Bushfire Prone Land Map)

Note:

The subject property is mapped as bushfire prone land by virture of the proximity of vegetation (bushland) located along the northern foreshore of Narrabeen Lagoon (i.e. south of the site).

Other Known Constraints:

A desktop review of the publicly available planning enquiry system has found no other constraints to be considered regarding the proposed development upon the subject site.

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

2.1 Site Description/ Proposed Development

Lot 2 is a battle-axe property (zone E4 – Environmental Living) located on the northern side of Wakehurst Parkway in Elanora Heights (within the Northern Beaches Local Government Area).

The subject property has a southerly aspect and is bordered in each direction by established residential properties. The site rises steeply toward a cliff face and escarpment located within the rear (northern) section of the property. This area contains remnant vegetation (bushland) which extends across the top of the escarpment and along the rear section of adjacent properties to the north and west.

Existing development on the site comprises a three-level dwelling with detached garage. Approval for the existing dwelling was granted in 2007 subject to assessment in accordance with the provisions of PBP 2006. The bushfire assessment report completed for the original dwelling application (Fire Base Consulting; Reference 452; dated 11 March 2007) included provision for the following bushfire protection measures:

- Bushfire construction to a minimum standard of Level 1 of AS 3959-1999 (i.e. equivalent to BAL-12.5 construction in terms of the current standard);
- Provision of a 5,000 litre static (tank) water supply dedicated and maintained for firefighting;
- Management of the area of the property south of the cliff face (i.e. 30 metres from the northern property boundary) in accordance with Asset Protection Zone – APZ (Inner protection Area) standards.

An inspection of the subject property (8 August 2020) indicates that the water supply and APZ recommendations have been reasonably enacted.

The proposed building development is for construction of an inclinator (Class 10b structure) providing access to the dwelling from the lower section of the property adjacent to the garage. The proposed inclinator is manufactured by P.R. King & Sons Pty Ltd. A Material Schedule for the inclinator (dated 7/11/2011), supplied by the manufacturer has been reviewed as part of this

assessment. All materials associated with construction of the inclinator have been found to be non-combustible (i.e. steel and masonry) and therefore do not pose any fire risk to the dwelling.

The proposal also includes provision for construction of three (3) landings (Class 10a as defined by the NCC). The mid and top landings will be connected to the existing deck areas running along the eastern side of the dwelling. These landings are proposed to be of the same construction as the existing decking (i.e. metal framed with hardwood timber decking). The lower landing is located within six (6) metres of the dwelling located on the adjacent property to the east.

PBP (Section 8.2.3) states the following regarding construction of Class 10a structure located within six metres of a dwelling:

'Where a Class 10a building is located within 6m of a dwelling it must be constructed in accordance with the NCC'.

In accordance with this provision, the relevant provisions of AS 3959-2018 are applicable for construction of the proposed landings. **Note:** there are no bushfire construction provisions specified under PBP for Class 10b structures.

The location/ site of the development is shown in Figure 2 and Appendix 1 (Site Plan).

SECTION 3 BUSHFIRE HAZARD RISK ASSESSMENT

The relevant bushfire attack level (BAL) is determined using the assessment methodology detailed in Appendix 1 of PBP. The required methodology is detailed as follows:

I. Determine vegetation formations in all directions around the building to a distance of 140 metres (refer to A1.2); and

II. Determine the effective slope of the land from the building for a distance of 100 metres (refer to A1.4 and A1.5); and

III. Determine the relevant FFDI for the council area in which the development is to be undertaken (refer to A1.6); and

IV. Determine the separation distance by measuring from the edge of the unmanaged vegetation to the closest external wall; and

V. Match the relevant FFDI, appropriate vegetation, distance and effective slope to determine the appropriate BAL using the relevant tables at the end of this section of PBP (A1.12.5, A1.12.6, and A1.12.7); and

VI. Refer to Section 3 in AS 3959 and NASH Standard to identify appropriate construction requirements for the calculated BAL.

3.1 Vegetation (bushfire hazard) within 140m of the proposed building/s

Vegetation extent (bushfire hazard) within the study area is derived from aerial photo interpretation (API); a review of the SEED Portal (NSW Government Data/Mapping); and an inspection of the subject property and surrounds. The area/s of vegetation considered as a hazard and subsequent threat to the site is summarised as follows:

Table 1.0: Vegetation (hazard) located within the study area (out to 140 metres)

Direction from subject dwelling	Primary Vegetation (hazard) Formation (Keith 2004 Formations)	Comment
North/northwest	*Remnant (modelled as 'Rainforest')*	That associated with remnant bushland (<1 Ha in total) located along the top of the escarpment to the north/ northwest within the rear section of adjacent properties. Remnant vegetation is considered as a 'low' hazard under PBP (Section A1.11.1) with the relevant fuel load modelled as 'rainforest'.
South	*Forest (Wet and Dry Sclerophyll)*	That located on the southern side of Wakehurst Parkway to the south of the site.

3.2 Effective slope that will influence bushfire behaviour

The effective slope is the gradient within the hazard which will most significantly influence fire behaviour, determined over a distance of at least 100 metres from the building footprint. In this instance, the relevant gradient has been determined Department of Lands SIX Mapping (displaying 10 metre contours – refer Appendix 2) and via observations made during the site inspection. The effective slope influencing bushfire behaviour is assessed as:

- **All Upslopes and Flat Land:** underlying the hazard (N/NW);
- **>0-5 degrees down slope:** underlying the hazard (S)

Figure 2: Site context/ bushfire hazard within the study area

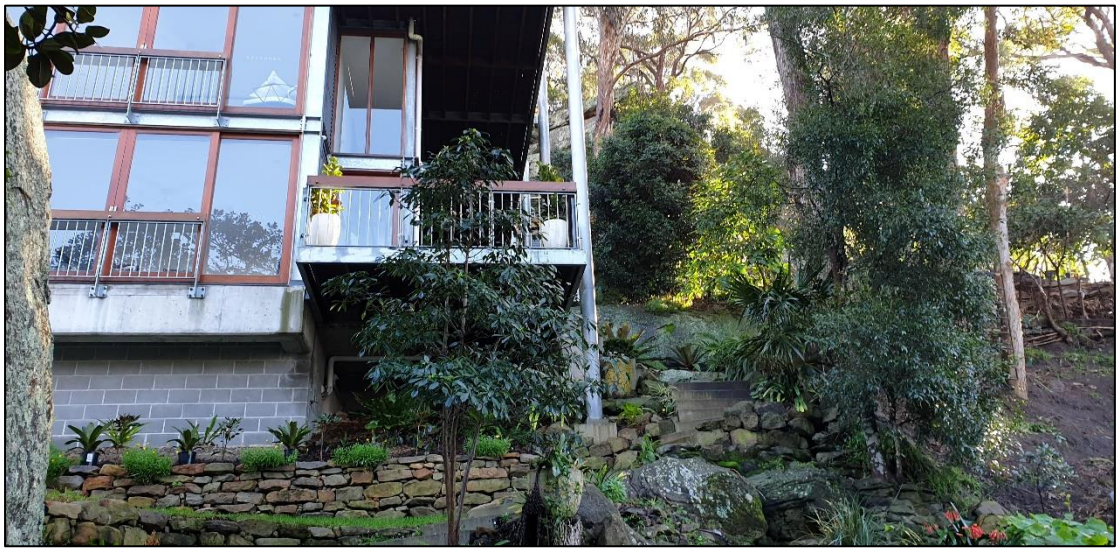

Plate 1: View north along eastern side of dwelling – proposed development site

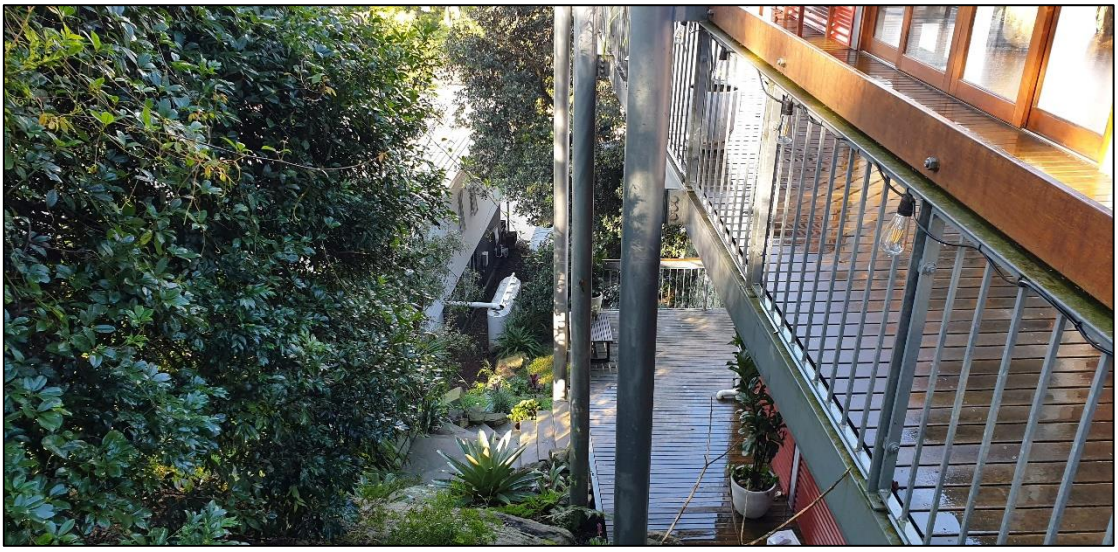

Plate 2: View south along eastern side of dwelling – proposed development site

Plate 2: Cliff face/ escarpment to the rear (north) of dwelling

3.3 Separation Distance (between the bushfire hazard and proposed development):

- 15 metres: between the subject development and remnant hazard (N);
- 99 metres: between the subject development and forest hazard (S);

3.4 Forest Fire Danger Index (FFDI) for Local Government Area (LGA)

☑ **100** ☐ 80 ☐ 50
Greater Sydney Region (NSW RFS)

3.5 Determination of Bushfire Attack Level & Relevant Construction Standards (AS3959-2018 – NCC DTS)

The relevant BAL rating has been determined using the assessment methodology detailed in PBP (Section A1.1) and the values given in PBP Table A1.12.5 – Refer Appendix 3).

Table 2.0: *BAL Rating/ BAL Construction Requirement – Proposed Development*

Vegetation Formation (Direction)	Current separation from hazard	Slope Category (AS3959-2018)	Bushfire attack level
Remnant (N)	15 metres	Upslope	**BAL – 29**
Forest (S)	99 metres	>0-5^{o} d/slope	**BAL – 12.5**

Note: The highest BAL affecting the development is assessed as BAL-29. Based on this outcome the proposed development **can comply** with the deemed to satisfy (DTS) construction provisions of the NCC.

The categories of bushfire attack, their corresponding risk and relevant construction provisions (AS 3959-2018) are summarised as follows:

Table 3.0: *Explanation of BAL Ratings and their corresponding Risk and Construction*

Bushfire Attack Level (BAL)	BAL Risk Rating	Description of predicted bushfire attack	Construction Provisions AS3959-2018
BAL - LOW	VERY LOW	Minimal attack from radiant heat and flame due to the separation distance of the building from the vegetation (hazard). Some attack from burning debris is possible.	**N/A –** insufficient threat to warrant bushfire construction standards.
BAL – 12.5	LOW	Attack from burning debris is significant with radiant heat not greater than 12kW/m². Specific	**Sections 3 & 5 –** Specific construction required for ember protection &

Bushfire Attack Level (BAL)	BAL Risk Rating	Description of predicted bushfire attack	Construction Provisions AS3959-2018
		construction requirements for ember attack and accumulation of debris are warranted.	accumulation of burning debris.
BAL - 19	MODERATE	Attack from burning debris is significant with radiant heat flux (not greater than 19kW/m² threatening some building elements. Specific construction requirements for ember attack and radiant heat are warranted.	**Sections 3 & 6 –** Specific construction for protection against ember attack & radiant heat is necessary.
BAL - 29	HIGH	Attack from burning debris is significant with radiant heat flux (not greater than 29kW/m² threatening building integrity. Specific construction requirements for ember attack and radiant heat are warranted.	**Sections 3 & 7 –** Specific construction for protection against ember attack and higher radiant heat is necessary.
BAL - 40	VERY HIGH	Radiant heat flux and potential flame contact could threaten building integrity.	**Sections 3 & 8 –** Buildings must be designed & constructed to withstand extreme radiant heat & potential flame contact.
BAL - FZ	EXTREME	Significant radiant heat and significant higher likelihood of flame contact from the fire front will threaten building integrity and result in significant risk to residents.	Flame zone construction requires an alternate solution & is outside the scope of the DTS requirements of AS3959-2018.

SECTION 4 RECOMMENDED BUSHFIRE PROTECTION MEASURES

The intent of bushfire protection measures (BPM's) prescribed under PBP (section 7.4 – Infill Development) is given as follows:

To minimize the risk of bush fire attack and provide protection for emergency services personnel, residents and others assisting firefighting activities.

The following BPM's are recommended in accordance with the acceptable solutions of PBP.

4.1 Construction Standard Recommendations

RECOMMENDATION 1.

That the proposed landings are constructed to BAL-29 standards in accordance with Section 7 (**BAL-29**) of Australian Standard AS 3959-2018 '*Construction of buildings in bushfire-prone areas*' inclusive of the following:

- All elements of construction for the proposed landings shall be:
  a. Of non-combustible material; or
  b. Of bushfire-resisting timber (refer Appendix F of AS 3959-2018); or
  c. A combination of Items a. or b.

4.2 Electricity Supply Recommendations

RECOMMENDATION 2.

That the electricity supply servicing the proposed development is located underground from the connection point to the inclinator.

SECTION 5 COMPLIANCE/ NON-COMPLIANCE WITH PBP PERFORMANCE CRITERIA - BUSHFIRE PROTECTION MEASURES FOR INFILL DEVELOPMENT.

Bushfire Protection Measure (BPM)	Performance Criteria	Comment
Asset protection Zones	> APZs are provided commensurate with the construction of the building; > A defendable space is provided; > APZs are managed and maintained to prevent the spread of fire to the building; > The APZ is provided in perpetuity; > APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	*As conditioned as part of a previous development consent for the existing dwelling under section 79BA EP & A Act.*
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 supplies; > Firefighting vehicles can access the dwelling and exit the property safely.	*As conditioned as part of a previous development consent for the existing dwelling under section 79BA EP & A Act.*
Water Supplies	> An adequate water supply is provided for firefighting purposes; > The integrity of the water supply is maintained; > A static water supply is provided for firefighting purposes in areas where reticulated water is not available.	*As conditioned as part of a previous development consent for the existing dwelling under section 79BA EP & A Act.*
Electricity Services	> Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of the building.	*Can comply – Predicated on compliance with Recommendation No. 2.*
Gas Services	> Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	*N/A There are no gas services proposed as part of the subject development*
Construction Standards	> The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact; > Proposed fence and gates are designed to minimise the spread of bush fire; > Proposed Class 10a buildings are designed to minimise the spread of bush fire.	***Can Comply*** *– Predicated on compliance with Recommendation 1.*
Landscaping	> Landscaping is designed and managed to minimise flame contact and radiant heat to	*As conditioned as part of a previous development consent for the existing dwelling under section 79BA EP & A Act.*

Bushfire Protection Measure (BPM)	Performance Criteria	Comment
	buildings, and the potential for wind-driven embers to cause ignitions.	

SECTION 6 ENVIRONMENTAL IMPACT OF ANY PROPOSED BUSHFIRE PROTECTION MEASURES

Bushfire Protection Measure	Likely Environmental Impact	Comment
APZ (Rec. No.1)	Insignificant	*N/A.*
Construction Standard (Rec. No. 2 - 3	Insignificant	*New works to be constructed within approved building area.*
Water Supply for fire fighting (Rec. No 4)	Insignificant	*N/A*
Utility service protection (Rec. No.5)	Insignificant	*N/A*
Vehicle Access	Insignificant	*N/A*

CONCLUSION

Where the recommendations of this report are incorporated, it is considered that this development proposal can comply with *Planning for Bushfire Protection 2019*, as required under section 4.14 of the *Environmental Planning and Assessment Act 1979.*

The recommended bushfire protection measures include provision for construction of the proposed landings in accordance with the relevant bushfire construction standards and utility installation designed to reduce the potential for material ignition and fire spread from electricity. These measures reasonably address the aim and objectives of PBP and are consistent with the relative and current bushfire risk to the subject development site.

As infill development, the proposal can satisfy the intent of the performance criteria of PBP and as a considered opinion can reasonably facilitate PBP objectives.

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

Kieran Taylor

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REFERENCES/ FURTHER READING

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

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.

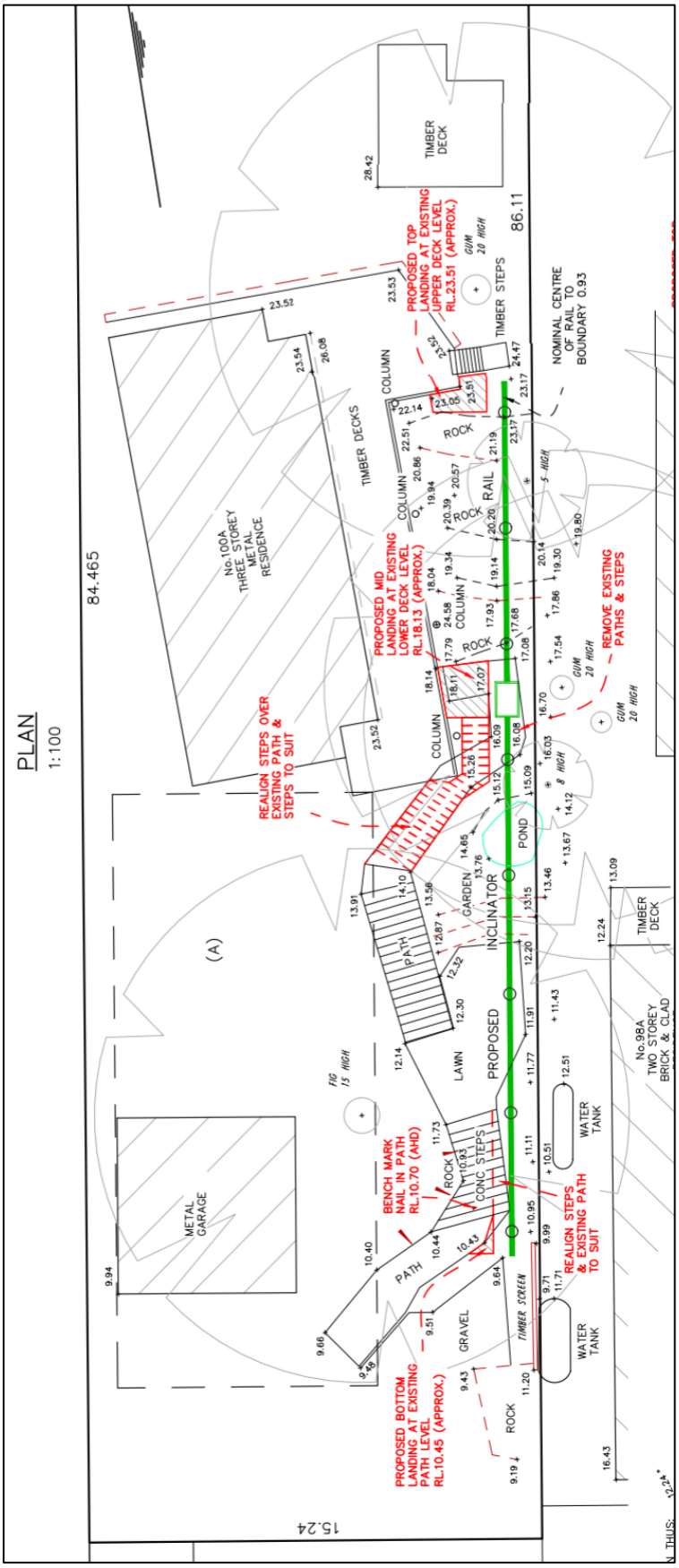
National Construction Code (2019) – Australian Building Codes Board, Canprint.

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

Standards for Asset Protection Zones – NSW Rural Fire Service

Appendix 1: *Site Plan (Source: YSCO Geomatics)*



Appendix 2: *Contour Map/ Effective Slope (Source: SIX Maps - 10 metre contours)*

Appendix 3: *PBP Table A1.12.5*

Table A1.12.5

Determination of BAL, FFDI 100 – residential developments

KEITH VEGETATION FORMATION		BUSH FIRE ATTACK LEVEL (BAL)				
		BAL-FZ	BAL-40	BAL-29	BAL-19	BAL-12.5
		Distance (m) asset to predominant vegetation class				
ALL UPSLOPE AND FLAT LAND	Rainforest	< 8	8 -< 11	11 -< 16	16 -< 23	23 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 18	18 -< 24	24 -< 33	33 -< 45	45 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 9	9 -< 12	12 -< 18	18 -< 26	26 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 7	7 -< 10	10 -< 14	14 -< 21	21 -< 100
	Tall Heath	< 12	12 -< 16	16 -< 23	23 -< 32	32 -< 100
	Short Heath	< 7	7 -< 9	9 -< 14	14 -< 20	20 -< 100
	Arid-Shrublands (acacia and chenopod)	< 5	5 -< 6	6 -< 9	9 -< 14	14 -< 100
	Freshwater Wetlands	< 4	4 -< 5	5 -< 7	7 -< 11	11 -< 100
	Grassland	< 8	8 -< 10	10 -< 15	15 -< 22	22 -< 50
> 0 > 5 DEGREES – DOWNSLOPE	Rainforest	< 11	11 -< 14	14 -< 21	21 -< 29	29 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 22	22 -< 29	29 -< 40	40 -< 54	54 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 12	12 -< 16	16 -< 23	23 -< 32	32 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 9	9 -< 12	12 -< 18	18 -< 26	26 -< 100
	Tall Heath	< 13	13 -< 18	18 -< 26	26 -< 36	36 -< 100
	Short Heath	< 8	8 -< 10	10 -< 15	15 -< 22	22 -< 100
	Arid-Shrublands (acacia and chenopod)	< 5	5 -< 7	7 -< 11	11 -< 16	16 -< 100
	Freshwater Wetlands	< 4	4 -< 6	6 -< 8	8 -< 12	12 -< 100
	Grassland	< 9	9 -< 12	12 -< 17	17 -< 25	25 -< 50
> 5 > 10 DEGREES – DOWNSLOPE	Rainforest	< 14	14 -< 18	18 -< 26	26 -< 37	37 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 28	28 -< 36	36 -< 49	49 -< 65	65 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 15	15 -< 20	20 -< 28	28 -< 39	39 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 12	12 -< 16	16 -< 23	23 -< 33	33 -< 100
	Tall Heath	< 15	15 -< 20	20 -< 29	29 -< 40	40 -< 100
	Short Heath	< 9	9 -< 12	12 -< 18	18 -< 25	25 -< 100
	Arid-Shrublands (acacia and chenopod)	< 6	6 -< 8	8 -< 12	12 -< 18	18 -< 100
	Freshwater Wetlands	<5	5 -< 6	6 -< 10	10 -< 14	14 -< 100
	Grassland	< 10	10 -< 13	13 -< 20	20 -< 28	28 -< 50
> 10 > 15 DEGREES – DOWNSLOPE	Rainforest	< 17	17 -< 23	23 -< 34	34 -< 46	46 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 36	36 -< 45	45 -< 60	60 -< 77	77 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 19	19 -< 25	25 -< 36	36 -< 49	49 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 15	15 -< 20	20 -< 29	29 -< 41	41 -< 100
	Tall Heath	< 17	17 -< 22	22 -< 32	32 -< 44	44 -< 100
	Short Heath	< 10	10 -< 13	13 -< 20	20 -< 29	29 -< 100
	Arid-Shrublands (acacia and chenopod)	< 7	7 -< 9	9 -< 14	14 -< 20	20 -< 100
	Freshwater Wetlands	< 5	5 -< 7	7 -< 11	11 -< 16	16 -< 100
	Grassland	< 11	11 -< 15	15 -< 23	23 -< 32	32 -< 50
> 15 > 20 DEGREES – DOWNSLOPE	Rainforest	< 23	23 -< 30	30 -< 42	42 -< 56	56 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 46	46 -< 56	56 -< 73	73 -< 92	92 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 24	24 -< 32	32 -< 44	44 -< 59	59 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 19	19 -< 26	26 -< 37	37 -< 50	50 -< 100
	Tall Heath	< 19	19 -< 25	25 -< 36	36 -< 49	49 -< 100
	Short Heath	< 11	11 -< 15	15 -< 23	23 -< 32	32 -< 100
	Arid-Shrublands (acacia and chenopod)	< 7	7 -< 10	10 -< 16	16 -< 23	23 -< 100
	Freshwater Wetlands	< 6	6 -< 8	8 -< 13	13 -< 18	18 -< 100
	Grassland	<13	13 -< 17	17 -< 26	26 -< 36	36 -< 50

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