## Date 19/2/2020

The below additional supporting advice is provided for school alterations and additions to St James Primary School located at 30 Vista Parade, Kotara.

The specific vegetation in question is the arm of forest remnant located off the southeastern boundary of the site. A 5 metre wide concrete cycleway is located between the school and the arm of forest remnant. This distance of management was agreed with Mr Joshua Calandra during a site visit adjacent the school on 18/2/2020.

New South Wales Rural Fire Service (NSW RFS) highlight concerns in applying remnant provisions defined in Planning for Bushfire Protection 2006 to AS3959 2009 Method 2 detailed fire modelling calculations. The qualitative definition of forest remnant as defined in Planning for Bushfire Protection 2006 is detailed below:

"Remnant vegetation is a parcel of vegetation with a size of less than 1 Ha or a shape that provides a potential fire run directly toward buildings not exceeding 50m. These remnants are considered a low hazard and APZ setbacks and building construction standards for these will be the same as for rainforests. The effective slope is to be determined over the length of the remnant."

Design fires are detailed below for a fully developed fire using Planning for Bushfire Protection 2006 defined forest fuel loads of 20 tonnes per hectare surface fuel load, 25 tonnes per hectare overall fuel load.

## Design Fire Arm of Forest Remnant burning Northeast to Southwest – Adjacent Burn

A fire could not evolve within this bushland to have a 100-metre wide headfire. The real head width would be smaller and produce less radiant heat exposure than that described Planning for Bush Fire Protection (2006) or AS3959 (2009) design fires.

The fire will still be an adjacent burning flank fire or narrow headfire which will reduce rate of spread and intensity as it burns out of the larger body of forest it is connected too.

A fire could evolve within this bushland to have a narrow head fire burning adjacent to the site. The most conservative measure of headfire width can be calculated using a 40 second residence time. Wotton et al. (2012) identified 37 seconds as an estimated residence time for the headfire, with this having been rounded up to 40 seconds. The rate of spread is 2.4 km/h for forest vegetation on level slope with a 40 second residence time yielding a 26.66 metre wide head fire (distance = speed x time).

A detailed fire model has been calculated with a 26.66 metre wide head fire width and modified McArthur flame length due to the potential for some crowning. The flame angle has been set at 90 degrees as the fire will be burning adjacent the school buildings rather than directly towards them. The convection centre of the fire will draw the fire vertically.

Dry Sclerophyll Forest Flame Length: 18.6 m Radiant Heat Flux: 9.72 kw/m2 (BAL 12.5) considering 5 metres of management on the concrete cycleway.

## Design Fire Arm of Forest Remnant burning Southeast to Northwest – Direct Burn

A fire could not evolve within this bushland to have a 100-metre wide headfire. The real head width would be smaller and produce less radiant heat exposure than that described Planning for Bush Fire Protection (2006) or AS3959 (2009) design fires.

Measuring the fire from a point ignition travelling directly towards the concrete cycleway a number of conservative assumptions are made. The currently mown grass revegetates to forest to form a 24 metre direct fire path. The fire will still be an accelerating or evolving fire and will not be in equilibrium state of energy release due to constricted headwidths.

The most conservative measure of fire run is 24 metres for a direct fire path excluding the concrete cycleway. The slope is deemed level.

The most conservative measure of fire run is 24 metres with a short fire run calculation having been made based on Martin Alexander's research of fire shape. This is considered reasonably conservative using NSW Rural Fire Service Community Resilience Fact Sheet Short Fire Run – Methodology for Assessing Bushfire Risk for Low Risk Vegetation.

Utilising Alexander's (1985) ellipse model the flame width for a fire burning directly towards the buildings will be 8.78 metres.

Alexander's ellipse model does not differentiate the width of the ellipse with differing fuel loads or fuel structures. The flame width input has however been utilised to model the detailed fire models for the differing vegetation structures.

It is considered highly unlikely there will be crowning within the vegetation, however McArthur modelled flame height is retained due to the connection to the larger body of forest. Project vesta flame lengths would be 13.14 metres for a 1.4 metre high elevated fuel layer. This provides significant redundancy for the McArthur flame length of 18.6 metres.

Inputs		
Fire Run Distance	24	metres
FDI	100	
Veg Slope	0	deg
Surface Fuel Load	20	tph
Overall Fuel Load	25	tph

Short Fire Run Calculations are shown below:

Wind Speed	30	kph
Elevated Fuel Height	1.4	metres
Outputs		
ROS	2400.00	metres per hour
Length/Breadth Ratio	2.82	
Headfire/Backfire spread	29.85	metres per hour
Full Ellipse Length	80.39	This should be less than the fire run distance
Full Spread	2480.39	
Full Spread divided by LBR	878.49	
ROS	40.00	metres per minute
Duration to travel Fire Run	0.60	minutes
ROS	2.40	kph
Length/Breadth using ROS	2.82	kph
Headfire/Backfire spread ratio	29.85	
_	41.34	metres per minute
Total Ellipse Length	24.80	metres
Head Width	8.78	metres

Dry Sclerophyll Forest

Flame Length: 18.6 m

Radiant Heat Flux: 4.7 kw/m2 (BAL 12.5) considering 4 metres of management on the concrete cycleway.

The eastern forest remnant will yield a radiant heat flux of less than 10 kw/m2. If you require any further information to support the above design fires, do not hesitate to contact me.

**Yours Sincerely** 

Phillip Couch GIFireE MA FireInvestigation B Info Science Grad Dip Design for Bushfire Prone Areas FPAA BPAD – Level 3 Accreditation Number BPD-PA-16132 Director Newcastle Bushfire Consulting Phone 0423923284





## NBC Bushfire Attack Assessment Report V3.0

AS3959 (2009) Appendix B - Detailed Method 2 Print Date:

19/02/2020 Assessment Date:

19/02/2020

Site Street Address:	50 Vista Parade, Kotara		
Assessor:	Phillip Couch; Newcastle Bushfire Consulting		
Local Government Area:	Newcastle	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 Elame Angle: Tan et al., 2005			

Run Description:	Southeastern Forest Adjace	ent Burn		
Vegetation Informatio	on			
Vegetation Type:	Forest	Vegetation Group:	Forest	and Woodland
Vegetation Slope:	0 Degrees	Vegetation Slope Type:	Downs	lope
Surface Fuel Load(t/ha)	: 20	Overall Fuel Load(t/ha):	25	
Vegetation Height(m):	2	Only Applicable to Shrub	/Scrub a	and Vesta
Site Information				
Site Slope:	0 Degrees	Site Slope Type:	Downs	slope
Elevation of Receiver(m	n): 2	APZ/Separation(m):	27	
Fire Inputs				
Veg./Flame Width(m):	26.66	Flame Temp(K)	1090	
<b>Calculation Paramete</b>	<u>rs</u>			
Flame Emissivity:	95	Relative Humidity(%):	25	
Heat of Combustion(kJ/	<b>kg</b> 18600	Ambient Temp(K):	308	
Moisture Factor:	5	FDI:	100	
Program Outputs				
Category of Attack:	Category of Attack: LOW Peak Elevation of Receiver(m): 9.3			9.3
Level of Construction:	BAL 12.5	Fire Intensity(kW/m):		31000
Radiant Heat(kW/m2):	9.72	Flame Angle (degrees):		90
Flame Length(m):	18.6	Maximum View Factor:		0.157
Rate Of Spread (km/h):	2.4	Inner Protection Area(m	ı):	27
Transmissivity:	0.812	Outer Protection Area(n	n):	0

Run Description:	Southeastern Forest Direct	Burn		
Vegetation Information				
Vegetation Type:	Forest	Vegetation Group:	Forest	and Woodland
Vegetation Slope:	0 Degrees	Vegetation Slope Type:	Downs	slope
Surface Fuel Load(t/ha)	: 20	Overall Fuel Load(t/ha):	25	
Vegetation Height(m):	2	Only Applicable to Shrub	/Scrub a	and Vesta
Site Information				
Site Slope:	0 Degrees	Site Slope Type:	Downs	slope
Elevation of Receiver(n	n): 2	APZ/Separation(m):	27	
Fire Inputs				
Veg./Flame Width(m):	8.78	Flame Temp(K)	1090	
Calculation Paramete	rs			
Flame Emissivity:	95	Relative Humidity(%):	25	
Heat of Combustion(kJ/	<b>kg</b> 18600	Ambient Temp(K):	308	
Moisture Factor:	5	FDI:	100	
Program Outputs				
Category of Attack:	LOW	Peak Elevation of Receiv	ver(m):	7.52
Level of Construction:	BAL 12.5	Fire Intensity(kW/m):		31000
Radiant Heat(kW/m2):	4.7	Flame Angle (degrees):		49
Flame Length(m):	18.6	Maximum View Factor:		0.075
Rate Of Spread (km/h):	2.4	Inner Protection Area(m	):	27
Transmissivity:	0.828	Outer Protection Area(m	ו):	0