

**Proposed Commercial Building Development
Review of Approved Bushfire Protection Measures
Lot 7335 DP 1152473
Frenchs Forest Bushland Cemetery
Hakea Avenue
Frenchs Forest NSW 2086**



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General Introduction

The following is a revised Bushfire Assessment, based on an existing Bush Fire Safety Authority, addressing a review of the approved Bushfire Protection Measures (BPMs) which have been amended due to the environmental impacts to an EEC (Coastal Upland Swamp) and associated buffer zone, which has been identified as being within the approved Asset Protection Zone. This will see the retention of bushfire vegetation within an area previously proposed to be maintained as an 'Inner Protection Area' (IPA), and now requires a significant and specific review of the bushfire risks, and associated BPMs. The Development Application remains undetermined at this time.

This review is based on the following documentation:

- Bush Fire Safety Authority issued by the NSW Rural Fire Service (Reference No. DA20200520001778, Dated 3 June 2020).
- The Northern Beaches Council Development Application (DA2020/0484).
- Biodiversity Development Application Report, prepared by Travers Bushfire & Ecology (Reference No. 18LIG07BDAR, Dated 23/04/2020).
- Bushfire Protection Measures Map prepared by Travers Bushfire & Ecology (Reference No. 18LIG07_BF001, Dated 28/09/2020).
- Peer Review prepared by Travers Bushfire & Ecology (Reference No. 18LIG07BF, Dated 7 October 2020).

The revised bushfire assessment, including a reduced IPA, is based on site specific engineering (Method 2 calculations as appended and discussed within the body of this report), which are a critical element to achieving compliance with the provisions of 'Planning for Bushfire Protection 2019' (PBP 2019).

In addition, the interpretation related to building classifications also forms a critical part of this review. It is noted the development proposal includes certain aspects related to 'Public Assembly' buildings (i.e. Class 9 buildings), however PBP 2019 provides for two distinct pathways in relation to Public Assembly facilities, those related to small facilities (i.e. <500m²) and those related to large facilities (>500m²), and this will be discussed within the body of this report.

The following report outlines an assessment for the statutory compliance of the proposed commercial building development to occur within Frenchs Forest Bushland Cemetery, Hakea Avenue, Frenchs Forest NSW 2086 – Lot 7335 DP 1152473 (herewith 'the subject property'), and at least 140m beyond (herewith 'the study area'). Appendix 1 / Map 1 denotes the subject property and study area.

The Building Code of Australia 2020 (BCA 2020) does not provide for any **bushfire specific** performance requirements for types of developments other than 'Residential and Special Fire Protection Purposes (SFPP)' within bushfire prone areas.

This development does not fit into either category.

PBP 2019 s8.3.11 states: *'Public Assembly buildings are not defined as SFPP by RF Reg but require referral under EP&A Act 1979 Section 4.14 to the NSW Rural Fire Service. Buildings used for public assembly, with a floor area of greater than 500m² are required to consider bushfire. These developments will be treated technically as SFPP due to the large numbers of occupants.'*

Assembly buildings can accommodate large numbers of persons of various physical capabilities. Emergency management planning for these developments must account for the total number of occupants and be commensurate with the level of risk. These developments must not experience radiant heat levels of greater than 10kW/m² on any part of the building. Assembly buildings include places of public worship.

Due to the variation in risk associated with the occupants of assembly buildings, a variety of bush fire safety solutions may apply based on the merits of the situation.'

This development will be located within a well-established cemetery development. It will incorporate the construction of a new chapel, 'Alterations & Additions' to an existing 'Multipurpose Room' and all associated infrastructure (internal roads and landscaping), within the South Eastern section of the subject site, and a new detached lavatory building remote and to the North East of the main development envelope.

This does not constitute an unacceptable development type within a bushfire prone area.

Methodology for this site assessment for bushfire attack is based on NSW Planning for Bush Fire Protection 2019.

Terrain (slope) considered by this assessment is based on the Department of Lands Online Six Viewer contours, site plans and a site inspection (13/5/2019) of the subject property.

Vegetation extent within the subject area has been derived from available aerial photo interpretation (API) and a site inspection (13/5/2019) conducted prior to finalising this report.

The extent and location of the proposed development is based on DA drawings prepared by Hector Abrahams Architects, Sydney (Drawing Name FFBC, Drawing Nos. 00 – 35, Issue DA7, Dated Oct 2019).

1.0 Property Details

Applicants Name: Northern Metropolitan Cemeteries Trust (herewith, 'the proponent')

Council: Northern Beaches Council

Zoning: 'SP1 – Special Activities' (Warringah LEP 2011)

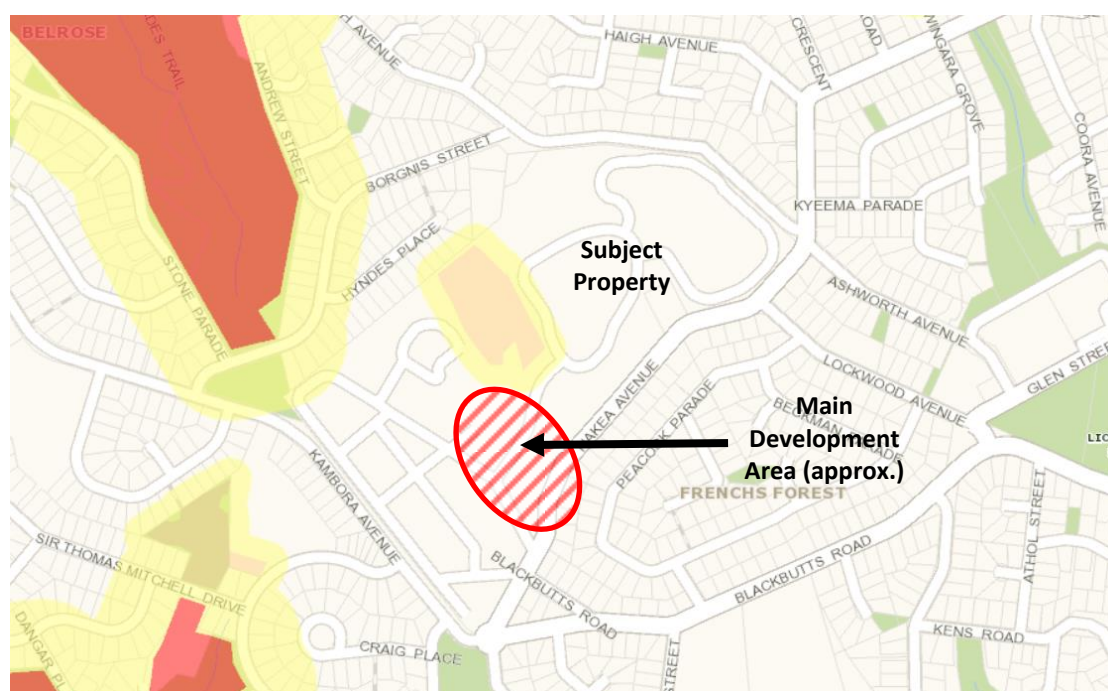
Council Reference: DA 2020/0484

Lot: 7335 **DP:** 1152473 **Area:** 22 Hectares (approx)

Address/Location: Frenchs Forest Bushland Cemetery
Hakea Avenue, Frenchs Forest NSW 2086.

Bushfire Prone Land: YES

The subject property is mapped as being bushfire prone as currently shown by the Northern Beaches Bushfire Prone Land Map 2020 (s10.3 EP&A Act 1979). Parts of the subject site, remote from the proposed building envelopes, are constrained by vegetation classified as 'Category 1 & Category 2 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 of the *Environmental Planning & Assessment Act 1979*.



Extract Northern Beaches Bushfire Prone Land Map 2020

Other Known Constraints:

An area of 'Coastal Upland Swamp' has been identified within the study area. This constraint, being located within an area previously identified as part of the recommended 'Inner Protection Area', has predicated a detailed reassessment of the bushfire risks, and associated asset protection zone requirements.

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

A desktop assessment of any publicly available council mapping and planning enquiry system has not found any further constraints to be considered in regard to development upon the subject property.

2.0 Type of Proposal

- ☒ **New Building** ☒ **Urban** ☐ Dual Occupancy
☐ Rural Residential ☒ **Alterations/Additions** ☐ Isolated Rural

Proposal Description

The proposed building development is to construct 'Alterations & Additions' to an existing cemetery development.

Included are as follows:

- Construction of a new chapel (130 seats) inclusive of plant and utility rooms
- 'Alterations & Additions' to an existing multipurpose room (130 seats)
- Supporting internal roadways, new car spaces and extensive landscaping
- Detached Lavatory structure (remote to the NE)

The approximate location/site of the proposed buildings (herewith 'the subject development') is as denoted below.

The extent and location of the proposed building is based on plan drawings prepared by Hector Abrahams Architects, Sydney (Drawing No. FFBC / 01 – 13, Dated April 2019).

Building Development Capacity and Size (Public Assembly Building)

The proposed development includes the construction of a new Chapel, with a seating capacity of 130 persons, and further 'Alterations & Additions' to an existing Function Centre (within the existing Administration Building), increasing its capacity to up to 130 persons. The development will therefore have the capacity to assemble a total of 260 members of the public, at any given time.

It should be noted that the overall floor space provided for the purposes of 'public assembly' is limited within these 2 structures, and additional floor space is allocated for 'back of house' purposes (e.g. storage, plant & operations) within the Chapel, and for existing operational purposes (e.g. existing staff offices, office reception and Kitchen) within the main Administration Building, that also contains the Function Centre.

In total the Chapel will have an allocated internal floor space of 270m², whilst the extended Function Centre will have an internal floor space of 72m², giving a combined overall internal floor space of 342m² for the assembly of members of the public. Outdoor public area attached to both of these structures may add an additional combined floor space of 149m².

The consulting building certifiers (MBC Group) have confirmed that BCA Clause D1.13 defines that a church and a function centre requires the allocation of 1m² per person, when defining capacities, and that allowances can be defined based on the intended population of the premises (See attached Appendix 6).

As such, and based on these allowances, a 'public assembly building, with a combined floor space of 491m² could have a capacity of 491 persons. The existing proposal is for a total capacity of 260 persons which is well within this BCA tolerance.

Public Assembly areas (internal and external) for the entire proposal total 491m², which is below the 500m² threshold that triggers the standing requirement for a 'Special Fire Purpose Development' (SFPP), within Section 8.3.11 of PBP 2019.

As such the development will be considered to be infill development, and requirements for Asset Protection Zones and building construction provisions will be assessed under the criteria of Chapter 7 PBP 2019, however, due consideration has already been given to other Bushfire Protection Measures, and it is not proposed to amend the existing approval in relation to access provisions, the provision of services (i.e. water, gas & electricity) and emergency planning, contained within the current Bush Fire Safety Authority.

3.0 Bushfire Attack

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

The vegetation within the study area now considered to be a bushfire risk to the development, due to the retention of an EEC and associated buffer, is not currently mapped as 'Bushfire Prone Vegetation' on Council Bushfire Prone Land Maps. This vegetation is located in a number of different locations, separated by the existing and proposed buildings, and internal roadways.

The primary bushfire risk is to the new chapel development, and consists of a small area of 'Coastal Upland Swamp', and a vegetated buffer of 'North Coast Wet Sclerophyll Forest', generally North to North East of the new Chapel footprint.

This vegetation would support **two** distinct fire runs towards the new Chapel (to be known as **Fire Run 1**, from the North East, & **Fire Run 2** from the North, for the purposes of the assessment). The overall width of this vegetation is limited to 55m wide, and the potential total fire front width, which could not exceed the actual width of the vegetation, has also been limited to 55m for the purposes of this assessment.

The secondary bushfire risk is to the existing Function Centre (i.e. 'Alterations & Additions') development, and consists of a small area of 'Sydney Coastal Dry Sclerophyll Forest', generally North East of the Function Centre footprint.

This vegetation would support **one** distinct fire run towards the Function Centre (to be known as **Fire Run 3** from the North East, for the purposes of the assessment). The overall width of this vegetation is limited to 20m wide, and the potential total fire front width, which could not exceed the actual width of the vegetation, has also been limited to 20m for the purposes of this assessment.

An additional secondary bushfire risk is also located to the South of the new chapel development, and consists of a thin line of riparian vegetation, running from the South East to the North West past the new Chapel footprint. This will be considered to be Remnant vegetation, due to its limited size, and assessed as equivalent to 'Rainforest' in terms of A1.11.1 of PBP 2019.

This vegetation would support **two** distinct fire runs towards the new Chapel (to be known as **Fire Run 4**, from the North West, & **Fire Run 5** from the South East, for the purposes of the assessment). Both fire runs have the same inputs and setback provisions.

Vegetation directly South West of the Chapel is excluded for the purposes of this assessment, as it is considered to be low threat, and although is technically forms part of the riparian area, only presents as a managed ornamental garden.

See attached APZ Map (Appendix 1) for further reference.

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 subject property is currently used as a cemetery. It contains large expanses of tradition graves and crypts within manicured gardens with the occasional over storey tree within a major extent of the facility.

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

3.2 Distance/Separation between building line and bushfire hazard

For the purposes of bushfire safety compliance, this assessment notes that the subject property does contain some limited areas of bushfire vegetation. Considering the location of the proposed development and the extent of the retained bushfire vegetation, the achievable separation distance has been assessed as:

Fire Run	Fire Run 1	Fire Run 2	Fire Run 3	Fire Run 4	Fire Run 5
Direction	North East	North	North East	North West	South East
Distance	>20m	>24m	>19m	>12m	>12m

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;

Fire Run	Fire Run 1	Fire Run 2	Fire Run 3	Fire Run 4	Fire Run 5
Direction	North East	North	North East	North West	South East
Slope	4 Degrees Upslope	Flat	4 Degrees Upslope	Flat	Flat

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

☒ 100 ☐ 80 ☐ 50

Northern Beaches Council – Greater Sydney Region
(NSW Local Government Areas Community Resilience May 2017 – NSW RFS)

3.5 Radiant Heat Flux Calculations (Method 2)

Note: The following Bushfire Attack Levels (BAL) have been calculated utilising the accepted methodology within 'AS 3959:2018 - Appendix B Detailed Method (Method 2)' & the corresponding fuel loadings have been determined through reference to the 'Comprehensive Vegetation Fuel Loads NSW RFS March 2019' (see Appendix 2 for full calculations).

Fire Run 1 – Reduced Flame Front 55m				
Element	Vegetation	Slope	Minimum Distance	Outputs
Chapel	North Coast WSF	4 Degrees Upslope	>20m	RHF 26.07 kW/m ² FL 17.34m

Fire Run 2 – Reduced Flame Front 55m				
Element	Vegetation	Slope	Minimum Distance	Outputs
Chapel	North Coast WSF	0 Degrees Flat	>24m	RHF 25.85 kW/m ² FL 21.48m

Fire Run 3 – Reduced Flame Front 20m				
Element	Vegetation	Slope	Minimum Distance	Outputs
Function Centre	Sydney Coastal DSF	4 Degrees Upslope	>19m	RHF 17.84 kW/m ² FL 15.88m

Fire Runs 4 & 5 – Remnant / Riparian Vegetation				
Element	Vegetation	Slope	Minimum Distance	Outputs
Chapel	Remnant	0 Degrees Flat	>12m	RHF 25.57 kW/m ² FL 9.38m

3.6 AS 3959:2018 Construction Standard for Bushfire Attack Level (NCC – BCA)

Element	Construction Standard
Chapel	BAL – 29
Function Centre	BAL – 19

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.

4.0 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 managed road reserves, car parking areas, large cemetery areas etc.). Most Adjacent residential lands are also free from any bushfire risk.

Asset Protection Zone recommendations are as listed in Section 5.0 (Bushfire Safety & Compliance Recommendations).

5.0 Bushfire Safety & Compliance Recommendations

The following recommendations are proposed for bushfire safety & protection for the development of a proposed new Chapel and 'Alterations & Additions' to an existing Function Centre (and associated infrastructure) within the Frenchs Forest Bushland Cemetery, Hakea Avenue Frenchs Forest NSW 2086.

Bushfire Safety / Compliance Recommendations

No.	PBP Standard	Recommendation
1	Asset Protection Zone	<p><u>Inner Protection Area</u></p> <p><i>As denoted in Appendix 1 (APZ Map), the area identified as 'Inner Protection Area' (IPA) is to be managed / maintained as an APZ for the life of the development.</i></p> <p><i>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 defensible 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.</i></p> <p><i>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.</i></p>

No.	PBP Standard	Recommendation
		<p>Trees</p> <ul style="list-style-type: none"> • 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. <p>Shrubs</p> <ul style="list-style-type: none"> • 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. <p>Grass</p> <ul style="list-style-type: none"> • 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.
2	Bushfire Maintenance (Landscaping)	<p><i>A simple Bushfire Maintenance Plan be developed to complement the existing landscape management plan for the subject development site which, at least, clearly identifies;</i></p> <ul style="list-style-type: none"> • <i>A proposed schedule of landscape maintenance and activities which ensure the provisions of proposed fire / asset protection management zones.</i>
3	Building Construction Standard	<p><i>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;</i></p> <p>Chapel Building</p> <p><i>Construction for Bushfire Attack Level 29 (BAL – 29) – Section 7 (AS 3959:2018)</i></p> <p>Function Centre ('Alterations & Additions' Only)</p> <p><i>Construction for Bushfire Attack Level 19 (BAL – 19) – Section 6 (AS 3959:2018)</i></p> <p><i>Alternately, the relevant sections of 'NASH Standard – Steel Framed Construction in Bushfire Areas (NASH 2014)' may be applied.</i></p> <p><u>Existing Function Centre</u></p> <p><i>The existing function centre is 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).</i></p>

No.	PBP Standard	Recommendation
		<i>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.</i>
4	Fire Fighting Water	<ul style="list-style-type: none"> • <i>Fire hydrant spacing, sizing and pressures should comply with AS 2419.1 – 2005.</i> • <i>Sufficient signage indentifying location of reticulated water supply points (pillar hydrants) for firefighting operations</i>
5	Electrical Connection	<i>Any new or re-located power line connections to service the subject development site to be located underground.</i>
6	LPG Gas Cylinders	<p><i>As applicable, any future proposed gas supply connections should be designed & located in accordance with PBP.</i></p> <p><i>Bottled gas should be installed and maintained in accordance with AS1596 - 2002 and the requirements of relevant authorities. Metal piping is to be used.</i></p> <p><i>Fixed LPG tanks should be kept clear of all flammable materials and preferably located on the non hazard side of the residential building.</i></p> <p><i>If gas cylinders need to be kept close to the building, the release valves must be directed away from the building and away from any combustible material, so that they do not act as catalysts to combustion.</i></p>
7	Emergency Management Planning and Implementation	<p><i>A bushfire specific emergency/evacuation plan is prepared consistent with the RFS guidelines for the Preparation of Emergency / Evacuation Plan</i></p> <p><i>This is to be incorporated into the facilities current Emergency Planning procedures, which should comply with AS 3745-2010 'Planning for Emergencies in Facilities'</i></p> <p><i>If not already established, an Emergency Planning Committee is established to consult with staff in developing and implementing an Emergency Procedures manual.</i></p> <p><i>Detailed plans of all Emergency Assembly Areas including "onsite" and "offsite" arrangements as stated in AS 3745-2010 are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.</i></p>

6.0 Conclusion/Summary

Based on the above assessment and the 6 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 defensible 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.



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References/Further Reading

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

Building Code of Australia (2019) – 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 (2006/2019) – NSW Rural Fire Service.

Standards for Asset Protection Zones – NSW Rural Fire Service

Appendix 2 – RHF Calculations (Method 2)

 NBC Bushfire Attack Assessment Report V4.1 <small>AS3959 (2018) Appendix B - Detailed Method 2</small> Print Date: 10/1/2020 Assessment Date: 10/1/2020	
Site Street Address:	Frenchs Forest Bushland Cemetery, Frenchs Forest
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:	Fire Run 1
<u>Vegetation Information</u>	
Vegetation Type:	North Coast WSF (Shrubby)
Vegetation Group:	Wet Sclerophyll Forests (Shrubby)
Vegetation Slope:	4 Degrees Vegetation Slope Type: Upslope
Surface Fuel Load(t/ha):	22 Overall Fuel Load(t/ha): 35.98
Vegetation Height(m):	1.4 Only Applicable to Shrub/Scrub and Vesta
<u>Site Information</u>	
Site Slope:	0 Degrees Site Slope Type: Level
Elevation of Receiver(m):	Default APZ/Separation(m): 20
<u>Fire Inputs</u>	
Veg./Flame Width(m):	55 Flame Temp(K): 1090
<u>Calculation Parameters</u>	
Flame Emissivity:	95 Relative Humidity(%): 25
Heat of Combustion(kJ/kg)	18600 Ambient Temp(K): 308
Moisture Factor:	5 FDI: 100
<u>Program Outputs</u>	
Level of Construction:	BAL 29 Peak Elevation of Receiver(m): 7.51
Radiant Heat(kW/m2):	26.07 Flame Angle (degrees): 60
Flame Length(m):	17.34 Maximum View Factor: 0.406
Rate Of Spread (km/h):	2 Inner Protection Area(m): 11
Transmissivity:	0.844 Outer Protection Area(m): 9
Fire Intensity(kW/m):	37240

Run Description: Fire Run 2	
<u>Vegetation Information</u>	
Vegetation Type:	North Coast WSF (Shrubby)
Vegetation Group:	Wet Sclerophyll Forests (Shrubby)
Vegetation Slope:	0 Degrees
Vegetation Slope Type:	Level
Surface Fuel Load(t/ha):	22
Overall Fuel Load(t/ha):	35.98
Vegetation Height(m):	1.4
	Only Applicable to Shrub/Scrub and Vesta
<u>Site Information</u>	
Site Slope:	0 Degrees
Site Slope Type:	Level
Elevation of Receiver(m):	Default
APZ/Separation(m):	24
<u>Fire Inputs</u>	
Veg./Flame Width(m):	55
Flame Temp(K):	1090
<u>Calculation Parameters</u>	
Flame Emissivity:	95
Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600
Ambient Temp(K):	308
Moisture Factor:	5
FDI:	100
<u>Program Outputs</u>	
Level of Construction:	BAL 29
Peak Elevation of Receiver(m):	9.11
Radiant Heat(kW/m2):	25.85
Flame Angle (degrees):	58
Flame Length(m):	21.48
Maximum View Factor:	0.407
Rate Of Spread (km/h):	2.64
Inner Protection Area(m):	13
Transmissivity:	0.836
Outer Protection Area(m):	11
Fire Intensity(kW/m):	49077
Run Description: Fire Run 3	
<u>Vegetation Information</u>	
Vegetation Type:	Sydney Coastal DSF
Vegetation Group:	Dry Sclerophyll Forests (Shrubby)
Vegetation Slope:	4 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
<u>Site Information</u>	
Site Slope:	0 Degrees
Site Slope Type:	Level
Elevation of Receiver(m):	Default
APZ/Separation(m):	19
<u>Fire Inputs</u>	
Veg./Flame Width(m):	20
Flame Temp(K):	1090
<u>Calculation Parameters</u>	
Flame Emissivity:	95
Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600
Ambient Temp(K):	308
Moisture Factor:	5
FDI:	100
<u>Program Outputs</u>	
Level of Construction:	BAL 19
Peak Elevation of Receiver(m):	6.26
Radiant Heat(kW/m2):	17.84
Flame Angle (degrees):	52
Flame Length(m):	15.88
Maximum View Factor:	0.276
Rate Of Spread (km/h):	1.94
Inner Protection Area(m):	13
Transmissivity:	0.85
Outer Protection Area(m):	6
Fire Intensity(kW/m):	27357

Run Description: Fire Run 4 & 5	
<u>Vegetation Information</u>	
Vegetation Type:	Rainforest
Vegetation Group:	Forest and Woodland
Vegetation Slope:	0 Degrees
Surface Fuel Load(t/ha):	10
Vegetation Height(m):	2
Vegetation Slope Type:	Level
Overall Fuel Load(t/ha):	13.2
	Only Applicable to Shrub/Scrub and Vesta
<u>Site Information</u>	
Site Slope:	0 Degrees
Elevation of Receiver(m):	Default
Site Slope Type:	Level
APZ/Separation(m):	12
<u>Fire Inputs</u>	
Veg./Flame Width(m):	100
Flame Temp(K):	1090
<u>Calculation Parameters</u>	
Flame Emissivity:	95
Heat of Combustion(kJ/kg)	18600
Moisture Factor:	5
Relative Humidity(%):	25
Ambient Temp(K):	308
FDI:	100
<u>Program Outputs</u>	
Level of Construction:	BAL 29
Radiant Heat(kW/m2):	25.57
Flame Length(m):	9.38
Rate Of Spread (km/h):	1.2
Transmissivity:	0.863
Fire Intensity(kW/m):	8184
Peak Elevation of Receiver(m):	4.32
Flame Angle (degrees):	67
Maximum View Factor:	0.39
Inner Protection Area(m):	12
Outer Protection Area(m):	0

Appendix 5 – BCA Compliance Letter (Class 9 Buildings)



7 October 2020

Attn: David Ham
Northern Metropolitan Cemeteries Land Manager
Cnr Delhi and Plassey Roads
North Ryde NSW

Attn: Alex Bloch-Jorgensen

Re: Frenchs Forest Bushland Cemetery, 1 Hakea Avenue, Frenchs Forest NSW 2086

Dear Alex,

MBC have been requested to provide confirmation that the following provisions of the National Construction Code 2019 Amendment 1 are applicable to the proposed development:

- BCA Class 9b is applicable to the development
- BCA Clause D1.13 defines the area per person of the proposed building to be 1m² per person.

It is noted that the provisions National Construction Code 2019 Amendment 1 are required to be satisfied, this is not limited to the above listed items.

Regards,

A handwritten signature in black ink, appearing to read 'Joel Lewis', is positioned above the printed name.

Joel Lewis

A series of overlapping, light blue wavy lines that sweep across the bottom right portion of the page, creating a modern, fluid design element.

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