21st August 2019

WINCREST GROUP PTY LTD
Att: Lynn Li
Shop 4 Ground Floor
115 Sailors Bay Road
NORTHBRIDGE NSW 2063

P: 02 8380 8239
Em: lynnl@wincrest.com.au

Our Reference: WGPL30719
Your Reference:

Subject: AS3959 Bushfire Attack Level Risk Assessment (Detailed) for Proposed Residential Building Development within Lot 4 DP27703 (No.30) Owen Stanley Avenue Beacon Hill 2100

Post Office Box 1727
Queanbeyan NSW 2620

Post Office Box 334
Narooma NSW 2546

Mob: 0428 296 526
Ph: 02 6100 3143

Bushfire Protection Planning & Assessment Services Pty Ltd

www.bushfireconsultants.com.au

ABN. 29 155 412 981 **ACN. 155 412 981**

Member of the Australian Bushfire Assessment Consultants Group

Dear Lynn,

As per your email instruction (dated 3/07/19) to undertake a Bushfire Attack Level (BAL) assessment for a proposed residential building development within Lot 4 DP27703 (No.30) Owen Stanley Avenue Beacon Hill, the following advice is provided.

The BAL assessment has been reasonably undertaken in accordance with Australian Standard 3959 (Building in bushfire prone areas) Simplified & Detailed procedures as considered appropriate.

Predicated upon the Asset Protection Zone (APZ) areas identified / considered by this assessment, the relief and extent of scrub vegetation and residential allotments / subdivision development adjacent to the subject property are considered reasonably adequate for the purposes of APZ compliance using View Factor (detailed) modelling.

Notwithstanding the above, the Consent Authority may have a different opinion in this regard which may alter the outcome of this assessment.

Please feel free to contact me and discuss any of the attached advice.

Sincerely

Matt Jones
BAppSc Environmental Health
Grad. Dip Design for Bushfire Prone Areas
BPAD-L3-14598 Accredited Practitioner
Bushfire Protection Planning & Assessment Services Pty. Ltd

AS3959 BUSHFIRE ATTACK LEVEL (BAL) SIMPLIFIED & DETAILED ASSESSMENT REPORT

Lot & DP of Subject Property:	Lot 4 DP27703
Address of Subject Property:	No.30 Owen Stanley Avenue Beacon Hill 2100 (Northern Beaches LGA)
Allotment Area & Zoning:	620sqm Zoned R2 – Low Density Residential
Proposed Development:	Removal and replacement of existing residential structure with a two storey residential building (Class 1a) – total building foot-print of ≈160m^2.
Standards / Guidelines:	AS3959 Construction of Buildings in Bushfire-Prone Areas, herein '*AS3959* '.
Plans / Advice Reviewed:	Attached Appendices 1 – 8.

For the purpose of this assessment, it is specifically noted, understood or assumed that:

1. The proposed development will be setback within the subject property by ≈7m from the southern boundary or frontage to Owen Stanley Avenue.
2. The southern elevation or front of the structure (including facias, awnings, verandah overhang and attachments) will not exceed 8.5m above finished ground level at its maximum height.
3. The primary (and only) bushfire vegetation or hazard likely to persist within direct vicinity of the subject property is located to the SW-SE within an adjacent area of Council Reserve land - Lot 7313 DP1133205 (Allenby Park - Zoned RE1), opposite side of Owen Stanley Avenue.
4. Own Stanley Avenue is a fully formed and maintained public roadway, which affords at 18m separation between the subject property and the current edge of the identified bushfire hazard within Allenby Park.
5. The primary hazard is somewhat fragmented and constrained in area directly adjacent to the subject property by virtue of an existing town water reservoir tank and associated cleared operational land within Lot 1 DP564490, also being a Council Managed Reserve.
6. Given the discontinuous area of the primary hazard, the maximum potential width of a fully developed fire front that may directly impact upon the subject property would not reasonably exceed 50m, and more likely <25m wide at the hazard interface.

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7. Further influencing a reduced intensity and size of a fire front which may impact upon the subject property, the primary hazard at the interface of Allenby Park to Owen Stanley Avenue is generally of lower (<4m high) scrub vegetation only on flatter and occasional sandstone outcrops nearer the top of the slope (above the 105m contour interval).
8. The subject property forms part of the existing Owen Stanley Avenue, Ethie Road & Goroka Place residential precinct, with all neighbouring residential allotments being zoned R2 Low Density Residential.
9. The residential precinct of Owen Stanley Avenue, Ethie Road & Goroka Place is entirely developed for residential building / living purposes, associated managed land and public roadway areas.
10. At least 3 existing street hydrant connection points are located within vicinity (<90m) of the subject property, with one hydrant point located directly adjacent to the subject property and easily within 60m or less of the furthest most point of the proposed development site.

Date of Assessment:	21st August 2019.
BAL Assessment Procedure:	Simplified (Method 1) & Detailed (Method 2)[1] as per Appendix B of AS3959. Detailed calculations or View Factor (VF) modelling have been derived courtesy of Bushfire Attack Level calculator (BALc) – Method 2 (as shown Appendix 8).
Fire Runs:	All potential fire runs are taken over a transect length considered to represent the reasonable gradient and extent of the vegetation hazard which will most significantly influence the fire behaviour directly impacting upon the proposed development site. Five indicative transects identified A1, A2, B, C & D are as denoted Appendix 7.
Fire Front / Flame Width:	Fire Runs A1 & A2 are assessed a two different 'design fire' widths to represent the descending width of a fire front as it moves directly towards the subject property between the town water reservoir tank within Lot 1 DP564490 and Owen Stanley Ave. All other fire front / flame widths are assumed accordance with default VF modelling or simplified assessment parameter (**100m**) which reasonably overestimates the potential fire threat in this regard.
Relevant FDI:	**100** (Greater Sydney), as per Table 2.1 of AS3959.
Effective Slope:	As denoted Appendix 7.

[1] *VF modelling using specific slope, elevation of receiver height & fuel load / height limits, see Appendix 8 of this report.*

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The effective slope to the subject property does not significantly exceed 15.5° over the length of transects considered by this report, and more reasonably **5-10°** only if considering the interfacing vegetation only above the 105m contour interval.

This assessment acknowledges that the effective slope to the subject property becomes steeper than 15.5° further to the SW and below the 95m contour interval. However, given the distance (>90m) between this steeper transition and the proposed development site, this area of steeper slope is NOT considered a gradient within the hazard (vegetation) which will most significantly influence the fire behaviour to directly impact upon the proposed development site.

Site Slope:

As denoted Appendix 7.

For the purpose of a detailed VF assessment for direct fire impact, the site slope to the SW of the subject property is estimated to be **6° downslope**.

Elevation of receiver:

For the purpose of the detailed VF assessment, **≤8.5m** to the front / south elevation - based on the maximum height above finished ground.

Flame Angle:

All flame angles calculated in accordance with default VF modelling parameters.

Classified Vegetation Type:

The bushfire hazard is identified as partly **FOREST** with a transitional area of low **SCRUB** at the interface to Owen Stanley Avenue (or above the 105m contour interval).

For the purpose of detailed VF modelling, the forest bushfire hazard is specifically identified as COATSAL SANDSTONE GULLY FOREST (Sydney Dry Sclerophyll Forest) by current BioNet vegetation mapping for the Sydney Region. In this regard, the specific fuel load parameters as outlined by the NSW Rural Fire Service Comprehensive Vegetation Fuel Loads (March 2019) include;

- Elevated & Surface Fuel: 21.3 t/ha, &
- Overall Fuel Load: 27.3 t/ha

For the purpose of both detailed VF modelling and Simplified Assessment, the scrub bushfire hazard is specifically identified as COATSAL SANDSTONE HEATH-MALLEE (Tall Heath) by current BioNet vegetation mapping for the Sydney Region. In this regard, the specific fuel load parameters as outlined by the NSW Rural Fire Service Comprehensive Vegetation Fuel Loads (March 2019) include;

- Elevated & Surface Fuel: 36.9 t/ha, &
- Overall Fuel Load: 36.9 t/ha

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Site Distance to Vegetation, Effective / Site Slope & BAL (Subject Exposures):

	Distance (m)	Vegetation *Location / Direction*	Effective Slope	Site Slope	BAL *(RHF)*
Detailed Assessment (VF) for Direct Impact from SW, Forest – 100m wide Design Fire (See Appendix 8)	≥53m	FOREST *Lot 7313 DP1133205 / SW - Fire Run (A1)*	15.5°	6°	29 (*23kW/m²*)
Detailed Assessment (VF) for Direct Impact from SW, Forest – 50m wide Design Fire (See Appendix 8)	≥53m	FOREST *Lot 7313 DP1133205 / SW - Fire Run (A1)*	15.5°	6°	19 (*17kW/m²*)
Detailed Assessment (VF) for Direct Impact from SW, Scrub – 100m wide Design Fire (See Appendix 8)	≥32m	SCRUB (Tall Heath) *Lot 7313 DP1133205 & Lot 1 DP564490 / SW - Fire Run (A2)*	9°	6°	19 (*17kW/m²*)
Detailed Assessment (VF) for Direct Impact from SW, Scrub – 50m wide Design Fire (See Appendix 8)	≥32m	SCRUB (Tall Heath) *Lot 7313 DP1133205 & Lot 1 DP564490 / SW - Fire Run (A2)*	9°	6°	12.5 (*9kW/m²*)
Simplified Assessment for Direct Impact from S-ESE, (See Appendix 9)	≥22m	SCRUB (Tall Heath) *Lot 7313 DP1133205 & Lot 1 DP564490 / S - Fire Run (B)*	10-15°	-	29
	≥26m	SCRUB (Tall Heath) *Lot 7313 DP1133205 & Lot 1 DP564490 / SE - Fire Run (C)*	10-15°	-	29
	>41m	SCRUB (Tall Heath) *Lot 7313 DP1133205 & Lot 1 DP564490 / ESE - Fire Run (D)*	0-5°	-	12.5

Determined Highest BAL:

Predicated upon the proposed development being ≈7m from the front / south boundary of the allotment and the ongoing management of interfacing vegetation to Owen Stanley Avenue, BAL-29 is reasonably concluded as per both Method 1 & Method 2 (Appendix B) of AS3959.

Other Estimate / Recommended BAL:

Excluding the southern (front), western and part of the eastern side elevations and entire roof area of the proposed development, BAL-19 would be technically permissible on the sections of the proposed development where reasonably shielded away from the primary hazard to the SW-SE, as per Clause 3.5 of AS3959. Recommended BAL requirements to specific elevations / sections is as otherwise denoted Appendix 8.

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Notwithstanding the above, it is acknowledged that the calculations and modelling presented rely on professional judgement and discretion for interpreting the spatial data considered. The determined BAL outcome in this regard is performance based. In this regard and given a more conservative suggestion that this performance-based assessment may have underestimated calculated values and assumptions, it is otherwise be recommended that the proposed development be designed and constructed one BAL (i.e. BAL-40 / 29) higher than determined by this report.

The above BAL assessment has been prepared by:

Matt Jones
BAppSc Environmental Health
Grad. Dip Design for Bushfire Prone Areas
BPAD-L3-14598 Accredited Practitioner

(I hereby certify that I have undertaken the assessment of the above site and determined the Bushfire Attack Level stated above in accordance with the requirements of AS3959 and/or NSW Planning for Bushfire Protection Guidelines 2006 as applicable)

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BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Appendix 1 – Aerial Photo / Boundary Overlay Lot 4 DP27703

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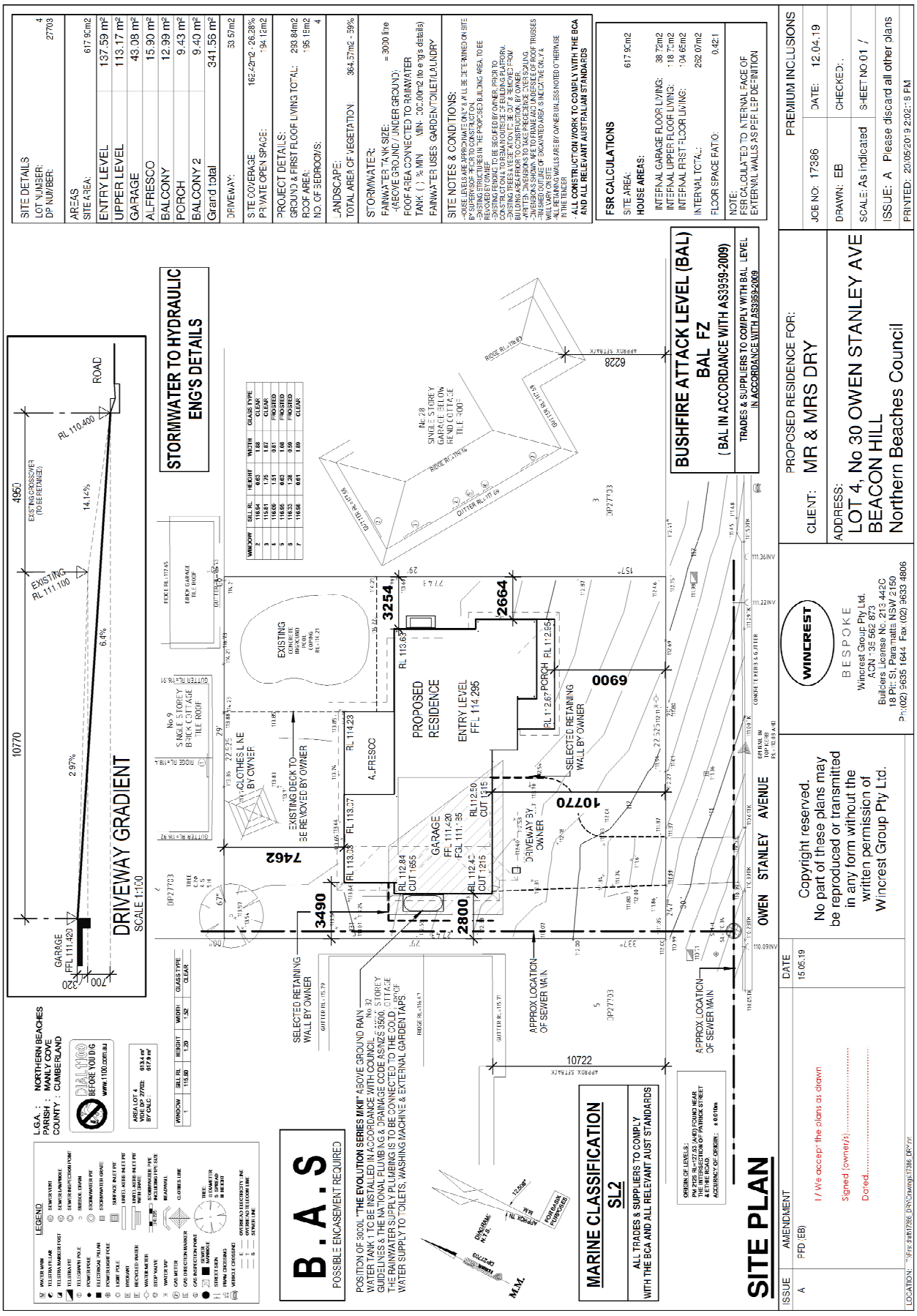
Appendix 2 – Proposed Development – Siting



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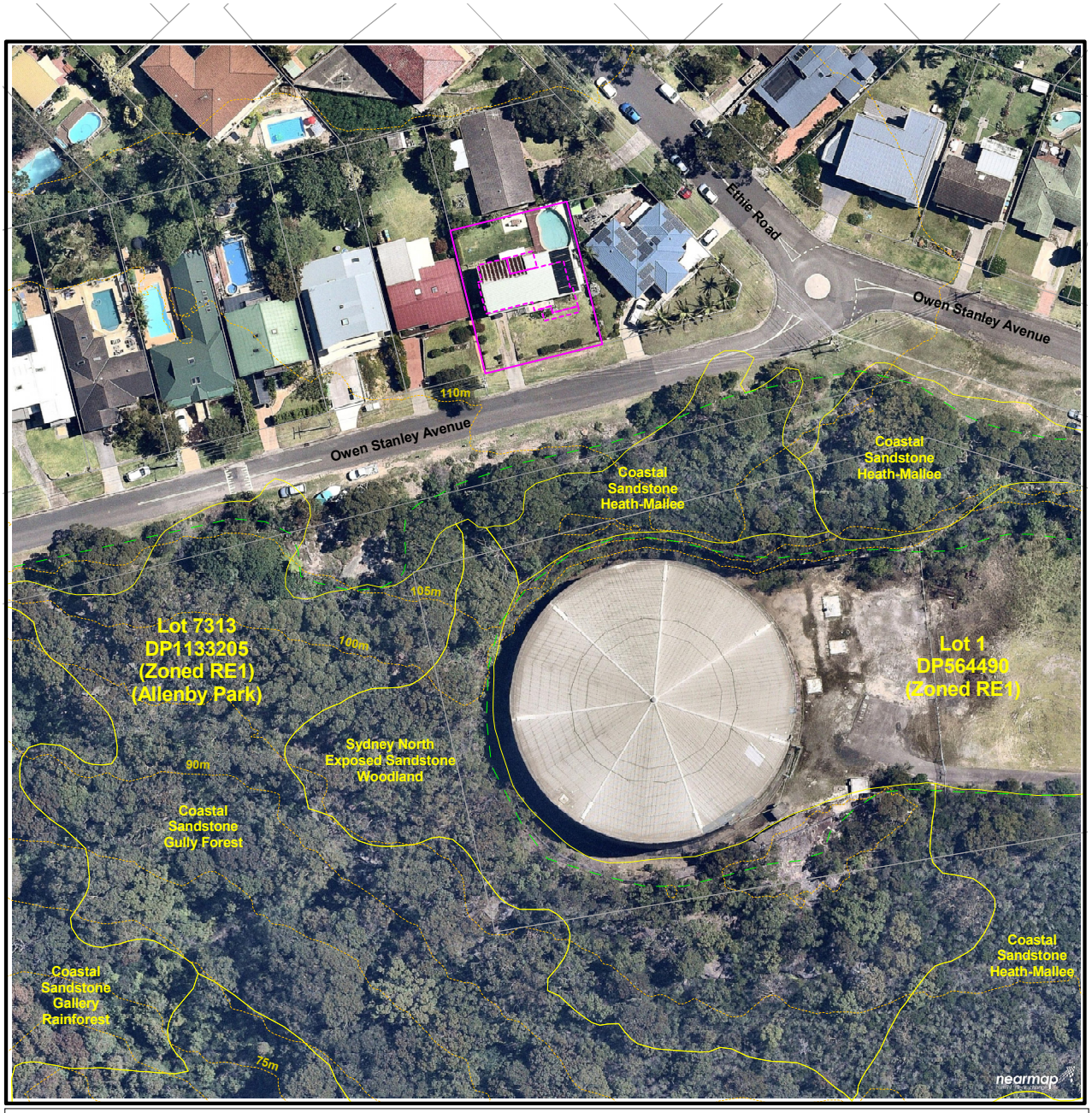
Appendix 3 – Detailed Aerial Photo / Boundary Overlay Lot 4 DP27703



Map 1 - 6/08/19

Study Area

Lot 4 DP27703

Proposed Development

Estimated Edge of Hazard

Biometric Mapping

Contour Interval (LiDAR Analysis)

5m

25 0 25 50 75 Metres

Aerial Photo Courtesy: https://www.nearmap.com/au

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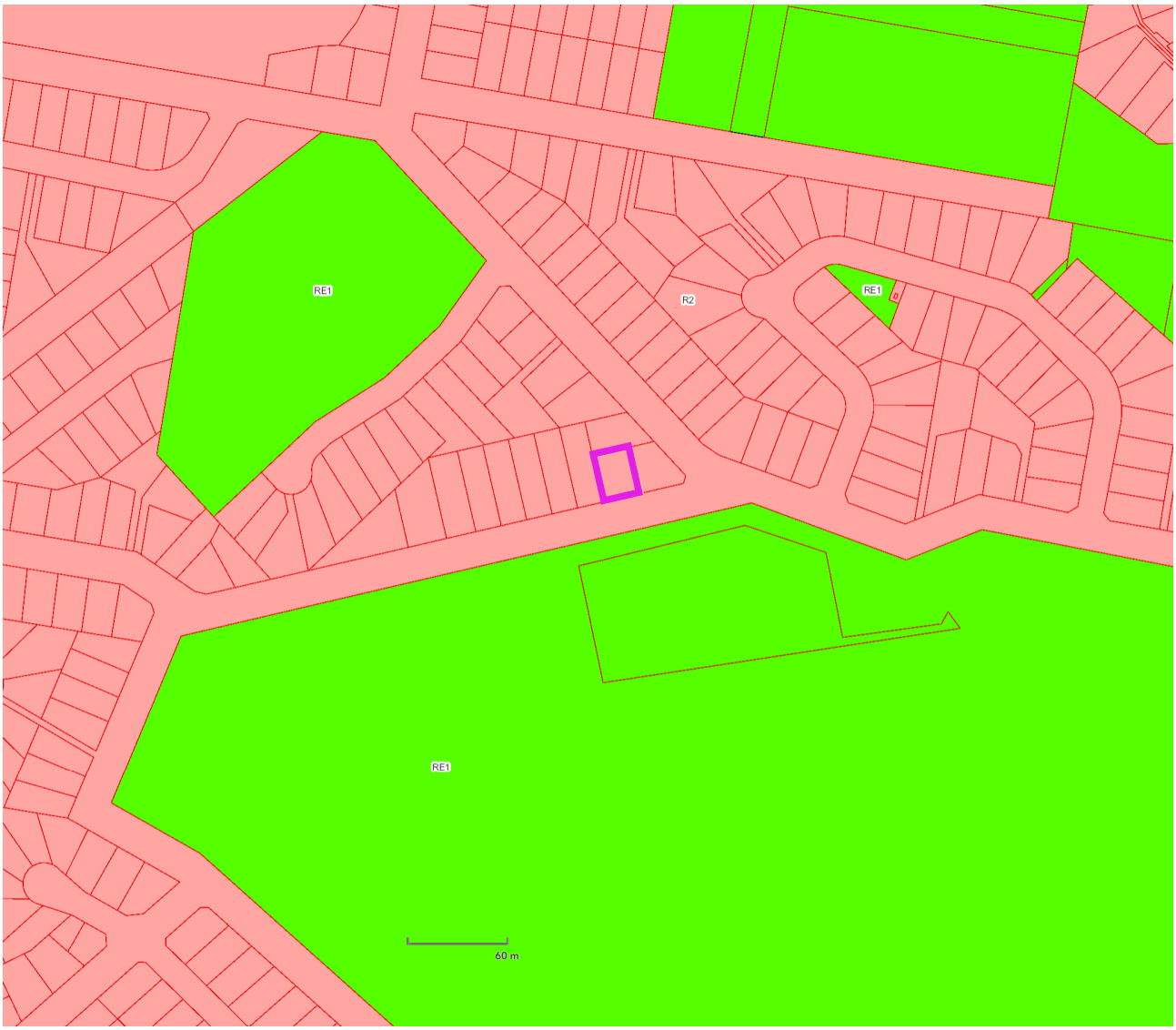
Appendix 4 – Land Zoning



Courtesy: https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/lot

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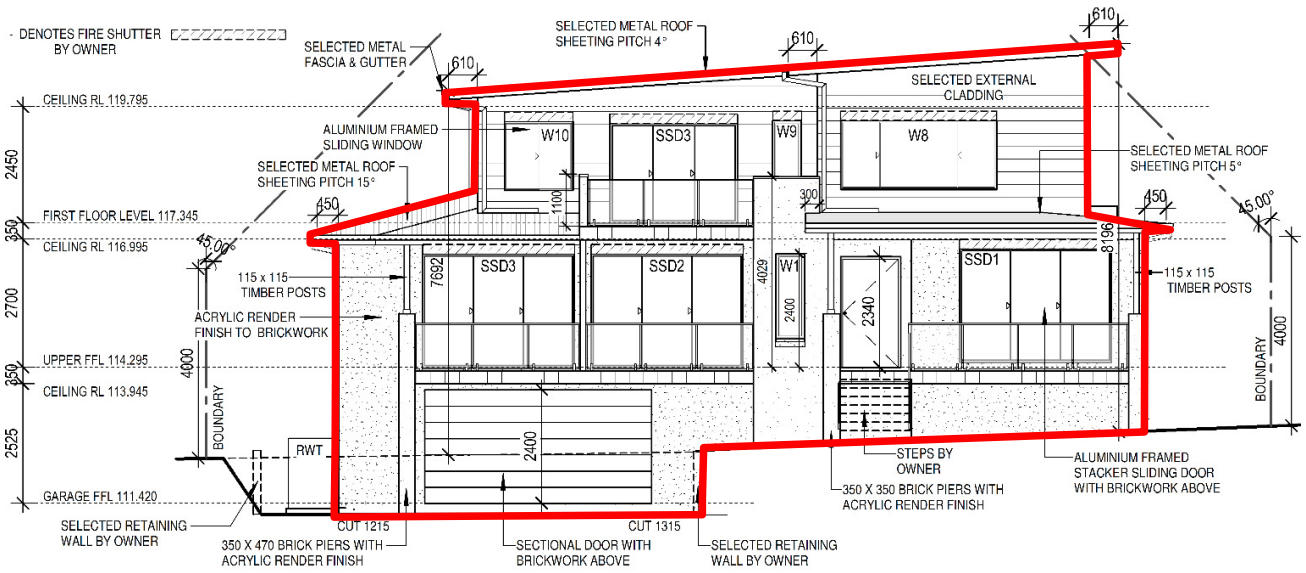
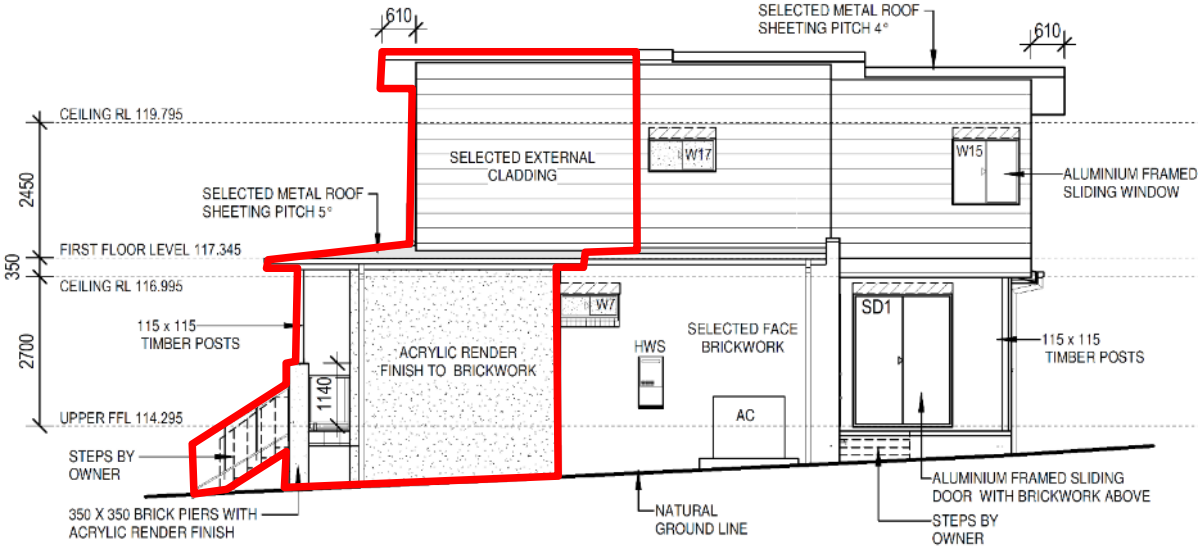
Appendix 5 – Proposed Elevations / Heights & Recommended BAL



South (Front) Elevation



East (Side) Elevation

BAL-29 Minimum Required

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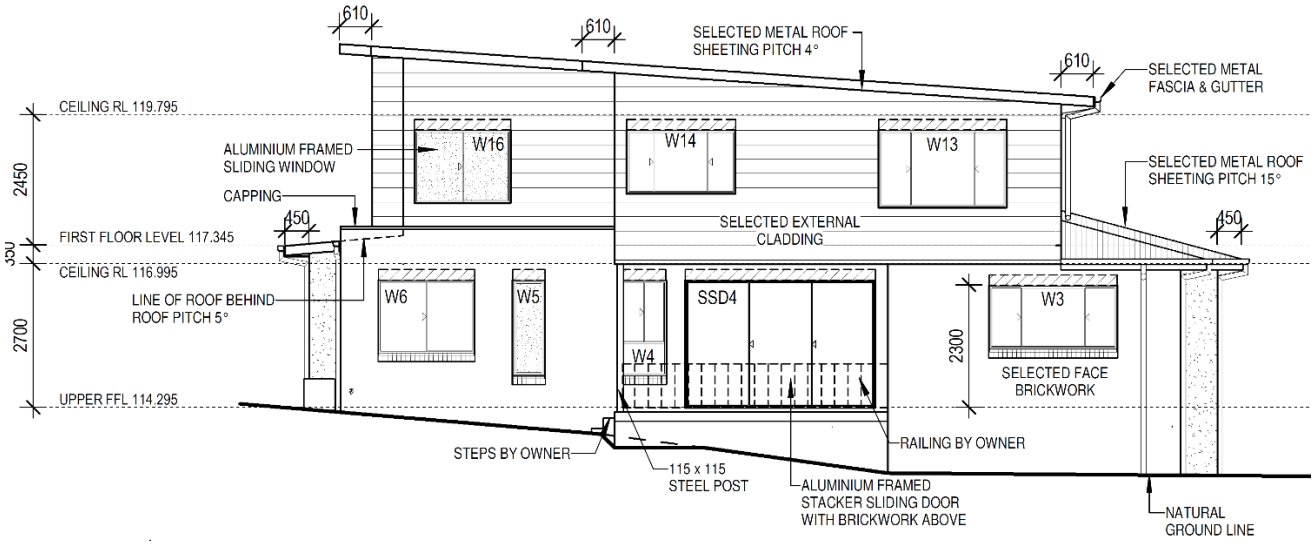
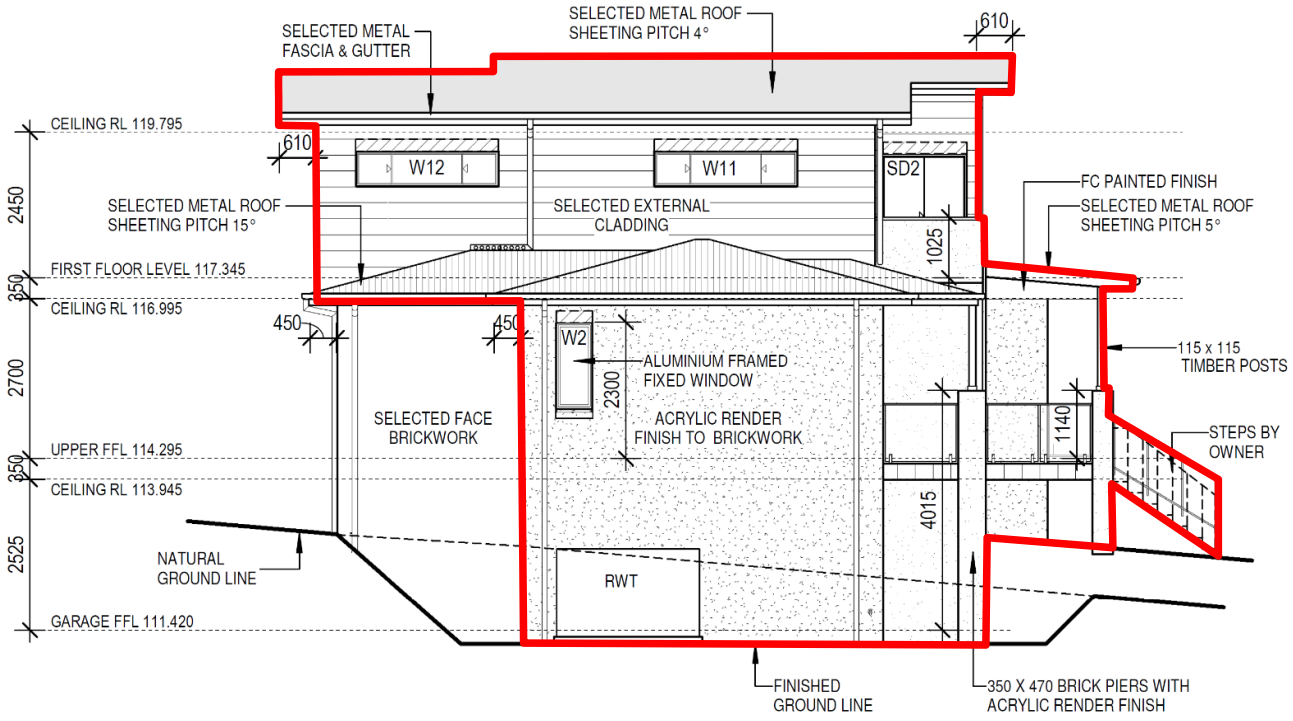
Appendix 6 – Proposed Elevations / Heights & Recommended BAL



North (Rear) Elevation



West (Side) Elevation

BAL-29 Minimum Required

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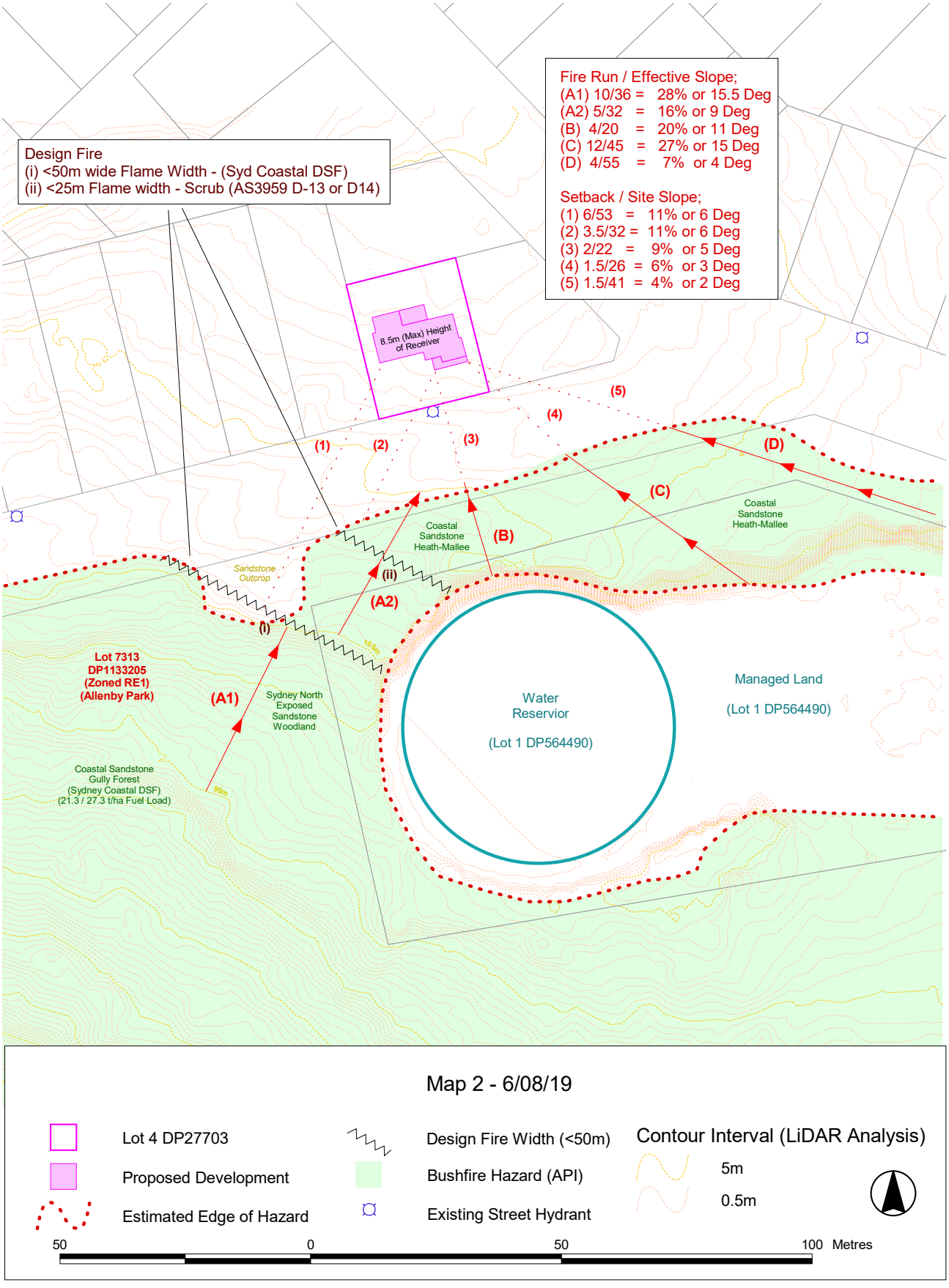
Appendix 7 – Detailed Slope / Site Analysis / Design Fire Runs



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Appendix 8 – Bushfire Attack Level Calculation (Detailed Assessment – Run A1 & A2)

Calculated August 21, 2019, 1:22 pm (BALc v.4.8)

Fire Run A1 - Lot 4 DP27703 (No.30) Owen Stanley Avenue Beacon Hill

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	7.44 km/h
Vegetation classification	Forest	Flame length	51.68 m
Surface fuel load	21.3 t/ha	Flame angle	55 °
Overall fuel load	27.3 t/ha	Panel height	42.34 m
Vegetation height	n/a	Elevation of receiver	8.5 m (user defined value)
Effective slope	15.5 °	Fire intensity	105,053 kW/m
Site slope	6 °	Transmissivity	0.787
Distance to vegetation	53 m	Viewfactor	0.3896
Flame width	100 m	Radiant heat flux	23.33 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-29
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated August 21, 2019, 1:24 pm (BALc v.4.8)

Fire Run A1 - Lot 4 DP27703 (No.30) Owen Stanley Avenue Beacon Hill

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	7.44 km/h
Vegetation classification	Forest	Flame length	51.68 m
Surface fuel load	21.3 t/ha	Flame angle	48 °
Overall fuel load	27.3 t/ha	Panel height	38.41 m
Vegetation height	n/a	Elevation of receiver	8.5 m (user defined value)
Effective slope	15.5 °	Fire intensity	105,053 kW/m
Site slope	6 °	Transmissivity	0.792
Distance to vegetation	53 m	Viewfactor	0.2883
Flame width	50 m	Radiant heat flux	17.37 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-19
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated August 21, 2019, 12:46 pm (BALc v.4.8)

Fire Run A2 - Lot 4 DP27703 (No.30) Owen Stanley Avenue Beacon Hill

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	9.050000000000001 km/h
Vegetation classification	Scrub	Flame length	19.87 m
Surface fuel load	36.9 t/ha	Flame angle	76 °
Overall fuel load	36.9 t/ha	Panel height	19.28 m
Vegetation height	4 m	Elevation of receiver	8.5 m (user defined value)
Effective slope	9 °	Fire intensity	172,647 kW/m
Site slope	6 °	Transmissivity	0.805
Distance to vegetation	32 m	Viewfactor	0.2811
Flame width	100 m	Radiant heat flux	17.22 kW/m²
Windspeed	45 km/h	Bushfire Attack Level	BAL-19
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Catchpole et al. 1998

Flame length - Byram, 1959

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated August 21, 2019, 12:50 pm (BALc v.4.8)

Fire Run A2 - Lot 4 DP27703 (No.30) Owen Stanley Avenue Beacon Hill

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	9.050000000000001 km/h
Vegetation classification	Scrub	Flame length	19.87 m
Surface fuel load	36.9 t/ha	Flame angle	67 °
Overall fuel load	36.9 t/ha	Panel height	18.29 m
Vegetation height	4 m	Elevation of receiver	8.5 m (user defined value)
Effective slope	9 °	Fire intensity	172,647 kW/m
Site slope	6 °	Transmissivity	0.8090000000000001
Distance to vegetation	32 m	Viewfactor	0.1453
Flame width	25 m	Radiant heat flux	8.94 kW/m²
Windspeed	45 km/h	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Catchpole et al. 1998

Flame length - Byram, 1959

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005